Corvinus University of Budapest

Doctoral School of Management and Business Administration

# Value creation of the automotive manufacturing industry in Hungary within global value chains

## Analyzing key suppliers

Ph.D. Thesis

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## 1. Introduction

Today's globalization enables international fragmentation and sharing of production. By connecting companies, employees and consumers, global value chains (GVCs) influence the structure of international trade with effects on countries' GDP levels, employment and ultimately on the global economy. With the integration in value chains, companies are able to be involved in international trade. Enterprises have the possibility to enter and also upgrade their position within GVCs, leading to a deeper integration into global trade. However, participation in GVCs also has a number of complex requirements for companies and countries as well, including the need to invest in infrastructure, institutions, services, labor, and the general trading and business environment. For many developing countries, this integration process is an important lever for intensive development. We can also name some specific features that allow economies to step up their activities within a GVC, such as cheap labor, proximity to end markets, or signed trade agreements.

There is a general trend observable in the operation of today's global economy: there has been a systematic shift from the traditional multinational business model to a more dynamic one, in which ownership and control are separated. It is the result of growing pressure for cost efficiency, organizational flexibility and agility to attain resources and reach consumers in different markets (Beleska-Spasova, 2016). With regard to production activity, there has been a significant relocation tendency from industrialized developed countries to developing countries since the 1990s (Baldwin et al., 2014). By opening up to new and higher value markets, participation in the global value chain – especially for developing countries – offers multiple technological innovations and the ability to add more value to industrial production, improve labor demand and productivity, and that increase income consequently. Governing and upgrading within or between GVCs can improve the development and competitiveness of economies (Bamber et al., 2013). However, the improvement of own capabilities is a complex prerequisite for using this opportunity to foster structural economic growth. The GVC analysis includes the impacts of these new patterns of international trade and production (Gereffi, 2016).

The purpose of my thesis includes the analysis how the automotive manufacturing companies, with focus on suppliers, being active in Hungary operate in global value chains. Although the topic of GVC is widespread and discussed in international literature, there is a gap in relation to the Hungarian automotive manufacturing industry, especially in this situation when the COVID-19 pandemic effect the operation of the multinational enterprises (MNEs).

The main identified research question is the following:

***What is the value creation of the automotive manufacturing industry in Hungary within global value chains?***

On one hand, I chose the automotive manufacturing industry as a field of research because of the fact that it is one of the leading sectors in Hungary ("The role of vehicle production is the most significant in the Hungarian manufacturing industry. In 2019, it produced 29% of the manufacturing output." KSH, 2019a). On the other hand, the automotive manufacturing industry is one of the most advanced industries in the world, one of the strongest competitive, global and mature industries (Gelei, 2006), from which most of the most modern solutions, technologies and concepts originate. Being a network industry, the automotive industry is a good example of many features of B2B (business-to-business) transactions, especially the role of business relationships and networks. There are many related industries to the automotive manufacturing, including the transfer of knowledge and technology (Magyar – Hlédik, 2018).

In this thesis I also include the following subtopics based on an extensive literature review and field research with specialists from the industry:

- Main characteristics of the key automotive suppliers, who are active in Hungary including global value chain participation;
- Effects of future trends (electromobility, automatization, robotization, sharing economy, etc.) on these companies' operation within global value chains;
- Role of the COVID-19 pandemic in the operation processes of automotive producers.

The first main part of this thesis provides a comprehensive theoretical background of global value chains in general, including their *key features, functions, types and upgrading opportunities*. After introducing the so called 'GVC-framework' including the theory of the **'Smile curve'**, I describe the development path of the FDI inflow to Hungary from the 1990s including the **near-shoring phenomenon** with focus on the automotive industry and its connection to global value chains. I also introduce in detail the main features and the key players in the automotive manufacturing industry in the country, including the 5 main original equipment manufacturers (OEMs) and their key suppliers. Based on my research, I also describe the automotive manufacturers' main reactions to the future trends which are specific in the industry and also to the COVID-19 pandemic in terms of their daily operation. As a closing remark, I mention some predictions about the future trends of the industry in general and its relations to Hungary.

Following the comprehensive literature review I formulated two hypotheses in relation to the value creation of the Hungarian automotive manufacture companies in Hungary.

My **first hypothesis** is about the 'Smile curve': the theory of the curve is also valid in case of the Hungarian automotive manufacturing industry, because typically low value-added production processes take place in the country. To be able to accept or reject this hypotheses, I conducted an online survey and sent it out to the key automotive – basically TIER 1 – suppliers being active in the country and received 22 answers.

My **second hypothesis** is about the near-shoring activity in Hungary: in addition to the central location, the cheap and skilled Hungarian labor was the most important factor in the near-shoring activities of multinational companies expanding to Hungary. To test this statement, I conducted 3 in-depth interviews with experts from the industry, from TIER 1 companies of different size.

The main findings of the research are as follows: I reject the first hypothesis, because in case of the Hungarian automotive manufacturing industry the theory of the 'Smile-curve' is not entirely valid. Despite the large-scale production activity in Hungary, which has a fundamentally low added value, also significant added value is produced in the country due to the research and development activities of bigger TIER1 suppliers. I accept the second hypothesis, because according to my interviewees for their foreign owned companies the cheap and skilled workforce was the primary consideration in selecting the location (Hungary) to invest. This thesis contributes to the global value chain literature in a number of ways presenting the main characteristics of the global value chains in Hungary in the automotive industry – focusing on the supplier side – and concentrating on global and local changes occurred in the recent decades, from the moment when foreign direct investment (FDI) of automotive manufacturers appeared in the country until the appearance and spreading of new technologies, like electric cars and autonomous vehicles. It also contains the main challenges that automotive companies have faced in 2020 and 2021 when the COVID-19 pandemic has spread in the world and entire economies came to a standstill overnight virtually, and both supply and demand collapsed. The results of this research could be of great help to companies and policymakers answering questions about possible development paths and could provide some ideas for measures that are necessary for an effective and beneficial participation in GVCs in the automotive manufacturing industry. Furthermore, with this comprehensive analysis of business activities of the key suppliers in the automotive industry in Hungary, the related companies can take steps to create competitive advantage, improve efficiency, and also increase profit margins.

## 2. Research conception

In this thesis I follow the conception of Maxwell (2004), which suggests that the following five tasks should be taken into consideration during research planning:

1. Goals,
2. Conceptual framework,
3. Research questions,
4. Methods,
5. Validity.

### 2.1 Goals

According to Maxwell (2004), the goals of a research should contain the reasons of the study, the issues to be clarified, the policies and practices to be influenced and the main reasons and takeaways of the study.

The goal of my study is to conduct a comprehensive analysis about the automotive companies' participation in the global value chains, who are present in Hungary focusing on the supplier side. One main reason of my study is that the automotive manufacturing industry is facing many technological innovations in the recent years, like electromobility, digitalization, autonomous cars, sharing economy, etc. These new trends will transform and already has transformed the basic operation of the OEM[1]s (in Hungary: Audi, BMW, Mercedes, Opel (member of PSA Group) and Suzuki) and of their suppliers and I am interested in the key changes of the supply chains and value chains, if there any already. Not just the new automotive trends, but COVID-19 also has affected the day-to-day operations of these companies: supply chains and value chains have been changed, factories were shut down for months and employees were fired.

The key result of the study should be a general overview about the value creation of these suppliers operating in Hungary and could be a great of help for the actors within the automotive industry, because they can get a comprehensive overview about what is happening in the industry nowadays. The key findings could be also useful for policy makers because they can see in the research results where exactly the value is generating within the global value chain.

[1] Original Equipment Manufacturer

## 2.2 Conceptual framework

Based on Maxwell's theory, the conceptual framework should include the theories, the prior research findings and the personal experiences, which lead the research towards.

In the first part of this thesis, after a comprehensive literature review about the theory of the global value chains and foreign direct investment in Hungary, I introduce the key facts about automotive manufacturing industry in the country, including my personal views. The conceptual framework of my research is based on the global value chain analysis framework by Gary Gereffi. This methodology is a systematic conception of the economic development containing the analysis of global industry structures, trends and national value chains, which are based on existing economic statistics, field research, interview with key suppliers of the international lead firms, intermediaries and institutional stakeholders (Gereffi, 2016).

The reason why the term GVC is often used in the literature is that many analysis focus on the exact location and process of the value generation in production and consumption.

The following questions arise often in relation to the GVC analysis:

- *Where are GVCs located and what are the reasons behind of them?*
- *Where and what kind of jobs are created in different parts and different locations (countries, cities) of the value chains?*
- *How does the share of tasks look like, who controls the management of GVCs, who is the lead and who is the executing firm, etc.?*
- *How do developing economies strive to be a part of GVCs and update the quality of their involvement?* (Low, 2016).

With the help of the GVC approach an industry's main activities, economic actors can be mapped by the researchers, where the flow of value-addition across economies in terms of production, distribution and consumption can also be followed. Companies are the primary actors within the value chains, therefore they have a central importance in the methodology. The analysis seeks the reasons of firm productivity in the international supply chains, examines the influences of private-sector governance and public polices on firms' performances, and identifies the strategies and factors, which enable companies to move into higher-value segments of the global value chains. Chain governance is central to GVC analysis, which contains the distribution of profits and risk within an industry (Gereffi, 2016).

To be able to upgrade in global value chains from using low-cost and unskilled labor to high-value activities and integrated manufacturing, the identification of conditions for developing and developed countries and firms is needed. Many of the highest value activities are in the pre- and post-production phase ('Smile curve': it will be described later in detail), which is a serious challenge for host countries, because they need to develop the required workforce strategies to be able to serve these services (Gereffi, 2016). The GVC analysis also identifies the constraints firms are facing (Cattaneo et al., 2010).

The most common constraints in GVC upgrading in the developing countries are the following:

- weaknesses in the productive capacity (e.g. labor, innovation systems, etc.);
- inappropriate infrastructure and services;
- restrictive investment and trade policy;
- inadequate business environment;
- problems and insufficiency in the institutionalization within industry (e.g. PPP).

After the prioritization of these obstacles, the next step is the stakeholder analysis. To drive the required changes, identification of the appropriate roles for the key actors is needed. Furthermore, strategies to support upgrading can include developing upstream or downstream industries to improve the cooperation with local companies, supporting the access to finance for SMEs, etc. (Gereffi, 2016).

The global value chain approach helps to understand companies' connections to the global economy, including the institutional context, trade policy, standards and regulations. The global value chain analysis focuses mainly on the organization, reorganization and coordination issues within an industry, furthermore on the power and governance within value chains (Humphrey – Schmitz, 2001).

The global value chain income calculation is a methodology for measuring the characteristics and extent of the increasing fragmentation of production processes. It can give more information about the competitiveness of the participating economies than the simple export data. However, it is important to note, that the trends in the global value chain income data as trends in the competitiveness should be interpreted carefully (Gurgul – Lach, 2016).

It is important to highlight that FDI is the basis of the operation of global value chains, therefore in addition to the GVC approach, I would like to underline some thoughts from the international literature, which also serve as a basis of my studies:

- FDI plays a key role in prospering productivity growth of an economy (ECB, 2009);
- the impacts of FDI on the productivity depend significantly both on the 'sender' and on the 'recipient' countries, industries and companies (e.g. in case the domestic companies lack sufficient capabilities to adopt technologies used by foreign firms, the potentially positive effects of FDI may fail (ECB, 2009); and
- level of human capital influences the impact of foreign direct investment (ECB, 2009).

These are the main reasons, why I also include the aspects of foreign direct investment in my analysis.

### 2.3 Research questions

The main identified research question in relation to the topic is the following:

***How does the value creation of the key suppliers of the 5 OEMs in Hungary look like within global value chains in the automotive manufacturing industry?***

To be able to deliver an answer to this research question my questions to be answered are the following:

1. Which factors do influence 'Hungarian' companies' participation in the global value chains in the automotive industry? Which are the supporting / hindering effects regarding
    a. workforce?
    b. business environment?
2. How does the upgrading path for Hungary over the last 3-5 years and for the next 3-5 years look like and the development of value-added part in the production processes over the last decade? What measures can be taken in general to improve this value-added share in the production in Hungary?
3. Which are the main effects of the presence of multinational automotive industries operating in Hungary
    a. on the employment?
    b. on the business environment?

4. What are the main competitive challenges the automotive industry is facing today with the expansion of electric and self-driving cars? How do these new trends effect the operations of the automotive manufacturer companies and its suppliers, and what are the effects of the sharing economy (e.g. role of car sharing companies)?
5. How does near-shoring appear in the companies' operation (during settlement in Hungary)?
6. What are the effects of the COVID-19 pandemic on the operating processes?

### 2.4 Methods

During the research process, I applied both *quantitative* and *qualitative* research methods.

Part I.: The quantitative research method

Using one of the highly structured methods, I prepared an online survey with 24 questions (please find the questions in the *Appendix 3*).

With the help of the survey, I strived to confirm hypothesis about more phenomena, including my first hypothesis about the relevance of the 'Smile-curve' in the Hungarian automotive manufacturing industry. My questions were closed-ended and the design of the study was stable during the whole process. It is also characteristic to such surveys that the responses of the participants do not affect the researchers' next questions.

Key topics of the questionnaire were the following: general personal data (name, company and position), company size, effects of COVID-19 on the business operation, company profile (key products, clients and business partners), and potential effects of the global automotive trends on the company.

Part II.: The qualitative research method

According to Maxwell's qualitative research theory, a good research question should specify what exactly the researcher would like to better understand about the participants and its environment, organization he or she is studying. The research questions should summarize these goals. Based on the literature overview of this thesis, a number of questions have arisen, which should serve as a basis of the research. Although the quantitative method will be the dominant in my research, I also conducted interviews with industry experts (a Managing Director, a Vice President of Operations and a Head of Department of Manufacturing of three of the key TIER 1 automotive suppliers being active in Hungary). The qualitative research

method in general seeks answers to a question, collects evidence and obtains new findings in a topic. It also strives to understand a research theme from the side of the involved local population. This type of research is effective in producing culturally specific contents about values, opinions and behaviors of particular populations (Northeastern University, 2016). I have used this method, because it was able to provide complex information on how the participants have experienced the main issues of my research topic (personal beliefs, opinions, emotions and relationships of individuals). Paired with quantitative research, qualitative research can help to better understand the complexity of the situation and the results and findings of the quantitative research part.

There are three common qualitative methods used nowadays in research processes: the *participant observation*, the *in-depth interviews* and the *focus groups*, which are different and specific in terms of the obtained data. Participation observation is applied, when the natural behavior of the target persons is the main target of the data collection. To compile data about participants' personal experiences and histories the in-depth interviews are optimal, and for getting broad overviews and cultural norms of a group, focus groups are generally applied. The generated data of the three methods are usually notes, audio or video recording and transcripts (Northeastern University, 2016). During the interviews with the industry experts, I applied **in-depth interviews** and made notes.

The most significant difference between the qualitative and quantitative methods lies in flexibility. Qualitative methods are more variable and flexible, they allow spontaneity, e.g. with the mostly used open-ended questions, where participants are able to respond freely with their own words (Northeastern University, 2016). Table 4 in *Appendix 5* presents the main differences between the quantitative and qualitative research methods in detail.

### 2.5 Validity

The chosen methodology has been comprehensive, because I tried to cover the key suppliers of the five main foreign affiliates (Audi, Mercedes, Opel, Suzuki and BMW) from TIER 1 to TIER 4 categories, operating in automotive manufacturing in Hungary. The analysis covers more than 20 companies of different size (number of employees) and different place of the value chain.

The qualitative part of my research with the in-depth interviews focuses on a limited number of participants within the Hungarian manufacturing industry, from this point of view, it can have some limitations. In contrast to the existing literature, which focuses on the value upgrading in several industries at the same time, like apparel, electronics and fresh vegetables

industries, I focus primarily on the automotive industry and its value added and value upgrading possibilities and only in Hungary.

Based on the interview results, I prepared case studies. To describe the end results of my research precisely, I tried to validate my conclusions with the help of several documents from the companies available online.

## 3. Theoretical background

### 3.1 The concept of global value chains

The concept of the *global value chain* is not new. Over the years, researchers have analyzed various terms to define how companies organize activities such as *commodity chains*, *supply chains, international production networks, value networks*, etc., depending on the specific relationships that have developed between companies and other actors (Hernandez – Pedersen, 2017; van Dijk, 2008). However, the concept of the global value chain emerged at the beginning of the discussions about the effects of globalization and can be seen as broader than the other terms (van Dijk, 2008).

The ***commodity chains*** are much older and come closest to GVC (van Dijk, 2008). In case of a commodity chain, the company shapes, controls, coordinates and distributes the value along the chain (Azmeh – Nadvi, 2014). We distinguish between two types of commodity chains:
1. in a buyer-driven commodity chain, the leading company plays a central role as the merchandiser and ensures that all parts of the business come together;
2. in a producer-driven commodity chain, the leading company plays a key role in the production (Gereffi – Korzeniewicz, 1994).

The ***supply chain*** concept explains the relationships that companies have with suppliers and customers in order to deliver products or services at a lower cost (Christopher, 2005). The supply chain concept, for example, typically takes the perspective of a western company that takes care of the procurement of raw materials and spare parts (van Dijk, 2008).

***International production networks*** refer to efforts to outsource and relocate the production of certain parts to developing countries (van Dijk, 2008).

The concept of ***value chain*** goes one step further and explains that companies can be interconnected and create value that represents competitive advantage. This system describes how companies can reduce location and transaction costs by coordinating the global value chain in such a way that all activities are linked by international flows of intermediate products that the multinational corporation controls but not necessarily owns, and where knowledge is internalized (Hernandez – Pedersen, 2017).

### 3.2 Company structures and their connections to global value chains

Most of the research papers about value chains has focused on various configuration aspects of the activities of companies around the world. In particular, an important part of the literature has focused on explaining the reasons and effects of localizing individual activities abroad, including and encompassing the entire value chain (Hernandez – Pedersen, 2017).

The global strategic literature takes the company perspective and focuses on the question of how multinational companies can optimize their global operations, while the GVC literature highlights the industry or industry gaps and focuses on the value upgrading issue of companies in the value chain (Pananond et al., 2020). Global strategy is more management-oriented, while the GVC approach is more descriptive and focuses on relationships rather than individual actors (Pananond et al., 2020).

In case of the construction of a company or a group of companies, the principles governing the division of labor plays a key role at the value chain level. This means dividing labor into parts of a larger set of tasks and allocating the building blocks of the decomposed operation to different organizational units (Dobák – Antal, 2010). The role of *processes* in the operation of multinational corporations has already been highlighted by many authors. For example, Szalavetz (2012) notes that the basic unit of international trade is no longer the commodity, but the individual processes and activities. Processes are interpreted as a complex set of activities that use resources and produce output that represents value to the customer (Demeter et al., 2008). While the classical value chain concept is characteristic for a single company, the *global value chain* is the interconnected system of the internal processes of a multinational group of companies (Gelei, 2017). This thesis examines the structure of the global value chain (i.e., internal network) of multinational corporations in the automotive industry being present in Hungary.

There are many different lines of research examining the various aspects of the structure of global value chain, e.g. governance types, upgrading processes, etc. (Humphrey and Schmitz, 2002). However, a comprehensive review about the global value chain in relation to the automotive industry in Hungary has not yet been carried out. A complex global value chain configuration can constantly evolve due to changes in countries, industries and companies. Traditionally, research has focused on specific topics, such as: governance, location and coordination decisions (Hernandez – Pedersen, 2017).

Companies have to decide how to organize their activities: keeping them in house, going to market, or using mixed modes like alliances with other companies. Furthermore, they have to also make a decision about where to locate and how to coordinate them globally? These decisions can evolve over time depending on the circumstances and must therefore be continuously reviewed (Hernandez – Pedersen, 2017). With the development of technologies, the comparative advantages of countries change, new specialized suppliers appear and the activities become more standardized. Companies can therefore reconfigure their value chains in new ways (Hernandez – Pedersen, 2017). According to Hernandez and Pedersen (2017), emerging market companies are becoming increasingly important international players, and their countries are not any more only recipients of the activities of developed country companies. The management of a global value chain presupposes that governance decisions are made in different host countries and activities that cannot be viewed independently of one another, as there are mutual dependencies between them in terms of strategic control and learning (Hashai et al., 2010). In this dissertation, I will also address these statements as to how the above holds true for Hungary.

### 3.3 Origin and main characteristics of global value chains

Global value chains (GVC) have its origin in the global commodity chain (GCC) approach from Gary Gereffi. The concept of GVC refers to an international character of value flows, where multiple nations bring their goods or services through the different phases of production and deliver them to final consumers and final disposal after use. It is described as an interorganizational network around one product, which connects households, enterprises and states. The network is specific and embedded in the world-economic (Gereffi – Korzeniewicz, 2004). Recent years' trade liberalization for goods and services together with investment arrangements have facilitated the growth of global value chains, which has supported economies in their interconnectedness.

Due to advanced information technologies, transport, trade and business innovation nowadays, GVCs have a central role in the global economy. Modern-day globalization allows the international fragmentation and sharing of production within international supply chains and global value chains, which actually refer to the same thing but with different characterizations of an intensified internalization of economic processes (Low, 2016).

The *value chain* concept was first described in 1985 by Harvard Business School professor Michael Porter, in his book Competitive Advantage: *Creating and Sustaining Superior Performance*. According to Porter, because of the high relevance of international competition, companies need to adopt global strategies by expanding activities in the value chain among countries. A value chain is a collection of business activities at the firm level, like creation of product or services, delivery, marketing, after sales services, etc. To ensure competitive advantage on the basis of such discrete activities, firms either have relative lower costs to their competitors or differentiate their products (Gereffi, 2005).

Global value chains are short or long, with few or lots of discrete stages in production, consumption and trade. To perform its tasks, the lead firm can decide about the in-house solutions or outsourcing (Low, 2016). In case of outsourcing – when a product is completed in a particular country – it does not mean that the domestic companies lead and govern the value chain, e.g. Apple governs the production network of its products and they are completed in Asia (Timmer et al., 2014).

According to Baldwin (2006; 2009) the reason behind the emergence of the global value chain is the unbundling of the supply chain. The first unbundling occurred in the late 19$^{th}$ century, when lower transport costs allowed companies to move their goods between countries and even

regions. It was not needed anymore to place production close to final consumers, companies could make location decisions based on new motives (Baldwin, 2006; 2009; Grodzicky, 2014). The second unbundling lies in the possibility of production process divisions into several stages. Instead of whole sectors of production, single types of activities were in the focus (Baldwin, 2006; 2009; Grodzicky, 2014). Due to the first unbundling, separation of factories and consumers was enabled, while the second unbundling allowed the separation of factories and offices (Baldwin, 2006). In Europe the second unbundling was stimulated, when Spain and Portugal joined the EU in 1986 and later on by the emergence of CEE nations (Baldwin, 2009).

Stages of manufacturing are dispersed around the world and often are owned or controlled by independent suppliers. Lots of these kinds of international supply chains are regional and not global (Baldwin, 2009). In generally, the tendency of a growing specialization is observable, where specific activities and stages in value chains are in focus rather than entire industries. In GVCs not all firms and countries are equally involved. The connectedness of economies is influenced by many different factors, where there are some fix considerations (e.g. location, resources, etc.) and some by public policy shaped ones (e.g. infrastructure, investment climate, human capital, etc.). Countries' policy makers can influence the extent of firms' involvement in GVCs significantly, e.g. with attracting investments or with influencing competitiveness (OECD, 2014). Today's global value chains are still dominated by advanced economies' multinational enterprises, like companies from the USA, Japan or Germany, and an international division of labour are characteristic on the participating countries based on the factor endowment differences of economies (Alvstam et al., 2016).

A final product's GVC comprises the *value added* of all activities that are directly and indirectly necessary for its production (Timmer et al., 2014) at a firm level. In case of an economy, the *domestic value added* part of production processes is measurable in gross exports as follows: in producing goods and services for export, value added is simply defined as the difference between gross output at basic prices and intermediate consumption at purchasers' prices, where the measure is a percentage share of value. "It can also be derived as the difference between GDP (at market prices) and taxes on products less subsidies on products" (OECD, 2021).

### 3.4 Types of global value chains

The literature distinguishes between *goods value chains* and *services value chains*. There is some difference in the way of their function, but globalization affects both similarly, e.g. also service-related tasks are increasingly outsourced. The development of value chains in goods also need services (e.g. information technology, telecommunication, transport, logistics and distribution, marketing, R&D (Research and Development), etc.) (WEF, 2012). In case of a services value chain, the activity of a company can be a core competence or an outsourced competence (mostly back-office activities) from the headquarter. The aim of these services is to be higher value added through innovation, design, R&D or branding development. Banking, tourism, health and IT services are the most typical among services value chains (WEF, 2012). Car manufacturing falls into the **goods value chain** category, so this type was the interesting one for my research.

Based on the governance, we also distinguish between *buyer-driven* and *producer-driven* chains. In case of a buyer-driven chain, large retailers and merchandisers have powerful roles (e.g. Tesco, Nike). In producer-driven chains technological and scale advantages are in the focus and vertically integration is characteristic to the segments of the supply chain (Gereffi – Fernandez-Stark, 2016). The automobile industry belongs to the **producer-driven** GVCs, which tend to have high entry barriers because many supply chains require capital and technology-intensive production processes.

According to an other way of GVC differentiation, one type originates with a natural resource (mining, farming, etc.) and it is less sensitive to policy in the early stages of a value chain, but in terms of where value is added is more sensitive to the policy environment. The second type of value chain, which has **less connection to nature**, is more sensitive to the policy factors. For such GVCs the costs, location, and quality of infrastructure are very important influencers (Low, 2016) – such as for the automobile industry.

Global value chains are still in majority, but regional GVCs are having growing importance in nowadays value chains research (Staritz et al. 2011).

### 3.5 Conditions for participating global value chains

Organizations have to face constantly accelerating changes in the macro-, industrial- and micro environment, which requires them to become more dynamic and to adapt faster to the turbulent and complex environment (Balaton et al., 2014; Balaton – Tari, 2014). For example, the rise of the internet has transformed the way radically, how MNEs and GVCs operate in the global economy. Industry 4.0, the digital economy has not only transformed the role of the traditional leading companies in GVCs (how and where they create value in the global economy), but has also created new leading companies related to e-commerce, internet searches, a wide range of social media and entertainment and digital services (Pananond et al., 2020).

GVCs mostly consist of differently developed private firms from small and medium enterprises (SMEs) to multinational enterprises (MNEs). They are different regarding their place in the GVC hierarchy, the industry within they are active, their organizational manner, etc. Value chains are coordinated by large MNEs in general, who determine the most high-value activities and the participating conditions for other firms, including the upgrading opportunities for them (OECD, 2014). Typical GVC entry for SMEs is selling goods and services to larger MNEs. According to OECD, 80-90% of total employment in the developing countries are employed by companies in GVCs. For this reason, it could be important to stimulate the participation of such firms in global value chains. SME development policies, supplier-development programs can support the cooperation with foreign firms.

In GVCs the application of different quality standards is usual, which could mean entry barriers for SMEs, especially when the standards are complex and wide-ranging (OECD, 2014). It is different from country to country, how open an economy is for foreign service providers (OECD, 2014). There are several limitations regarding entry, ownership, operation and licensing. To act competitively in GVCs, import tariff reduction could be a crucial step. According to OECD, in general, to protected industries belong professional and transportation services, while finance, retail and telecommunication services are more open (OECD, 2014).

In terms of GVC participation (and also upgrading), there are several requirements for companies to be met. How companies are able to correspond to these kind of expectations is determined mostly by the institutional context where they operate (OECD, 2014).

Among others, the quality and efficiency of developed logistics services and international regulatory cooperation are essential in GVC participation. In case of trade it is important to

avoid unnecessary delays, to cut costs and to reduce uncertainty, because these can contribute to countries' GVC participation (OECD, 2014).

GVCs also require skilled labor force; therefore, they also effect the labor market of countries. Nowadays, there is a strong international competition between workers, which used to be between companies and industries in different nations before. Individual tasks are able to be offshored, which is very helpful for some workers, but can be harmful for others. However, global competition on the firm level is remained to be important (Baldwin, 2006).

The mentioned gains above are not automatic, to stimulate growth only participating GVCs is not enough: governance frameworks, effective social and environmental policies are essential to maximize the benefits of GVC participation. Minimizing risk in countries is also important, especially in the developing countries. Structural policies and macroeconomic measures should also facilitate the growth process, where the local conditions of each country are different (OECD, 2014).

In the mid- and medium term, GVC participation of economies are determined mostly by geographical factors and by countries' policy. The most important factors are *the size of the domestic market, the income per capita*, *the* s*hare of manufacturing sector and country's distance to manufacturing hubs* (OECD, 2014).

Governments also play a crucial role in the regulation of firm capacities, which have a huge impact on competitiveness and on general investment attractiveness. Also educational institutions are important, because they are responsible for the human capital development which is necessary in different segments of the global value chain. Besides institutions and industrial policies, resources and policy implementing capabilities, long-term commitment, regular control, monitoring and evaluation are also necessary. Investment- and development encouraging policies – focusing on local suppliers – are crucial in the GVC accessing and upgrading process of *developing economies*.

*Developing countries*

Developing countries, during their integration into global markets, have to deal with a higher competitive pressure, where producers have two choices to handle: either to increase the skills and competence of their activities and workers or to move to other niche markets, where entry barriers lower the level of competition (Humphrey – Schmitz, 2002).

According to Bamber et al. (2013), in case of developing countries, five factors have influence on competitiveness of GVC participating countries:

- *Productive capacity* (e.g. workforce);
- *Infrastructure and services* (e.g. transportation);
- *Business environment* (e.g. access to finance);
- *Trade and investment policy* (e.g. trade tariffs);
- *Industry institutionalization* (e.g. industry maturity).

They significantly differ among specific industry contexts (Bamber et al., 2013).

According to a questionnaire conducted by the OECD and the WTO in 2013, developing economies point out three main obstacles their firms have to deal with by connecting value chains: *infrastructure problems*, *financial market accessibility problems* and *standard compliance problems* (OECD, 2014).

### 3.6 Consequences of participating global value chains

Successful integration into GVCs has numerous positive effects on countries' trade, growth, infrastructure, labor market (including the quality of the local workforce, management and organizational methods, wages, etc.) and general economical development (OECD, 2014), because participating companies have access to new technologies and know-how, which compared with specialization results in improved productivity. Furthermore, GVCs can provide access to global markets and to acquisition possibilities of technological and managerial knowledge. However, at the same time they also could have negative effects on other companies' operations by limiting their participation or excluding them from the GVCs (Contreras et al., 2010).

The complexity of cross-border activities has been key to making the GVC concept a focal point for economic and social development policies. Nonetheless, participating GVCs does not automatically generate development benefits for all countries alike. The benefits of GVC participation depends on a wide range of factors, including the macro-economic foundations of the country and firm resources and capabilities in each industry (Pananond et al., 2020). So not just opportunities are given for SMEs, but also barriers to overcome set by the governments or by foreign firms, furthermore they have to be able to comply with several international standards. Even if the less developed countries and small companies put effort to build capacities and prosper development, a lot of them fail to succeed meeting the requirements of high-income markets (Staritz et al., 2011). Barriers for domestic companies can be caused by defects or weaknesses in the financial market, in the infrastructure, in human capital or in the local industry. Therefore, it is important to emphasize that local firms' opportunities to gain advantages from GVCs depend not only on the chain where they operate, but also on the local circumstances of a country. The business environment and institutions influence local firms' ability to increase their productivity and to upgrade to a higher value-added activity within global value chains (OECD, 2014).

### 3.7 Upgrading

Stakeholders of value chains are companies, employees, educational institutions, government agencies, etc. The relationship between stakeholders and the role of institutions influence significantly the operation of value chains. The upgrading process and the growth strategy of industries depend also in a higher proportion on the stakeholders, therefore key players of the value chain should be identified first and foremost (Gereffi, 2016).

In this dissertation I also analyze the competitiveness from the perspective of automotive companies that fundamentally affect the operation of today's economies. For the key players in our globalizing economy, the basic unit of analysis in terms of competitiveness is not exclusively the company interpreted as the organizational framework of the business enterprise (Chikán, 2008). The concept of corporation and its global value chain reflecting its internal value configuration are also very important for the competitiveness (Gelei, 2017). The structures of different global value chains are very important for competitive considerations on the macroeconomic level (Csaba, 2007). Hungary is known to be strongly integrated into the global value chains of some large international companies, a significant part of the Hungarian small and medium-sized enterprise sector also acts as a supplier of such global value chains. The example of the Hungarian economy shows how strongly they have an impact on the macro-level competitiveness of the economy (Gelei, 2017). The current level of integration is often criticized, because there is a relocation characteristic of low-income and low value-added activities into Hungary, which has short-term benefits (e.g. increased employment level and export capacity) but leads to a lag in global competition in the long run (Gelei, 2017).
In connection with this tendency, many words fall into the so-called *upgrading* opportunities: how to achieve the settlement of process elements that are able to create greater value added, increase knowledge and innovation content, and strengthen the country's long-term competitiveness (Bamber et al. 2013; Gelei, 2017).

The global competition and increasing development force enterprises to upgrade their activities, bringing higher value added constantly. Last decades' changes in the global business organizations have had significant impact also on developing countries' upgrading possibilities (Gereffi, 2005). Also lead and supplier companies can improve (upgrade) their skills in several ways, based on a global value chain configuration: ***product, process, functional and (inter-) chain upgrading*** (see below in detail) (Humphrey and Schmitz, 2002). However, particular attention has been paid to the upgrading process for local producers who can learn from global buyers, where the leading companies can influence the improvement potential of the other

actors in the value chain (Azmeh – Nadvi, 2014). During an upgrading process, companies in developing countries can go through a modernization process, moving from developing activities with low added value to activities with high added value. These companies have gained access to global markets (Pananond, 2013).

According to Humphrey and Schmitz (2002), the upgrading process of firms' activities can occur in four different ways:

- *Product upgrading:* producing higher-value products.

  During this upgrading process a company acquires capabilities, which result in better end-product quality, in more value-added and sophisticated product lines and faster new product releasing abilities. By getting experienced in the industry, the company can move to higher-value added commodities with higher returns (Humphrey – Schmitz, 2002; OECD, 2014; Fernandez-Stark et al., 2011;). The upgraded products have a higher unit value price (Staritz et al., 2011).

- *Process upgrading:* using more sophisticated technologies and methods in the production.

  In process upgrading a company acquires new capabilities, which are more efficient than its rivals' ones. Capital investment and better skills of workers are needed to use the new technologies, but costs can be reduced and flexibility can be improved this way. It can result e.g. in more complex services and less defect rate (Humphrey – Schmitz, 2002; OECD, 2014; Fernandez-Stark et al., 2011). This type of upgrading can also occur by the re-organization of the production system, and not just with the introduction of new technologies (Staritz et al., 2011).

- *Functional upgrading*: moving to higher value-functions.

  During functional upgrading a company acquires new capabilities, which are higher value-added. This way, competitive products and services in new segments of a GVC can be offered by the company (Humphrey – Schmitz, 2002; OECD, 2014; Fernandez-Stark et al., 2011). With the range of functions, the position of the firms also increases. There is a movement observable from low-value activities, like manufacturing into high-value activities, like R&D or marketing, etc. (Staritz et al., 2011).

- *Chain upgrading*: moving to an other higher value added chain.

  In this upgrading process a company acquires capabilities to be able to participate in a new global value chain and to produce higher value-added products or services (Humphrey –

Schmitz, 2002; OECD, 2014; Fernandez-Stark et al., 2011). One chain's acquired capabilities can lead to competitive advantage in other chains (Staritz et al., 2011).

Further upgrading possibilities by Gereffi and Fernandez-Stark (2016):

- *Backward linkages upgrading:* a local company supplies products or services to foreign companies who are located in the country and are already members of a separate GVC.
- *End-market upgrading:* a company moves into larger or more sophisticated markets, which require production on larger scale and stability of prices or standardization.

It is important to emphasize that *product- and process upgrading* can encourage growth in industries (Fernandez-Stark et al., 2011), and the way of upgrading is influenced by different types of industries and by different business environments of countries (e.g. input-output structure of value chains, institutional context, etc.) (Gereffi – Fernandez-Stark, 2016). The possibilities of upgrading differ in each type of chains as well, because of the varying core competence of lead firms. Lead firms' strategies can support or enable the upgrading process, but in general they are supportive in the product and process upgrading (Staritz et al., 2011). The structure of a value chain is influenced by the lead firm, who governs the whole chain. The allocation of resources and the relationships among the different participants within the value chain are determined by the governance structure (Staritz et al., 2011). Also the upgrading process within and between value chains are influenced by the governance structure of the chains.

According to Humphrey and Schmitz (2002) there are four different governance structures, four different types of relationships between lead companies and local suppliers: *hierarchical governance* (vertical integration), *quasi hierarchical governance*, *networks* (where competencies are complementary) and *arm's length market relations* (where there is an asymmetry in competence or power). These different structures determine the different upgrading possibilities:

1. for *product and process upgrading* favorable conditions are in the **quasi-hierarchical chains**, but the functional upgrading is not supported in this governance structure;
2. for *functional upgrading* favorable factors are in the **market-based relationships**, but it does not support the fast product and process upgrading.

Ideal upgrading opportunities are offered in **networks**, but not in the case of developing country producers (Humphrey and Schmitz, 2002).

In developing countries, the upgrading process can often fail, because of shortage of qualified workforce, including management and supervisors. Differences in culture and languages can also limit the transfer of capabilities (Fernandez-Stark et al., 2011). There are significant asymmetries between and within economies, both in firm and state capacity to use the possibilities of upgrading (Staritz et al., 2011). Therefore, the challenge of the upgrading process is to find those circumstances when developing and developed countries are able to upgrade their processes in value chains. The private sector has a highlighted role in development of labor force in the production sector, e.g. a lot of companies have different internal trainings for employees at the entry. Furthermore, international institutions can support the upgrading process, as well, e.g. the cooperation between the International Labour Organization (ILO) and the World Bank helps in raising of global supply chains' labor standards ('Better Work Program'), and also global buyers have influence on improving working conditions and workforce development practices (Fernandez-Stark et al., 2011).

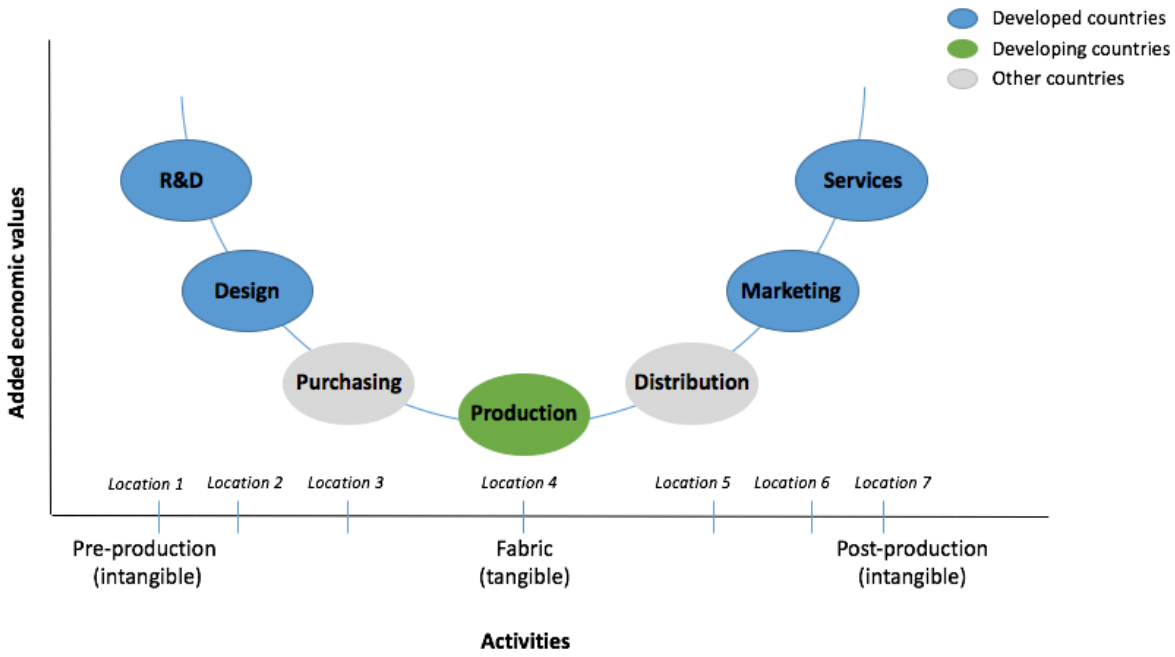
Beside the economic dimensions of upgrading, the **social upgrading** is also very important, which makes the whole upgrading process more complex. Upgrading in social terms means better working conditions with skilled workforce and improved salaries. Both types of upgrading are usual, they often (but not necessarily) happen parallel (Staritz et al., 2011).

### 3.8 'Smile curve' concept

The so called 'Smile curve' concept was originally introduced by the founder and number one leader (CEO) of Acer, Stan Shih in the 1990s in the information technology-related manufacturing industry (Baldwin et al, 2014). According to this idea, traditionally R&D, design and consumer branding activities that determine the content of a product or service are those that have a particularly high value-creating potential, so multinational companies typically hold these activities in-house, while low-value-creating activities – such as production itself – are outsourced (Gelei, 2017). However, this decision in fact is more complicated, as it is influenced by a number of other factors.

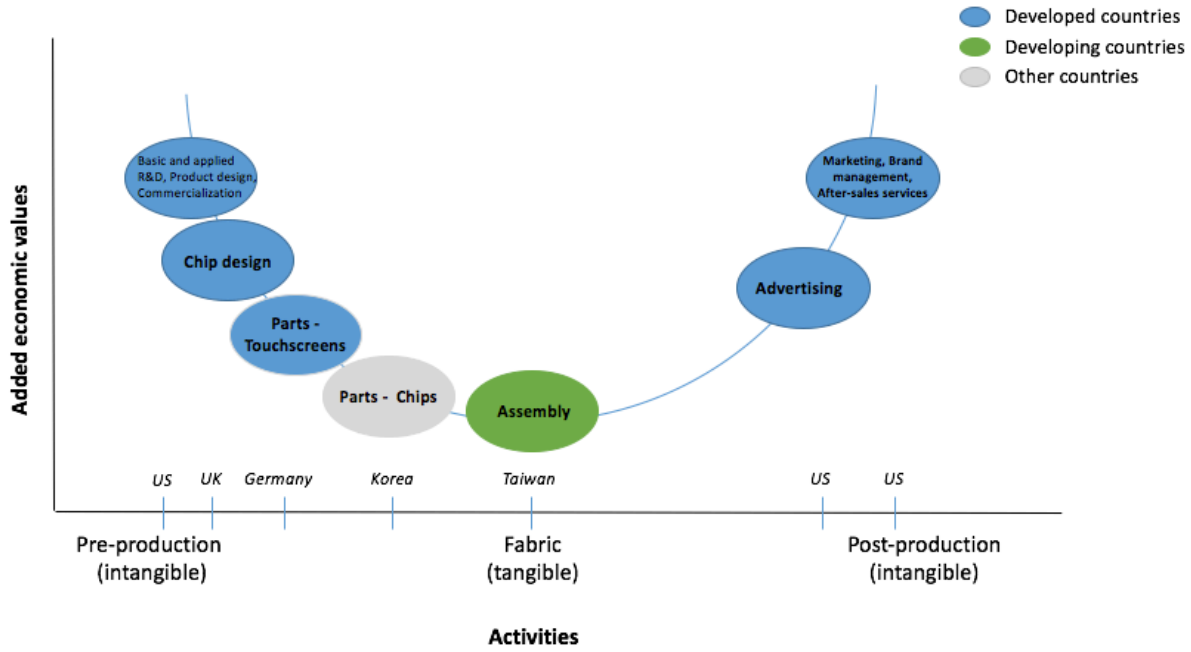
As the 'Smile curve' shows on Figure 1, developed countries concentrate on high value added activities like R&D, design, marketing and services, while developing countries on the lower value added ones, like production (Gereffi – Fernandez-Stark, 2016). The 'Smile curve' also presents that the value added activities in manufacturing are in the pre- and post-fabrication services. To pre-fabrication services belong for instance the R&D and design activities, while marketing and other services count as post-fabric activities. Both pre- and post-fabrication are carried out by developed countries, while production activities mostly by the developing countries.

**Figure 1 – Smile curve**




Source: Author's creation based on Baldwin et al., 2014 p. 2 and Mudambi, 2008 p.711

**Figure 2 – Value creation in an iPhone**




Source: Author's creation based on Baldwin et al., 2014 p.2 and Mudambi, 2008 p.711

Based on Mudambi (2008), Figure 2 shows value creation and value chain breakdown using the case of the iPhone. Both ends of the value chain ('Smile curve') show high added value: the pre-production like research and development activities, chip design and touchscreen parts are carried out in the US, UK and Germany and post-production activities like advertisement, marketing, brand management and after sales services in the US. The low-value added assembly activities are outsourced to Taiwan.

Also Francois and Wörz (2007) analyzed the linkages between services and manufacturing and made some observations in this regard, including the following:

- with the level of development, also the importance of services in production is rising;
- linkages of services to manufacturing have become important in the 1990s.

As described in detail in previous chapters ('*Conditions for participating global value chains'; 'Upgrading'*), in countries which are aiming to enter into GVCs or to upgrade within them, policies can help companies in the innovation and cost lowering processes.
Support in GVC participation and upgrading can happen in two different ways by politics: one is the so called *horizontal policy*, when the effects are characteristic economy wide e.g. stable political and economic environment, developed labor market, human capital, infrastructure and telecommunication systems, etc. (WEF, 2012). The other is the *sector-specific policy*, but it can

be harmful for the international competition. Within a GVC, cooperation between governments is also very important, because it can contribute to different development goals in terms of infrastructure, education, etc. significantly. Beside the policies and government measures, also innovative firms can help in supporting the upgrading process (OECD, 2014). As mentioned before, countries who would like to participate in GVCs or to upgrade within value chains, have to invest in R&D, innovation, organizational know-how and branding. It has a consequence that countries, which are participating GVCs have higher skill levels than countries who are not. It is characteristic for most of the OECD countries that the share of high-skilled workers in total GVC manufacturing increased faster than the share of low-skilled workers. For developing countries to move up into mid-value segment means focusing on technical education, while moving further into high-value segment requires development of managerial tasks (OECD, 2014).

During my research, I tested whether the 'Smile curve' hypothesis works in the automobile and auto part production. The potential for generating value added varies significantly across the various functions along a firm's value chain. However, it is important to note that there are many different industries, where the theory of 'Smile curve' cannot explain the operation of the sector (e.g. pharma, banking and insurance) in case of research and development activities, in data and knowledge production operations. Data production involves routine, repetitive activities with lower value-creating potential, and knowledge production is coupled with non-repetitive, high-tacit knowledge and high value-creating potential (Gelei, 2017). For example, some pharmaceutical companies are more likely to outsource the coordination of data-intensive clinical trials while assigning knowledge-intensive trials to internal teams (Azoulay, 2004).

### 3.9 Outsourcing and offshoring as two key strategic decisions in relation to GVCs

An important impact of the increasing integration of the world economy is the growing importance of offshoring and outsourcing opportunities of value-creating activities (Mudambi – Venzin, 2010).

There are many industries, where companies are able to break down their value chains into smaller parts. Large international corporations form the structure of global value chains through two basic management decisions: ***outsourcing*** (or insourcing), and ***offshoring*** (or back- and near-shoring). Outsourcing and offshoring are two closely related but clearly separable strategic decisions, where the primary content of these two concepts is the division of labor. Outsourcing divides the processes between the members of the external and internal networks; offshoring determines the internal division of labor of the organizational activities by specifying the geographical localization of the established organizational units (Gelei, 2017). Key drivers of outsourcing and offshoring have traditionally been explained by the theory of *comparative advantage*, where the goal is to find optimal resources globally (e.g. low wages, cheap raw materials) that exploit a source of competitive advantage for the group as a whole (Gelei, 2017). Both managerial decisions restructure the value chain (Jahns et al., 2006; Jensen et al., 2013) including the division of labor and localization issues and in case of both decisions the value-creating potential of the given process element is a key consideration (Kaplinsky, 2004).

***Offshoring*** is one of the hottest topics in international business and it can be viewed as the process of reconfiguring value chain activities across different locations. It is often defined as follows: 'relocating business processes abroad to take advantage of the supply of skilled but relatively cheap labor' (Mudambi – Venzin, 2010). During an offshoring process corporations has to face higher number of tasks and activities which increases the operational complexity. In relation to offshoring it is important to note that hidden costs can arise from unexpected organizational requirements and usually they relate to areas such as knowledge transfer, new interdependencies, different trainings, protecting intellectual capital or monitoring the performance of the offshored units (Larsen, M. M. – Manning, S. – Pedersen, T., 2013).

A stream of academic literature shares the widespread view that the primary goal of offshoring is to minimize costs by moving business processes to low-cost locations. Another stream of literature views offshoring as a more general location strategy that involves minimizing costs and seeking knowledge. Mudambi and Venzin (2010) argue that offshoring decisions are closely related to outsourcing strategies, which are about finding the optimal level of control over the company's activities. In addition, using the transaction cost theory by Coase, 1937 and

Williamson, 1975, Mudambi and Venzin argue that the firm selects the components over which to maintain control after disaggregating the value proposition. The result of their analysis states that companies should maintain control over the processes/components that enable them to create the greatest possible value. Conversely, operations that create less value should be outsourced (Mudambi – Venzin, 2010).

Offshoring and outsourcing are analyzed as aspects of the global disaggregation of the value chain where companies combine the comparative advantages of geographic locations with their own resources and skills in order to maximize their competitive advantage. The interaction of comparative and competitive advantages determines the optimal location of value chain components (offshoring) and the company boundaries and the control strategy (outsourcing). Firms in all industries leverage the geographic dispersion of their value chain activities to create and maintain competitive advantages (Mudambi – Venzin, 2010).

*'Went for price, stayed for quality'*

(Dossani and Kenney, 2003)

### 3.9.1 Near-shoring – as a subtype of off-shoring

Many European companies choose a CEE country for their manufacturing activities – e.g. German automotive manufacturers – so the near-shoring phenomenon is also present in Hungary.

***Near-shoring*** companies move their off-shored manufacturing activities close to their home countries, because of shorter lead times, easier way of control and cheaper labour- and delivery costs (Stehrer et al., 2012; Stentoft, J. et al., 2015). In Europe the term is used in the context of offshoring to Central and Eastern Europe (Stehrer et al., 2012).
*'Backshoring'* or *'re-shoring'* is used, when companies, because of different reasons (e.g. operational costs, operations management, quality problems, loss of knowledge, extended and uncertain lead times, etc.), move their previously offshored activities back to their original location (Stehrer et al., 2012). The relocation generates FDI and international trade (Sass – Hunya, 2014). Both near-shoring and re-shoring result in job creation in the host countries. Furthermore, near-shoring firms pay higher salaries in general and often spend more on research and development (Stentoft, J. et al, 2015). Re-shoring and near-shoring – as different types of foreign direct investment – are not only characteristic of larger firms, even small and medium enterprises (SMEs) consider moving manufacturing offshore. For the EU15 countries[2] near-shoring locations are especially in the CEE region (Bobirca, 2007). Key levers are: cost advantages relative to Western European economies, close alignment of time zones, capabilities (expertise in engineering and in the Information Technology (IT) and automotive sectors), educated skills and close cultural connectivity (Baldwin, 2016; Coleman, 2015).

Outsourcing and offshoring/near-shoring are major drivers in the global economy, especially in the IT sector (IDG Connect, 2015). IT outsourcing is getting more important in the European Union. This is also of paramount importance to the automotive industry, as IT is becoming increasingly important in the automotive manufacturing, with the rapid spreading of hybrid, electric and self-driving cars. The United Kingdom and Ireland invested a large amount of their IT budget into offshoring, the continental Europe is a "newcomer" in this sense. We can also find examples for near-shoring by Western European manufacturing firms into the Central Eastern European region: in 2011 the AWS Electronics Group – a leading independent electronic manufacturing solutions provider – has announced the opening of a new purpose-built facility in Slovakia. New projects and growing orders have enabled the company to expand

[2] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, (United Kingdom = already an ex-EU member)

its operations in CEE. According to the company, costs at the Slovakian facility are comparable with countries in Asia, like China or Malaysia, which results in "back-shoring" activities by some customers from South-East Asia to CEE (AWS, 2014). But we can find further examples in the region: in Poland Sabre and Motorola have near-shored software development centres, while Comarch, Capgemini and HCL are active in the IT consulting field. In Romania IT and business process providers have bases, such Accenture, Capgemini, Genpact, Luxoft and Wipro (Coleman, 2015). Not just IT skills, but human resources, finance, sales and customer service functions are also being outsourced through near-shoring (Coleman, 2015). "Balancing cost-savings with other benefits, such as access to skills, greater speed to market or improved control over the supply chain, are important variables to consider." – said Mark Craddock, global business services director at Deloitte (Coleman, 2015).

CEE adopts global service models increasingly: 30% of the top global outsourcing companies are already in the region. According to World Bank's 'Ease of Doing Business' rankings, CEE is ranked ahead of other globally competitive O&O (Outsourcing & Offshoring) regions (Baldwin, 2016). Also for the United Kingdom the nearest and most suitable near-shoring market is CEE, namely the Baltics, Bulgaria, the Czech Republic, Poland, Slovakia, Romania and also Turkey (IDG Connect, 2015). However, the UK's exit (Brexit) from the EU in 2020 is likely to change the situation.

Why could CEE be attractive over other parts of the world as possible offshoring destination? For both near- and re-shoring firms there is a wide range of investment incentives in the CEE region from the micro to the macro level:

- Cheap labour costs;
- Qualified workers / available skills (university degree, English-knowledge, etc.);
- Good location and infrastructure / improved speed to market and control over the supply chain / better control over the intellectual property;
- Low corporate tax rate;
- Attractive economies of scale;
- Local domestic economic growth;
- Political stability;
- Nearby time zones;
- Cultural familiarities, etc. (IDG Connect, 2015; Coleman, 2015).

According to Coleman, as the labour cost gap between Europe and Far East is getting closer, but the demand for speed and flexibility is rising, near-shoring is one of the viable solutions for

many firms. If some of the factors above are failing or missing, near-shoring can have disadvantages too. For example, the main challenges for Kabbee (producing software application, which company near-shored its operation from the UK to Kiev) were the lack of proficiency in English. Intensive English lesson should have been provided by the company to its Ukrainian employees (Coleman, 2015).

### 3.10 Types of jobs relating to global value chains

Gereffi and Fernandez-Stark (2016) differentiate five types of work in GVCs:

a) *Informal small- / micro-enterprise, household work:* these types of work are characteristics more for developing countries and for industries like agriculture or apparel. These are in general low-paid jobs and the production comprises both the paid and unpaid family labor with long working hours. Education level is low.

b) *Low-skilled, labor-intensive work:* the work relationship between the employer and the worker can be temporary or permanent. Workers' education is low, up to six years in general. In global value chains the access of such low-cost and labor-intensive workforce was the main driver of offshoring activities.

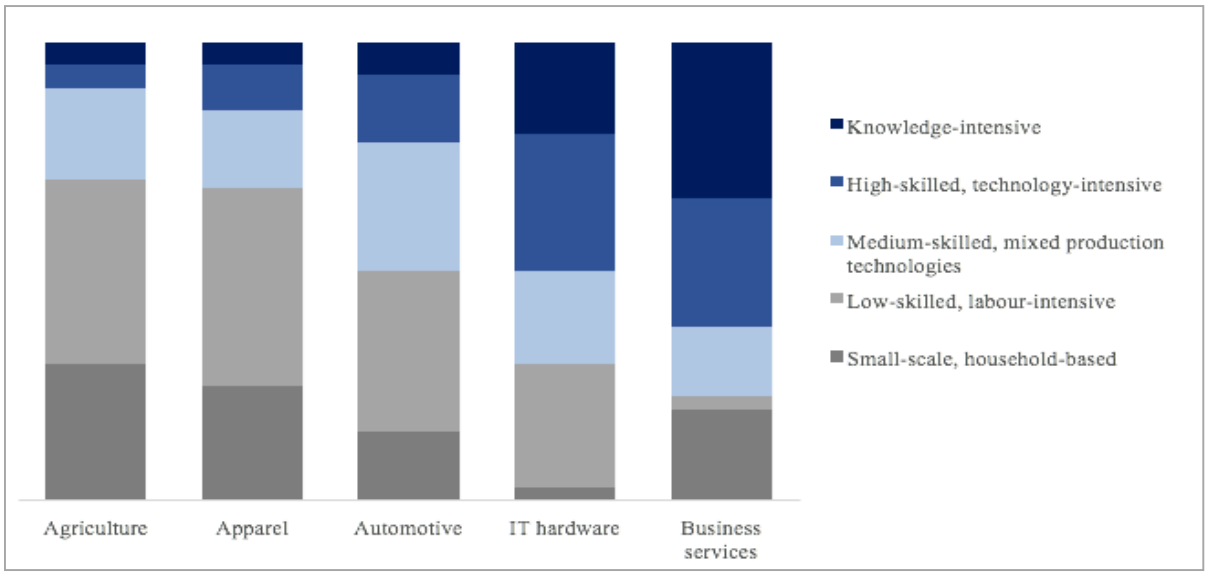
c) *Moderate-skilled work:* in this stage of employment specific technical knowledge is required, the level of education is higher, secondary education in general. It is characteristic to the technology-intensive supply chains, like the automotive or the electronics industry. For my research, this is one of the relevant type of works.

d) *High-skilled, technology-intensive work:* the off-shoring of this type of work was especially characteristic in the years of 1980s and 1990s. It is typical for capital- and technology-intensive industries (automobile, electronics), but for a smaller share of GVCs employment. Level of education (technical) and wages are also higher. The high-skilled, technology-intensive work is also relevant for my dissertation.

e) *Knowledge-intensive work:* business services, including IT, medical services, finance or engineering count as knowledge-intensive services. Due to the knowledge spillover into developing countries, these kind of services have significant growth opportunities. High level of education and high income are characteristic to workers in this category, and the share of employment in GVCs is quite small.

Changes in production locations have brought restructuring also in the specialization patterns. According to the traditional Heckscher-Ohlin model of trade, each country produces goods in those factors that are relatively abundant. It means, that advanced countries focus on activities with high-skilled labor and capital, while other countries on less-skilled activities (Timmer et al., 2014). As Figure 3 shows, there is a general concern that to high-wage service jobs belong activities like R&D, design and marketing, while to the low-wage jobs belong production services (as the iPhones' example showed, its products are designed in California and manufactured in China / Taiwan) (Baldwin et al, 2014).

**Figure 3 – Workforce allocation within different industries**




Source: Author's creation based on Gereffi – Fernandez-Stark, 2016 p. 24

## 4. Connections between foreign direct investment and global value chains

The significant decrease of communication and coordination costs in general has resulted in the split of the production processes, each stages at locations with the lowest costs (Timmer et al., 2014).

According to Gereffi (2005) there are three aspects characteristic to the current stage of globalization:

1. a larger share of intermediate inputs in the total trade;
2. the development of global production networks;
3. the presence of production processes all around the world.

FDI is one of the major drivers of the growth of GVCs: as a business strategy, multinational enterprises expand their operations in foreign countries. Foreign affiliates play a key role in countries' participation in the international product networks, as well as in the global value chains. Developing countries with their low cost labor and raw materials and developed countries with their R&D and design capabilities affect each other even in widely separated locations (Gereffi – Fernandez-Stark, 2016). An OECD study states that there is a strong correlation between FDI stocks and countries' GVC participation index both in developed and developing countries (OECD, 2014).

In the last couple of decades, the spread of FDI has changed the attitude of countries. To attract investments from foreign multinational companies, most economies have liberalized their policies, e.g. entry barriers were lowered. Raising employment, exports, tax revenues and knowledge spillover were the expectations of FDI. It is important to notice that if foreign investors in their fundamental operation are similar to local firms, FDI subsidies can have competition distorting effects and may generate losses among companies in the home country. Spillovers are more likely when foreign and local companies are in a more direct competition with each other (Blomström – Kokko, 2003).

According to case studies in this topic, multinational companies can have several effects on the host countries' economy, including the following:

- contributing to efficiency by breaking the supply bottlenecks,
- introducing new technologies, know-how and training workers who are later employed by the local companies,

- stimulating competition and efficiency by breaking down monopolies or building up monopolies, etc. (Blomström - Kokko, 2003).

It is important to add that according to Gurgul and Lach, the separation of the production processes around the world does not necessarily lead to increased unemployment rates in the developed countries. Furthermore, offshoring can result in decreased output prices and higher demand for the final products, and this way the net effects on the domestic jobs could be even positive (Gurgul – Lach, 2016). In todays globalized economy within these transnationally separated value chains, semi-finished products and services are traded typically. It is also common, that countries own just a little part of the value chain, even if the production process finalizes there (Kinkel et al, 2016).

### 4.1 The appearance of foreign direct investment in Central and Eastern Europe

The CEE region includes Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. Leaving the state economic control behind, competition has appeared in these countries after 1989 with the privatization processes. The privatization of the state-owned industries and the introduced reforms on the labor market attracted foreign direct investments, which resulted in productivity growth and increase in GDP per capita between the early 1990s and 2008, until the beginning of the great financial crisis (McKinsey Global Institute, 2013). Nearly 20 years after the transition process, the great financial and economic crisis has spread from the United States to Europe and has influenced the Central and Eastern European economies, significantly. Hungary, Romania and Bulgaria had to face huge macroeconomic imbalances and increasing inflation rates. Including Hungary, IMF's financial aid was necessary to save some countries' economy in 2009 and 2010. Because of these deteriorating circumstances paired with high tax rates, growing macroeconomic instability and high rate of corruption, also Hungary lost its attractive features for FDI (Balaton, 2011). The crisis in 2009 affected the region's manufacturing production and international trade, but a slow rebuilding was characteristic since 2010 (Grodzicky, 2014).

The eight CEE countries have also common and different features: in terms of development, population and culture they are diverse, but they have the similar geography, history and growth model for free-market economies since 1990. In 2004 the Czech Republic, Hungary, Poland, Slovakia and Slovenia succeeded in joining the EU. Three years later Bulgaria and Romania and in 2013 Croatia also followed them. Only two of the eight countries, Slovenia and Slovakia introduced the Euro. In the last decades, relative to their economic size the Czech Republic and Hungary were among the main FDI recipients at country level (ECB, 2009). Literatures (Dunning, Globerman, Shapiro) as to why multinational companies invest in specific locations say that these companies find the strong economical fundamentals important in the host economies, e.g. market size, income levels, quality of infrastructure, skill levels, political and macroeconomic stability (Blomström – Kokko, 2003).

According to McKinsey Global Institute's studies, the strengths that enabled rapid growth in the CEE region before the crisis remain nearly the same. Decisions about FDI are in close connection with decisions about value chains. These kinds of decisions about where to go and innovate, about services and sources are determined by several different factors within CEE:

- *Educated and cheap labor* force (ca. 10 years ago, 22% of the workforce has had tertiary education, hourly wages were 75% lower than in the EU-15);

- *Stable macroeconomic environment* (e.g. public debt was below 60% of GDP);
- *Attractive business environment* (good rankings at the OECD ease of doing business, low corporate tax rates compared to Western Europe);
- *Legal and policy environments:* they are critical factors of value chain decisions, because poor national standards in labor or in environment or high level of corruption can hinder or limit countries in value chain participation. Similarly, supporting policies in manufacturing and services – investing in transportation, education, innovation – can make countries attractive. In emerging markets, the legal and policy environment were the most critical, improvement is needed in the near future (WEF, 2012).
- *Good location:* CEE economies lie geographically and culturally close to Western Europe. Physical infrastructure (e.g. effective transportation system, telecommunication, etc.) is the key strength of countries in global competition, because it enables them to connect into global production processes (WEF, 2012).

These strengths were attractive for foreign direct investment and in the 1990s and 2000s Western European companies (especially banks) moved into the region: between 2004 and 2008 the net FDI inflow into the region was about 168 billion euros, of which one-fifth only went to the financial sector. The large amount of FDI inflow fostered the growth in the region: outdated factories were modernized, new efficient methods were introduced and productivity raised in general. In the 1990s new automotive factory establishments and acquirements of local automotive manufactures by Western European, US and Asian firms were characteristic in the region (e.g. acquisition of Skoda by Volkswagen, FSM by Fiat, Dacia by Renault, etc.). In Hungary Audi, Opel and Suzuki opened their new plants. The production in the vehicle manufacturing more than doubled, in 2011 3.4 million units were produced, while the employment in the sector rose by 60% (McKinsey Global Institute, 2013).

European countries are the biggest providers of FDI in CEE: Germany, Austria, France and Italy had the highest share of the total FDI investment in Central Eastern Europe (ECB, 2013b).

There is a strong connection between FDI and trade, countries in the Euro area also account for a large share of CEE countries' external trade, typically in the intermediate stages of GVCs. About 33% among the top 15 trading partners of CEE countries in global value chains are from this area, where the most important ones are Germany, Italy, France and Austria (ECB, 2013a). In general, CEE economies' exporter companies participating the GVCs are joint ventures or owned outright by euro area enterprises. CEE countries are mostly importers of industrial equipment and higher value added components from countries of the area. These are used

further to produce final goods along the value chains around the world. In GVCs CEE countries are among the main trading partners of other CEE countries, but the largest CEE economies also have their own value chains within the region (e.g. some Polish and Czech exporters) (ECB, 2013a).

CEE became characteristic for the so called outsourcing and offshoring (O&O) industry as a target for foreign investment in the past decade, which means back-office and support operation mostly for foreign Western firms. These days, 300 000 people were employed in different types of O&O works, today this number is even bigger. Because of the regions' low wages, attractive business environment and skilled labor force, global companies appeared in several industrial segments, e.g. Hewlett- Packard, Philips, UniCredit, etc. In the year 2006 more than 200 business process outsourcing were present in the CEE nations; to the bigger business centers belonged Budapest, Prague and Warsaw. As FDI in CEE after the financial crisis decreased significantly, to keep this attractive feature and to keep or to upgrade their position in the manufacturing value chain in the future, CEE countries should do a lot, including innovating, investing in R&D, attracting high-value activities, etc. The CEE region need to invest in education as well, based on the fact, that these countries score below the OECD average on the PISA test (McKinsey Global Institute, 2013). Also labor productivity levels of the CEE countries are well below compared to the rest of the EU, even if there was a significant increase recently (ECB, 2009). According to McKinsey Global Institute estimates, under current trends the aging labor force in the CEE could reduce the per capita GDP by yearly 0.7 percent between 2010 and 2020 and yearly 0.3 percent between 2020 and 2030. It is a significant challenge for all countries in the region and therefore it is important to improve the productivity of the labor force due to constant innovation processes and implementation of more effective technologies and techniques. In CEE countries the labor participation rate is significantly lower than in Western Europe (65% vs 72%). The difference can be explained by the low participation rate of women and young workers and earlier retirement ages. At EU-27 level, the gender employment gap has narrowed since 2005, but in 2019 the employment rate was still 11.7 percentage points higher for men than for women (Eurostat, 2021). Female participation rate in Hungary was 50% in 2009 and 63% in 2019, while in Denmark it was 71% and 73% (Statista, 2021). In the CEE economies a small proportion of women have part-time job, which can be explained with the lack of access to part-time work (McKinsey Global Institute, 2013). FDI has a significant role in this sense, it not just introduces new technologies and methods, but it also leads to spillover effects. For example, foreign automakers established subsidiaries and

factories in Hungary have influenced the suppliers of the country. As described before, spillover effects include transfer of technology, adoption of processes, organizational innovations and also the imitation of advanced methods used by foreign companies, which results in more productive local companies (McKinsey Global Institute, 2013).

Advanced manufacturing industry (including automotive, aerospace, electronics, etc.) in the CEE economies have great opportunities for growth in the future, based on their current capabilities. Knowledge-intensive manufacturing in the CEE is developing. The global manufacturing is also growing, because of the raising demand in the developing economies and the several innovative manufacturing technologies, e.g. China and Asia are moving up the manufacturing value chain through investing R&D and innovation, which means strong competition for CEE economies (McKinsey Global Institute, 2013). Support in this competition could be clusters between manufacturers, institutions (e.g. universities, research institutions, etc.) and other players of the supply chains (e.g. suppliers). According to the World Economic Forum, the evolution of these kind of clusters in the CEE (in automotive, electronics, aerospace, etc.) are lagging behind the levels of clusters in the US, the EU-15 and the BRIC economies, but these mean potentials for the future development.

CEE nations have qualified workforce, but the quality of education could be still improved. (As mentioned before, according to PISA studies, most of the CEE countries score below the OECD nations' average). The government also has a crucial role in supporting innovative investments or offering tax incentives. However, larger investments in R&D and innovation are also needed to be able to move up industry value chains and to produce higher-value-added products. With investing in technical education and with improving the connection between academia and business, governments can have a supporting role also in the cluster development. According to the World Economic Forum on a scale of 1 to 7 CEE countries score 3.6 for R&D collaboration between businesses and universities. For the EU-15 the score is 4.7, which means that further development is needed. To enforce the GDP growth, not just the institutions and education of work force, but also the infrastructure should be supported by the governments (McKinsey Global Institute, 2013).

*Visegrad 4 countries*

In case of the Visegrad 4 countries (Czech Republic, Hungary, Poland and Slovakia), we can see an increasing GVC participation and integration since 1995. Not just the volume of import of intermediate inputs for manufacturing industries, but also their production contributing to GVC have increased steadily. Even the countries showed up some common features, differences were also observable, e.g. the integration level into GVCs varied. In terms of imports and exports, Hungary is the most extent dependent on participation in GVC, while Poland is to the least. The Czech Republic, Hungary and Slovakia have relative comparative advantage in capital-intensive and high-tech industries, while in Poland the resource-based industries are predominant (Grodzicky, 2014). The index of the economic openness (sum of exports and imports in % of GDP) shows that Hungary and Slovakia have had the most significant international trade since 1990, but there is an observable increase in Poland and in the Czech Republic as well (Grodzicky, 2014). A further sign of the internalization and of economic integration is the increasing presence of multinational companies within these countries' production structures. In 2008 MNCs employed nearly the quarter of all labor force and produced 30-50% of the domestic products of the countries. Due to capital accumulation, structural transformation and knowledge diffusion, the presence of multinationals and the international trade have positive effects on the development of countries. The role of the EU was also important in the region's integration process within the global economy (Grodzicky, 2014). Based on case-studies, an ongoing industrial upgrading process is observable in the Visegrad countries: besides of assembly operations at the early stages of the involvement, more and more complex tasks are being performed in the region. The highest share of manufacturing in GVC income (ca. 60%) are in Hungary and in the Czech Republic (Grodzicky, 2014).

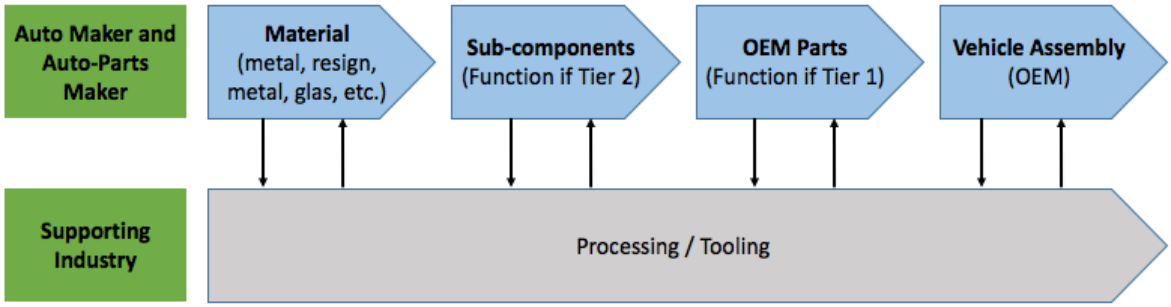
## 5. Value creation of the automotive manufacturing industry

During an industrial upgrading process, economic actors (countries, companies, workers) in global production networks move from low-value to high-value activities. In the economic success also institutions, governments, corporate strategies, technologies and skills of workers are involved (Gereffi, 2005). When we speak about value chains and value upgrading in general, in addition to the corporate and managerial level, we must also take economic factors into account, if only at the level of mention.

FDI is considered as the most important channel of the international technological diffusion between countries. The reason behind it is that multinational companies, including Western European firms in the automotive industry, have advanced managerial techniques and invest in R&D in a huge amount. These technologically advanced enterprises may transform their technologies and practices with FDI to foreign economies, which can spread later on over the entire economy (ECB, 2009).

The production of automotive products is the result of a very wide-ranging corporate collaboration. During the production of cars, thousands of parts are produced, which are not manufactured by one company, but the wide cooperation of suppliers characterizes the activity of this sector (Magyar – Hlédik, 2018). Along the value chain in the automotive manufacturing we find manufacturing companies starting from OEMs (automakers or vehicle assembly makers), Tier 1 companies (OEM parts makers), Tier 2 companies (parts/subcomponents makers), material suppliers, and processing and tooling manufacturers as supporting industry (JICA, 2019).

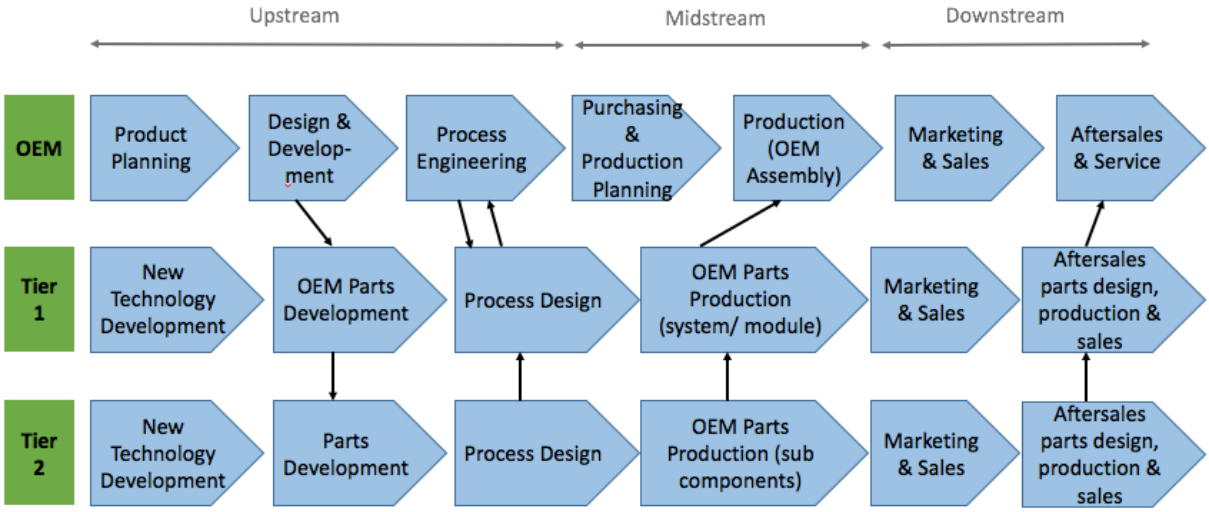
**Figure 4 – Supply chain of the automotive manufacturing**




Author's creation based on JICA (2019), p.56

As Figure 4 shows, a general value chain in the automotive manufacturing industry consists of different processing phases: the first one is the processing of the basic materials (metal, resign, metal, glas, etc.), the second is the production of the sub-components of cars, which is the function of the Tier 2 suppliers. Tier 1 suppliers are in the next (third) phase of the chain producing the OEM parts and vehicle assembly is the final stage conducted by the OEMs. Beside the auto makers and auto-parts makers there are also many companies from different industries along the value chain to support the processing and tooling processes of car production (JICA, 2019).

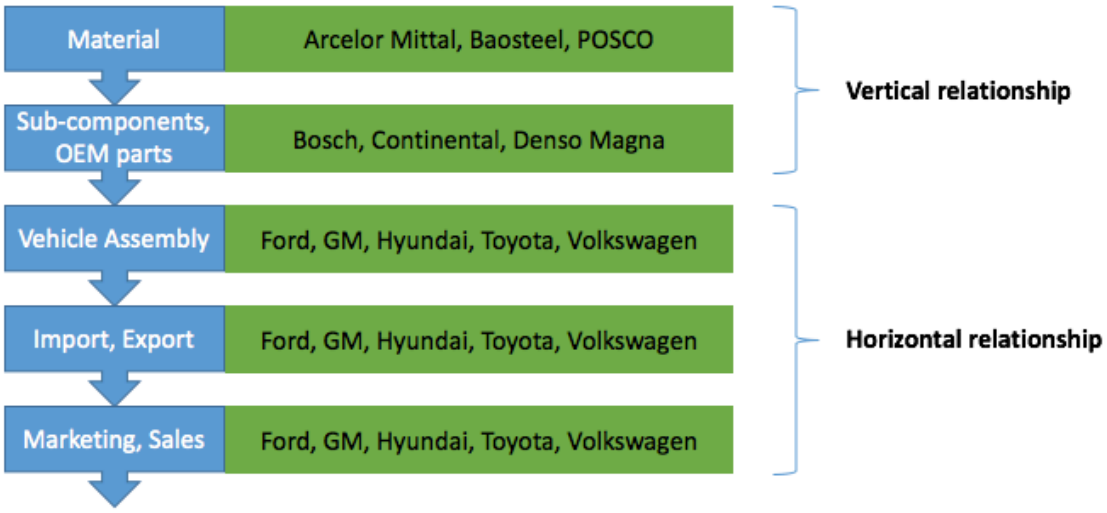
**Figure 5 – Value chain of the automotive industry**




Author's creation based on JICA (2019), p.56

As we can see on Figure 5, in the automotive industry we distinguish three basic phases along the long value chain: *upstream, midstream* and *downstream*. To the upstream phase belong design and development activities such product and technology planning, R&D. Purchasing and production are part of the midstream phase. Downstream functions are e.g. marketing, sales, aftersales and maintenance activities (services) (JICA, 2019). This chain above is a typical example of a *vertical value chain*. Figure 6 shows the same value chain with company examples. Import, export and marketing activities carried out by the OEMs are also added to this figure. The processing of materials, sub-components and OEM parts are proceeded by companies from different level, while the activities like vehicle assembly, import, export, marketing and sales carried out by OEMs mainly on similar level. So we can distinguish between vertical and horizontal relationship along the value chain.

**Figure 6 – Example of a value chain in the automotive industry**




Source: Author's own creation based on Figure 4

As explained in earlier chapters, my research project placed the focus on the supply chain analysis of the Tier 1 and Tier 2 companies (auto parts manufacturing) or the midstream portion of the long value chain of the automotive industry. It is necessary to analyze the Tier 2 / Tier 1 relationship as they sometimes work together to develop new parts. Other value chain functions, such as R&D and sales activities were also examined indirectly through the in-depth interviews.

The automotive industry – besides the electronics and apparel industries – belongs to those sectors where large suppliers manage complex global production activities and have a significant impact on logistical, financing, design and product development processes (Staritz et al., 2011). It is a very concentrated sector with a small number of large assembly firms and globalized suppliers. For local suppliers of the sector the increased globalization was an opportunity to join the global value chains. Relocating the manufacturers resulted in contact with local suppliers who could gain from the potential positive effects this way, e.g. local producers have the opportunity to learn from global players how to improve quality and speed of their production processes. Furthermore, in case suppliers develop their capabilities and prepare themselves for these potential effects, it is more likely that more knowledge will be transferred by the satisfied leaders to such companies (Contreras et al., 2010).

So in a global sense, there are just a few large design centers (Detroit, Stuttgart, Tokyo) of automotive development, which result that automotive industry's local, national and regional value chains are embedded within global organizational structures (Cattaneo et al., 2010).

As discussed earlier, global value chains refer to the international division of production, a phenomenon in which production is divided into different tasks and activities that are carried out in different countries. Western European automotive corporations play a crucial role in foreign direct investment processes in Central Eastern Europe and typically they lead the global value chains in these countries. Because of these circumstances, unique technologies and governance policies, **upgrading** in the automotive industry is different from other upgrading processes. Engineering and designer skills, costs and availability of workforce are the most important factors relating upgrading process in this industry (Contreras et al., 2010). Upgrading in the automotive industry is connected to public commitments, which support the FDI and innovation among companies (Bamber et al., 2013). In general, with the spread of different automation technologies, a *functional upgrading* process is observable from the labor-intensive to capital-intensive processes within the industry (Contreras et al., 2010).

## 6. The ‘spillover’ of the automotive industry into Central Eastern Europe

In the period after the Second World War until 1990, the automotive industry in Eastern Europe was state-owned, depended heavily on Western technologies and was largely isolated from the world market. It was mainly geared towards domestic demand in various segments (cars, trucks, buses), but was often unable to meet this demand. Overall, only the Czech Republic and the former East Germany developed automotive industries on their own technological basis and with recourse to industrial traditions that went back to before the Second World War. Poland, Romania and the former Yugoslavia relied on Western licenses to initiate mass production of automobiles in the 1950s and 1960s. Hungary did not assemble cars, but specialized in the production of buses and components for the Central Eastern European markets. Bulgaria and Romania had the least developed automotive industry in Central Eastern Europe (Pavlínek, 2020).

Since the early 1990s, the automotive industry in Central Eastern Europe has experienced a complete transformation and integration into the European and global production networks. This process was driven by investment strategies of transnational corporations: large inflow of foreign direct investment caused a restructuring of the existing automotive industry. Development of new capacities and rapid increase in the production of vehicles and vehicle components were characteristics (Pavlínek, 2020).

As mentioned in previous chapters, for developing economies foreign direct investment and global value chains are especially important, because in this way they are encouraged to improve skills and to innovate in general. Not just the foreign investment in production and services is crucial for them, but the applied new technologies, advanced operation techniques, R&D activities and innovation, as well. According to OECD studies, developing countries taking part in global value chains have GDP per capita growth rates of 2% above average. In the first instance, these benefits are characteristic for countries with large domestic markets and local knowledge capacities, economies with lower income or far from the international markets, are able to benefit less (OECD, 2014).

The presence of multinational companies in a country have several economic effects. The applied technologies and technical know-how can spread into local economies through suppliers’ connection or through the movement of workers from multinational to national companies. The spillover from the applied know-how happens not automatically, it depends significantly on the “sender” foreign affiliates and on the “receiver” parties, as well (OECD/WTO, 2011; Contreras et al., 2010). Technology transfer between countries require the

receiving ability of the host country, because the technological knowledge is often specific. In case of receivers, the human capital and the productivity are not the only factors of knowledge absorptive capacity, companies' innovation effort also very important in this regard (ECB, 2009). Countries, based on previous knowledge, need to invest in innovation to establish the appropriate business environment. Technologies are getting more complex and more difficult to adopt them, therefore increasing extent of investments is needed. Low financial development of a country can cause difficulties (Aghion et. al, 2005). Local companies not always have the accurate capabilities to take over the advanced technologies or techniques from foreign companies, therefore, it is necessary to support learning and investment also in local companies. At the same time, multinational companies often focus on property rights and restrict the spillover of their own know-how to local companies (Blomström - Kokko, 2003). A further positive "externality" for locals is the increased competition caused by foreigners' entry, because it can stimulate local companies to invest in new technologies and to work more effectively. The increased competitiveness could be attractive for further foreign investors, which have raising effects on national income and welfare, and it also motivates the host countries in FDI subsidization (Blomström – Kokko, 2003).

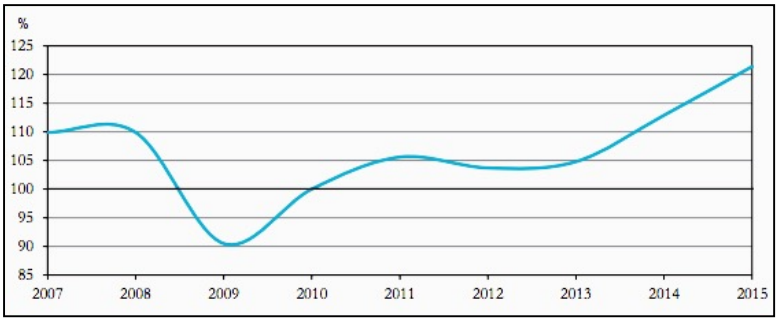
The country, the sector, the type of the firms paired with the nature of the FDI and the domestic companies' absorptive capacities influence the spillover effect (ECB, 2009). Characteristics of the technology import by multinational companies in the host countries are the following: they are larger, where the educational level is higher, the local competition is tougher and the operational requirements are fewer (Blomström – Kokko, 2003). Without any knowledge spillovers also the pure presence of multinationals can be beneficial for the recipient countries, because these companies are among the technologically most advanced enterprises (ECB, 2009).

## 7. Key general facts about the Hungarian industrial production

Central Eastern European countries went through a systematic transformation process during the 1990s (Balaton, 2005). In the first half of the 1990s a relatively large volume of FDI arrived in Hungary. Privatization was applied by the Hungarian government and as a result foreign investors attained a significant role in the ownership structure of enterprises in Hungary by the end of the century (Balaton, 2011). Economic conditions became similar to those of Western European countries and companies became able to compete with firms in developed market economies (Balaton, 2005). As a result, foreign investors appeared also from the automotive industry in Hungary in these years. Paired with the new investors, also high-technology, modern business management and organization methods have come into the region. These factors altogether have contributed to the successful change of the industrial structure (KSH, 2011).

*Industrial production*

**Figure 7 – Changes in Hungary's industrial production between 2007 and 2015**

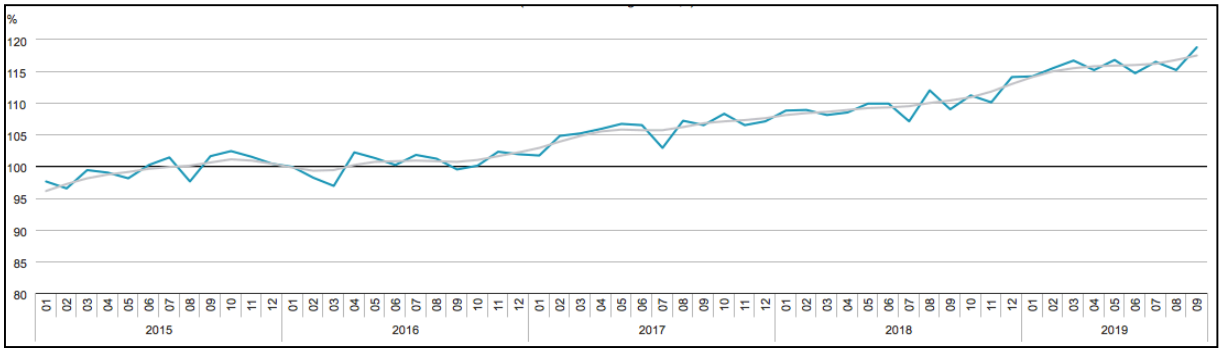



(monthly average of 2010 = 100%) Source: KSH, 2016b

Based on data of the Hungarian Central Statistical Office (KSH), in Hungary the industrial growth in 2015 was 21.5% compared to the basis year 2010 (Figure 7). Among the CEE countries, only Slovakia, Romania and Estonia have better growth performance in this period. In case of Hungary, presumably the automotive industry has an outstanding role in this achievement: in 2015 – due to the high performance of the **vehicle production** – the volume of the output rose by 7.5% (similar to 2014) (KSH, 2016b). The highest productivity growth of 9.1% was recorded in the automotive industry. Also the car industry supplier companies were able to rose their production in 2015. (Cables and electronic components for cars are produced mainly by these kind of companies.) In connection with automakers' performance, the greatest

increase in the number of staff by 6,400 employees (7.4%) was characteristic to the automotive industry between 2014 and 2015, where 76% of the workers were blue-collar (KSH, 2016b).

**Figure 8 – Changes in Hungary's industrial production between 2015 and 2019**



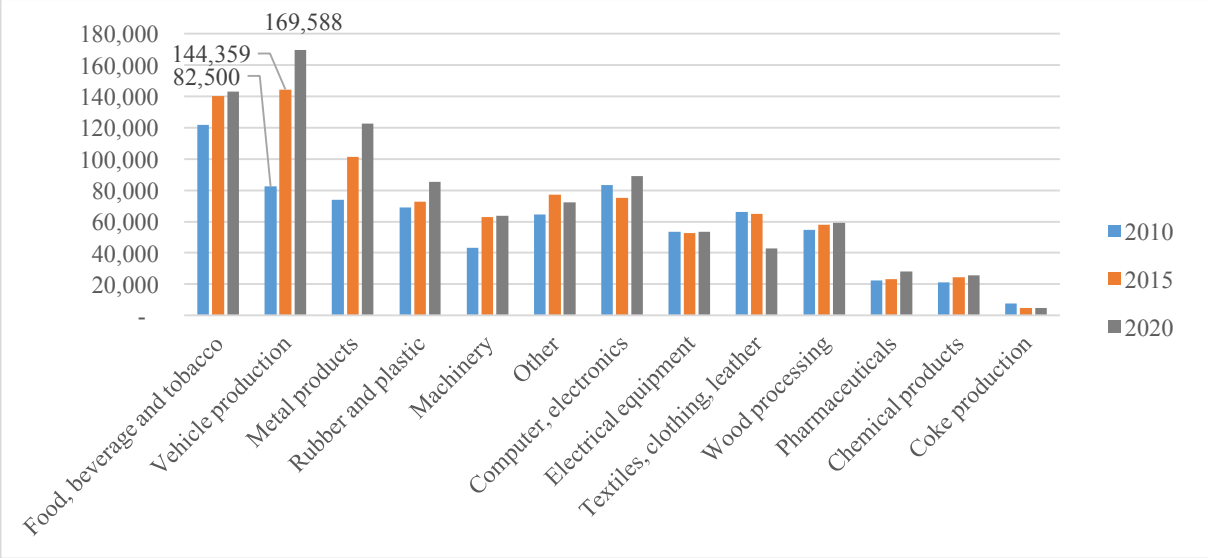

(green line = seasonally and working day adjusted, grey line = trend)

(monthly average of 2015 = 100%) Source: KSH, 2019b

We can observe the same trend in Figure 8 as in Figure 7, there is a systematic growth in Hungary's industrial production between 2015 and 2019, and so from 2009 to 2019.

*Employment*

**Figure 9 – Number of employees in the processing industry in 2010, 2015 and 2020**

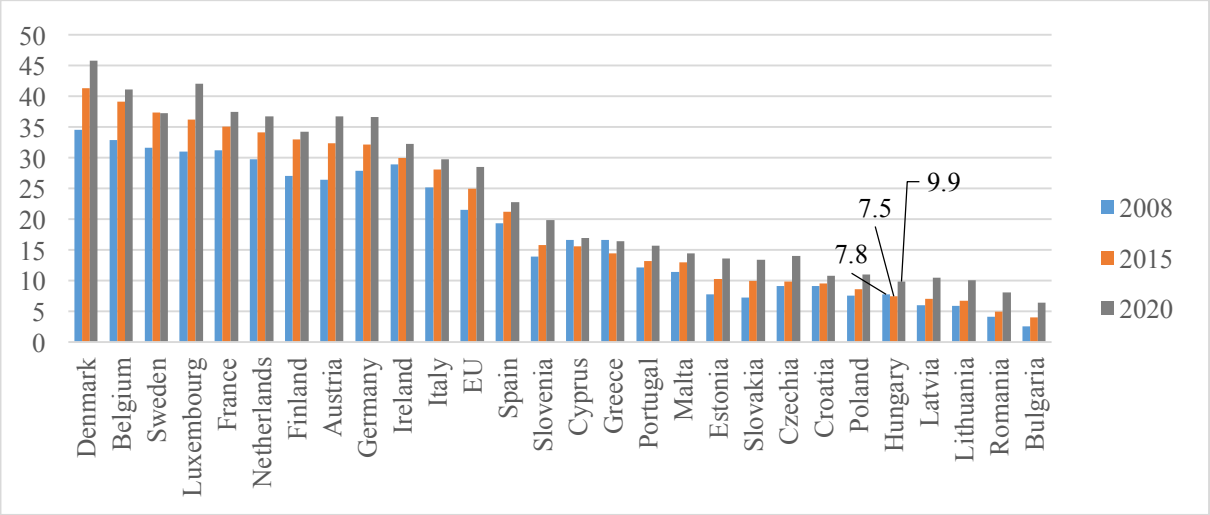



Source: KSH, 2021

Nowadays, in Hungary's manufacturing industry most resources are concentrated in the **automotive sector**, the vehicle production has the highest share of employment in the processing industry. On Figure 9, we can see that the number of employees in the vehicle production has doubled (from 82,500 to 169,588) within ten years, between 2010 and 2020.

Why do car manufacturers like Hungary? First of all, the territorial proximity and the relatively cheap and skilled labor force are necessary for great manufacturers to assemble vehicles in the country. Furthermore, in investment decisions tax incentives also play a crucial role. The cheap labor and the geographical location mean comparative advantage for Hungary and for the Central European region compared to other regions, therefore there is a competition within CEE for the Western European car manufacturers. In Slovakia and Czech Republic, the automotive industry has similar effects on the whole economy, the automotive sales counting as a significant proportion of the exports (Szabó, 2016).

**Figure 10 – Labor costs in the European Union (EUR) in 2008, 2015 and 2020**




Source: Eurostat, 2021

Labor costs remained lower in Central Eastern Europe than in Western Europe significantly, although the gap has narrowed over the past thirty years gradually (Pavlínek, 2020). As Figure 10 shows, labor costs in the CEE region are far below the Western and Southern European levels, and this significant difference between the regions has increased since the crisis. Within the CEE region, Hungary is among the countries with the cheapest labor costs, it was EUR 9.9 in 2020. There is an increase observable since 2008, when it was only EUR 7.8, followed by a slight fallback in 2015 (EUR 7.5).

Incumbent companies with successful production structure transformations and with effectively implemented modernization programs, and also newly-settled foreign firms together have enabled the automotive industry to have outstanding value generating capabilities in the Western regions of Hungary (KSH, 2011). Because of the constant demand for products with high technological solutions or with improved technology, the innovation potentials of the automotive business are high. Besides applying the most advanced technologies and innovating continuously, the automotive industry is characterized by a small number of medium or large enterprises with high value added products (KSH, 2011). Due to advanced level of technologies, wide range of automation, high level organization of work and high value of product range, the automotive sector has the highest production value per employee within the machinery industry and plays a key role in the employment too. With company establishments, production capacity expenditures and supplier networks widening, the industry has generated a growing demand for labor and as a result, it has contributed to the decline of the region's unemployment rate (KSH, 2011).

**Table 1 – Recent changes in the employment and unemployment rate in Hungary (Q4 data of each year)**

| | Employment rate | | | Unemployment rate | | |
|---|---|---|---|---|---|---|
| **Region** | **2010** | **2015** | **2020** | **2010** | **2015** | **2020** |
| Central Hungary | 53.0 | 60.0 | 64.5 | 8.6 | 4.7 | 3.6 |
| Central Transdanubia | 51.5 | 60.0 | 62.6 | 9.2 | 4.2 | 2.3 |
| Western Transdanubia | 52.2 | 59.5 | 62.8 | 8.6 | 3.5 | 1.9 |
| Southern Transdanubia | 45.9 | 51.9 | 55.1 | 12.6 | 8.1 | 4.6 |
| Northern Hungary | 43.1 | 52.2 | 55.9 | 15.8 | 7.1 | 5.3 |
| Northern Great Plain | 44.7 | 53.1 | 57.2 | 14.1 | 10.2 | 7.4 |
| Southern Great Plain | 47.9 | 54.8 | 58.8 | 10.1 | 7.1 | 4.6 |
| **Hungary (total)** | **49.0** | **56.6** | **60.5** | **10.8** | **6.2** | **4.2** |

KSH, 2021

In 2015 disparities in employment and unemployment between the regions decreased slightly. However, while in Central Hungary, in Central- and Western Transdanubia regions the labor indicators were favorable, in Southern Transdanubia, Northern Hungary, Northern- and Southern Great Plain the indicators were far below the national average (within population between 15-64) (Table 1). Until 2015 and 2019 the employment expanded and the

unemployment declined in all regions compared to the previous year. In Central and Western Transdanubia the level of employment was the highest (KSH, 2016a).

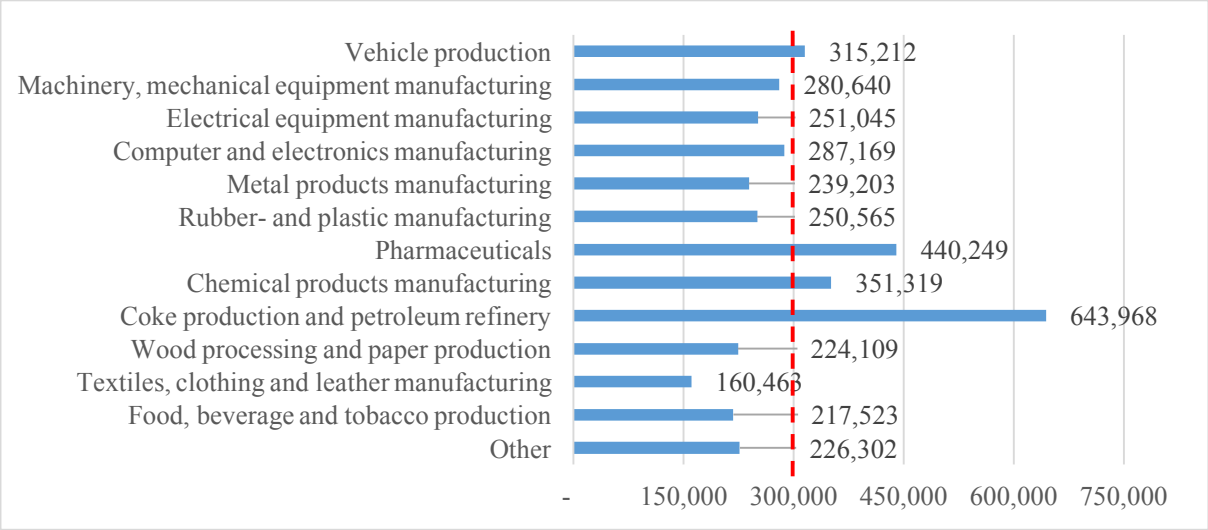
Automotive manufacturing needs high capital investment, because the production of components and the final assembly works require high-tech machinery and equipment with skilled workforce. Because of the complex and technical nature of the activity, the massive capital need of the production and the high quality requirements, the number of individual entrepreneurs is rather small in this industry (KSH, 2011). Besides the high-skill talent and cheap workforce, the North-West Hungarian region also has several research universities, e.g. Széchenyi University in Győr, where a wide range of automotive training and education take place. The institution has developed strong and active cooperation with automotive enterprises of the region, like Audi. As an integral part of the R&D activities, the number of research topics associated with automotive has begun to rise from 2007. 92% of the research projects have dealt with innovative developments to implement new processes, systems and services and this way to improve companies' market positions. International cooperation was a key characteristic of the successful research projects (KSH, 2011).

The economic recession in 2009 set back the production of the automotive industry significantly, but because of the increasing demand, recovery happened relative quickly. In leading automotive companies' strategies, the focus from the exploitation of local resources has shifted to the increase of efficiency. This shift has offered an opportunity for domestic suppliers to integrate into the supply chain, operate with higher income level and also in the deploy sufficient technical expertise (KSH, 2011). Nowadays, ca. 65% of cars and car party produced in CEE plants are exported to Western Europe. 17% of cars production in Greater Europe comes from CEE factories (it was only 7% in 2000) (McKinsey Global Institute, 2013). The development of the Hungarian industry and sales is primarily influenced by the global, mostly European economic processes (KSH, 2016b). In 2010 external conditions enabled the industry to grow by 11%, which was followed by a slow down in 2011 (5.6%) and 2012 (1.8%). In 2014 the production volume was around 7.7% again (KSH, 2016b).

In 2015, the year when the automotive industry has had the biggest growth rates compared to the previous years, more than 28% was the weight of the vehicle production among the Hungarian processing industry, which was around 18% 10 years ago. In this year the vehicle production's output was more than eight times larger than of pharmaceuticals, which counts as a very successful sector among the Hungarian processing industry and all other sectors are far behind the automotive industry (KSH, 2016b).

The automotive sector's average wages are higher compared to the national economy average or to the industry average (KSH, 2011).

**Figure 11 – Monthly average gross wages in the processing industry (HUF), 2015**




Source: KSH, 2016b

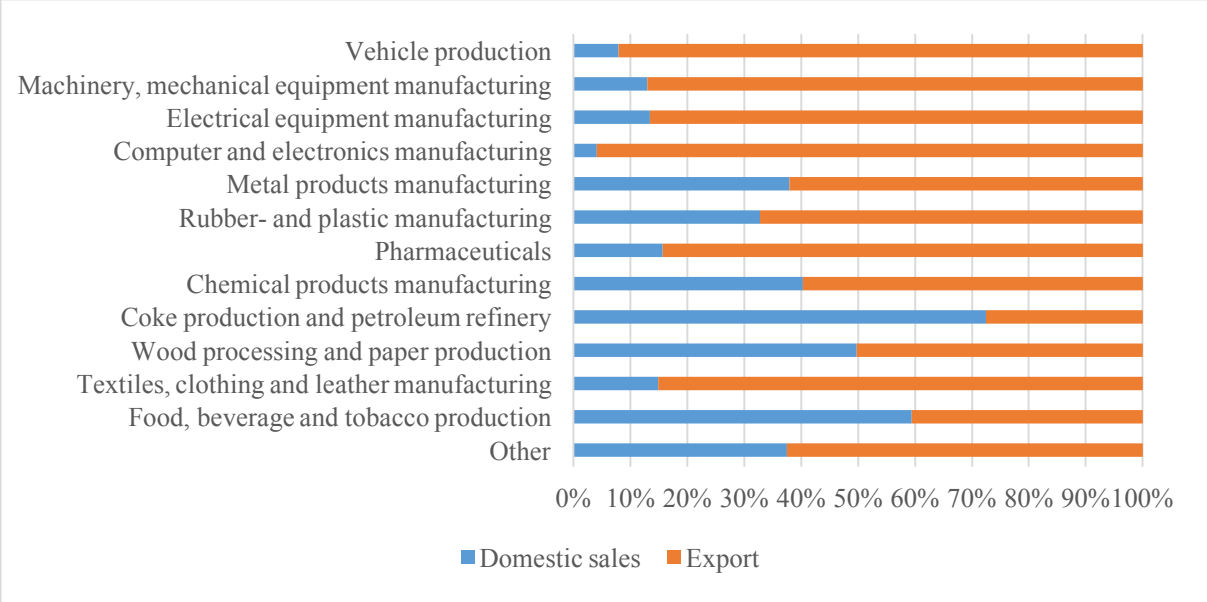
Figure 11 presents the monthly average gross wages in the Hungarian processing industry in 2015. In four subsectors (vehicle production; pharmaceuticals; chemical products manufacturing; coke production and petroleum refinery) wages were above the industrial average (299,000 Forint), between 315 and 644 thousand Forint. In many subsectors average gross wages were far below the industry average (between 160 and 287 thousand Forint) (KSH, 2016b). In coke production and petroleum refinery the wages were very high, because the number of graduated engineers is large. In contrast, in the automotive industry not just graduated engineers work, it explains the lower average wage of the sector. According to the Hungarian Central Statistical Office, the average wage in Hungary in June 2015 was net 159,000 Forint. The average salary in the automotive industry is net 196,000, which is above the Hungarian national average, but far below the German salaries in the same positions.

*Sales volume*

In 2015 the vehicle production increased by 17.2% compared to 2014, which is the greatest increase among the processing industry's subsectors. Both the domestic and the export sales were growing (domestic sales recorded the largest increase in sales amount (35%) in the last 20 years so far) (KSH, 2016b).

The large, export-oriented companies of the Hungarian automotive sector have significant impact on the trade balance improvement. Business activities related to the automotive industry affect the economic development and the standard of living of the regions.

**Figure 12 – Domestic and export sales distribution in the processing industry, 2015**



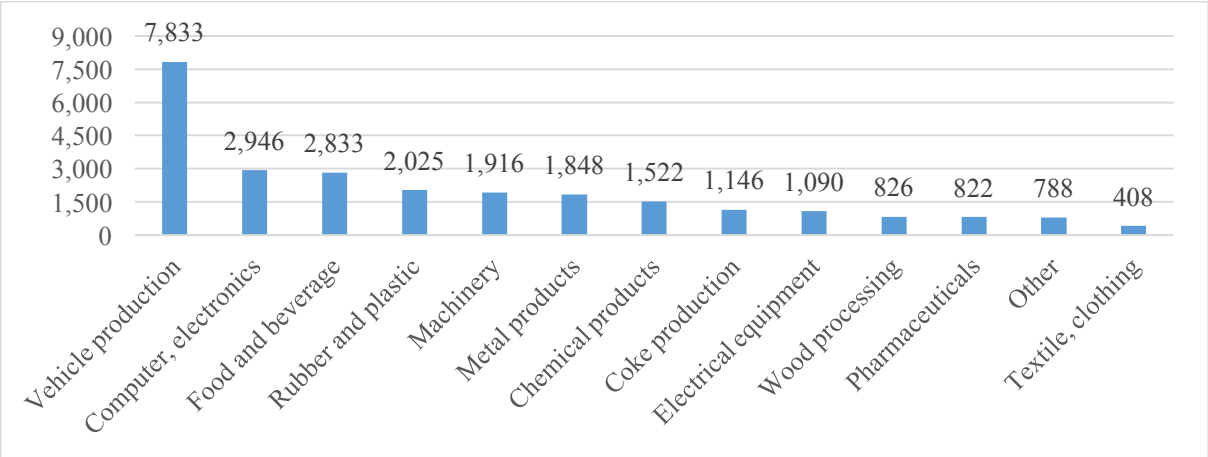

KSH, 2016b

As Figure 12 shows, in 2015 more than 90% of the automotive industry's production was exported. Exports are very important for the country, because the positive current account balance helps to ensure the operation of the economy. In case of export surplus, the country's external position is also improving. It is not clear export, because a lot of raw material and production line should be imported from abroad for the production (value added in Hungary is relatively small), nevertheless car industry improves the Hungarian economy's external balance very seriously.

In the last two decades, high-value investments were made by automotive manufacturers into the fields of passenger cars, vehicle motors and parts manufacturing (new hall buildings, expansions, renovations, installation of new production lines or restructuring the existing ones, etc.). However, in 2015 volume of investments in the vehicle production decreased by ca. 10% compared to the previous year. The downturn lasts since 2013 continuously and investments decreased despite the fact that production increased significantly[3] in 2015 (KSH, 2016b).

[3] Record amount of passenger cars produced in Hungary in 2015 (Figure 13) (KSH, 2016b)

**Figure 13 – Annual production values in the processing industry (billion HUF), 2015**




Source: KSH, 2016b

Car industry's dominant role has positive effects on a country's economy in general, but it could be very dangerous at the same time. Among the main advantages, the most important is the high level of export activity. However, the operation of the whole country depends on only one industry and on some huge companies' decision making. Furthermore, the industry is very concentrated and Hungary has just a few so concentrated industry sectors. Even if the number of small and medium enterprises in Hungary is large, they realize only a quite minimal part of the industrial production. It is especially characteristic of the automotive industry, where there are ca. 900 companies, but about 70 companies with more than 250 employees produce the 90% of the sector's output (KSH, 2016). (Small players are stronger in the domestic sales, but not in export activities.) Several existing studies about electric devices, like laptops, tablets or mobile phones show a similar pattern of specialization, when advanced economies are responsible for the contribution of skilled labor and capital and emerging economies deliver the low-skilled activities with little added value (Timmer et al., 2014). The case is similar in the automotive industry in Hungary, as well. A significant share of intermediate production processes of German cars is performed outside of the country, typically in Europe and it means also that a big part of German cars' value is produced abroad. In this regard, the question arises often: to what extent are these cars really German? (Gurgul – Lach, 2016). Based on the value added in production by a country and on the involved jobs and capital in the production chains, new measures of the globalization can be met in the trend of the increasing globalization (Gurgul – Lach, 2016).

Since foreign companies are concentrating on cost reductions and low wage costs, they have mainly built up production capacities in Central Eastern Europe, but have invested much less

in areas with high added value, such as research and development. Nevertheless, the automotive industry in Central Eastern Europe has experienced a significant process and product upgrade (Pavlínek, 2020).

A rapid upgrade of the processes was necessary in order to achieve increased competitiveness through the transfer and modernization of technology and a reorganization of production. It was mainly driven by foreign firms by introducing western style of production and management in acquired firms, joint ventures (JVs) and in newly built factories: transnational corporations have often set up state-of-the-art factories in Central Eastern Europe. They also put pressure on local companies to improve the quality of their products and processes (including products with higher added value) (Pavlínek, 2020).

The least progress has been made in functional upgrading, which involves activities with higher added value and functions such as research and development, marketing and other service activities: the vast majority of companies in Central Eastern Europe have no research and development activities. If they have R&D activities in the region, this is mostly concentrated on routine activities and low-level areas of research and development, while strategic research is mostly carried out at their parent companies. R&D activities by local firms are either non-existent or of a very limited nature (Pavlínek, 2020).

Hungary participates in the value chain mainly as an assembly plant – not the higher value added activities are carried out in the country like design, sales or R&D – which can also strengthen the defencelessness of the country. The total value added is rather low compared to the regional standards, about 40% of the manufactured cars are domestically value added. It may have negative effects, because the remaining income in Hungary is proportionally less. Therefore, the increased participation of the domestic suppliers in the automotive manufacturing value chain is very important to achieve higher domestic income volume and employment and to reduce the defencelessness of the country (Szabó, 2016). According to Stocker (2014) an increase in the GVC participation of the local suppliers could have a positive effect on the value added per revenue. As Table 5 in the appendix shows, among the top 50 biggest exporter companies in Hungary, in 2015 there were 17 from the automotive industry: vehicle manufacturer, tire manufacturer or car dealer; and the companies are all foreign-owned. Complete cars production value, which are performed by the three major car manufacturers (Audi, Mercedes and Suzuki) are in total greater than the rest of the automotive industry (parts and components manufacturers).

## 8. Automotive manufacturers operating in Hungary

The liberalization of handicrafts and direct investment after 1989 led to the introduction of new car manufacturers in Central Eastern Europe and began to build new factories in Hungary, the Czech Republic, Poland and Slovakia. The first were Suzuki and Audi in Hungary in 1990 and 1994 and GM in Poland in 1995. The low production costs in Central Eastern Europe were a key driver for this increased investment. The choice of location was also strongly influenced by efforts to minimize transport and logistics costs. Although cost-cutting motives were predominant in the location factors, other factors also played a role for the investing companies, such as the qualification of the workforce, industrial tradition, the flexibility of the workforce, the strength of the trade unions and access to local know-how and technology. This trend was exacerbated by various factors. The first was the prospect of EU accession for the Central and Eastern European countries, which also took place in 2004 and 2007, respectively. The second was the introduction of generous investment incentives in the late 1990s and increased competition for foreign investment in Central Eastern Europe (Pavlínek, 2020). Production value increased more than eight-fold between 1999 and 2019, including the rapid increase in the value of parts and components. The growth of the automotive industry was concentrated in five Central Eastern European countries: the Czech Republic, Slovakia, Poland, Hungary and Romania (Pavlínek, 2020).

Driven by the attractive wages and geographical proximity of the country, automotive manufacturers appeared also in Hungary in the beginning of the 1990s.

**Figure 14 – Locations of the five OEM's in Hungary**


Source: KSH, 2011 and own edition

The four main automotive manufacturers are Audi Hungaria Motor Kft. in Győr, Mercedes-Benz Manufacturing Hungary Kft. in Kecskemét, Opel Szentgotthárd Autóipari Kft. in Szentgotthárd and Magyar Suzuki Zrt. in Esztergom (Figure 14). BMW is also building a new production facility with an annual capacity of 150,000 vehicles in Debrecen, although the opening has been postponed to 2024.

Besides Germany, Hungary is the only country with production facilities for the 3 premium car manufacturers in Europe (Audi, BMW and Mercedes) (HIPA, 2021).

## 8.1 Audi Hungaria Motor Kft.

*The History of Audi Hungaria*

The story of Audi in Hungary began in the year 1993, when the agreement on the purchase of the industrial site and on the general conditions of the greenfield investment project were signed. A year later the plant already started its operation. In 2000 the manufacturer hall for the four-cylinder diesel engines was opened and also this time the Engine Development Centre of Audi Hungaria was also established. The latter enabled engineers to carry out development works not just for the Audi Hungaria, but also for the headquarter company Audi AG. Between 2002 and 2005 further factory (tool factory, eight-cylinder engine factory) expansions happened and in 2008 the 400,000$^{th}$ car was produced in Győr. Audi has completed a joint project with the Technological University Munich and with the West-Hungarian University in the topic "environment protection". Audi Hungaria School and visitor's centre were established and further plant's expansion was announced in the year 2010, when the 500,000$^{th}$ car left the assembly line. For Audi the cooperation with universities was especially important, therefore the company supported the opening of a new building for Audi Hungaria Internal Combustion Engines Department of Széchenyi István University. Later, a new building for Audi Hungaria Internal-Combustion Engines Department was inaugurated and two departments (a new Vehicle Development Department and the fifth Audi Hungaria Department) were established at the Széchenyi István University, later on also a high-tech lab and a whole faculty. Moreover, a Project and Training Centre with vocational trainings opened in Győr and among the company's development activities the vehicle development has also appeared (Audi Hungaria, 2016).

According to Audi Hungaria, for them the close cooperation with governments (Hungarian government and Local Government of Győr) is essential, e.g. the company supported hospital modernizations and the expansion of Airport Pér. After the first twenty successful years also a strategic partnership agreement was signed with the Hungarian government and Audi became a partner of the Hungarian Olympic Committee. A multifunctional hall "Audi Arena Győr" was built with the support of the company. In the last 25+ years, the production processes in Audi have became more and more complex. The Audi A3 Sedan was the first to be completely produced in Hungary in the year 2013 (Audi Hungaria, 2016).

The company was also successful among its employees, it won the prize as the "Most Attractive Employer" six times in a row. The number of employees exceeded the 11,000 in 2014 and the 12,200 in 2020 (Audi Hungaria, 2020).

*Why Hungary?*

Audi AG was looking for a site to start its new engine plant where production could be started as soon as possible. Győr offered the best opportunities by offering the hall of the Rába factory and the following factors played a major role in the establishment of Audi Hungaria.

Cost factors:

- domestic labor costs accounted for only 25-40% of German labor costs;
- the availability of the former Rába factory (Rába Hall) has significantly reduced construction costs;
- costs other than the production processes, such as internal and external transport, general maintenance, cleaning and security costs were significantly lower in Hungary than in Germany;
- the Hungarian government has granted a number of financial and tax incentives to new investors (Jakab, 2017).

Exceptional geographical location:

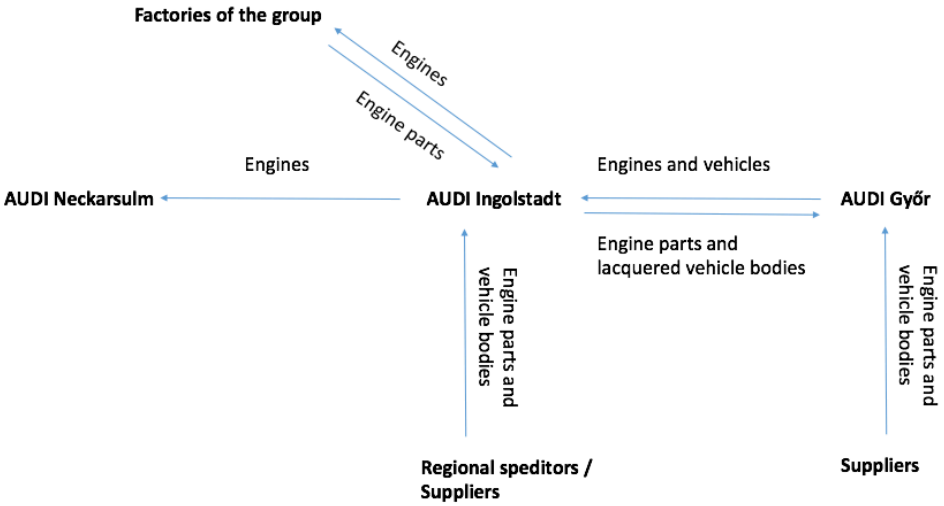
- Budapest-Vienna-Munich motorway;
- Budapest-Vienna main railway line;
- development of the Gönyű international river port and the former military airport in Pér into a civilian airport;
- Győr is 610 km from Audi AG's headquarters in Ingolstadt, Germany. Within the Volkswagen Group, there are several assembly plants at a similar distance from the central site. This distance is still manageable, with excellent logistics routes allowing just-in-time production (Jakab, 2017).

Other:

- highly trained and immediately available workforce with experience in the mechanical engineering industry: Győr has extensive experience in the field of mechanical engineering and vehicle manufacturing, based on the traditions of the Rába factory, which survived the transition period with redundancies and reorganizations, so a large number of experienced professionals were out of work in the local labor market. Due to this, the city of Győr and its labor market area of attraction had not only quantitative but also qualitative human resources in its work culture, which can easily adapt to German

work ethic, thanks to centuries of experience in the machine industry, automotive industry and production culture (Jakab, 2017).

**Figure 15 – Logistics between Audi Hungaria and the sites of the Audi Group**



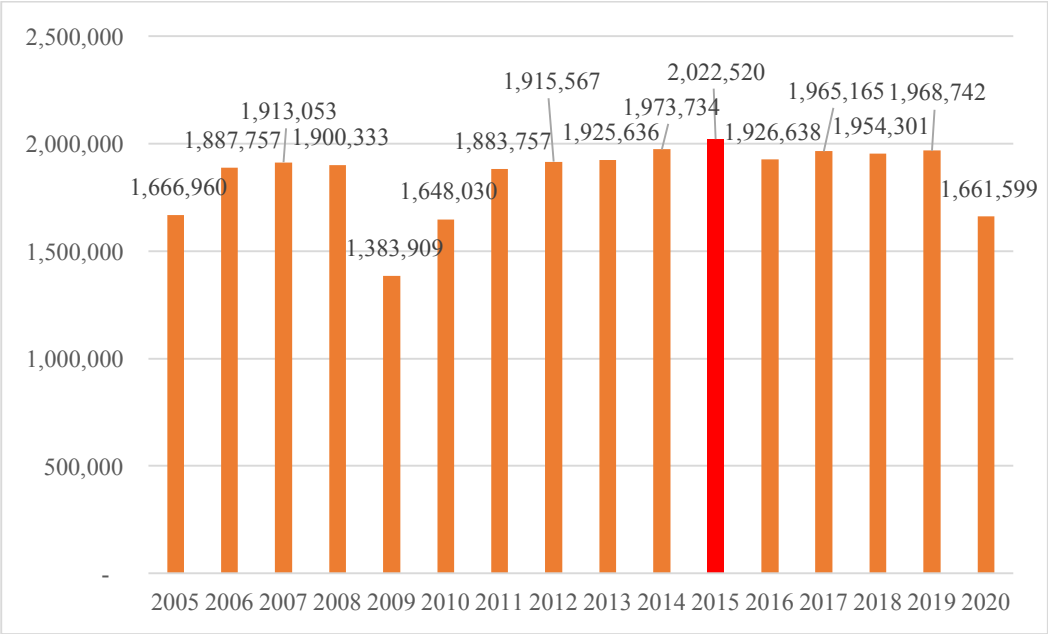

Source: Author's creation based on Horváth, 2011, p. 22

Figure 15 above illustrates the logistics supply chain of AUDI AG. The company is headquartered in Ingolstadt, the engine parts and the lacquered vehicle bodies are supplied from the HQ to Győr. The manufactured engines and vehicles are supplied back directly to Ingolstadt. AUDI Győr also has numerous (more than 85) Hungarian serial suppliers for engine parts and vehicle bodies (Horváth, 2011; Audi Hungaria Kft., 2020).

*Facts and figures*

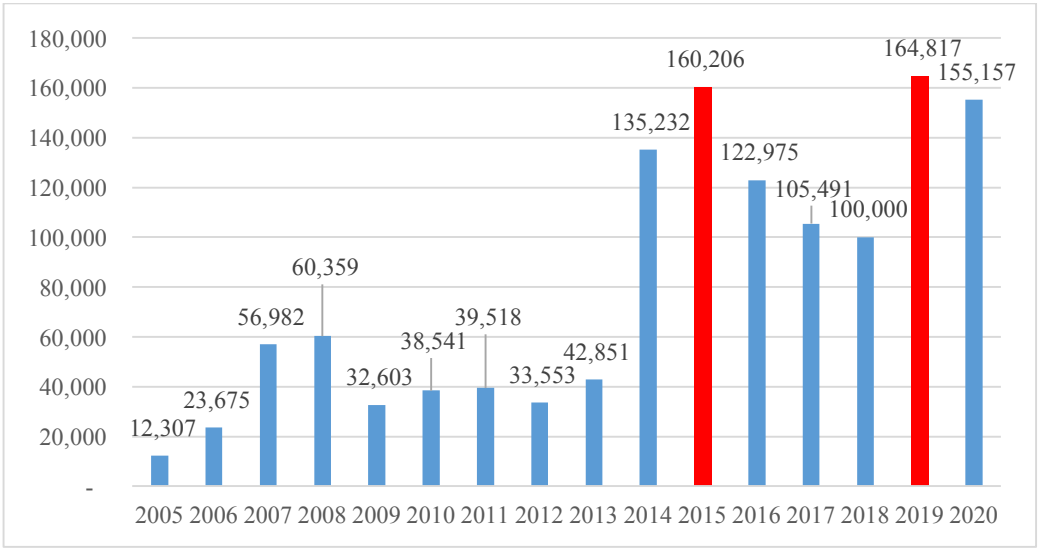
In the world's biggest motor plant more than 2 million motors were produced in 2015 (Figure 16), which is 50,000 more than in the year before. With the appearance of A3 Limousine in Győr, the volume of cars produced in the factory also increased. While in 2014 the number of produced cars was about 135,000, it exceeded 160,000 in 2019 and in 2019 (Figure 17) (Audi Hungaria Kft., 2020).

**Figure 16 - Number of engines manufactured by Audi Hungaria in the last 15 years**




Source: Audi Hungaria Kft., 2020; 2021

**Figure 17 - Number of cars manufactured by Audi Hungaria in the last 15 years**




Source: Audi Hungaria Kft., 2020; 2021

As we can see on the figure above, 155,157 Audi models rolled from the production line in 2020 in vehicle manufacturing, which represented only 6 percent of reduction compared to 2019. Despite the extremely difficult operating environment, the company managed to produce the third most cars in the history of the Hungarian production base after 2019 (164,817) and 2015 (160,226).

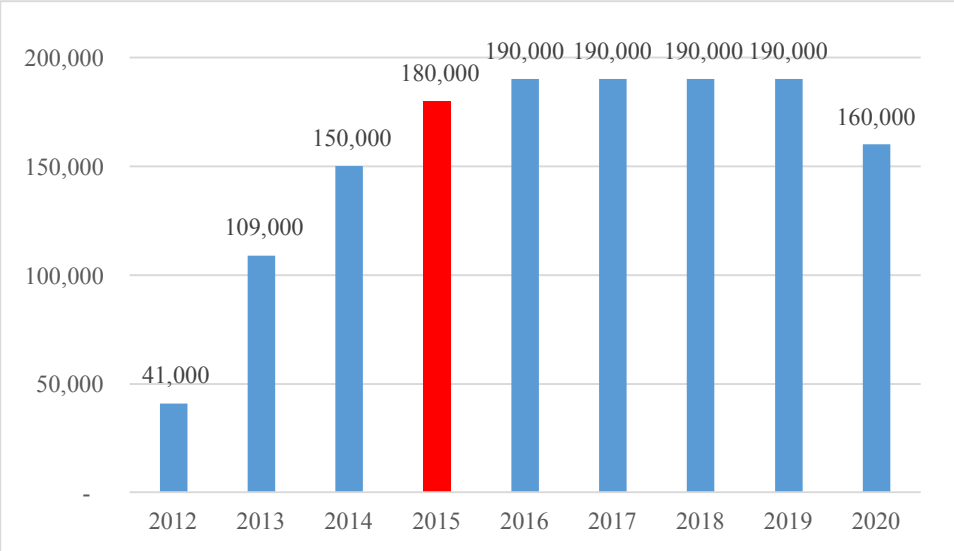
The coronavirus pandemic has put the global automotive industry in an extremely difficult position last year, with austerity measures taken to curb the first and second waves causing a significant drop in global demand for cars. All this also had an impact on the performance of the world's largest engine factory, Audi. Nearly 1.67 million engines were produced at the Audi plant in Győr in 2020, which is the lowest number in the last ten years. The good news, however, is that automotive production has remained high despite the challenging operating environment, thanks to the Audi Q3 and Audi Q3 Sportback models competing in the popular SUV segment (Audi, 2021).

### 8.2 Mercedes-Benz Manufacturing Hungary Kft.

On 17th June 2008 the decision was made about the establishment of a new Mercedes-Benz plant in Kecskemét, Hungary. Construction works were finished in October 2011 and in March 2012 the factory opened its gates. The production works of the Mercedes Class B began, which was followed by the serial production of the CLA in 2013 and the CLA Shooting Brake in 2015 (Mercedes-Benz, 2016).

Since 2014 employees work in three shifts in the factory. Due to the regular expansions in the last few years, the numbers of employees were about 4,000 at the end of 2015. Also the number of the local suppliers has risen recently to the amount of 32 in 2015, when more than 180,000 Mercedes were produced within a year in Kecskemét (Figure 18) and the company became one of Hungary's most important investor and employer. Mercedes introduced the dual training in Hungary, which provides career opportunities for students, from the vocational schools to college. Mercedes is a popular employer, the company strives with different services and programs, e.g. factory nursery and kindergarten, family days, etc. to create a convenient working environment. Also a cooperation agreement was signed between Mercedes and the Hungarian government. In 2016 production of new versions of the CLA and CLA Shooting Brake began (Mercedes-Benz, 2016).

**Figure 18 – Number of cars manufactured by Mercedes Hungary in recent years**

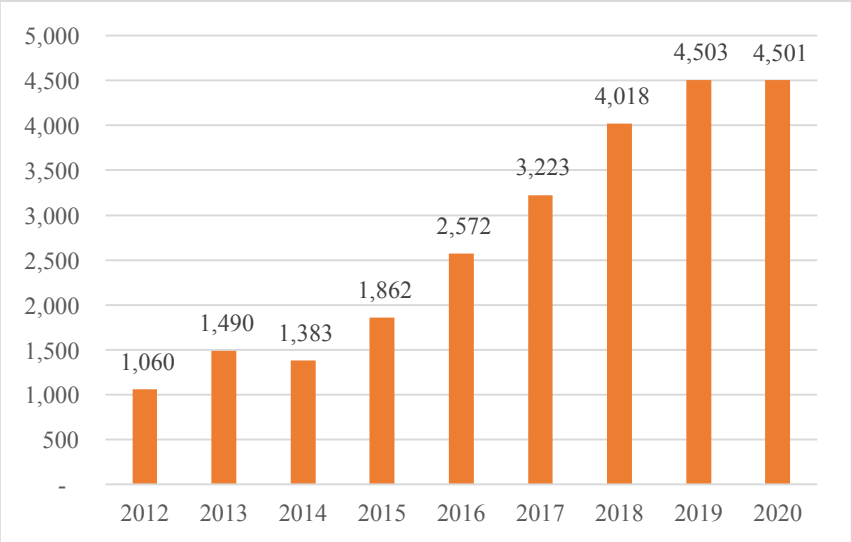



Source: Mercedes-Benz, 2020; 2021

2015 was a successful year for Mercedes-Benz Hungary, because there was a huge demand for such compact cars, which are produced in Kecskemét. In 2015 180,000 cars were manufactured in the Hungarian plant, which is a 20% increase compared to 2014. In 2015, thanks to the large amount of sales, a profit of 66 million Euro was realized. Because of the high profit margin, the infrastructure improvements in the country and subsidies by the Hungarian government, the management of the Daimler AG has decided about a 500 billion Forint investment in Hungary until 2020. The investment also covered a new plant in Kecskemét, which construction works were scheduled to begin in 2018 with a production start scheduled at the end of the decade. In addition to the production of front- and rear-wheel passenger cars, alternative-powered models manufacturing are also planned. The EQB, manufactured at the Kecskemét plant, will be the first purely electric vehicle manufactured in Hungary and produced in series production (Mercedes-Benz, 2021).

The coronavirus epidemic and the challenging operating environment in 2020 did not significantly reduced the performance of the Kecskemét plant either, more than 160,000 cars rolled off the production line (Mercedes-Benz, 2021).

**Figure 19 – Sales of cars (pieces) manufactured by Mercedes Hungary in recent years**




Source: Mercedes-Benz, 2020; 2021

As we can see on Figure 19 above, almost exactly the same number of Mercedes-Benz cars were placed on the market in Hungary last year as in 2019.

### 8.3 Opel Szentgotthárd Autóipari Kft.

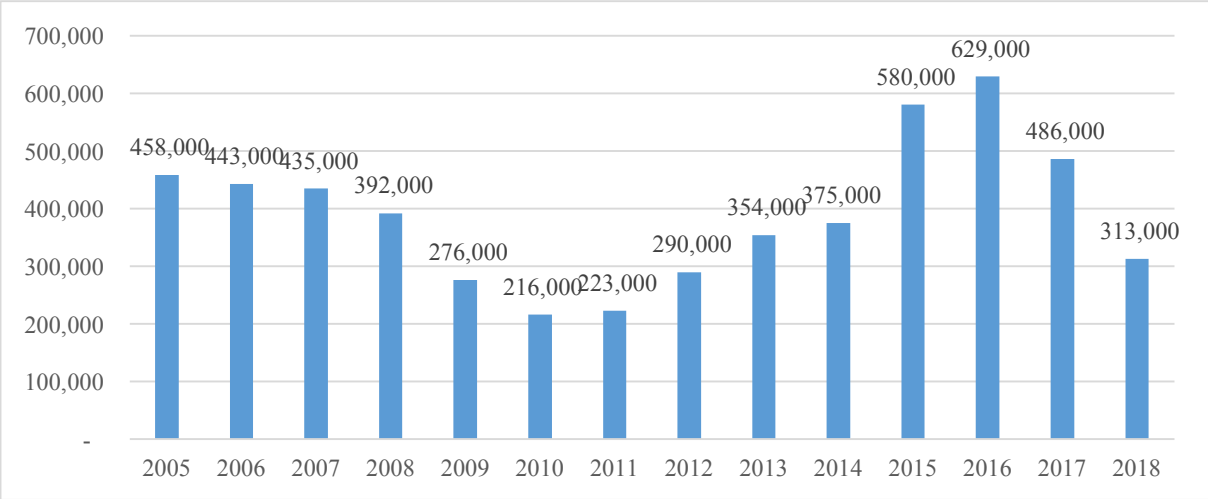
In June, 1990 the General Motors and the Rába Magyar Vagon- és Gépgyár signed a contract about the establishment of a joint venture company. It was Hungary's first multinational company after the political transformation. Construction works and the employment of the first workers began in 1991. The first Opel Astra was rolling down from the production line in March, 1992. It was the first Hungarian built car in the modern age. Two years later sales were increasing, therefore the second and the third shifts were introduced in the factory. The company has a cooperation with the Hungarian Police, thus 200 Opel Astra were produced as Police cars in the year 1997. In 2001 plant expansion was executed and third generation of motors was launched. The outstanding expertise of the employees enabled the company to broaden its activity in 2006, as the renovation of gears and motors became also part of services (Opel Szentgotthárd Autóipari Kft., 2016).

Opel also has strong cooperation with the Hungarian universities and the first scientific conference about R&D was held in the year of the 15$^{th}$ jubilee. The company was popular as an employer too, its factory being among the top 30 best workplaces in Hungary in 2010. Further expansions were planned these years. The objective of an investment of 500 million Euro was to enlarge the factory and to launch the production of three different types of motors, which are able to consume less fuel and to emit less $CO_2$. The investment resulted in 800 new workplaces and 500,000 motors produced within a year in Szentgotthárd (Opel Szentgotthárd Autóipari Kft., 2016). The West Pannon Automotive and Mechatronics Centre comprises the region Szombathely – Szentgotthárd – Zalaegerszeg. It was enunciated as a special automotive center by the Hungarian government in 2012 and its goal was to foster growth and competitiveness of the region's automotive industry. In 2013 the plant expanded further: the size of the hall was extended by 1,600 m$^2$, which resulted in the growth of employment by 100 people in the next couple of years (Opel Szentgotthárd Autóipari Kft., 2016).

For Opel the Corporate Social Responsibility (CSR) is very important, like computer and motor donations for several institutions including primary-, secondary schools, colleges and universities in the region. The donations aim to contribute to maintain the high standards of education and to cultivate cooperation among the schools and institutions. In 2015 an investment was announced to establish a study center in Szentgotthárd in a value of 1.7 million Euros. It was an important step by the company to ensure the workforce replacement and to develop and support the dual vocational education opportunities in the West-Hungarian region. For these vocational trainings in the fields of technician, electrician, etc. different apprentice

workshops were built. The company also signed a long term strategic cooperation with the Weöres Sándor theatre of Szombathely (Opel Szentgotthárd Autóipari Kft., 2016).
Overall, total investments into the plant exceed the 700 million Euros and the yearly production capacity is about 650,000 motors (Opel Szentgotthárd Autóipari Kft., 2016). In 2015 the number of motors produced in Szentgotthárd was nearly 600,000 (Figure 20), which shows a high increase in production compared to the previous years.

**Figure 20 – Number of motors produced by Opel in recent years**




Source: Opel, 2020

In Szentgotthárd the production increased, because in addition to the old Familiy-1 plant, an increasing number of motors are produced in the new Flex-plant. Beside the internal combustion engine, motor component manufacturing is also a very important business sector, where cylinder-heads, motor blocks and connecting rods are made. Furthermore, automatic gears (Allison-type) for trucks are also produced in the plants (Opel, 2020).

Opel Szentgotthárd currently produces one of the PSA Group's most significant petrol engines, with a capacity of 350,000 units per year. The ten millionth engine was a three-cylinder turbo petrol from the PureTech family. Production of the three-cylinder petrol turbo engine began at the factory in 2020, and the 1.2-liter engine is available in 100 and 130 horsepower versions. These low-consumption and environmentally friendly engines will be integrated into PSA's Opel, Peugeot and Citroen models. Due to the pandemic, this plant could not avoid the shutdown in the spring either, but overall, Opel's plant in Szentgotthárd closed a positive year in 2020.

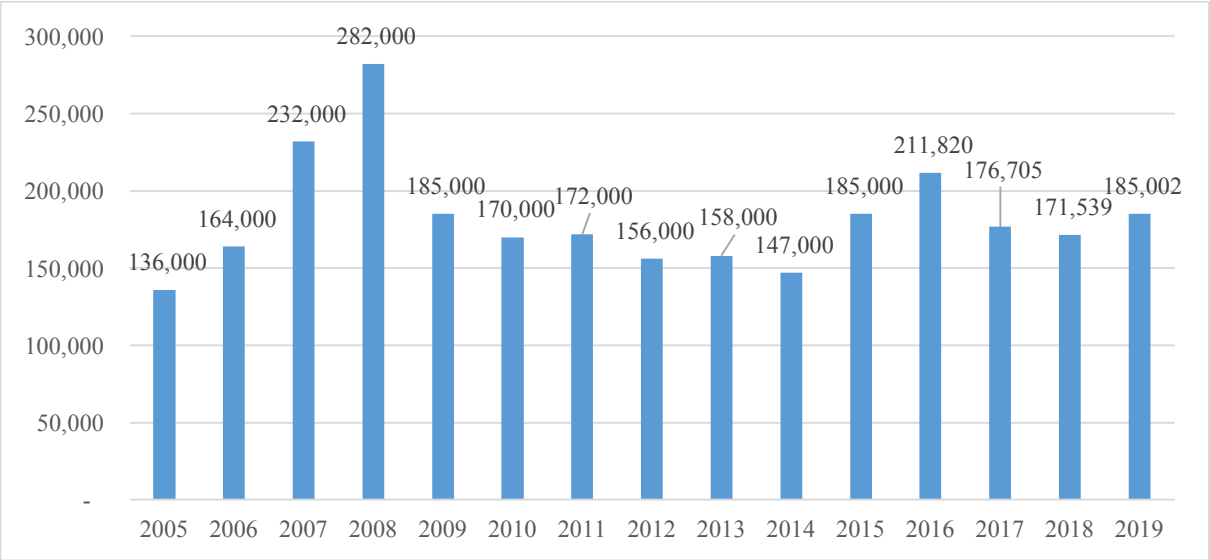
### 8.4 Magyar Suzuki Zrt.

The Magyar Suzuki Rt. was established in 1991 in Esztergom from a capital of 5.5 billion Hungarian Forints. Its founders were the Japanese Suzuki, the Hungarian government, the Itochu and the World Bank. A year later the production of the first Swifts with 5 doors began, which was followed by the production of Swift Sedans in 1993. In 1994 the company was able to manufacture cars for export, where the first destinations were China, the Netherlands and Italy (MTI, 2015). In 2000 and 2003 the production line was extended with the serial production of Wagon R+ and Ignis; in 2005 the new Swift, in 2006 the SX4 and in 2008 the first Splash were born in Esztergom (Magyar Suzuki Zrt., 2016a).

Suzuki also lays an explicit emphasis on the cooperation with governments and with local institutions, e.g. with the Puskás Ferenc Football Academy and the Puskas-Suzuki cup was established. Furthermore, on the 20$^{th}$ jubilee in 2012, Suzuki signed a strategic cooperation agreement with the Hungarian government (Magyar Suzuki Zrt., 2016a). To reach the best professionals, the company signed an agreement with the University of Óbuda in Budapest and works closely with other universities, colleges and secondary schools. Engineers have the opportunity during an intensive six-month internship to get to know the main automobile manufacturing processes (Magyar Suzuki Zrt., 2016b). The factory employs more than 3,000 workers, and with its whole supplier network ensures about 10,000 workplaces (MTI, 2015). In 2014 already 2.5 million Hungarian Suzuki were manufactured in the plant of Esztergom.

Today, the company has the following ownership structure: Suzuki Motor Corporation (97.53%), ITOCHU Corporation (2.46% and Hungarian shareholders (0.01%) (Magyar Suzuki Zrt., 2016b). Suzuki has always paid attention to R&D activities and put the development of new types of its models into focus. For instance, three generations of the world popular Swift were produced in Hungary within 20 years. In 2015 a new model, the Suzuki Vitara was introduced to the market (Magyar Suzuki Zrt., 2016a). During that year 185,000 Swift, S-CROSS and Vitara rolled down from the production line of the factory in Esztergom (Figure 21). This running-in was also characteristic on the sales of motorcycles and marine engines. In addition to the domestic sales, Suzuki serves more than 100 countries' markets (even in Guatemala or in the Dominican Republic people drive Suzuki S-CROSS and Vitara) (Magyar Suzuki Zrt., 2016b). The novelty of 2016 is the Baleno, which is manufactured in India and its distribution in Europe started in April 2016. The new model provides a number of technical innovations, like hybrid motor, which is the part of the new midterm business plan of the company, of the so called SUZUKI NEXT 100 (Magyar Suzuki Zrt., 2016b).

**Figure 21 – Number of cars produced by Suzuki in recent years**




Source: Magyar Suzuki Zrt., 2021

Mainly because of the high demand for the new Suzuki Vitara, instead of the planned 165,000 cars 185,000 were produced in Esztergom in the year 2015. In recent years, 88 percent of total production has been exported. In December 2019, Magyar Suzuki started the series production of hybrid vehicles in Esztergom and since January 2020, it has been selling hybrid cars in EU markets. 3.5 million Suzuki models have been produced in nearly 30 years at Esztergom plant and have been delivered into 123 countries. The 3.5 millionth car became a hybrid version of the audience-favorite Vitara model (Magyar Suzuki Zrt., 2021).

Thanks to the Hybrid Pro 3+7 years' warranty on the engine, transmission, turbocharger and hybrid batteries, nationwide brand service network and standard brand quality, new car customers have welcomed Suzuki's alternative-drive models. Thus, more than 65 percent of production was already a hybrid vehicle by 2020. In 2020, the company produced exclusively Suzuki Vitara and SX4 S-CROSS models equipped with 48 Volt ISG technology for the Hungarian and EU markets (Magyar Suzuki Zrt., 2021).

After 2016, 2017, 2018 and 2019, Suzuki closed the year in 2020 with good sales results in the domestic market, despite the pandemic situation. Nearly 15,000 Suzuki cars were registered in Hungary in 2020, so 11.55 percent of all passenger cars on the market (128,031) were Suzuki last year (Magyar Suzuki Zrt., 2021).

### 8.5 BMW Manufacturing Hungary Kft.

The preparatory work for the new factory site in Debrecen, Hungary is progressing as planned. The construction works started in spring 2020 and the company launched a recruitment campaign. The BMW Group has announced that they will cooperate with two educational institutions of the Debrecen Vocational Training Center, and will launch the concept of dual vocational training in Hungary as well, which was developed and based on the German model: the first two of the five-year vocational training will be carried out by the participants in the partner schools, and the three-year practical development will be completed in the BMW Group factory. Debrecen is a premium choice for the company mainly due to its excellent infrastructure (highways and airport), mature logistics connections and optimal integration into the supplier network. The highly qualified labor market in the region is another key factor (BMW, 2020).

In addition to the employees of the future production unit of the BMW Group, representatives of the supplier network and direct service providers will also offer numerous job opportunities in the North-East Hungary region (BMW, 2020).

The presence of the multinational automotive manufacturers operating in Hungary has improving effects on the quality and skills of workforce and education, and also has economic prospering effects on the Hungarian economy and on the general company culture in the country due to partnerships with local suppliers.

## 9. Introducing some of the largest automotive suppliers in Hungary

Final products of automotive manufacturing are the complex, high value added cars in high volume. Before 1990, the production of autobuses, trucks and vehicle parts was characteristic to Hungary. With the social and economic transformation, changes also in the ownership structure have taken place, and the production of autobuses has declined significantly. In addition to the production of trucks and lorries, the manufacturing of cars (Audi, Opel, Suzuki) and its main parts has started with the inflow of high-volume FDI, especially into the Western part of the country. Parallel to the arrival of the large automotive manufacturers between 1990 and 1994, automotive parts producing medium- and large companies have also appeared in the country (KSH, 2011).

Due to the complexity of the automotive products, the smooth running of production can only be imagined on the basis of an efficiently organized supply chain. The basic principle of automotive manufacturing is that the finished product manufacturing plant itself produces only basic parts, the other parts are procured from an external supplier. Technical requirements, deadline and quality requirements are specified for the suppliers (Magyar – Hlédik, 2018).

The so-called supplier pyramid in terms of division of labor describes the relationship between car factories and suppliers. At the top of the pyramid are the end-product manufacturers / OEMs (Original Equipment Manufactures), the multinational companies whose tasks include basic activities such as final assembly, gaining and maintaining a market position, and design or development (Magyar – Hlédik, 2018). So the automotive companies are located at different levels of the supplier pyramid. At the top level of the pyramid the car manufacturers / OEMs (Audi, BMW, Mercedes, Opel, Suzuki) can be found. Below these companies we can find the so-called *integrator companies*, i.e. the first suppliers, such as **Knorr-Bremse**, **Lear** or **ZF Hungária**. These companies typically manufacture complete components for assembly car factories, most of them are subsidiaries of multinational companies (Czakó et al., 2003).

Most of the world's largest component manufacturers have subsidiaries in Hungary (e.g. **Delphi, Visteon, Lear, Knorr-Bremse, Johnson Controls, Robert Bosch, Continental, ZF, Valeo, Denso**, etc.). Foreign ownership is decisive at this level of the pyramid, however famous Hungarian suppliers also can be mentioned, like **Rába**. Integrators have strong industry connections and competitive knowledge capital, and their R&D activities are significant. They play an important role in conveying the quality, technological and logistical requirements of car factories to the lower levels of the supplier pyramid (Czakó et al., 2003).

Under the integrator companies are the *second-round suppliers*. This category includes **Videoton Holding, KALOplastic, Salgglas or PEMÜ**, among others. These companies manufacture some of the more complex components. At this level, the proportion of Hungarian owners is increasing, but the role of foreign capital is still significant (Czakó et al., 2003).

At the lowest levels we find the *second-, third- and "many"-round suppliers* in the pyramid. These companies produce the simplest parts. The share of Hungarian capital is the largest at these levels. R&D activities are negligible due to lack of capital. Contract/lease work and the production of spare parts are typical. Furthermore, they must meet the quality assurance requirements set by car companies and integrator companies (Czakó et al., 2003).

The table below summarizes the main Hungarian automotive component suppliers being active in Hungary. Most of them are in the TIER 1 category.

**Table 2 – Major car parts manufacturers and suppliers in Hungary**

| Company name | Main activities |
|---|---|
| AGC Glas Hungary Kft. | Manufacturing glass parts (windows) |
| Allison Transmission Hungary Kft. | Manufacturing and service of vehicle parts |
| Apollo Tyres (Hungary) Kft. | Manufacturing and sale of tires |
| Aptiv Connection Systems Hungary Kft. | Manufacturing semiconductors and other electronic components |
| Arconic Köfém Kft. | Producing aluminium rolls |
| Autoliv Kft. | Developing and manufacturing airbags, seatbelts and steering wheels |
| Bálind Kft. | Manufacturing engine components, car body parts and break system parts |
| BPW Hungária Kft. | Manufacturing undercarriages and undercarriage systems |
| BorgWarner Oroszlány Kft. | Providing efficient technology solutions |
| Bridgestone Magyarország Kft. | Manufacturing tires and rubber products |
| Continental Automotive Hungaria Kft. | Specialization in brake systems, interior electro-nics, automotive safety, tires and other parts |
| Dana Hungary Kft. | Manufacturing drive trains and e-propulsion systems |
| Delphi Hungary Kft. | Manufacturing control and safety systems, switches, radars, air conditioning, airbag and diesel engine controllers and plastic components |
| Denso Gyártó Magyarország Kft. | Manufacturing transmission products |

| | |
|---|---|
| ElringKlinger Hungary Kft. | Manufacturing wide range of parts: lightweighting, shielding systems, electromobility, etc. |
| Emerson Automation Solutions Aventics Hungary Kft. | Providing automation solutions |
| Federal Mogul Hungary Kft. | Manufacturing rubber products |
| Flextronics International Kft. | Manufacturing semiconductors and other electronic components |
| F. Segura Hungary Kft. | Manufacturing seats, interiors, bodies, engines, exhaust systems |
| Gedia Hungary Kft. | Making compressed and welded components for the production of bodywork and chassis |
| Hajdu Autotechnika Ipari Zrt. | Manufacturing parts for the automotive industry by metalworking and sheet metal forming |
| HANKOOK TIRE Magyarország Kft. | Manufacturing and trading tires |
| Hanon Systems Hungary Kft. (Alba Plant) | Manufacturing air conditioning compressors, refrigerant conveyors and heat pump valves |
| Harman Becker Gépkocsigyártó Rendszerek Kft. | Providing innovative products, technologies and solutions for automotive connectivity (ADAS[4]) |
| Hydro Extrusion Hungary Kft. (SAPA) | Manufacturing aluminium parts |
| ISD Dunaferr (Dunai Vasmű) Zrt. | Manufacturing hot-rolled, pickled and cold-rolled steels for machine industry |
| Jabil Circuit Hungary Kft. | Providing electronics manufacturing services (driver-assistance systems, electric vehicles, etc.) |
| Johnson Controls International Kft. | Providing integrated products, systems and services (e.g. batteries) |
| KALOplasztik Kft. | Manufacturing plastic and rubber products for the industry |
| KIRCHHOFF Hungária Kft. | Developing and producing metal parts and hybrid structures |
| KNORR-BREMSE H-Fékrendszerek Kft. | Producing braking systems and other parts for commercial and rail vehicles |
| Lear Corporation Hungary Kft. | Specialized in seats and e-systems (electrification, connected mobility, etc.) |
| Le Bélier Magyarország Formaöntöde Zrt. | Producing 3 product lines: braking, air intake and chassis-structure |
| LuK Savaria Kft. (Schaeffler Savaria Kft.) | Supplying engine systems, drive systems, chassis systems and hybrid and electric drive systems |
| MICHELIN Hungária Kft. | Trading tires |
| Modine Hungária Kft. | Providing highly efficient thermal management solutions |
| Nemak Győr Alumíniumöntöde Kft.<br>NI Hungary Kft. | Manufacturing cylinder heads for gasoline and diesel engines |

[4] ADAS = Advanced Driver Assistance Systems

| | |
|---|---|
| PEMÜ-Műanyagipari Zrt. | Producing foamed polyurethane components - awnings, elbows and cushions |
| Provertha Electronic Components Zrt. | Producing connectors and cables |
| RÁBA Járműipari Holding Nyrt. | Producing automotive components for commercial and passenger vehicles |
| Rigó Kft. | Manufacturing sheet metal parts and machine frames |
| Robert Bosch Kft. | Providing efficient technology (mobility) solutions |
| SALGGLAS Glass Industry Co. Ltd. | Producing tempered and laminated safety glass parts (“Glass in Glass” construction) |
| Schwarzmüller Járműgyártó és Kereskedelmi Kft. | Developing and producing towed commercial vehicles |
| Shinwa Magyarország Precíziós Kft. | Manufacturing communications equipments |
| Siemens Zrt. | Providing digital solutions |
| Simon Plastics Kft. | Manufacturing plastic |
| Sisecam Automotive Hungary Kft. | Producing flat glass |
| SK Battery Manufacturing Kft. | Producing battery cells |
| SMR Automotive Mirror Technology Hungary Bt. | Developing and manufacturing rear view mirror system and intelligent camera technologies |
| Starters E-Components Generators Automotive Kft. | Developing and producing generators and starters |
| thyssenkrupp Components Technology Hungary Kft. | Manufacturing steel springs and stabilizers |
| thyssenkrupp Materials Hungary Zrt. | Manufacturing steel, light and non-ferrous metal and plastic parts |
| Takata Safety Systems Hungary Kft. | Producing air bags and seat bells among others |
| Titan '94 Kft. | Producing manufacturing tools |
| Tom-Ferr Zrt. | Producing seat structure and vehicle body elements, suspension elements and solid pipes |
| Valeo Auto-Electric Magyarország Kft. | Manufacturing electronic components and systems for passenger cars and trucks |
| Videoton Holding Zrt. | Providing electronics manufacturing services |
| Visteon Holdings Hungary Kft. | Manufacturing displays, electrification systems, domain controllers, electric solutions, etc. |
| ZF Hungária Kft. | Manufacturing and selling manual and automated transmissions and their components |
| 4iG Nyrt. | Providing IT service management solutions |

Source: Author’s collection from company websites

## 10. Clusters, associations and organizations in the automotive industry in Hungary

Inter-organizational relationships have an increasing role in today's business environment. In general, main drivers of different cooperation are the need for new capabilities, cost-efficiency, innovation and the sharing of risks. It is especially characteristic for industries with significant technological development, where consumer needs are in the focus (Balaton, 2015).

Participants in the automotive industry and closely related activities recognized that it is worthwhile to work together to protect their interests. Coordinated behavior provides benefits to companies clustered in organizations (Czakó et. al, 2003). These advantages were also recognized by the actors of the Hungarian automotive industry, and several organizations (clusters, associations and organizations) were established.

### 10.1 Clusters

Clusters are geographic concentrations of interconnected companies and institutions with similar activities. They comprise a number of linked industries and other entities, for example, providers of specialized equipment such as components, machines and services as well as suppliers of specialized infrastructure (Porter, 1998). Clusters, especially in case of small companies, can be suitable channels for joining the market competition, as these enterprises are mostly capital-deficient and would not be able to integrate into (European) market processes on their own. The members are market competitors and collaborators and connected by long-term business dynamics, innovation, cost-effective and efficient business management of jointly streamlined activities. Many clusters include institutions such as universities, think tanks, vocational training providers, and trade associations because they can provide specialized trainings, information, research, and technical support (Porter, 1998).

*Automotive and mechanical engineering clusters in Hungary:*

- **Pannon Automotive Cluster** (Pannon Autóipari Klaszter, PANAC);
- Alföldi Iparfejlesztési Nonprofit Közhasznú Kft., AIPA;
- Hungarian Vehicle Development Cluster (Magyar Járműfejlesztési Klaszter, MAJÁK);
- Automotive Consulting Cluster (Autóipari Tanácsadó Klaszter);
- Hirös Supplier Cluster (Hirös Beszállítói Klaszter);
- Central Transdanubia Regional Innovation Cluster (Közép-Dunántúli Regionális Innovációs Klaszter);

- Cluster of Automotive Parts Suppliers in Szekszárd (Szekszárdi Autóipari Alkatrész-beszállítók Klasztere);
- Southern Great Plain Green Mechanical Technology Development Cluster (Dél-Alföldi Zöld Gépipari Technológia-fejlesztési Klaszter);
- DÉL-GÉP Mechanical Engineering Innovation Cluster (DÉL-GÉP Gépipari Innovációs Klaszter);
- Sárrét Metallic Cluster (Sárrét Metál Klaszter);
- Northern Great Plain PRIZMATECH Debrecen Instrument Manufacturing and Development Cluster (Észak-Alföldi PRIZMATECH Debreceni Műszergyártó és Fejlesztő Klaszter);
- Machine Manufacturers, Suppliers and Technology Development Cluster, Northern Hungary, Eger (Gépgyártói, Beszállítói és Technológiai Fejlesztési Klaszter, Észak-Magyarország, Eger);
- Northern Hungarian Automotive Cluster, Miskolc (Észak-Magyarországi Autóipari Klaszter, Miskolc);
- Ajka Mechatronics and Automotive Cluster (Ajkai Mechatronikai és Járműipari Klaszter);
- Automotive Cluster in Debrecen (Járműipari Klaszter Debrecenben).

### 10.1.1 Pannon Automotive Cluster (PANAC)

In Hungary, in most cases among the newly arrived Western European companies the business relations and partnerships with local suppliers have been emerging slowly. To improve this situation, central-driven initiatives were introduced in the early 2000s. This was also a reason for the establishment of Pannon Automotive Cluster (PANAC) in 2000 (KSH, 2011), which is one of the most significant automotive clusters in Hungary. Nowadays, it comprises companies like Audi, Opel and Suzuki. The number of member companies is ca. 100, and the number of workers is more than 100,000 (PANAC, 2021). The main strategic aims of PANAC are to support the establishment of new automotive plants, to widen the cooperation between enterprises, to raise the overall level of quality, to strengthen innovative practices to *increase value added in corporate activities*. In order to achieve these goals, the PANAC also offers different services, such information assistance, technology transfers, different trainings and conferences, supplier development programs, partnership and project management tasks, etc. The initiative also supports Hungarian suppliers in successfully joining global supply chains.

PANAC supports its partners in manufacturing increasingly complex products with a higher knowledge content, thereby improving their position in the supply chain and trying to make the network and its members more and more visible on an international level (PANAC, 2021).

The activities of PANAC are not restricted to the members only, its services are available for all enterprises related to the automotive industry (PANAC, 2021).

### 10.2 Associations and organizations

Besides the automotive clusters, there are three key organizations in relation to the Hungarian automotive industry:

- Association of the Hungarian Automotive Industry (Magyar Gépjárműipari Szövetség, MAGE)
- National Association of Hungarian Vehicle Parts Manufacturers (Magyar Járműalkatrészgyártók Országos Szövetsége, MAJOSZ)
- Hungarian Investment Promotion Agency (HIPA)

#### 10.2.1 Association of the Hungarian Automotive Industry (MAGE)

The MAGE association is a national advocacy organization for vehicle manufacturers and their suppliers.

By the end of the 20th century, more and more multinational companies had established their subsidiaries in Hungary. In addition to the companies that settled in order to expand production, companies based on research and development also appeared. As a result of all these factors, the ten most important companies in the international and domestic automotive industry operating in the country formed the Association of the Hungarian Automotive Industry (MGSZ) in December 1998, which in 2014 became an association called the Association of the Hungarian Automotive Industry (MAGE, 2021).

The aim of the association is to improve the competitiveness of the Hungarian automotive industry, to develop the supplier background and to improve the financial and legal conditions of the operation. Their fundamental goal is to make Hungary the most attractive place to invest in the automotive industry. The Association of the Hungarian Automotive Industry comprises more than 50 member companies, including OEMs (Opel Szentgotthárd Kft., Magyar Suzuki Zrt. and Mercedes-Benz Manufacturing Hungary Kft.) and suppliers (SMR Automotive Mirror Technology Hungary Bt., Autoliv Kft., Rába Járműipari Holding Nyrt., ZF Hungária Kft.,

Apollo Tyres Hungary Kft., Continental Hungaria Kft., Robert Bosch Kft., Bridgestone Tatabánya Termelő Kft., etc.) (MAGE, 2021).

### 10.2.2 National Association of Hungarian Vehicle Parts Manufacturers (MAJOSZ)

MAJOSZ was founded in April 1993. The number of founding members was 22 and it was registered as an advocacy social organization. Its members are main unit, component and component manufacturers, from all levels of the supplier hierarchy (Tier 1 – Tier n). In terms of company size, they include micro, small and medium-sized enterprises as well as large companies. The membership covers the entire country, with a higher concentration typically located around automotive competence centers. Some of its key members: AUTOLIV Kft., Bálind Kft., Autotherm Kft., Continental Automotive Hungary Kft., Magyar Suzuki Zrt., SMR Automotive Mirror Technology Bt. (MAJOSZ, 2021).

The fundamental goal of the association is to represent the professional, economic and social interests of companies operating in the field of domestic automotive parts and components manufacturing (MAJOSZ, 2021).

Main services provided by the association:

- *Representation of interest*: providing domestic and international representation of Hungarian vehicle parts production to create a favorable economic situation; promoting fair competition in market protection by prioritizing the technical and quality of goods traded; representation of employer interest; etc.
- *Development of competitiveness and suppliers*: providing assistance in modern quality management, environmental, energy management and occupational health and safety systems (including auditing) used in the automotive industry; information assistance for the procurement of raw materials; organizing courses for management to acquire advanced leadership skills; organization of technical exchanges and factory visits; etc.
- *Business relations*: producing and distributing information materials and publications; organizing and conducting various international and domestic conferences and lectures; having an up-to-date computer database – based on this database, providing information to members and potential partners on a regular basis (MAJOSZ, 2021).

### 10.2.3 Hungarian Investment Promotion Agency (HIPA)

The fundamental aim of the Hungarian Investment Promotion Agency is to connect potential financial and strategic investors with Hungarian investment projects. HIPA manages a continuously growing database that includes several investment projects from different industrial sectors. Key investment sectors are automotive, electronics, logistics, food industry, life science, medical technology, renewable energy, business service centers (BSC) and information and computer technology (ICT) (HIPA, 2021).

The agency assists investors in organizing meetings with project owners, giving more detailed information about the selected sector and the particular project. HIPA also supports the project sponsors in the successful preparation and presentation of their projects through constant advice and specialist training (HIPA, 2021).

Key partners of HIPA from the automotive manufacturing: Audi Hungaria, Aptiv, BMW, Borg Wagner, Bosch, Continental, DENSO, GS YUASA, Mahle, Mercedes, Motherson, Opel, Samsung and Samsung SDI, Schaeffler, SK Innovation, Suzuki, Thyssenkrupp, Valeo, Yanfeng, ZF (HIPA, 2021).

## 11. Future of the automotive industry in Hungary – Threats and opportunities

The growth of the Hungarian automotive industry may have some limits in the future, because manufacturers depend on the emerging markets, e.g. China significantly. It can be also dangerous in the long term, that in the Hungarian economic policy, serving the German automotive manufacturers is too dominant (Madár – Szandányi, 2016). The strong dependence of the lease work activities can hinder the upgrading process into more value-added segments of the supply chain. Table 5 in Appendix shows that in 2015 nearly half of the 50 largest export-revenue companies operating in Hungary were active in the automotive manufacturing industry. The mono-cultural sector in a country can be very dangerous to the economy, because it makes the whole country sensitive to economic shocks. In Hungary's GDP the automotive role is not extreme high, and the industry has a domestic value added of ca. 40%. Despite the great production volume, much of the value in the products come with the import, so it is foreign value added (Madár – Szandányi, 2016).

According to the latest trends, with the spread of the self-driving cars, automotive manufacturers form partnerships with tech companies. For development of self-driving cars, automotive manufacturers need the software producing capabilities of the tech companies, while tech companies are not able to produce cars themselves. These kind of changes can bring the transformation of the whole automotive industry, as well. The electric car and its motor have fewer components, and the automation of its manufacture processes is also easier. In addition, the value added part during the manufacturing process will be shifted to the software increasingly (Szabó, 2016).

As the car industry has an important role in Hungary, the electric car revolution in the next decades can particularly affect the country. The domestic motor and automotive manufacturers and also a significant part of the suppliers produces internal combustion vehicles and parts for these type of vehicles (Madár – Szandányi, 2016). Electrical cars are spreading globally with new technical basis and they are expected to account for 20-25% of the global car sales within the next ten to fifteen years. Even today there are political ambitions, which would relegate diesel vehicles from bigger cities until 2030. The replacement of the internal combustion engines by electro motors can result in a situation, where large automotive manufacturers lose their competitive advantage within a short time. With the appearance of electro cars and new techniques, manufacturers in Hungary should be prepared to be able to serve markets in the future as well, otherwise the demand for their products – which counts today as 22% of the total export – will be significantly diminished. According to data from the Hungarian Central

Statistical Office, not just complete vehicles, but bodyworks, motors and their components are also sold abroad in a significant amount. It is a very important aspect, because there is a huge difference between electro cars and traditional cars, namely the electro cars have a way less and totally different components compared to the traditional ones. With the penetration of the electro car manufacturing, the domestic manufacturers should change their production processes, otherwise their operation will be unnecessary in the future. It will be a long process, and there are signs from the automotive manufacturers in Hungary, especially from Audi and Mercedes, that they also showed up some motives heading to the new electro way.

In Mercedes' newest factory in Kecskemét also alternative-powered models will be manufactured (Mercedes-Benz, 2016, 2020) and presumably the company will produce complete electro cars in Hungary in the near future. In case of Audi, there are also signs of electro car production, the company plans the serial production of the electro cars and the electro motors in the Hungarian plant, stated Peter Kössler, President of Audi Hungaria Motor Ltd. (Audi Hungaria Kft., 2016, 2020). In case of Suzuki, in the field of alternative-powered vehicles, the production of the hybrid version of the new Baleno and Ignis models are planned in Esztergom (Suzuki, 2016, 2020).

Table 3 is a SWOT analysis, it summarizes the above statements and evaluates the internal strengths and weaknesses, and the external opportunities and threats of the Hungarian automotive industry.

T**able 3 – SWOT analysis of the Hungarian automotive manufacturing industry**

| | |
|---|---|
| STRENGHTS | • High relevance of car industry in Hungary<br>• Skilled but relatively cheap labor force<br>• Good location, developed infrastructure |
| WEAKNESSES | • High proportion of lease work activities<br>• Mono-cultural industrial sector<br>• Production is foreign value added |

| | |
|---|---|
| OPPORTUNITIES | • New trends in automotive manufacturing (e.g. electric cars)<br>• Partnerships with tech companies<br>• Memberships of clusters, associations, organizations, etc. |
| THREATS | • High dependence on China<br>• Serving the German manufacturers is to dominant<br>• Shift of value added part to tech companies |

Source: Author's own creation

## 12. Effects of COVID-19 on the value chains in the automotive industry in general

The globalization is increasingly challenged and tested through crises and pandemics. The global economic slowdown after the 2008-2009 crisis and the shift in political sentiment into economic nationalism in Europe triggered shocks through the global economic system. The global outbreak of COVID-19 in 2020 brought new problems and uncertainties around the world. Therefore, there is a need to call for methods to promote the flexibility and sustainability of the integration of global activities (Pananond et al., 2020).

The global system has rarely experienced such a serious and comprehensive crisis as the COVID-19 global epidemic in 2020 and 2021. Just a few months after the recognition of the new coronavirus epidemic in Wuhan, China, at the end of January 2020, the COVID-19 has already caused the most devastating and widespread public health crisis and unprecedented global economic disruption around the globe. As the virus swept across Europe and America in a matter of months, entire economies came to a standstill overnight virtually, and both supply and demand collapsed (Pananond et al., 2020).
Covid-19 also influenced the operation of MNEs, production processes were shut down for days or weeks so influencing the global value chains around the world.

József Nyírő (President of MAJOSZ, National Association of Hungarian Vehicle Parts Manufacturers) drew attention to the fact that the coronavirus epidemic appeared unexpectedly and caused a shock to the industry, when the transition to new technologies resulted in huge challenges. He also pointed out that the transformations in the automotive industry are proceeding at an astonishing rate, and electric cars and digitalization are advancing unstoppably (MAJOSZ, 2021). This must be acknowledged by all Hungarian industry players, and they must be prepared for these changes in time. As a general trend it is observable that supply chains are becoming shorter, with production capacities previously installed on other continents increasingly finding their way back to Europe (MAJOSZ, 2021).

For the automotive industry the semiconductor shortage has become the biggest challenge, which is also the result of the pandemic and factory shutdowns of many car parts manufacturers.

## 13. Research process and results

### 13.1 Hypotheses

Based on the comprehensive literature review and literature analysis, I formulated the following hypotheses:

**H1**: the theory of 'Smile curve' is also valid in case of the Hungarian automotive manufacturing industry, typically low value-added production processes take place in the country.

**H2**: in addition to the central location, the cheap and skilled Hungarian labor was the most important factor in the near-shoring activities of multinational companies expanding to Hungary.

### 13.2 Data collection

The research process consisted of conducting a sample survey and semi-structured interviews with the key car parts suppliers of the five big automotive manufacturing companies in Hungary. Executive board, managerial level and engineers were the target persons both of the survey and interviews. The subject of the survey and the interviews were among others the production processes, the core products and customers, the origin of materials, the supply processes, the purchasing policy, competitiveness strategies, the company's local training policies, the connections with local businesses, relationship with local institutions (e.g. universities), new trends in the industry, effects of the COVID-19 on the business operations, etc. Success stories about integrations into global value chains were also part of the analysis. *22 online surveys and 3 in-depth interviews* have been carried out with experts of the different companies.

#### 13.2.1 Survey

In order to be able to accept or reject the first hypothesis about the relevance of 'Smile curve' in the Hungarian automotive manufacturing industry, to position the automotive manufacturer companies being active in Hungary in the global automotive manufacturing value chain and to receive an in-depth understanding about investment incentives of the Western European firms in the country, data will be collected from the key automotive suppliers in Hungary. They also serve the 5 OEMs who are present in the country (Audi, BMW, Mercedes, Opel and Suzuki) among others. During my research I contacted ca. *60 experts from the key suppliers* via email, asking for consent and for the participation in an online survey – (please see the Consent request

form in *Appendix 1*). (The interviewees were also asked for their consent that all materials gained can be used and published for research purposes.) The survey consisted of 24 questions (*Appendix 3*). The last question was about a second round, whether the person willing to participate a video / phone interview with me.

### 13.2.2 In-depth interviews

To test my second hypothesis about the near-shoring activity in Hungary, I conducted 3 in-depth interviews with experts from the industry, from TIER 1 companies of different size. I have chosen three experts from the participants of the online survey and contacted them via email again (Please see in *Appendix 2*).

The process of selecting interviewees occurred through targeted sampling. In terms of sampling strategies, the idea was to find extreme cases (Horvath and Mitev, 2015) of GVC participation and investment incentives, possibly finding interviewees in industry with very limited GVC governance and industries with more GVC governing capabilities and investment readiness, therefore I chose also smaller and bigger supplier companies with employees under and above 500 employees. The interviewee options to conduct the data collection with will be based on the industry sector and on the company as well, so it is a two-layered selection.

*Data collection*

The data collection technique looked like as follows: firstly, I sent out a survey to supplier companies in the automotive manufacturing industry in Hungary with 24 short questions. I asked my respondents if they would be willing to participate in an online / video / phone interview with me as well. During the interviews I conducted semi-structured conversations with the interviewees, including two short exercises (rating and drawing). In the form of a semi-structured in-depth interview, I prepared with the list of the questions but I did not strictly follow this formalized guideline, but I rather asked more open-ended questions, allowing for a discussion with the interviewee rather than a straightforward question and answer iteration. This way I could leave space to the study participants to offer new perspectives to the topic (Galletta, 2012). I transcribed the interviews and analyzed by categorizing along key words and then collected the same or similar ideas and opinions said by the interviewees and compared them, and finally drew a conclusion.

This technique produces descriptive data and belongs to the qualitative research methodologies. The main incentive for this technique was that the literature for the current topic underlined. Most of the available studies are studying general GVC features, FDI attractiveness of countries

or the opinions of executives and lacking the point of view of experts from the supplier side of the automotive industry in Hungary.

*Desk research*

Before the interviews, I have also analyzed the companies' main profiles through on their websites (e.g. key products and services, annual financial reports, performance reports and advisory reports) to get a better understanding about the unique operations of the different companies and their role within the global value chains. This way, I could also prepare for the in-depth interviews.

*Interview methodology*

Firstly, I used the *narrative research* and conducted *semi-structured in-depth interviews* with the industry experts. A *narrative research* technique as a form of the qualitative research is all about collecting and telling a story of the interviewees. In this type of research, the researchers write narratives about experiences of individuals, describe a life experience, and discuss the meaning of the experience with the individual (Colorado State University, 2020). The *in-depth interviews* are unstructured; a skilled interviewer asks questions from a single respondent. The goals of the conversations are to cover the motivations, beliefs, feelings of the interviewee on the topic (Shukla, 2008). As described previously, each in-depth interview lasted from 20 to 30 minutes, asking for a wide range of information and in-depth data from the past, present and future. This technique was the most suitable for my research, because there was an opportunity to ask more and more new questions relating the previous answers. On the other hand, this technique also has some difficulties for the researcher, because the generated data is large and the unstructured feature makes the way of interpretation difficult. Furthermore, it is a one-to-one interaction with a single respondent's opinion. Costs and time necessity are also high in the case of the interview and the analyses (Shukla, 2008).

*Questions (for the interview guide please see Appendix 4)*

As a first step of the interview, to get some basic information about the interviewees, I asked them to fulfil a brief questionnaire on their personal data, including their name, position, and company name. My goal was also to find experts with different work experience level. It is important because a broader range in age and work experience can bring different results and perspectives on GVC participation.

The first few questions of my interview have dealt with doing business in Hungary in general, including the implementation of measures taken by foreign affiliates or the HQ, the quality of the local workforce, the business environment and the governmental support. These was followed by a question about the position and upgrading path of Hungary in the automotive manufacturing GVC. The next interview question was about the key challenges of the current industry trends, and the last question was about the near-shoring phenomenon in case of the interviewee's company, where the interviewees should complete a short questionnaire about the near-shoring characteristics of their company with classifying the key near-shoring features according to relevance for their own business.

*Rating exercise*

I sent out my questions to the respondents before the interviews, so they could see the statements / words about near-shoring to Hungary. The respondents should rank these words according to relevance to their company establishment in Hungary. They separated the words firstly and formed three groups: the first group contained the statements where the respondents agree with, the second one were the neutral answers and the third group contained statements with respondents do not agree with. As a next step, interviewees started to rank the words giving a special consideration to everyone of them. This technique is based on the Q-technique, but for applying the Q-technique the researcher would need 10 respondents at least (Hofmeister Tóth – Simon, 2006).

*Drawing exercise*

To make the interview process more diverse and interesting, I have asked my interviewees to put their companies into a 'Smile curve' (introduced on page 30). This exercise made the interview process more unconventional and tried to reveal whether the interviewees could place their enterprises in a global value chain, because one of the aims of my research was to test where do automotive companies in Hungary locate themselves in the global value chains and how it appears in the minds of people involved in this research.

After completing the interviews, during the analysis of the results, bias also needs to be discussed, as it impacts on the validity and reliability of the study findings (Smith – Noble, 2014). Bias also can occur when we select the questions to the interviewees, so to reduce the validity threats, I tried to form my questions as neutral as possible and not influencing the interviewees.

For me it was important that the interviewees and the interviewer get to know each other before the actual interview, in order to create a trusting atmosphere so that the conversation becomes as open and undisturbed as possible. Therefore, the location of the data collection would be under normal circumstances in a cozy surrounding; e.g. a Café, a quiet restaurant, or in case the participant has a stretched timeline, his / her own office would be the best place for the interview. Unfortunately, due to the COVID-19 and the restrictions, I only got to know my interviewees within the framework of an online chat.

## 14. Results

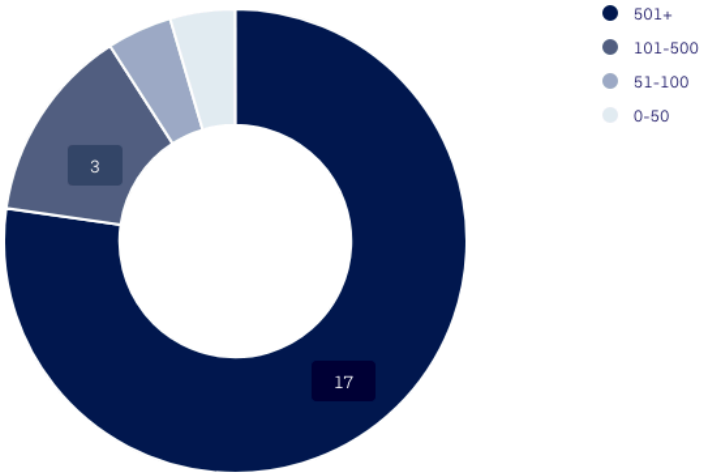
### 14.1 Results of the survey

I sent out my online survey to more than 60 persons employed at automotive part manufacturer companies (to seniors in the first place) and received 22 answers.

Among the respondents there were leaders, mainly head of departments and managers: VP Operations, Commercial Director, Director of Logistics, Head of Manufacturing IT Department, Logistic Specialist, Manager, Managing Director, Owner, Plant Manager, CFO, Purchasing Manager, Quality Leader, Quality Engineer, Sales and Purchasing Manager, Supply Chain Manager, System Software Architect, Technical Project Leader, Project Manager and Business Operation Manager.

And the analyzed TIER companies are the following: Automotive Transmission Systems, Continental, ElringKlinger, Hirschler Glas, ISD Dunaferr, Knorr-Bremse, Lear Corporation, Linamar, SEG Automotive, Schwarzmüller, Robert Bosch Elektronika Kft., Tenneco, Valeo and further anonym respondents.

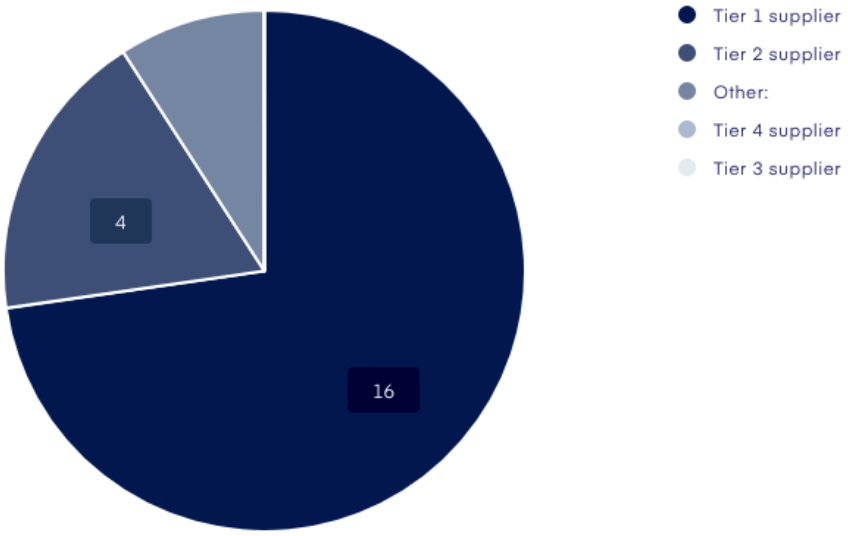
**Figure 22 – Number of employees**




Source: Author's own creation

As Figure 22 shows, 17 of the 22 asked persons work at companies with more than 501 employees, so the respondents of the online survey are from the bigger organizations in terms of number of workers. Three of them work at firms with 101-500 employees, one of them at a company with 51-100 employees and an other one with workers of 0-50 employees. As Figure 23 shows, 16 respondents work at companies from TIER 1 category, 4 respondents at firms from TIER 2 and the rest two persons work at rather smaller suppliers from 'other' category.

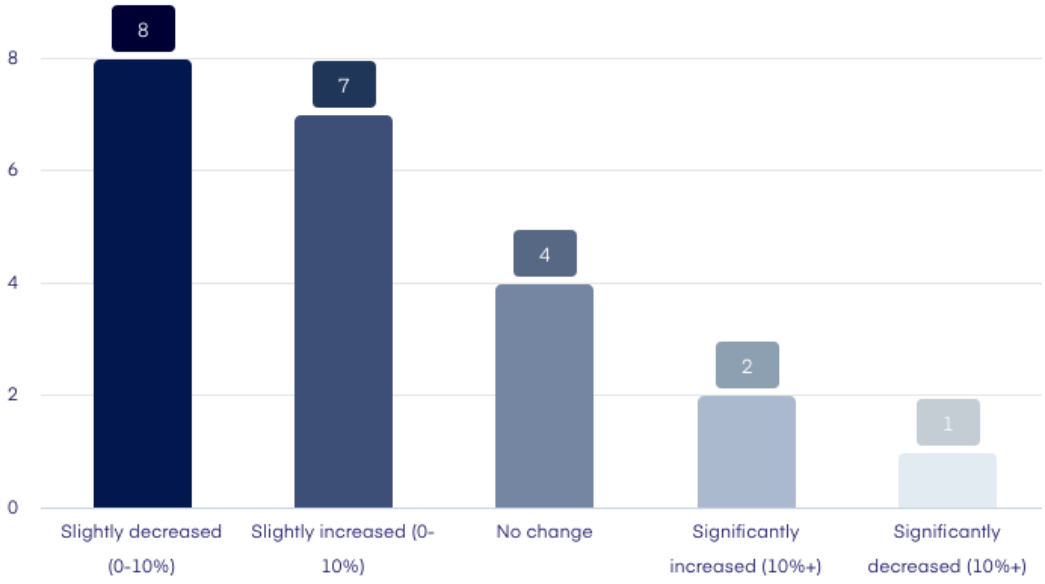
**Figure 23 – Position in the supply chain (value chain)**




Source: Author's own creation

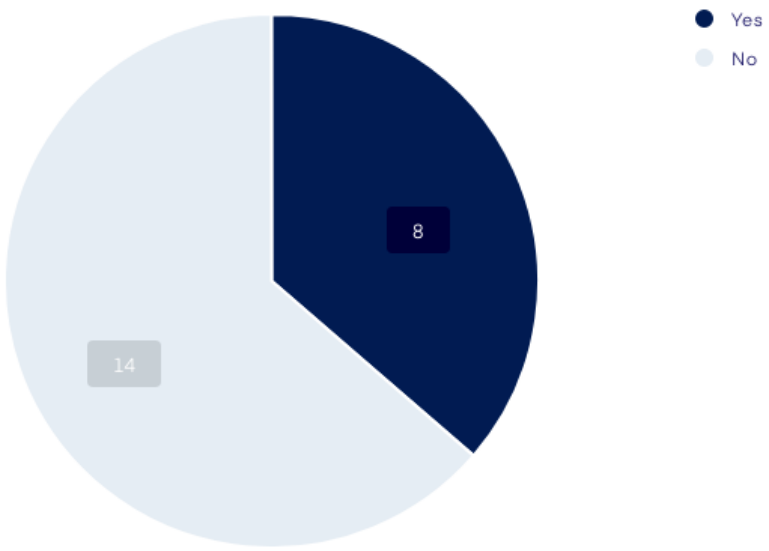
The next two questions were about the COVID-19 situation, which affected the companies from March 2020 until November 2021, when the online survey was sent out. As Figure 24 shows, nine respondents have realized loss of workers – only one with significant change (more than 10%). Other nine persons have realized increase in the number of employees, only two of them with significant change (more than 10%). Four respondents have answered that they do not see any change in the employment number at their organization.

**Figure 24 – Change in employment numbers during/after COVID-19**




Source: Author's own creation

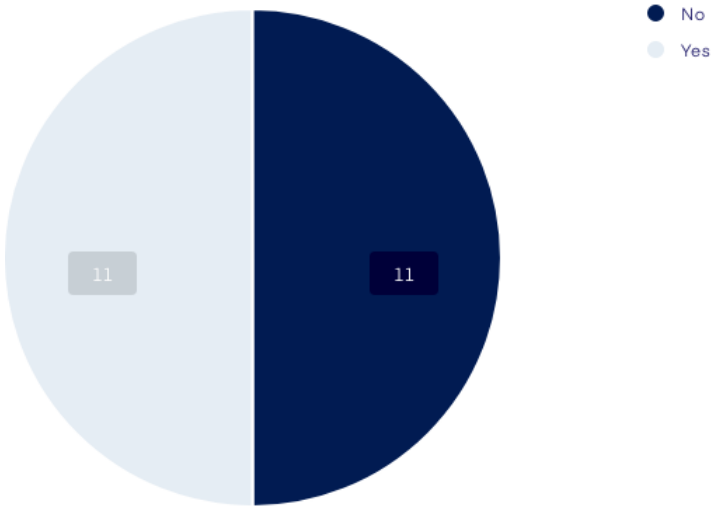
**Figure 25 – Unable to fulfil an order due to COVID-19**




Source: Author's own creation

36% (8 persons) of the respondents has stated, that COVID-19 was a problem in the fulfillment of orders, and 64% (14 persons) has answered the opposite (Figure 25). Lack of workforce seems to be a bigger problem, 50% of the asked persons has said that they already have such a problem due to lack of workforce (Figure 26).

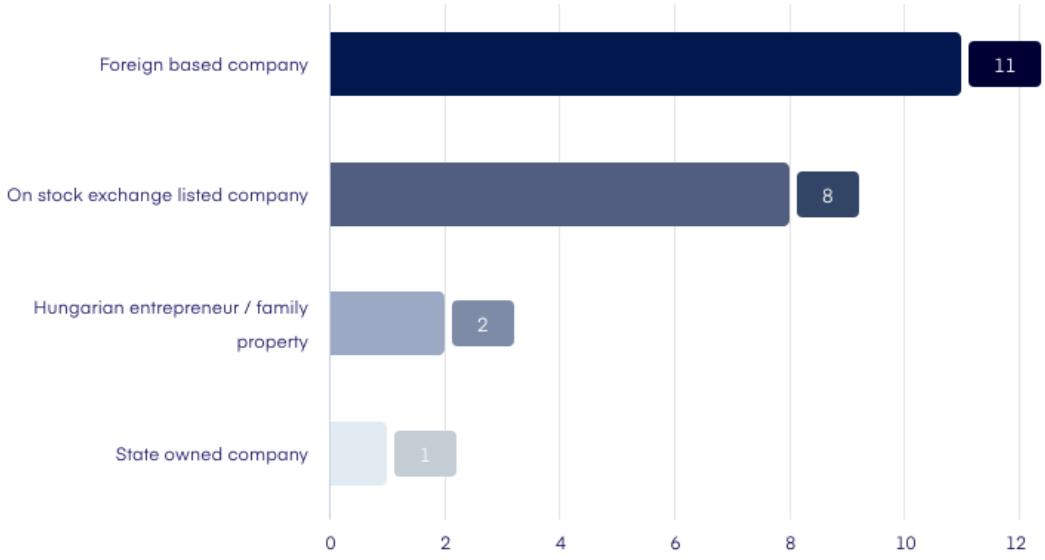
**Figure 26 – Unable to fulfil an order due to lack of workforce**




Source: Author's own creation

Figure 27 shows that the asked TIER 1 suppliers are mostly foreign based companies or on the stock exchange listed companies.

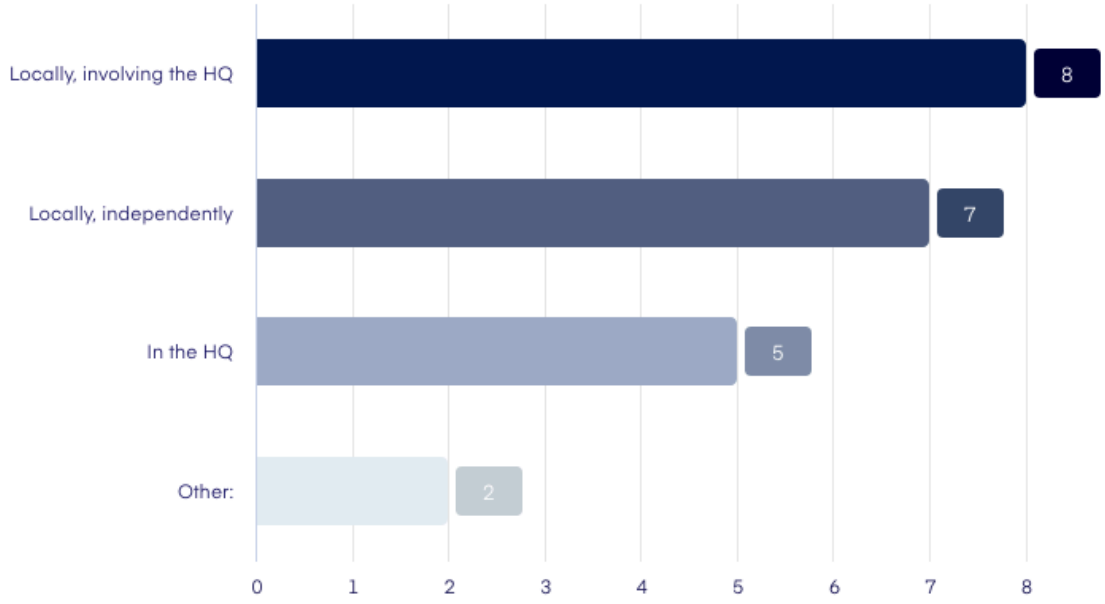
**Figure 27 – Ownership structure of the company**




Source: Author's own creation

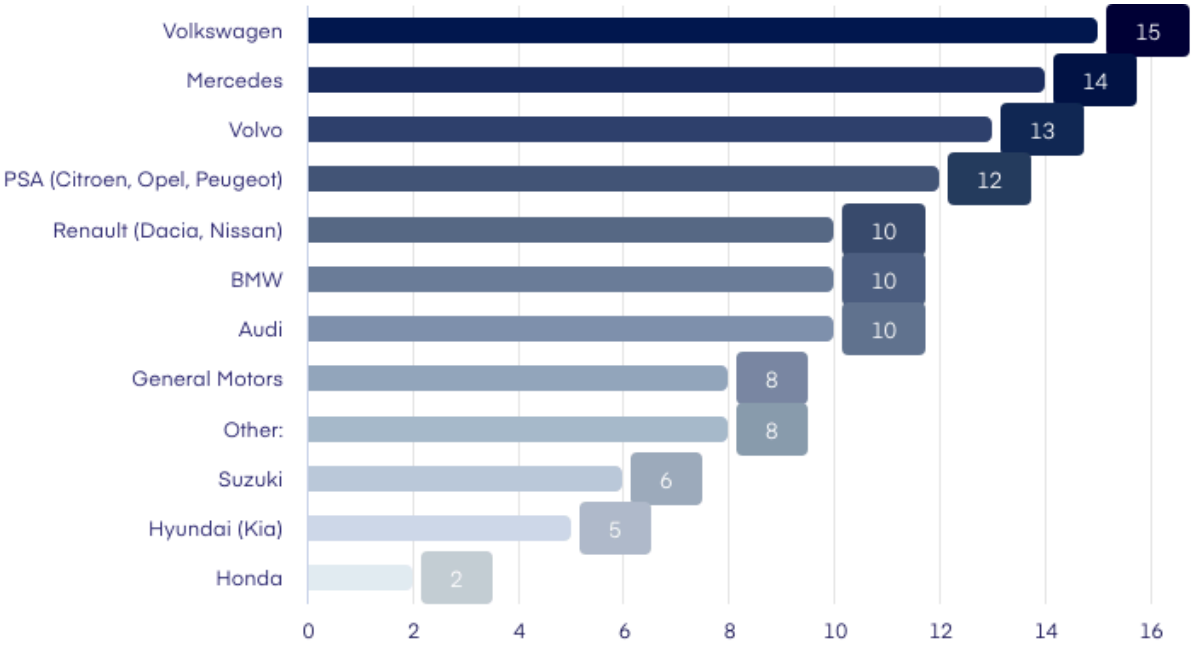
As we can see on Figure 28, the Hungarian entities of the analyzed (mostly TIER 1) suppliers have their own decision making power, decision-making takes place locally in most cases: involving the HQ in eight cases and independently in seven other cases.

**Figure 28 – Purchasing decisions made for the Hungarian production**



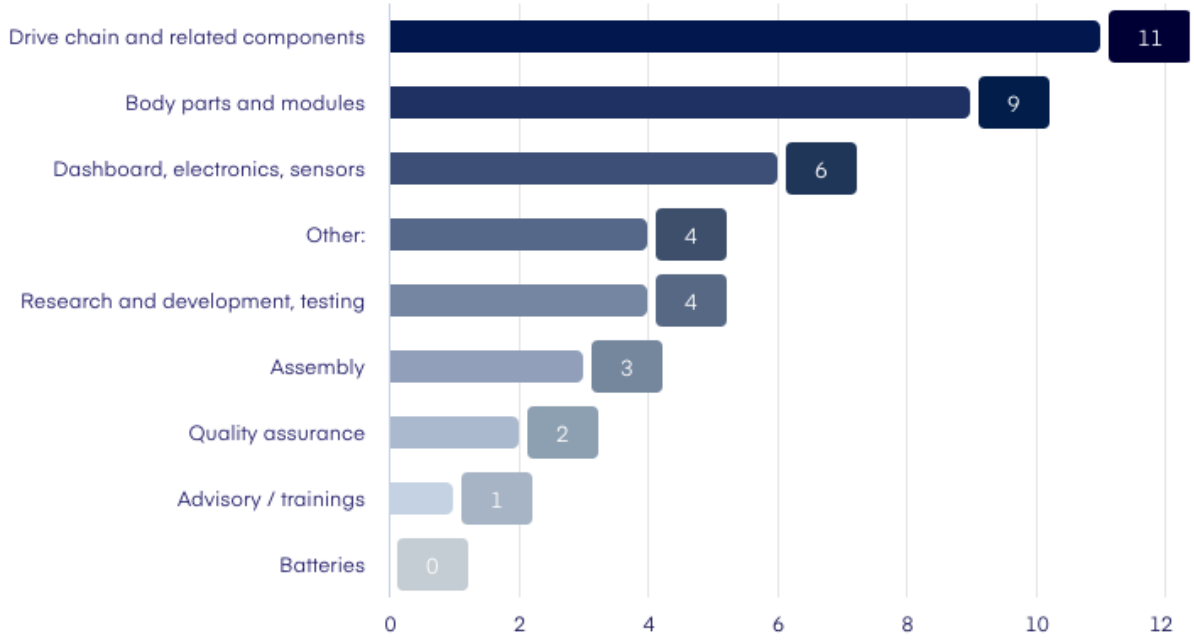

Source: Author's own creation

**Figure 29 – End users (OEMs) of products and services**




Source: Author's own creation

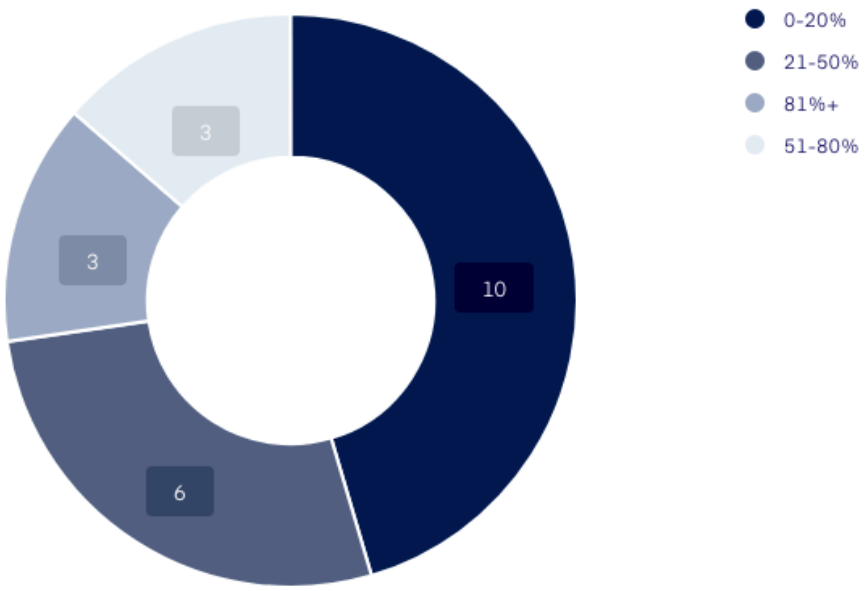
**Figure 30 – Manufactured parts and products**




Source: Author's own creation

Figure 29 and 30 illustrate that among the end users, we can also find the 5 OEMs who has (will have) factories in Hungary (Mercedes, PSA (Opel), BMW, Audi, Suzuki). Drive chain, body parts and electronic parts are the key products of the respondents' companies and these products are in a high proportion designated by OEMs, as we can see on Figure 31.

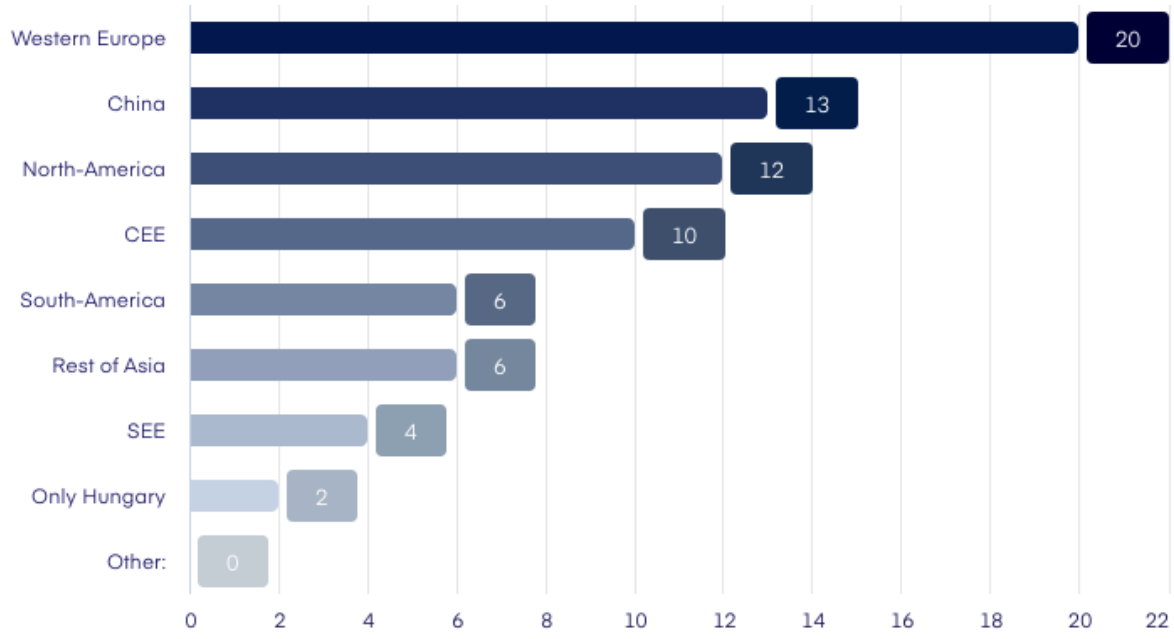
**Figure 31 – Proportion of products designated by OEMs**




Source: Author's own creation

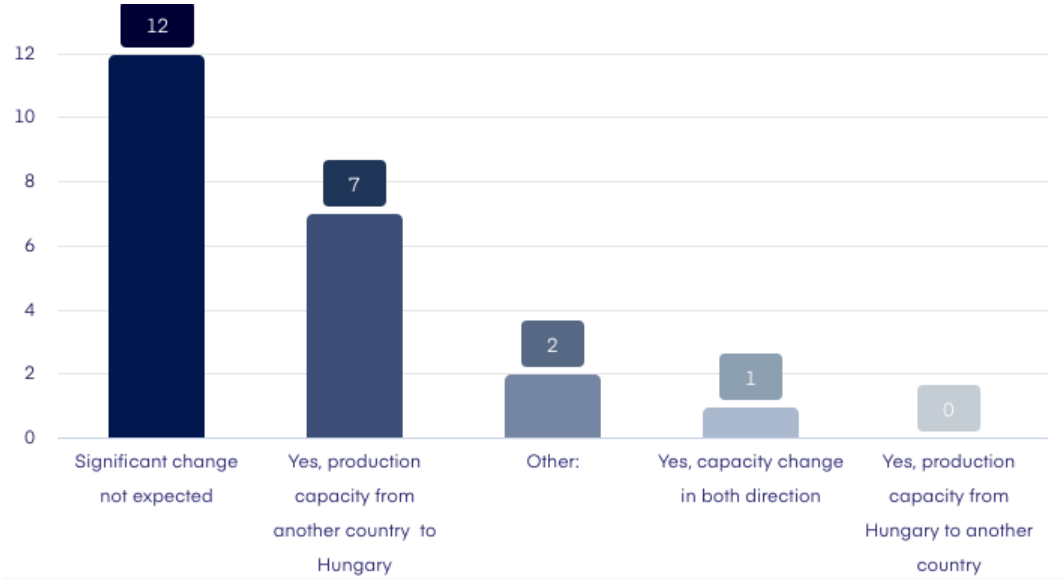
Western Europe is the key export market of the companies where the respondents of the online survey work. Among important export markets we can also find China, North-America and the CEE, so the companies do not concentrate on the neighboring countries, they also deliver its product overseas (Figure 32).

**Figure 32 – Most important export markets**




Source: Author's own creation

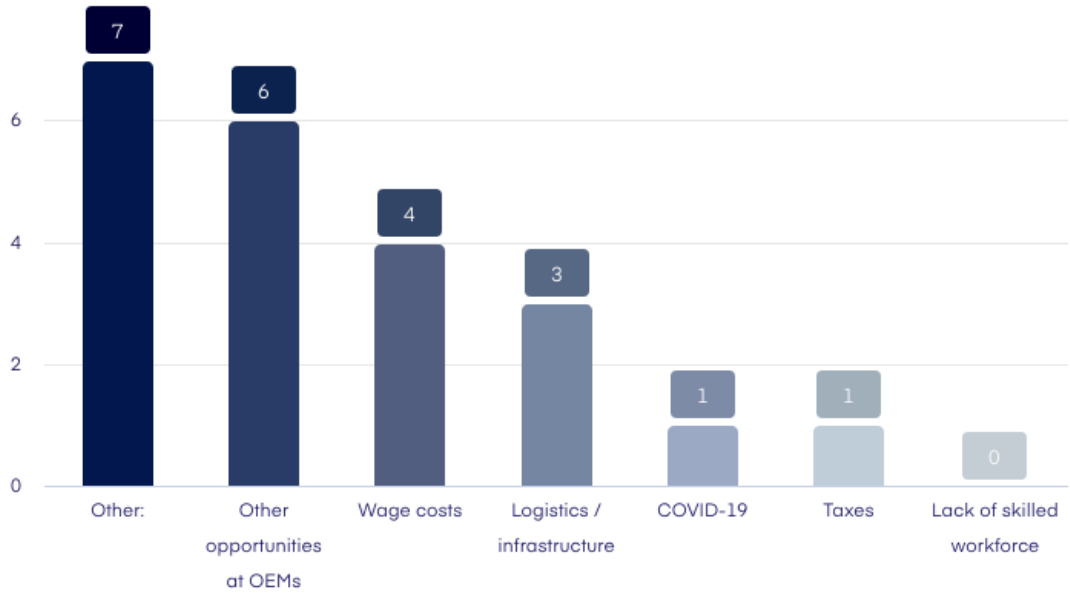
**Figure 33 – Relocation of production capacity**




Source: Author's own creation

Figure 33 and 34 show that typically the asked respondents do not have any relocation plans, if so, only production capacity from another country to Hungary. Main drivers of the relocation are the favorable opportunities at OEMs.

**Figure 34 – Main reasons of the relocation**

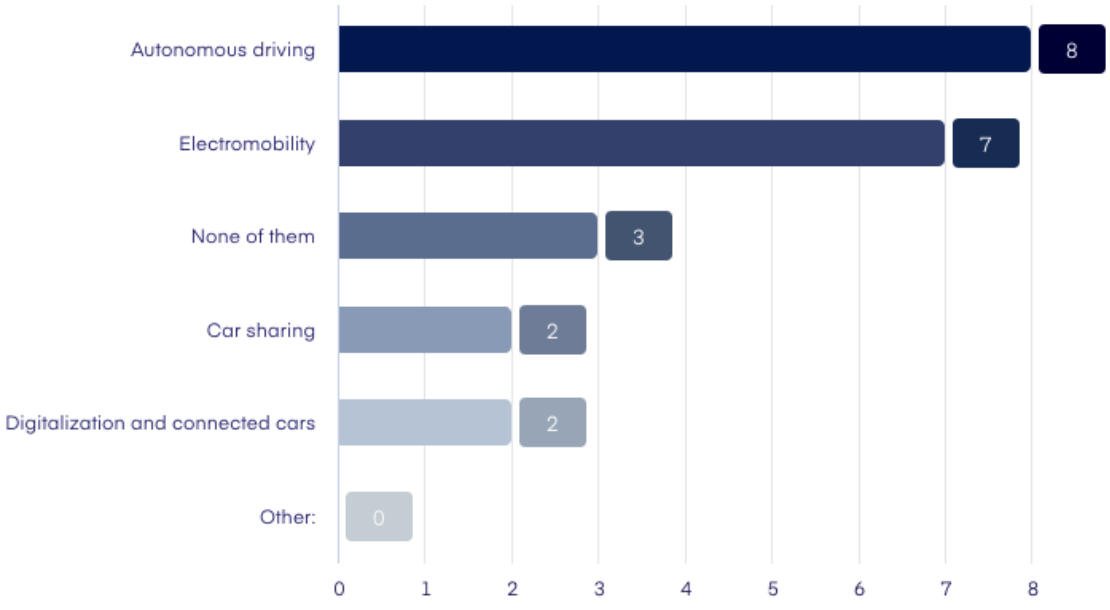



Source: Author's own creation

Nowadays' electric car revolution can particularly affect Hungary, as well. Electrical cars and autonomous vehicles are spreading globally with technically different, completely new basis. I.e. the EV30@30 campaign, launched in 2017 at the Eighth Clean Energy Ministerial, set the

collective goal for all EVI members to achieve a 30% market share for electric vehicles on all vehicles (except two-wheelers) by 2030 (IEA, 2020). (The Electric Vehicles Initiative (EVI) is a multi-government policy forum dedicated to accelerating the introduction and adoption of electric vehicles.)

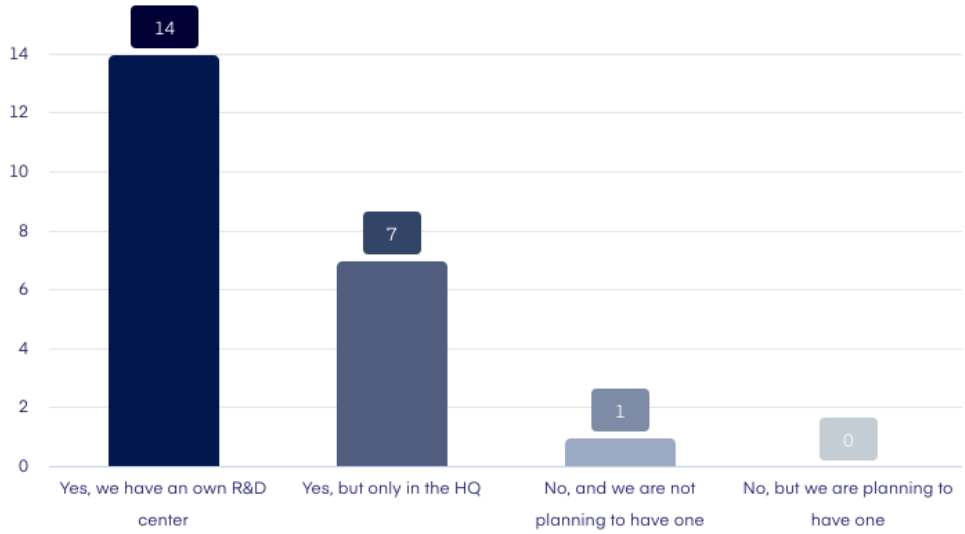
**Figure 35 – The most affecting global trends**




Source: Author's own creation

Figure 38, 39 and 40 in Appendix show when the new automobile trends will appear at the companies where my respondents work. All three new trends, electromobility, digitalization and connected cars and even autonomous driving already affect the firms or will affect them in the next 3-5 years.

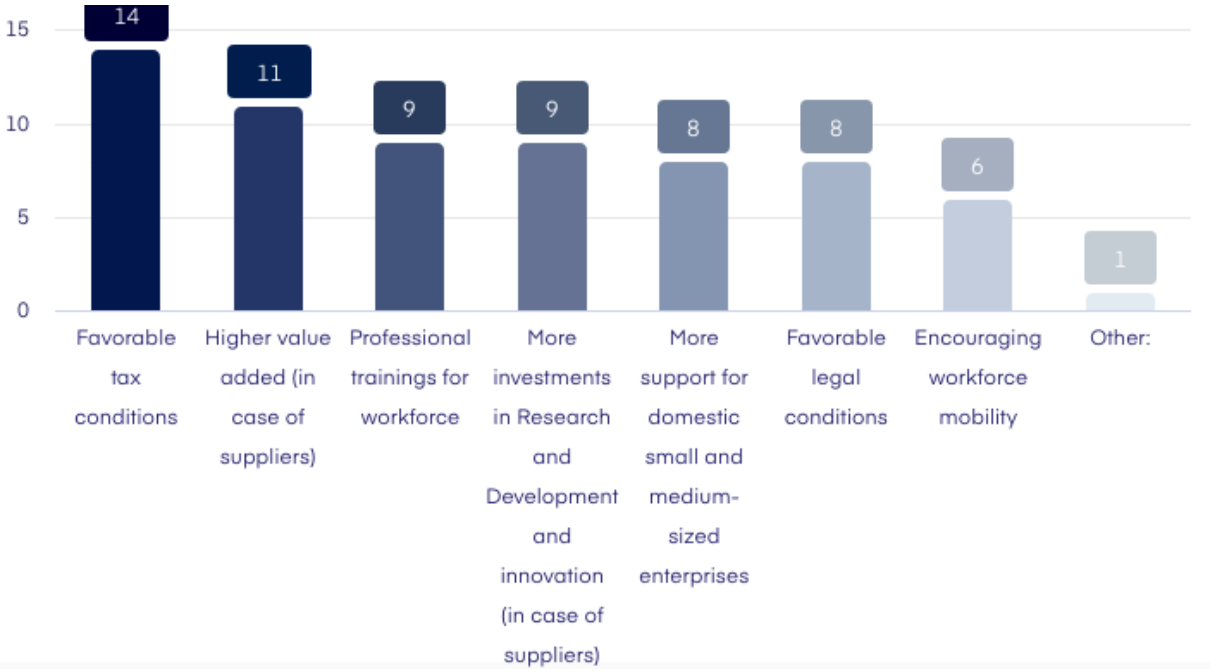
**Figure 36 – Having research and development capacity**




Source: Author's own creation

14 respondents have stated that they have an own research and development center locally, other seven have said that they have a research and development center but only in the HQ of the company and only one firm does not have any, and also does not plan to have such a center (Figure 36).

**Figure 37 – Success criteria for the Hungarian automotive manufacturing industry**




Source: Author's own creation

According to Figure 37, the respondents of the online survey find that favorable tax conditions and higher value added are the most important criteria for the Hungarian automotive manufacturing industry to remain competitive in the future. Professional trainings, more investment in research and development activities, more support for SMEs and favorable legal conditions are also important aspects. As we can see on the figure, workforce mobility is not characteristic to Hungary, only six respondent thinks that is is important to encourage the mobility of employees.

### 14.2 Results of the in-depth interviews

To underline or refute the above, I conducted personal interviews with experts / key employees of the most important suppliers of the five OEMs being present in Hungary. For this part of my research process, which is the *qualitative research method*, I used semi-structured in-depth interviews and also asked my interviewees to complete a short drawing exercise during the ca. 30 minutes long interview process.

The interviews pointed out the following topics (based on Contreras' (2010) paper in some part):

a) Business environment (workforce including skills of employment, trainings, main challenges and obstacles, infrastructure, legal environment, memberships, etc.);

b) Value added (production processes, research and development, 'Smile curve', etc.)

c) Near-shoring (company establishments, main reasons of the FDI inflow into Hungary, etc.)

d) New automobile trends (role of software engineers, role of OEMs, etc.)

e) COVID-19 (semi-conductor shortage, effects of the pandemic, etc.).

#### 14.2.1 Interview 1

**Name of the interviewee:** Havasi Csaba
**Position:** Vice President of Operations
**Company:** Linamar Hungary Zrt.
**Category:** TIER 1 supplier
**Address**: Csorvási út 27. Orosháza, 5900 Hungary
**Key activity**: Manufacturing parts and accessories for motor vehicles
**Number of employees**: 2,599 persons (in year 2022)
**Year of foundation in Hungary**: 1948
**Annual revenue (HUF)**: 50,184,160,000 (in year 2020)

Linamar is a publicly traded Canadian manufacturing company that operates worldwide. After Magna International, it is Canada's second largest auto parts manufacturer. The corporation manufactures and supplies products for the automotive and industrial markets having two divisions: Powertrain / Driveline and Industrial. These are further subdivided into the areas of

machining and assembly, light metal casting, forging, aerial work platforms and agricultural machinery. The Hungarian entity, the Orosháza agricultural machinery repair site was established in 1984 to carry out agricultural machinery repair and other repair activities. Orosháza Automotive Division was established on January 1, 1998, specializing in the cutting and other precision machining of automotive products (Linamar, 2022).

I have had the opportunity to contact the Vice President of Operation of Linamar Hungary Zrt., Mr. Havasi Csaba for a 30-40 minutes' phone interview. My first interview question to Mr. Havasi was about the implementation of measures taken by the Canadian HQ in the Hungarian operation in terms of employment and infrastructure. I asked whether he sees any difficulties in the processes in Hungary. He doesn't see such a problem; in general, everything works smoothly. The Hungarian entity operates as an independent profit center, and the management is responsible for the operation. My next question in relation to the business environment and general operation was the memberships of any organizations or clusters. He explained to me that they are part of several clusters, but they don't overdo it. Mr. Havasi mentioned the following memberships of Linamar in Hungary: MAJOSZ, Canadian Chamber of Commerce, Hungarian Chamber of Commerce, and within the own company they operate in a cluster system. Then, I moved to the legal environment in Hungary and asked him about the experiences with the amendments of the Consumer Protection Act CLV of 1997 entered into force on 22 August 2020 (after which the entire supply chain can be inspected by the consumer protection authority) and how did it affect Linamar's business operation. He answered that they didn't feel any impact on our daily operations.

My second big topic was the value added part and the 'Smile curve'. I sent the questions to Mr. Havasi per email before the phone interview, so he could see the 'Smile curve' in front of him and I asked him to place Linamar on the curve. He would mostly put Linamar Hungary in the middle of the 'Smile curve' as they do standard manufacturing activities. However, he added that at the same time they also produce products in Hungary that they do not develop elsewhere and also develop technological processes. But typically 80% is lease manufacturing and 20% is this kind of business. I also asked whether are there any plans about the change of the operation / production processes, e.g. more research and development, but he answered that there is no change expected in production processes in the close future (in the next 3-5 years). When I asked Mr. Havasi's opinion about how the Hungarian operation could produce more 'value' in its production processes, he told me that he sees the future in technological

development and agrees that the role of software development will be appreciated in the future. However, Linamar Hungary does not show a sign of such a change yet.

The third topic was the near-shoring activity in Hungary. The Linamar corporation came to Hungary on the basis of a business relationship. The primary reason was buyout, because the former company went bankrupt. I sent to Mr. Havasi key words about investment incentives in Hungary and asked him to rate them according to their relevance for Linamar. Then I gave numbers to the words based on a template (which is used in Q-technique analysis) to be able to compare the importance of them.
The aspects in order of importance: skilled labor (4), cheap labor (4), positive support system (3), favorable tax conditions (3), government policy (3), proximity to export markets (2): appreciating, good infrastructure (0), cheap raw material (0): world market prices, proximity to HQ (0): Canada.

Regarding the new automobile trends, which was my next topic, we talked about that mobility will continue to become more digital, more connected, and especially more electric, so automakers may need to reskill their current workforces. Mr. Havasi agreed that this is the future, however the Canadian parent company and thus Linamar Hungary do not have this outlook either. He also added that not even their business partners and suppliers show up this trend. The role of OEMs in the operation of the supplier companies was and is outstanding. There has always been (and is) a demand from the side of OEMs for transparency in the supply chain. They like monitoring the processes, but the suppliers including Linamar don't like it that much…

And my final topic was the pandemic and the semiconductor shortage, as a consequence of the COVID-19 factory shutdowns. Mr. Havasi told me that the semiconductor shortage has had a very serious impact on the car factories, including Linamar Hungary, as OEMs have reduced their orders. Currently, 65% of the capacity in the automotive industry is running, which is a very serious problem. Linamar has strived to retain its employees despite the loss of orders.
Not just the semiconductor shortage, but the whole pandemic made it very difficult for Linamar to operate, they could barely work for 3 months in 2020, there was no demand for its products, and the closures made it impossible to operate. As a result of the lockdown, people are not going anywhere, not even buying a car. Last year the production saw the fewest cars in recent years. Of course, Linamar tries to take measures to help restore the pre-virus situation and keep it running: they also introduced "home office" in areas where they can, test their workers regularly and promote vaccinations among them – said Mr. Havasi to my last question.

### 14.2.2 Interview 2

**Interviewee:** Thierry László
**Position:** Managing Director
**Company:** ElringKlinger Hungary Kft.
**Category:** TIER 1 supplier
**Address**: Paul Lechler utca 4. Kecskemét, 6000 Hungary
**Key activity**: Manufacturing parts and accessories for motor vehicles
**Number of employees**: 167 persons (in year 2022)
**Year of foundation in Hungary**: 2015
**Annual revenue (HUF)**: 8,090,622,000 (in year 2020) (E-beszámoló, 2022)

Based in Erms, Germany, ElringKlinger AG is one of the world's largest automotive suppliers. The company offers innovative solutions for optimal combustion engines, high-performance hybrids, environmentally friendly batteries and fuel cell technology. As a result of ElringKlinger's innovative solutions, vehicles use less fuel and emit less carbon dioxide. Due to the increasingly sophisticated engine technology, the group is constantly improving its products in order to achieve the highest possible standards (ElringKlinger, 2022, E-beszámoló, 2022).

The Hungarian entity was founded in 2015 and it is located in Kecskemét, Hungary (ElringKlinger, 2022). I have contacted the Managing Director of ElringKlinger Hungary Kft., Mr. Thierry László for a 30-40 minutes' phone interview. I asked the same questions as during the previous interview.

To my first question about implementing measures set by the German HQ, Mr. Thierry answered me that regarding the implementation of measures taken by the center in terms of employment and infrastructure, in the Hungarian operation usually everything goes smoothly. He stated that of course, there are always strict goals, the Germans are very structured and rigid, but this is the case everywhere where different nations work together. The challenges they face usually are economic in nature. My following question in relation to the business environment and general operation was the memberships of any organizations or clusters. According to Mr. Thierry their company is member of the Automotive Industry Association and they are now preparing to join the Hungarian Battery Association. He thinks that it is useful for their business, because the lobby plays a very important role in such memberships, as it allows individual members to tell what needs arise, what supplier improvements are needed, and also plays a

significant role in HR coordination. Among the universities, they cooperate with the local John Neumann University. We have also spoke about the amendments of the Consumer Protection Act CLV of 1997 entered into force on 22 August 2020, after which the entire supply chain can be inspected by the consumer protection authority. Mr. Thierry said that it does not affected the operation of the company much and there was no such inspection. ElringKlinger does B2B business and for the "aftermarket" activities the German headquarter is responsible.

My third main topic was the value added part of the operation with the 'Smile curve'. I asked him to locate ElringKlinger on the curve. He would mostly put the company in the middle, because ElringKlinger in Hungary does standard manufacturing activities, the engineering activity takes place in Germany. However, he noted, that at the same time, they do production optimization – e.g. what should be the optimal production process. They don't create new products, but the technology is evolving. Marketing activities and business development are the responsibilities of the centre (HQ). This has been the case for many years and no change is expected in the near future. Due to the size of the company, they do not carry out R&D activities in Hungary.

Then we switched the topic again and talked about near-shoring activities and the company foundation. ElringKlinger came to Hungary because Mercedes also came here in 2015. Furthermore, it also had an industrial property, so it already had the area to set up a site. Labour costs and skilled labour were very important considerations. Tax conditions and state subsidies were not examined separately at the time of the investment, but were used by the company. Also nowadays they have ongoing tenders. Cheap raw material is not primary because the central company purchase everything. The distance to export markets is important because the company produces especially large products. Infrastructure is also important, along with IT infrastructure.

Based on the Q-template (in Appendix 4) I rated the near-shoring aspects in order of importance: skilled labour (4), cheap labour (4), proximity to export markets (3), good infrastructure (3), proximity to HQ (3), positive support system (2), favourable tax conditions (2), government policy (2), cheap raw material (0).

My next question was in relation to the new automobile trends, about ramping up the number of software engineers relative to mechanical engineers at the company. Mr. Thierry stated that it is not characteristic to ElringKlinger, he sees the potential in electric drive and fuel cell development from the company's perspective. About the business partners and suppliers, he has no information yet, but maybe they also show some signs of change into this direction. I

also asked him about the transparency of processes along the value chain. Mr. Thierry underlined the statement that OEMs have more insight into the processes of suppliers at lower tiers. It depends on the business type, but yes there are such OEM customers who checks the suppliers on a regular basis, they agree on price and terms. Typically, you can work with an approved supplier. There is usually no direct intervention. At the same time, it is very important that there are no disruptions in the supply chain, the security of supply is paramount.

The last questions were about the COVID situation and the semiconductor shortage. According to the Managing Director, the COVID-19 has affected the operation of ElringKlinger, as well. A significant proportion of customers have cancelled their orders, the decline is over 15% and orders still remain volatile highly. Customer cancellations are still common today and this situation is expected to continue in the first half of 2022. This is a serious economic crisis. With the spread of COVID-19, the market collapsed last year. They sold only 20% of their general sales volume last April, which is of course linked to the semiconductor shortage, as it is also the result of the pandemic. According to him, the effects of COVID-19 are becoming less pronounced today, but the semiconductor crisis is continuing. Raw material prices have risen and there has been a shortage in several phases in the supply chain, e.g. metal, plastic. In areas where possible (e.g. procurement, HR, project management, engineering), they work from home, and taking the COVID-19 vaccine is the part of the corporate policy.

### 14.2.3 Interview 3

**Interviewee:** Anonym
**Position:** Head of Department in Manufacturing
**Company:** A German multinational engineering and technology company
**Address**: Confidential
**Key activity**: Manufacturing parts, providing various technologies and services for vehicles
**Number of employees**: 5,566 + 4,054 (in year 2020) / Location 1+2
**Year of foundation in Hungary**: 1898
**Annual revenue (HUF)**: 623,226,130,000 + 118 450 397 000 (in year 2020) / Location 1+2

My third interviewee has asked me not to reveal his name and where he is being employed, at a German multinational company. The firm has been present in Hungary since 1898 and today it has become one of the largest foreign industrial employers in the country. The Company Group is a leading international supplier of various technologies and services.

My first question to my interviewee was about the implementation of measures in the Hungarian operation taken by the German HQ in terms of employment and infrastructure. The Head of Department in Manufacturing explained me that it is usually not an impossible operation, it goes smoothly. Then we spoke about the benefits of being members of different associations and clusters and he told me that they are member of several associations and organizations, such as the Hungarian Logistics Association, the Artificial Intelligence Coalition, and many associations within the corporate group. They also cooperate with universities, e.g. they have a joint department with the Budapest Business School (‘BGE’) and the Eötvös Loránd University. The ‘BGE’ also has an outsourced training center in the city of the company’s main location. As part of the business environment topic, my next question was related to the legal environment. My interviewee is not aware of the amendments of the Consumer Protection Act CLV of 1997 entered into force on 22 August 2020, after which the entire supply chain can be inspected by the consumer protection authority. It doesn’t affect his business area and he has not heard of it.

My second topic was the value chain and the ‘Smile curve’. Such as the previous interviewees, I also asked the Head of Department in Manufacturing to locate the company on the curve I sent him before the interview. He explained me that they have a production site in Hatvan, which manufactures exclusively, however, they also carry out R&D activities at the Budapest site, so he would locate the company at both “Location 1” and “Location 2” on the ‘Smile

curve'. About the outlooks and upgrading trends, he told me that further investments in R&D are expected in the future, and developments related to artificial intelligence are also planned. R&D investments are very important, at the company artificial intelligence plays a key role in developments. He also thinks that this is the key for the value creation in production processes in the Hungarian operation.

My next question was about the near-shoring phenomena. According to him the primary aspects of the location of the company in Hungary are the skilled (engineers) (4) and cheap labor (4), which is becoming less and less cheap but still low compared to the West. The role of labor costs is declining because automation can also reduce these costs. The importance of skilled workforce is also supported and facilitated by the collaborations with universities. The price of the raw material is not decisive because it is purchased from all over the world and there are just a few local suppliers (0). Taxation (0), state aid (0), infrastructure (0) are also less relevant. Proximity to export markets is good but not decisive because they export to everywhere in the world (2), and proximity to HQ is also good, but not essential that much (2). Among their business partners, the Hungarian OEMs account for a relatively small proportion.

The next big chapter of my interview guide was the new trends in the automotive industry. My interviewee agreed with me on the statement that as mobility will continue to become more digital, more connected, and especially more electric, automakers may need to reskill their current workforces. He added that this is clearly the trend at their company as well, and the number of software engineers is growing compared to mechanical engineers. In today's developments not only electrical and mechanical engineers are involved. Furthermore, they also take part in the manufacturing activities with the spread of Industry 4.0. This trend is typical to their partners as well, but not to the same extent. As the previous interviewees, he also underlined that OEMs like to be involved in manufacturing activities and operation processes of TIER suppliers, they like to look at each process during the customer visits.

We moved than to my last topic, to the COVID-19 situation and the semiconductor shortage. The global semiconductor shortage, which began in the first quarter of 2021, has brought assembly lines to a standstill around the world as the long lead time for the silicon chips has slowed the production of driver assistance systems (McKinsey, 2021b). Compared to 2019, due to COVID-19 there is an EU-wide production loss of 22.9% of total EU vehicle production (passenger cars, trucks, vans and buses) (ACEA, 2021). These losses are the result of the temporary factory shutdowns. My interviewee stated that there are ongoing shutdowns due to the shortage of chips and this serious problem is expected to continue in 2022. At the end of

March last year when COVID-19 has begun to spread radically, they introduced home office in areas where they could. The situation is similar in November 2021, the company requires working from home again, austerity measures have been put in place, and they often test employees. Parallel, the semiconductor supply problem is also a consequence of COVID-19, which also makes their job more difficult.

## 15. Conclusions

### 15.1 Conclusion of the survey

The results of the online survey deliver a comprehensive overview about the current business activities and future outlook of the most known auto parts manufacturer companies. Most of the respondents work at bigger suppliers with employees over 500 persons and they are in the TIER 1 category, typically foreign multinationals or on the stock exchange listed companies. According to the respondents, COVID-19 did not affect the number of employees, in general there were no redundancies. The pandemic also did not affect the production and delivery of products significantly. 50% of the respondents stated that when they were unable to fulfil an order, the reason have been the lack of workforce. The purchasing decision for the Hungarian production happens locally decisively, either independently or with involving the head quarter. Among the end users of the parts we can find the biggest OEMs, including those who have manufacturing plants in Hungary (Audi, BMW, Mercedes, PSA, Suzuki). The manufactured products are typically drive chains, body parts and electric sensors and the proportion of products designated by OEMs is rather high. Western Europe is the biggest export market of the companies analyzed, followed by China, North-America and the Central Eastern European region. The respondents stated that their companies do not plan any relocation in the near future, if so, only from other country to Hungary and it is also determined by OEMs providing new opportunities for them. In some cases, wage costs and logistics also play a role in the relocation process. Electromobility and autonomous driving are the most affecting trends in the automotive manufacturing industry – stated the respondents. Except of one firm, all respondents said that they have research and development capabilities: two third of them have own R&D center and one third has it only at the head quarter of the company. It means that beside the manufacturing activities with low added value typically, also research and development activities take place at bigger multinational companies with higher added value, so I can reject the first hypothesis about the relevance of 'Smile curve' in the Hungarian automotive manufacturing industry. They also stated that favorable tax conditions and higher value added are the success criteria that will help the Hungarian automotive manufacturing industry to remain competitive in the future. Professional trainings, more support for SMEs and favorable legal conditions are also important aspects. The key players in the automotive part manufacturing has realized that value added is a very important factor in the success of an industry and it can be increased due to investment in research and development and innovation.

As revealed by the survey, they have already established R&D centers, so companies are well on their way to producing higher added value.

### 15.2 Conclusion of the in-depth interviews

After the **3 expert interviews** with TIER 1 supplier companies of different size in terms of employment and annual revenue, my conclusions are as follows:

1. **Business environment**: even the headquarters (HQ) of the three company is settled abroad (in Germany and Canada), there is no problem in the implementation of measures taken by the HQ in the Hungarian operation in terms of employment and infrastructure. If there are any problems, they are economic or cultural mostly.

   All three companies cooperate with clusters or are members of associations and organizations and they also work together with universities. They think that this is very useful for their business because of good business relationships and exploring business needs. Universities are useful because of research and development activities and finding the future workforce there. In terms of legal environment, none of my interviewees were aware of the amendments of the Consumer Protection Act CLV of 1997 entered into force on 22 August 2020, after which the entire supply chain can be inspected by the consumer protection authority. Probably it is the responsibility of the legal department or the companies were not inspected until the interview took place.

2. **Value added**: the extent of the value-added part in the export volume of the automotive manufacturing industry in Hungary is relatively small, because the share of the imported parts for the production is significantly large and this volume has not changed significantly in the past 5-10 years, because foreign companies are influenced strongly by the Western European headquarters also including taking improving measures. This value added part showed some improvement during the last decade, but it takes still a very low part out of the whole production value. My interviewees marked their companies on the middle of the 'Smile curve', especially the small suppliers. The last interviewed company, the biggest TIER 1 shows up intensive research and development activities and it will be more significant in the future, as my interviewee stated.

3. **Near-shoring**: it plays a key role in the operation of the automotive companies being present in Hungary, because the country has a very good location in the middle of CEE with a relatively good infrastructure and cheap and skilled workforce and an optimal business climate for foreign investors. The interviewed companies came here because of the cheap but skilled labor.

Based on the interviews, the ranking of the near-shoring aspect are the following:

- skilled labor (4), (4), (4) = 12
- cheap labor (4), (4), (4) = 12
- proximity to export markets (2), (3), (2) = 7
- positive support system (3), (2), (0) = 5
- favorable tax conditions (3), (2), (0) = 5
- government policy (3), (2), (0) = 5
- proximity to HQ (0), (3), (2) = 5
- good infrastructure (0), (3), (0) = 3
- cheap raw material (0), (0), (0) (world market prices) = 0

According to the research results, I can accept the second hypothesis about near-shoring in Hungary, because beside the proximity to export markets, the cheap but skilled labor was decisive when multinationals decided to invest in Hungary. The positive support system, favorable tax conditions, government policy and proximity to HQ were aspect the companies used them, but they are rather neutral factors. The good infrastructure is not so good in the real life and the cheap raw material is not cheap, because the firms has to deal with world market prices, thus, these were not attractive to investors.

4. **New automobile trends**: as mobility will continue to become more digital, more connected, and especially more electric, automakers may need to reskill their current workforces. The respondents of the interviews from the two small TIER 1 companies stated that they do not have such plans yet. However, the third interviewee from the big TIER 1 company underlined that this is the trend and the future outlook, the number of software engineers will increase relative to mechanical engineers at the company.

   So yes, automotive manufacturers will react to the spreading of electric, autonomous and connected cars gradually (with changes in their operations by extending or changing their production lines). However, the ways and the extents of modifications are more solid and will take slowly at smaller suppliers. My respondents have also agreed that nowadays digital is driving greater transparency in manufacturing and the components are more routinely tracked across the supply chain. There is a need from the side of OEMs to have more insight into the processes of suppliers.

5. **The COVID-19**: with the spread of COVID-19, the market collapsed last year, sales volumes decreased significantly. This is linked to the semiconductor shortage, as it is also the result of the pandemic. All three interviewees confirmed that they see the semiconductor shortage as a serious economic crisis. A significant proportion of their customers have cancelled their orders and the new orders are still volatile. This situation is expected to continue in the first half of 2022. Furthermore, all three agreed that in areas where possible (e.g. procurement, HR, project management, engineering) they work from home and encourage their employees taking the COVID-19 vaccine. The effects of COVID-19 are becoming less pronounced today, but the semiconductor crisis is continuing.

## 16. Summary

Globalization can no longer be seen as a coordinated breakdown of economic activities whose benefits are unequally distributed across geographies. It is more a strategic coexistence of value-added activities whose flexibility depends on the mutual interests of stakeholders in the value chain and across countries (Pananond et al., 2020).

Foreign direct investment is an important growth driver for Central Eastern Europe. Advanced business services are the most popular sectors for FDI in Europe, and Central Eastern Europe has extensive experience in these business areas (Skanska et al., 2016; Mattoo et al., 2004). After the economic and social transformation in the post-soviet CEE countries in 1989, because of the privatization processes and after the great financial crisis 2008-2009, because of cost-cutting processes, lots of multinational companies appeared in the CEE region or outsourced their business processes to developing countries. These near-shoring companies moved their off-shored manufacturing activities close to their home countries, because of shorter lead times, easier way of control and cheaper labour- and delivery costs (Stehrer et al., 2012; Stentoft, J. et al., 2015). In Europe the term is used in the context of offshoring to Central and Eastern Europe (Stehrer et al., 2012). FDI in the Central Eastern European auto industry have been driven by lower production costs compared to Western Europe (Pavlínek, 2020). The investment and location decisions were influenced by compared to Western Europe low wages, skilled workforce, procurement of components from one source, which makes component delivery cheaper, the geographical proximity to large markets and customers, which reduces transport costs, and further investment incentives (Pavlínek, 2020). Beside significant amount of capital, new technology expertise and know-how were also brought by new investors, which helped host countries to raise productivity (ECB, 2009). Companies from advanced economies have chosen for their unskilled-labor-intensive production activities other countries with lower wages and have kept the high-value-added functions and strategic operations at home, where the necessary skilled workers have been available (Timmer et al., 2014). It is illustrated by the so called ‘Smile curve’: in manufacturing the value added activities are in the pre- and post-fabrication services typically.

“GVCs today are complex networks of pre-production, production, trade and consumption.” (Law, 2016) Activities in the GVCs are production, R&D, design, marketing, logistics, etc. predominantly, which are within one firm or divided among firms. The embeddedness in GVCs are determined by the local economic, social and institutional conditions. The availability of inputs like labor, infrastructure, finance and other resources are important economic conditions;

the accessibility of skilled labor and education are main social factors, while tax policies, labor regulations, subsidies are relevant institutional features. According to Gereffi and Fernandez-Stark (2016), economic upgrading means that companies, countries or regions to increase their benefits, move to activities with higher values in GVCs. The benefits of the global participation can be higher value-added, security, profit or capabilities. To be able to move up the value chain in knowledge-intensive manufacturing and services, CEE economies need to invest in R&D and innovation. The education system allows countries to have a well-educated population, which is able to serve knowledge-intensive industries, but building up clusters and collaboration between companies and research institutions, universities are required. Additional investments in the education is needed, and the needs of the key leading manufacturing and service industries should be aligned with the profiles of the universities. Local workforce should be qualified enough to be able to enter global value chains. Furthermore, a modern and effective infrastructure is also a key element of growth for companies and for GVC participation. The quality of roads, airports, the operation of transportation and transport connections determine country attractiveness for FDI (OECD, 2014). In the automotive industry, which is in the main focus of my research, with the spread of different automation technologies, in general a *functional upgrading* process is observable from the labor-intensive to capital-intensive processes.

Since 1990, the Central and Eastern European automotive industry has been thoroughly restructured and integrated into the European automotive industry (Pavlínek, 2020). At the same time, the economic dependency of the externally owned and externally controlled automotive industry has grown significantly. Key characteristics of the automotive industry in CEE are the following: weak development of local companies, limited upgrading opportunities and subordinate and dependent positions in the global production networks (Pavlínek, 2020). The future of the automotive industry in Central Eastern Europe depends primarily on the strategies of foreign transnational corporations in the region.

The GVC requirements are also valid in case of Hungary. In the country from 2011 the vehicle and vehicle parts production became the number one engine of the industrial production. Beside the large motor and vehicle manufacturers, there is a strong network of automotive suppliers operating in the country. More than 700 companies are present in the sector as a supplier (Madár – Szandányi, 2016). The presence of the multinational automotive manufacturers has improving effects on the quality and skills of the workforce and education in the country, e.g. cooperation with universities, need for improved language skills and for higher qualifications, etc. To ensure

the growth, the country needs to invest in education and training of workers and so to raise labor productivity. The dependence on transnational corporations in terms of capital, technology, management, know-how and R&D is a fundamental structural characteristic and the greatest weakness of the FDI-driven growth of the automotive industry in Hungary. Participating GVCs in the automotive industry has improving effect on the quality and skills of the workforce and education in Hungary (cooperation between foreign multinationals and universities, language skills and higher qualifications, etc.); furthermore, on the general company culture in Hungary due to the partnerships with local suppliers (managerial skills, organizational methods, etc.). Altogether, participating GVCs in the automotive industry has prospering effects on the Hungarian economy (GDP growth, trade balance improvement, increasing averages wages etc.). However, we should note that beside improving the wage competitiveness, developing the quality of the human capital is primary to prevent the country to get stuck in the role of an "assembly workshop". Some car brands' success may have too much influence on the performance of the whole economy (Szabó, 2016).

The purpose of the thesis was to analyze how the automotive manufacturing companies being active in Hungary operate in global value chains, with a particular focus on suppliers. Although the topic of GVC is widespread and discussed in international literature, there is a gap in relation to the Hungarian automotive manufacturing industry, especially in the current situation when the COVID-19 pandemic affects the operation of the multinational enterprises. The main identified research question was the following: *What is the value creation of the automotive manufacturing industry in Hungary within global value chain?*

The research process started with a comprehensive literature review and theoretical background analysis about the GVC concept (including the introduction of 'Smile-curve') and FDI investment in Central and Eastern Europe (including the characterization of near-shoring activities) and continued with conducting a sample survey and semi-structured interviews with the key car parts suppliers. Executive board, managerial level and engineers were the target persons both for the survey and for interviews. Based on the literature review, I formulated **two hypotheses**: 1. The theory of 'Smile curve' is also valid in case of the Hungarian automotive manufacturing industry, typically low value-added production processes take place in the country. 2. In addition to the central location, the cheap and skilled Hungarian labour was the most important factor in the near-shoring activities of multinational companies expanding to Hungary.

In order to be able to accept or reject the first hypothesis about the relevance of the so called 'Smile curve' in the Hungarian automotive manufacturing industry, to define position of the automotive manufacturer companies being active in Hungary in the global automotive manufacturing value chain and to create an in-depth understanding about investment incentives of the Western European firms in the country, I prepared an online survey. To test my second hypothesis about the reasons of near-shoring activity in Hungary, I conducted 3 interviews with industry experts from TIER 1 companies of different size. The targeted automotive parts manufacturers are all suppliers of the 5 OEMs present in Hungary (Audi, BMW, Mercedes, Opel and Suzuki) among others.

The new results of the doctoral dissertation are the following:

I can reject the first hypothesis about the relevance of 'Smile curve' in the Hungarian automotive manufacturing industry, because beside manufacturing activities with low added value typically, also research and development activities take place at bigger multinational companies with higher added value. I can accept the second hypothesis about near-shoring in Hungary, because beside the 'proximity to export markets', the cheap but skilled labour was decisive when multinationals decided to invest in the country. The 'positive support system', 'favorable tax conditions', 'government policy' and 'proximity to HQ' were aspects that companies used, but they are rather neutral factors. The 'good infrastructure' is not so good in the real life and the 'cheap raw material' is not cheap, because firms have to deal with world market prices, thus, these were not attractive to investors.

Further results about the business operations of the analyzed supplier companies: the purchasing decisions for the Hungarian production happens locally decisively, either independently or with involving the HQ. The manufactured products are typically drive chains, body parts and electric sensors and the proportion of products designated by OEMs is rather high and Western Europe is the biggest export market of the companies analyzed, followed by China, North-America and the Central Eastern European region. Relocation processes are not characteristic of the firms. If so, only from other country to Hungary and it is also determined by OEMs providing new opportunities for them. In some cases, wage costs and logistics also play a role in the relocation process. Electromobility and autonomous driving are the most affecting trends in the automotive manufacturing industry. All the Hungarian motorcycle and car manufacturers and a significant portion of the suppliers produce internal combustion vehicles and components. The large manufacturers in Hungary, especially Audi and Mercedes have shown some evidence of the development of electric cars, electric motors and batteries

and other components in Hungary in the future (Audi and Mercedes company webpages, 2020). In case of parts manufacturers, the new automotive trends like electric cars, digitalization and connected cars or autonomous driving already affect the operations or will affect it within 3-5 years. The semiconductor shortage as a serious downside risk is also the result of the pandemic. The effects of COVID-19 are becoming less pronounced today, but the semiconductor crisis is continuing. Favorable tax conditions and higher value added are the success criteria that will help the Hungarian automotive manufacturing industry to remain competitive in the future, but rofessional trainings, more support for SMEs and favorable legal conditions are also important aspects.

Today, the CEE region, including Hungary is a net exporter of knowledge-intensive goods. To improve its global competitiveness and to be able to move into higher-value-added goods and services, the region should invest more in R&D, infrastructure, education and collaboration between companies and universities. The key players in the automotive part manufacturing has realized that value added is a very important factor in the success of an industry and it can be increased due to investment in research and development and innovation. As revealed by the research, they have already established R&D centers and joint projects with universities (e.g. departments), so companies are well on their way to producing higher added value.

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## Appendix

*Appendix 1 – Asking for filling out the online questionnaire*

Dear XY!

My name is Noémi Lőrincz and I am a PhD candidate at the Corvinus University of Budapest.

In the course of my research I examine the role of Hungarian automotive players in the global automotive value chain, the title of my dissertation is: *Value creation of the automotive manufacturing industry in Hungary – Analysing key suppliers.*

I am now contacting you because in the course of my research I would like to interview automotive suppliers on the above topic – online, in the form of a short questionnaire – exactly like your company. Of course, I will keep the answers given in the questionnaire confidential, I will not disclose the personal data, I will only use the answers provided for my own analysis.

Could you please help me progress my university research by filling out my questionnaire?

Thank you.

Kind regards:
Noémi Lőrincz

*Appendix 2 – Asking for the phone interview*

Dear XY!

Thank you very much for taking the time to help my PhD research, for completing my online questionnaire and agreeing to the further 30-minute interview.

Am I turning to you now because I would like to know if there might be time for this conversation any morning next week?

It would be appropriate for me between 9:30 and 11:30, any day except Thursday, and I was thinking of a Zoom meeting if it suited you.

I send you my questions attached.

Thank you and best regards:
Noémi Lőrincz

*Appendix 3 – Quantitative research: Online questionnaire*

1.) Name:

2.) Organization:

3.) Position:

4.) How many people does your company employ?
   a) 0-50
   b) 51-100
   c) 101-500
   d) 501+

5) How did the number of employees change in your company in 2020 during/after COVID-19?
   a) Slightly decreased (0-10%)
   b) Significantly decreased (10%+)
   c) Slightly increased (0-10%)
   d) Significantly increased (10%+)
   e) No change

6) Has your company ever been unable to fulfil an order due to lack of workforce?
   a) Yes
   b) No

7) Has your company been unable to fulfil an order due to COVID-19?
   a) Yes
   b) No

8) What is the ownership structure of your company?
   a) Hungarian entrepreneur / family property
   b) State owned company
   c) Foreign based company
   d) On stock exchange listed company

9) Where are the purchasing decisions required for the Hungarian production at your company?
   a) Locally, independently
   b) Locally, involving the HQ
   c) In the HQ
   d) Other:

10) On which level of the value chain is your company located?
   a) Tier 1 supplier

b) Tier 2 supplier
c) Tier 3 supplier
d) Other:

11) Which OEMs are the end users of the products you manufacture? (multiple answers possible)
a) Audi
b) BMW
c) General Motors
d) Honda
e) Hyundai (Kia)
f) Mercedes
g) PSA (Citroen, Opel, Peugeot)
h) Renault (Dacia, Nissan)
i) Suzuki
j) Volkswagen
k) Volvo
l) Other:

12) What does your company provide to the players in the automotive industry (product / part)? (multiple answers possible)
a) Drive chain and related components
b) Body parts and modules
c) Dashboard, electronics, sensors
d) Batteries
e) Assembly
f) Advisory / trainings
g) Research and development, testing
h) Quality assurance
i) Other:

13) What proportion of the materials / components you procure are designated by OEMs?
a) < 20%
b) between 20% and 50%
c) between 50% and 80%
d) 80% <

14) What are the most important export markets for your company? (multiple answers possible)
a) Only Hungary
b) CEE
c) SEE
d) Western Europe
e) China
f) Rest of Asia

g) North-America
h) South-America
i) Other:

15) Does the owner of your company plan to relocate production capacity from other country to Hungary or from Hungary to other country in the upcoming year?

a) Yes, production capacity from another country to Hungary
b) Yes, production capacity from Hungary to another country
c) Yes, capacity change in both directions
d) Significant change not expected
e) Other:

16) What are the main reasons of the relocation of capacity?

a) Wage costs
b) Lack of skilled workforce
c) Logistics / infrastructure
d) Taxes
e) Other opportunities at OEMs
f) COVID-19
g) Other:

17) Which of the following global trends affect the operation of your company the most?

a) Electromobility
b) Digitalization and connected cars
c) Autonomous driving
d) Car sharing
e) None of them
f) Other:

18) What do you think, within what time frame does **electromobility** as a new automotive trend affect your company?

a) Already affecting
b) 1-2 years
c) 3-5 years
d) 5<years
e) Never

19) What do you think, within what time frame do **digitalization and connected cars** as new automotive trends affect your company?

a) Already affecting
b) 1-2 years
c) 3-5 years
d) 5< years
e) Never

20) What do you think, within what time frame does **autonomous driving** as a new automotive trend affect your company?

a) Already affecting
b) 1-2 years
c) 3-5 years
d) 5< years
e) Never

21) What do you think, within what time frame does **car sharing** as a new automotive trend affect your company?

a) Already affecting
b) 1-2 years
c) 3-5 years
d) 5< years
e) Never

22) Do you have your own R&D capabilities and capacity?

a) Yes, but only in the HQ
b) Yes, we have an own R&D center
c) No, but we are planning to have it
d) No and we are not planning to have it

23) What are the success criteria that will help the Hungarian automotive manufacturing industry to remain competitive in the future (multiple answers possible)?

a) Favorable tax conditions
b) Favorable legal conditions
c) More support for domestic small and medium-sized enterprises
d) Higher value added (in case of suppliers)
e) Professional trainings for workforce
f) Encouraging workforce mobility
g) Other:

24) Can I contact you for an additional 20-30 minutes interview on this topic?

If yes, please write your email address.
If no, please answer 'No'.

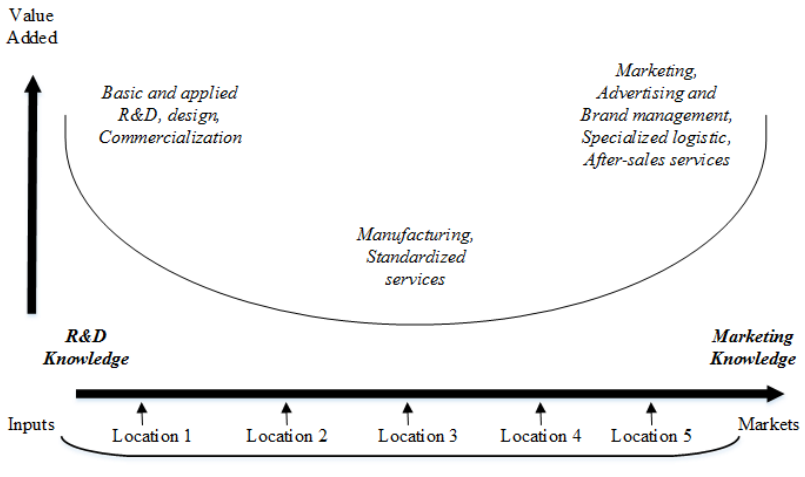
*Appendix 4 – Interview questions*

## 1) Business environment

- ✓ As the headquarter (HQ) of your company is settled abroad, how easy is it to implement measures taken by the HQ in the Hungarian operation in terms of a) employment and b) infrastructure?
- ✓ Does your company cooperate with any cluster, association, organization or university from the industry? If so, why is it useful for your business?
- ✓ Amendments of the Consumer Protection Act CLV of 1997 entered into force on 22 August 2020, after which the entire supply chain can be inspected by the consumer protection authority. How did it affect your business operation?

## 2) Value added

- ✓ This is the so called 'Smile curve' about the production process of a car. Could you please mark your company's main activity on that? (activities only in Hungary)
- ✓ How did it change in the past 3-5 and 5-10 years?
- ✓ Do you predict any changes, eventually upgrading trends in the upcoming 3-5 years?
- ✓ Can you give your opinion about how the Hungarian operation could produce more 'value' in the production processes?




*VALUE CHAIN DISAGGREGATION*

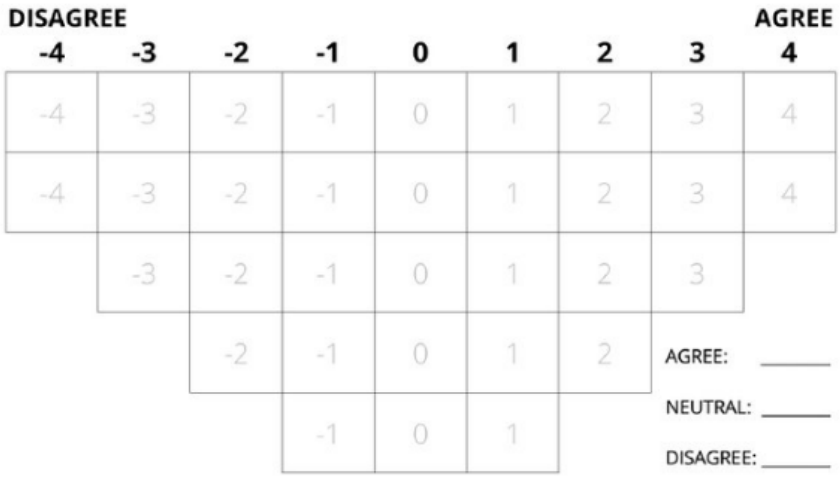
Source: Shih, 1992

**3) Near-shoring**

Applying the so called Q-methodology, please insert the following words to the Q-template according to their relevance for your company (from left to right: not relevant, neutral, or very relevant).

When selecting the location for the operational activities, the following criteria were the most important for my company:

- Cheap labor force
- Skilled labor force
- Taxation system
- State subsidies
- Cheap resources / raw materials
- Governmental policy
- Distance to the headquarter
- Distance to export markets
- Good infrastructure (high-way structure)
- Other:




Source: Aiora Zabala

**4) New automobile trends**

- ✓ Mobility will continue to become more digital, more connected, and especially more electric, so automakers may need to reskill their current workforces.

- Do you have any plans about ramping up the number of software engineers relative to mechanical engineers at your company?
- What about your business partners / suppliers?

✓ Nowadays digital is driving greater transparency in manufacturing, components are more routinely tracked across the supply chain. OEMs and TIER-1 suppliers have more insight into the processes of suppliers at lower tiers (McKinsey, 2021a).

- Is it a higher transparency observable in the supply chain at your company today as 3-5 years before?

**5) COVID-19**

✓ Compared to 2019, due to COVID-19 there is an EU-wide production loss of 22.9% of total EU vehicle production (passenger cars, trucks, vans and buses) (ACEA, 2021). These losses are the result of the temporary factory shutdowns.

- What is the situation at your company? How did COVID-19 influence the supply chains of your company and your business partners?

✓ The global semiconductor shortage, which began in the first quarter of 2021, has brought assembly lines to a standstill around the world as the long lead time for the silicon chips has slowed the production of driver assistance systems (McKinsey, 2021b).

- How do you see, is it really a crisis or just an excuse?
- Is/was your company also affected, and how?

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*Appendix 5*

**Table 4 – Differences between the quantitative and qualitative research methods**

| | **Quantitative method** | **Qualitative method** |
|---|---|---|
| **General framework** | Strive to confirm hypothesis about phenomena | Strive to explore phenomena |
| | Using highly structured methods (questionnaires, surveys, structured observation) | Using semi-structured methods in-depth interviews, focus groups, and participant observation |
| **Analytical objectives** | Quantifying variations | Describing variations |
| | Predicting causal relationships | Explaining relationships |
| | Describing population characteristics | Describing individual characteristics / group norms |
| **Question format** | Closed-ended | Open-ended |
| **Data format** | Numerical | Textual |
| **Flexibility in study design** | Design of the study is stable during the whole process | Some aspects of the study are flexible (interview questions) |
| | Responses of the participants do not affect the researchers' next questions | Responses of the participants affect the researchers' next questions |
| | Design of the study is subject to statistical assumptions | Design of the study is iterative, data collection, research questions derive from what is learned |

Source: Northeastern University, 2016

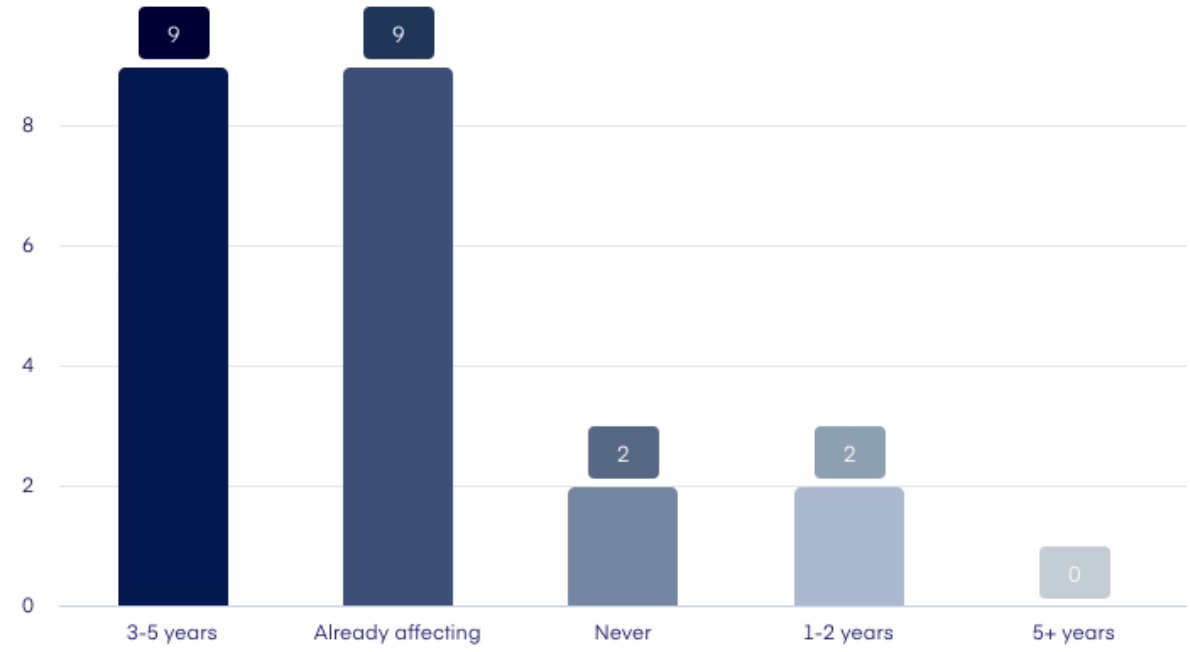
*Appendix 6*

**Table 5 – The 50 largest export-revenue companies operating in Hungary, 2015**

| Rank | Company name | Sector | Foreign sales rev. (mHUF) |
|---|---|---|---|
| 1 | GE Infrastructure CEE Holding Ltd. | property management | 4 483 809 |
| 2 | MOL PLC. | energy industry | 2 998 282 |
| 3 | Audi Hungaria Motor Ltd. | car manufacturing | 2 599 054 |
| 4 | Mercedes-Benz Manufacturing Hungary Ltd. | car manufacturing | 1 062 038 |
| 5 | Samsung Electronics Hungarian PLC. | electronic industry | 627 977 |
| 6 | Hungarian Suzuki PLC. | car manufacturing | 580 646 |
| 7 | Wizz Air Hungary Ltd. | transportation | 493 292 |
| 8 | Felxtronics International Ltd. | electronic industry | 469 051 |
| 9 | MVM Hungarian Electrical Works PLC. | property management | 463 962 |
| 10 | Robert Bosch Electronics Ltd. | car parts manufacturing | 458 569 |
| 11 | Bimbo Hungria PLC. | wholesale trade | 451 934 |
| 12 | Richter Gedeon Chemical Factory PLC. | pharmaceutical industry | 330 244 |
| 13 | PCE Paragon Solutions Ltd. | electronic industry | 284 648 |
| 14 | BorsodChem PLC. | chemical industry | 284 470 |
| 15 | GDF Suez Natural Gas Trading Ltd. | energy trade | 257 787 |
| 16 | Robert Bosch Energy and Body System Ltd. | car parts manufacturing | 275 455 |
| 17 | Sanofi-aventis/Chinoin | pharmaceutical industry | 261 486 |
| 18 | Harman Becker Ltd. | car parts manufacturing | 260 113 |
| 19 | Jabil Circuit Hungary Ltd. | electronic industry | 232 337 |
| 20 | Electrolux Lehel Refrigerator Factory Ltd. | machine manufactures | 230 081 |
| 21 | MOL Petrolchemical PLC. | chemical industry | 225 028 |
| 22 | LuK Savaria Kuplunggyártó Ltd. | car parts manufacturing | 222 382 |
| 23 | ContinentalAutomotive Hungary Ltd. | car parts manufacturing | 219 915 |
| 24 | Michelin Hungary Ltd. | rubber manufacturing | 218 975 |
| 25 | Hankook Tire Hungary Ltd. | rubber manufacturing | 211 968 |
| 26 | Alcoa-Köfém Ltd. | metal processing | 204 798 |
| 27 | Delphi Hungary Ltd. | car parts manufacturing | 193 434 |
| 28 | Teva Pharmaceutical Works PLC. | pharmaceutical industry | 185 192 |
| 29 | Lear Corporation Hungary Ltd. | car parts manufacturing | 180 317 |
| 30 | Denso Manufacturer Hungary Ltd. | car parts manufacturing | 178 704 |
| 31 | NI Hungary Ltd. | electronic industry | 168 643 |
| 32 | SE-CEE Schneider Electric Ltd. | wholesale trade | 162 986 |
| 33 | Opel Southeast Europe Ltd. | car trade | 148 990 |
| 34 | BorgWagner Oroszlány Ltd. | car parts manufacturing | 139 253 |
| 35 | Synopsys Global Ltd. | business services | 113 653 |
| 36 | Glencore Grain Hungary Ltd. | wholesale trade | 108 444 |
| 37 | Valeo Auto-Electric Hungary Ltd. | car parts manufacturing | 107 571 |
| 38 | Johnson Controls Mór LP. | car parts manufacturing | 107 046 |
| 39 | Porsche Hungaria Ltd. | car trade | 102 147 |
| 40 | SMR Automotive Mirror Technology LP. | car parts manufacturing | 100 054 |
| 41 | Robert Bosch Automotive Steering Ltd. | car parts manufacturing | 97 382 |
| 42 | Ibiden Hungary Ltd. | car parts manufacturing | 97 259 |
| 43 | Egis Pharmaceutical Works PLC. | pharmaceutical industry | 97 150 |
| 44 | Videoton Holding PLC. | electronic industry | 97 120 |
| 45 | Hungarian Telecom Telecommunicatio PLC. | telecommunication | 89 758 |
| 46 | Apcom CE Ltd. | wholesale trade | 89 215 |
| 47 | Coloplast Hungary Ltd. | plastic industry | 85 417 |
| 48 | Grundfos Hungary Ltd. | machine manufactures | 83 242 |
| 49 | Bunge Vegetable Oil Industry PLC. | food industry | 83 205 |
| 50 | Zollner Ltd. | electronic industry | 81 678 |

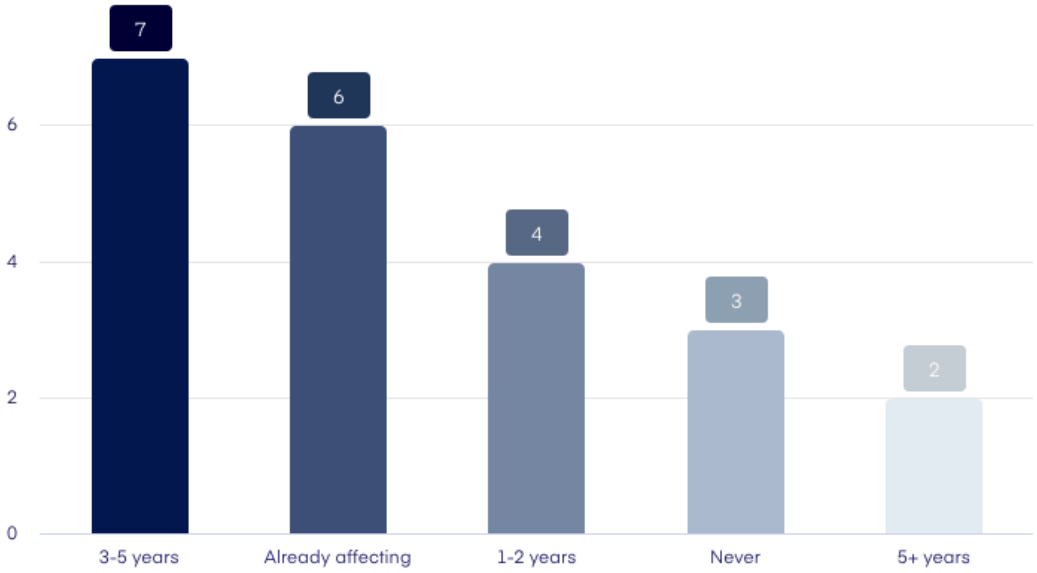
Source: HVG, 2016

**Figure 38 – Timeframe when electromobility affects companies**



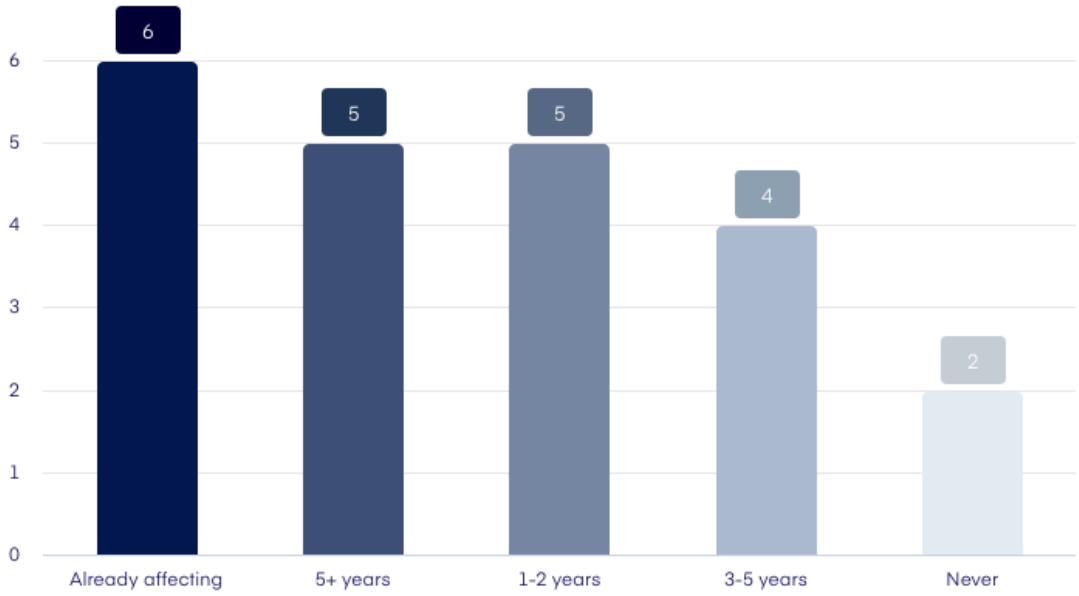

Source: Author's own creation

**Figure 39 – Timeframe when digitalization and connected cars affect companies**




Source: Author's own creation

**Figure 40 – Timeframe when autonomous driving affect companies**




Source: Author's own creation