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Economic cooperation within global value chains among CEE and LAC countries

**Example of the Volkswagen Group - case
study of Audi Motor Hungaria Kft.**

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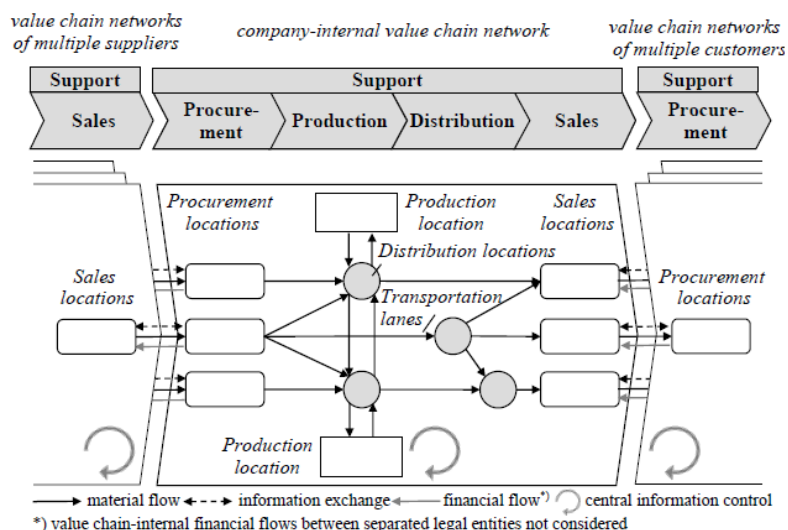
The purpose of this study is to identify the linkages of economic cooperation between one Central European country and several Latin American countries. We examine the cooperation taking place within the value chain of the Volkswagen Group. We explore the direct and indirect linkages among the individual production plants, i.e. between Hungary and three Latin American countries: Mexico, Brazil and Argentina. This geographical analysis illustrates the core activities of the original equipment manufacturer (OEM¹) relating to production. The main goal of our research is to geographically designate the activities, relating to the production in the global value chain and find the linkages among the production places.²

The idea of the value chain and internationalization of the firms

The methodology of this paper is based on the idea of the value chain defined by Michael Porter (1985). For the analysis of a company's value chain and finding the linkages among the separated production places we first have to separate the value activities in the company. The separation of activities in the value chain differs by author. Porter uses the classical functional separation of activities, distinguishing between primary and support activities along the supply chain. He specifies five primary activities (*inbound logistics, operations, outbound logistics, marketing and sales, service*). Schmid and Grosche (2008) separate activities into four variables (*procurement, R&D activities, production and sales*). Beside the support functions, Meyr et al. (2004) and Rohde et al. (2000) also specify four stages (*procurement, production, distribution and sales*) as primary activities. Kaplinsky and Morris (2002) distinguish between simple value chains with four stages (*design and product development, production, marketing, consumption/recycling*) and extended value chains with multiple linkages and value added activities.

Keeping the original divisions mentioned above, Kannegieser (2008) adds an internal network structure to the former linear idea. Therefore the value chains include internal relationships within the company and external relations with other companies (see Figure 1).

Figure 1 The value chain network



Source: Kannegieser, 2008 p. 16.

¹ The original equipment manufacturer (OEM) manufactures products or components that are purchased by another company and retailed under that purchasing company's brand name.

² This paper was prepared as part of the research project "Study on Latin America and the Caribbean and Central and Eastern Europe: Potential for Economic Exchange" financed by the EU-LAC Foundation.

When introducing value chain management he defines it as “*integration of strategy, planning and operations decisions in the value chain to reach a global value optimum*” (Kannegieser, 2008 p. 60.). Essentially this means that with value chain planning the firm plans its volumes and values throughout the global value chain network. The spatial scale of the value chain was highlighted by other authors as well: global commodity chains by Gereffi (1999) and global value chains/networks by Abonyi (2007). In their analysis of the global apparel value chain, Gereffi and Memedovic (2003) distinguish globally organized raw material networks; component networks; production networks; export networks and marketing networks in the value chain.

Developments of value chains are based on global processes, as globalization in the productive sphere implies functional integration between geographically dispersed activities (Gereffi et al. 2001). Thereby companies have to solve this internal integration process in addition to seeking to serve the market (i.e. proximity to customers, see: Dunning 1993, 2000), and take into account other internal and external factors as well. The main point of our research is the internationalization and framework of the value chain. Concerning internationalization and building up the regional structure of the value chain, Schmid and Grosche (2008) highlight four **external factors** in the automotive industry. The *emergence of new markets* increases the number of target markets and stimulates companies to assess the utility of taking up activities in these new markets. *The overall economic situation*, such as changes in the exchange rate or oil price, influences the decision-making processes in the case of installing a new factory. *Competition factors* like cost pressure also play an important role, as often investments are made due to the influence of newly arising competitors. *Industry-specific requirements* such as the introduction of new technologies or new developments may change the existing value chain. Examining the globalization of the automotive industry, Sturgeon and Florida (2000) identified four periods and their respective changing motivations concerning the internationalization activities of companies (offshore production, see Table 1).

Table 1 Changing motivations for offshore production in the automotive industry

| Motivation | Period |
|---|---------------|
| Customer proximity | 1890-1919 |
| Lower transport costs | 1910-1929 |
| Tariff avoidance/trade friction/local content rules | 1930s-present |
| Lower operating costs | 1980s-present |

Sturgeon-Florida 2000, p. 21.

Besides external circumstances, there are also **internal factors** that influence the geographical distribution of each value creation process. This study does not discuss the development of the different ideas of internationalization and foreign direct investment theories (for further details, see: Morgan and Katsikeas 1997 and Dima 2010), we focus on production development within the value chain. Concerning internal factors of the internationalization of the value chain, Schmid (2007) uses an eight-point development scale from the export to the subsidiary and the merger. At the initial stage of the development process, the local production plant is a net consumer, while later it operates as a net producer and supplier to other production plants. The Volkswagen plant in Mexico began with CKD assembly in the 1970s and now exports engines to Volkswagen’s Chattanooga Assembly Plant in the US (Volkswagen 2014).

The value chain in the automotive industry

The size and the geographical spread of the global value chain in the automotive industry – as any other globally operating industry – depend on the internationalization of the company. There has been a globalizing trend in the automotive industry since the 1980s, when an **increasing number of automotive firms began to start offshore assembly**. Although the share of the foreign sales had not been increasing, new production facilities were set up. The boom began in the 1990s when firms started **opening new plants in the emerging economies** in Central and Eastern Europe, India and China (Humphrey and Memedovic 2003). This development had also a significant **impact on industry structure** (Sturgeon and Florida 2000). Currently, there are automotive companies with high foreign shares compared to total sales. Japanese companies' (like Honda, Nissan, Isuzu, Mitsubishi and Toyota) foreign sales have higher shares than the German manufacturers Volkswagen, BMW and Daimler, as well as most recently the Korean company KIA (Schmid and Grosche 2008). The above-mentioned market entry strategies (Schmid 2007) and the evolutionary idea (Johanson and Wiedersheim-Paul 1975) confirm that evolution of **firms' internationalization** results from the development of a global value chain. Cooperation among OEMs, which provide local presence, such as that of Volkswagen and Daimler in assembling vans and exchanging components (transmission) and platforms, affect local content in the global value chains. Cooperation between Suzuki and GM-Opel to produce Splash/Agila cars on the same platform also transforms both value chains and allows them to take advantage of the opportunities offered by synergies.³ At the beginning of 2013, the Toyota Motor Corporation and BMW signed an agreement to tighten technical cooperation to jointly develop lithium-air batteries and new lightweight materials.⁴ The alliance between Nissan and Renault ensuring joint distribution and cooperation in R&D is a good example of deepening cooperation and synergies through cross-ownership.

Outsourcing also redraws the map of production. In 2012, Porsche gave the Boxer engines production from its Finnish partner Valmet to the Austrian supplier Magna Steyr.⁵ Technological cooperation also plays an important role in the allocation of R&D activities. It does not only mean that after new contracts the value production activities may be allocated to another location, but that increasing outsourcing restructures the whole value chain (Sturgeon and Florida 2000). A new globalizing trend emerged in the US automotive industry at the beginning of the 1990s. In the US, over one hundred thousand new jobs were generated between 1990 and 1996, showing the size of the transformation, which took place mostly at the suppliers rather than the OEMs.

Other authors including Sturgeon and Florida (2000) highlighted **globalization** as the engine of the transformation of the industry. The globalization of firms affects the structure of the industry (production, suppliers, investment) as well as the geography of the automotive industry (new emerging markets, expanding free trade agreements).

The other motivation for spreading international production is **political pressure** from the target country, e.g. increasing market protectionism in order to start regional/local production (Sturgeon et al. 2008). The OECD, UNCTAD and the WTO (2013, p. 15) have drawn attention to the importance of protectionism in companies involved in the value chain as it affects the demand, production and investment at all stages of the value chain.

³ Car news 6/15/2006: <http://www.autoweek.com/article/20060615/FREE/60614003>

⁴ Automotive News on 1/24/2013: <http://www.autoweek.com/article/20130124/carnews/130129913>

⁵ Automotive News Europe on 6/26/2008: <http://www.autoweek.com/article/20080626/FREE/491595533>

Geographical distribution of the activities in the Volkswagen Group

In 2012, the Volkswagen Group, with a production of 9,2 million vehicles,⁶ was the **third largest automotive company in the world**. The company consists of two divisions: the financial services division and the automotive division. The financial services division provides the financial background for strong earnings and high unit sales. Also, the favorable innovative background of the company allows leveraging additional potential along the value chain (Volkswagen 2013a, p. 126). The main scope of the Volkswagen Group is the automotive division. The company produces twelve brands, providing a broad spectrum of supply. Besides this, the company has a **large geographic extension** in the case of market areas and production plants. Since 1948, when the first export vehicles went to European countries other than Germany, Volkswagen has been steadily increasing its sales abroad. In 2012, the Group sold its vehicles in 153 countries all over the world. Concerning the geographical distribution of production, Europe still plays a decisive role: there are 37 production plants in 19 European countries. In a further eight countries in North and South America, Asia and Africa, there are a total of 21 factories (Volkswagen 2013a, p. 205).

Due to the conquest of new markets, cooperation and acquisitions, Volkswagen is a transnational company that involves more resources from abroad than from its home country Germany. In the case of sales revenue, the foreign share has been growing since 1956, in the case of foreign production since 1993, and in the case of employment abroad since 2008 (Volkswagen 2008). The foreign component of total activity is often used to measure the level of internationalization. It refers to **assets, sales, production, employment or profits** of foreign branches or affiliates (United Nations 1973, p. 4). In 1995, the United Nations Conference on Trade and Development (UNCTAD) introduced the Transnationality Index (TNI), which ranks transnational companies by the amount of their foreign activities. The index is calculated from the ratio of foreign **assets**, foreign **sales**, and foreign **employment** as a ratio of total values (UNCTAD 1995, p. 23). The TNI index for Volkswagen for the period from 1993-2010 grew from 43.3 to 60.8 percent, clearly indicating the company's globalization.

In recent years, the company has continued to increase its foreign exposure (see Table 2). In 2012, the foreign share of **production was 75 percent**, in **vehicle sales 87 percent** and in the case of **employees 56 percent**. The picture is quite asymmetric, showing that increasing internationalism on the side of allocation activities in the value chain is rather unequal.

Table 2 Changes of the foreign exposure of the Volkswagen Group

| | 2010 | 2011 | 2012 |
|--|--------------|--------------|--------------|
| Production (thousand units) | 7,358 | 8,494 | 9,255 |
| Germany | 2,115 | 2,640 | 2,321 |
| Abroad | 5,243 | 5,854 | 6,934 |
| Vehicle sales (thousand units) | 7,278 | 8,361 | 9,345 |
| Germany | 1,059 | 1,211 | 1,207 |
| Abroad | 6,219 | 7,150 | 8,137 |
| Workforce (yearly average, thousands) | 389 | 454 | 533 |
| Germany | 178 | 196 | 237 |
| Abroad | 210 | 258 | 296 |

Source: Volkswagen 2013a, p. 185.

Regarding revenues, the **automotive division** plays a decisive role. Passenger cars and light commercial vehicles account for 78 percent of total revenue and trucks and buses for 11 percent. Power engineering and financial services make up 2 percent and 10 percent of total revenue respectively.

⁶ Total production of the company is 9,254,742 of which 8,576,964 are cars (OICA 2013).

In order to compare data we take into account the latest available data from 2010.⁷ In terms of **sales**, Asia – mostly the Chinese market – has an outstanding role since the early 2000s, however, sales revenues in Germany and Europe are still dominant. The North and South American market proved to be stable in recent years (see Table 3). Apart from maintaining its share on the strategic European market and increasing sales in East and South Asia, the main target for the Volkswagen Group has been to regain the US market (Browning and Lohscheller 2011). The peak years were at the beginning of the 1970s, when in 1970 sales in the US market were close to 600 thousand units. Since then, due to the rise of new competitors, Volkswagen has been losing its market share.

Concerning the **geographic distribution of production places**, most of them are located in Europe and Asia. South America and Mexico also have significant spare capacities. Thus, Asian, South American and European production capacities play a key role in production. There were automobile production plants⁸ in the following countries at the end of 2012: Germany (headquarters), Belgium, Spain, Portugal, Czech Republic, Poland, Hungary, Slovakia Bosnia-Herzegovina and Russia in Europe. There are production facilities in Mexico, USA, North America,⁹ as well as Argentina and Brazil in South America. In Africa there are branches in South Africa, and in Asia there are affiliates in China and India.

Besides the European production sites, Brazilian and Chinese subsidiaries have the largest **output** (see Table 3), whereby the former branch is export oriented, and the latter, despite its increasing output, depends on imports.¹⁰ Mexican plants have also shown a remarkable development owing to exports mainly to the NAFTA region (KPGM 2012), which has a decisive share. Despite the competitiveness of production in Mexico, the exchange rate fluctuations of the US Dollar cause market disadvantages for the Volkswagen Group. In order to eliminate this, in 2008 Volkswagen decided to build a new production facility in the United States (Volkswagen 2009, p. 182). The Chattanooga assembly plant began production in 2011.

Table 3 Regional distribution of the production, sales and workforce of the Volkswagen Group in the main markets and production places (in 2010)

| country/region | production units | sales units | workforce person |
|--------------------------|-----------------------------|------------------------|-----------------------------|
| Germany | 2,115,000 | 1,062,652 | 178,291 |
| Europe – without Germany | 1,824,445 | 1,864,352 | 79,270 |
| USA | 0 | 358,500 | 0 |
| Mexico | 434,685 | 131,000 | 15,290 |
| Brazil | 1,067,105 | 727,790 | 26,303 |
| Argentina | 87,073 | 145,800 | 6,500 |
| South Africa | 119,613 | 72,279 | 5,634 |
| China | 1,692,517 | 1,924,649 | 39,980 |
| India | 50,019* | 53,555 | 4,459 |

*mainly from completely knocked down (CKD) kits

⁷ From the mid-2000s, the data for production and for employees are not included in Volkswagen's annual reports. As a result of detailed research work by the author, data from 2010 are available.

⁸ Except the Scania and MAN production plants and the Ducati, Lamborghini, Bentley and Porsche plants

⁹ Because of close economic and trade relations (NAFTA), Mexico is listed as a North American country in the statistical annexes of the Volkswagen AG.

¹⁰ Based on the balance of the sales figures and production figures in 2010.

Source: based on the author's compilation of business data and other official/governmental organizations

Based on the balance of **production** and **sales**, there are two types of foreign branches/markets. Those with a surplus of production are called “export producer subsidiaries”, such as Germany, Mexico, Brazil and South Africa. Foreign markets, where the amount of imports exceeds gross production, are identified as “import dependent markets”, such as Western Europe, the United States, Argentina, China and India.

In 2010, a total of 388 thousand people worked for the Volkswagen Group, of which 178 thousand employees worked in Germany, representing 46 percent of the total **workforce**. Outside Europe, most workers are employed in the Chinese and Brazilian production places (see Table 3). In the past decade, the geographical distribution of production and sales has been globalizing, i.e. the share of production and sales in Germany has been changing. However, the change in the workforce is different from the change in the production. Using the *Pearson correlation coefficient* for testing the nexus between the geographical distribution of production and the workforce, the correlation has been weakening since the beginning of the 1980s. In terms of employment, the development of the company favored sustaining employment in Germany and in Europe in relative terms.

The global value chain of the Volkswagen Group focusing on the relations between Central and Eastern Europe and the Latin American countries

Volkswagen is a global company, not just in the geographical sense (horizontally) but also in its model range (vertically). The production range covers everything from city cars to luxury vehicles, from small commercial vans to heavy commercial vehicles. Volkswagen offers twelve brands with 280 models produced at 100 production plants (Volkswagen 2013a, p. 23). A company with wide vertical and horizontal extension should seek to coordinate activities within the company. An inadequate structure of technology development and production in such a multi-structured company may cause a significant competitive disadvantage vis-a-vis its competitors. There have been examples in the past, such as integrated engine development in the 1970s, when parallel developments at Volkswagen, Audi, and Porsche were integrated (Tolliday 1995, p. 117) as a basis of the company's success. This integration had become necessary due to the emergence of new competitors and a decline in competitiveness in the 1970s. Besides increasing global production, enhancing international competitiveness through a competitive internal structure is currently the main target for the company (Volkswagen 2010, p.198). Therefore, the organizational structure of the company responds to internal and external challenges. Globalization means a structural step forward following international production and sales. Thinking globally for a company means (Eisenberg 2011, p. 10):

- Global production and platforms;
- Global design – no or minimum local adaptation;
- Global sourcing of local materials;
- Worldwide cooperation with suppliers;
- Flexibility in selection / changes of the production sites.

According to Pries (2003), Volkswagen is a “globally operating transnational company” since the beginning of the 1990's. The concept of Pries (2003) is based on the transformation of cooperation between the subsidiaries and the parent company. Pries takes into account the spatial configuration of resources, functions, competencies and power between headquarters and plants. In the case of corporate governance and profit strategies, this means that the company has followed a *globalised centralism and intra-organizational competition* strategy since the 1990s. In practice, this means that

carrying out a value activity in an affiliate is not only a question of ability, but of which subsidiary can make it the cheapest. The assignment of tasks is the result of competitive bidding within the company (Audi Hungaria 2014). Therefore, all analyses involving the company’s global value chain constitute only a snapshot.

Analysing the value chain of the Volkswagen Group, Wiese (2009) highlights the core values of the firm. Based on her concept, the company does not focus just on low costs. Instead customer proximity takes priority in determining the allocation of the various activities in the value chain. This is confirmed by Volkswagen’s global strategy, which highlights the closeness between production facilities and the main markets (Isensee 2011, p. 36).

Figure 2 An automobile manufacturer’s typical production stages

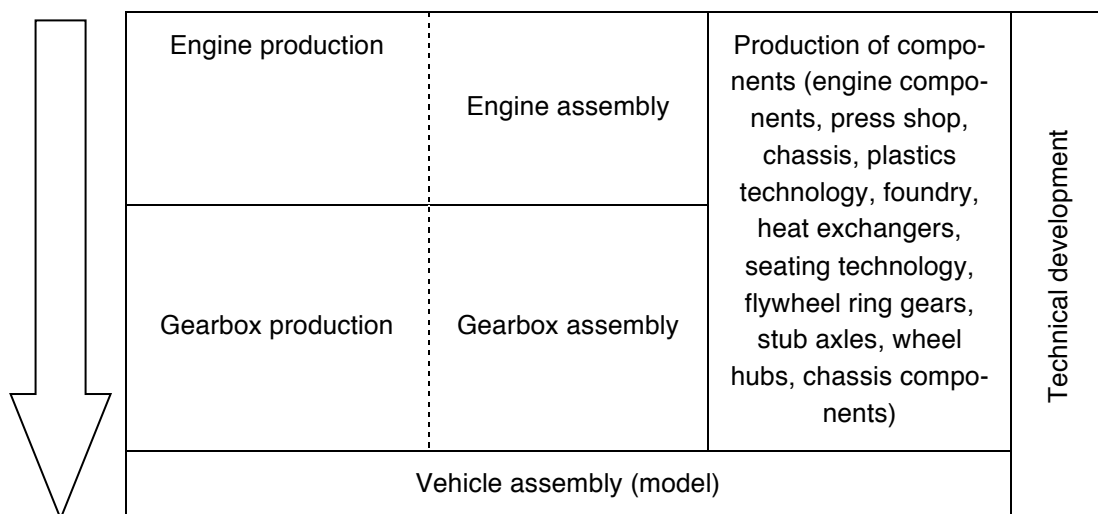
| | | | |
|---------------------------------|-------------------------|-------------------------|------------------|
| Production of other components | | | Vehicle assembly |
| Production of engine components | | Engine assembly | |
| Stamping vehicle body parts | Building vehicle bodies | Painting vehicle bodies | |

Source: Schmid and Grosche 2008, p. 20.

Based on Porter’s idea, Wiese (2009) analyzed five “chains” within the value chain of the Volkswagen Group: operations and marketing as primary activities, and technology development, human resource management and procurement as supporting activities. There are also other separations of activities in the value chain, as previously mentioned. This study is based on the idea of Schmid and Grosche (2008), the value function of production in the automotive industry (see Figure 2). In the automotive industry it is not necessary for the whole production to be present at one site, separation of the production stages can be observed at a global level.

The data for the analysis were obtained from company reports and interviews. According to data from the production sites, the Volkswagen Group distinguishes between seven different activities in the value chain (see Figure 3).

Figure 3 Value chain related to automobile production in the Volkswagen Group



Source: author

Cooperation between Hungary and Latin American countries in Volkswagen's global value chain – case study of the Audi Hungaria Motor Kft.

The Audi Hungaria Motor Kft. (hereinafter: Audi Hungaria), based in Győr in Western Hungary, develops and manufactures engines for Audi AG, the Volkswagen Group, as well as for other “third” partners.¹¹ Additionally, car assembly activities are also carried out in cooperation with the Ingolstadt factory of Audi AG. Since the founding of Audi Hungaria in 1993, Audi AG has invested a total of 5.7 billion Euros in Hungary. Today, Audi Hungaria is one of the biggest exporters and a leading automotive company in Hungary. Due to continuous investments on behalf of Audi AG, activities have been expanding. Car assembly started in 1998, and a motor development centre was opened in 2001. Audi Hungaria produced a total of 1,915,567 engines and 33,553 vehicles, and employed 8,663 workers in 2012.

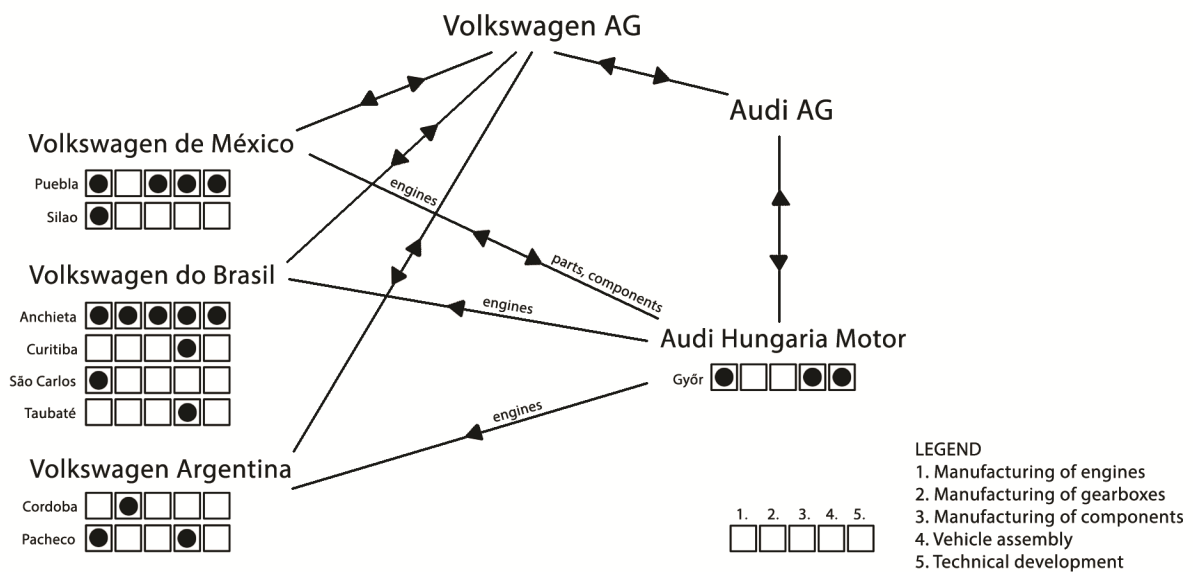
Audi AG has no other production facilities/affiliates in the CEE and LAC region, but as a part of the Volkswagen Group it has several partner locations worldwide, with which the company has direct and indirect linkages. **The whole structure and the decision-making mechanism of the company are highly centralized by Audi AG in Ingolstadt, Germany** (Audi Hungaria 2014). The company has broad relationships in the western Hungarian region, providing work for tens of thousands of people through its suppliers. The main suppliers are component suppliers and other maintenance services. The company has good relations with the local and state authorities and politicians. Audi Hungaria also cooperates with the higher education sector. In 2007, the Audi Hungaria Vehicle Engineering Department Group was launched as a part of the Department of Applied Mechanics at the Széchenyi István University in Győr.

The affiliate Audi Hungaria is the third production plant and the first foreign investment of the Audi AG. It attained a unique position as the Hungarian subsidiary shortly fulfilled the expectations of its parent company Audi AG, and assumed an important role within the company (Schmid and Grosche 2008). Through continuous investment and new functions, Audi Hungaria has become a “worldwide functional centre of excellence” in the field of engine production and engine development (Schmid and Grosche 2008, pp. 110-115). That means that the Hungarian site has special capabilities in terms of value functions, such as procurement production and sales. The production system implemented in Győr became a model for the whole Group worldwide.

Audi Hungaria has had direct linkages (trade relations) to all Latin American Volkswagen subsidiaries and still has them with some of these subsidiaries. Figure 4 shows the value chain related to automobile production. All activities and production stages are present in Mexico, Brazil and Argentina. In the Hungarian branch the production specializes in engine production and vehicle assembly as well as technical development. We will see that despite the extensive range of activities, there are linkages between the production plants.

¹¹ Companies not belonging to the Volkswagen Group

Figure 4 Value chain linkages in the examined Volkswagen subsidiaries



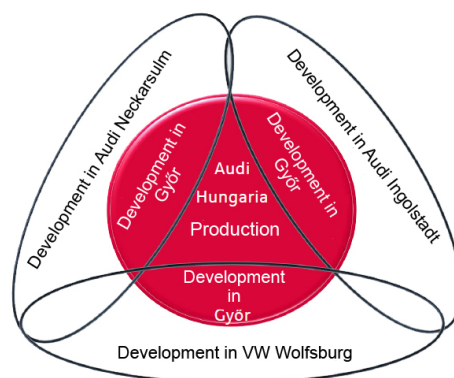
Abbreviations:

- Audi Hungaria: AUDI Hungaria Motor Kft.
- Volkswagen de México: Volkswagen de México, S.A. de C.V.
- Volkswagen Argentina: Volkswagen Argentina S.A.
- Volkswagen do Brasil: Volkswagen do Brasil Indústria de Veículos Automotores Ltda.

Source: author, based on Volkswagen 2013b and company reports

Concerning **linkages** in the value chain and among the production sites, there are two types of cooperation: **joint technological development** and **intra-firm trade**. In terms of **technology development**, joint engine development is managed by Audi AG (Audi Hungaria 2014). All development is coordinated by the Volkswagen Group. Concerning R&D there are neither duplications nor parallel development flows, and improvements are based on partial results (see Figure 5). Engines are developed in Győr for Audi, Volkswagen, and Porsche models.

Figure 5 Linkages of the technological development running at the Audi Hungaria



Source: author, based on Demmelbauer-Ebner 2012, p. 21.

Regarding engine production within the Volkswagen Group – similarly to Audi Hungaria – there is a modular approach to enable harmonized worldwide production (Schmidt 2012) and ensure a flexible

implementation of the global value chain. Standardization of mounting orientation increases efficiency and potential exchange of know-how and best practices among the Group affiliates.

In 1993, when Audi AG came to Hungary, it was one of the biggest “pioneering” investors, same as in 1953 in Brazil and in 1964 in Mexico. The subsequent period has shown that these markets and production places (both CEE and LAC) are key factors for the global competitiveness of the company. Today, the company’s locations can cooperate in research and development at the global level (Demmelbauer and Ebner 2012). Although technological cooperation (R&D activities) is indirect – development flows in parallel between each site – they **strengthen each other** (Audi Hungaria 2014).

Complete engine development exists only in Germany and in Hungary only partial tasks are being carried out. The results of Hungarian findings in the field of manufacturing technology development are used at all Volkswagen sites during production. At the Volkswagen branches in the LAC countries there are no engine development activities as at Audi Hungaria, but results on production developments and production technology can serve to increase the efficiency of the LAC branches.

The revenue (engines and vehicles) of Audi Hungaria is predominantly derived from subsidiaries of the Volkswagen Group. The individual subsidiaries are customers of Audi Hungaria. Audi Hungaria’s main partner is Audi AG, but other Volkswagen Group subsidiaries are also decisive. A large part of international trade is done through the parent company (Audi AG) and the Volkswagen AG. Concerning “direct linkages”, the main trade partner from the LAC countries is the *Volkswagen de México* factory in Puebla (see table 5). In the last ten years the other LAC subsidiaries *Volkswagen do Brasil* and *Volkswagen Argentina* were among the export partners, but this type of cooperation was only temporary. In the case of trade development between the Mexican and the Hungarian branch, 2003 was a changing year when export sales increased by 28 times. This increase in trade may have been caused by several factors. In 2003, there was a model change at the Mexican factory. After production of the Volkswagen Beetle (Type 1) ceased, new import cars and new types were been introduced over the following years (Volkswagen de México 2014). Modernization of the production range and technological content required more engines in Mexico. The Mexican production plant has had a key role in increasing exports to the US market in the 1990s and exports to the global market from the 2000s onwards (Lindner 2010). On the other hand, engines were available in Győr, so the Hungarian subsidiary could serve the needs of the other foreign branches. The third factor is the bilateral agreement and trade liberalization between the EU countries and Mexico from January 1, 2003.¹² Although in 2003 Hungary was not an EU member, Audi Hungaria had a special “free zone” status, so it could operate as if it were an EU/German factory.

Table 5 Export revenues of Audi Hungaria from the related LAC subsidiaries (1,000 Euros)

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Volkswagen de México, S.A. de C.V. | 899 | 1,575 | 44,740 | 27,098 | 51,133 | 63,164 | 67,267 | 83,761 | 38,316 | 42,440 | 42,907 | 74,620 |
| Volkswagen do Brasil | 5 | 747 | 264 | 7 | 4 | 2 | - | - | - | - | - | - |
| Volkswagen Argentina | - | - | - | - | 107 | - | - | - | - | - | - | - |
| Total | 3,461,780 | 3,487,579 | 3,632,778 | 3,829,607 | 4,137,559 | 4,921,497 | 5,775,614 | 5,534,080 | 3,844,912 | 4,741,444 | 5,509,078 | 5,203,712 |

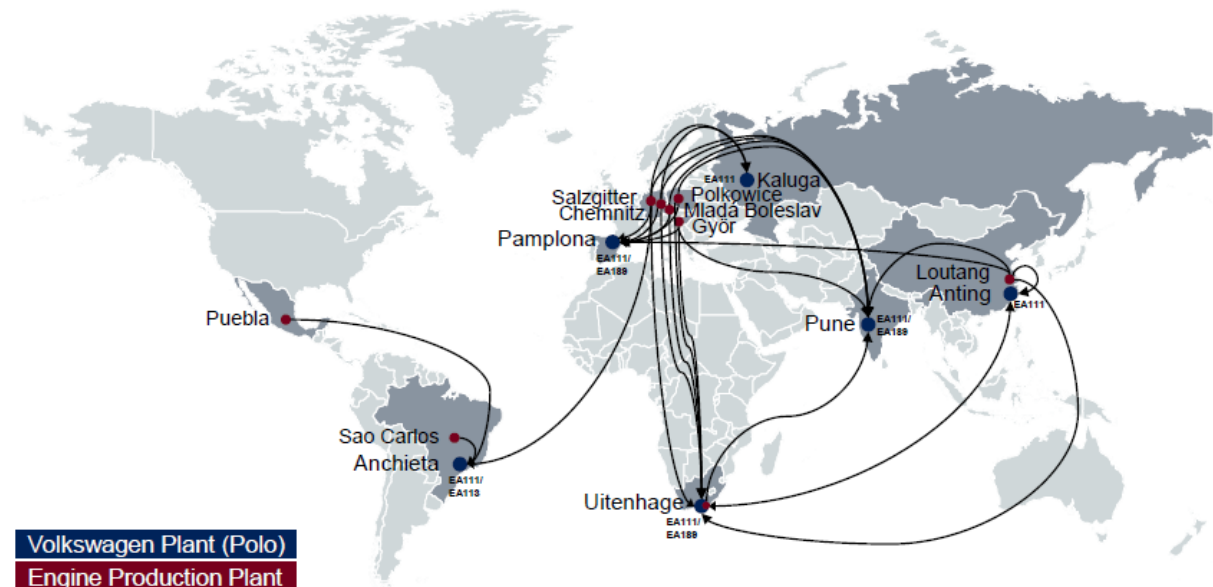
Source: relevant issues of the “Audi Hungaria Motor Kft. Kiegészítő melléklet”

¹² http://eeas.europa.eu/delegations/mexico/eu_mexico/trade_relation/free_trade/contents/index_en.htm

Besides the Hungarian exports to Puebla, Volkswagen de México delivers spare parts and components (engine blocks, crankshafts) to Győr. Relations also exist in the field of research and development, led by Audi AG under the coordination of the Volkswagen Group (Audi Hungaria 2014).

Mapping of cooperation in the value chain is complex (see Figure 6). We examined cooperation in the value chain concerning engine production and vehicle assembly. Semi-finished engines are exported from Mexico to Hungary and finished engines are sent directly to Mexico, and indirectly to other end markets. In 2012, Audi Hungaria delivered 240 engine types to 26 locations worldwide directly. After the Audi AG the second biggest customer is the Volkswagen AG. Through the parent company Audi AG and the head of the Group Volkswagen AG, there are linkages to other subsidiaries that are not listed in the corporate reports. Based on the analysis of the relationship, linkages depend on the **current model or model range** and on the **capacity of the production plant** as internal factors. Furthermore, **capacity utilization**, i.e. economies of scale, causes geographical differences regarding demand and supply. Thus mapping of the linkages regarding the frame or network of the intra-company trade can be just a snapshot. Multi-supplier linkages to a certain production site point to the next factor. Opening a new production site or starting engine production in a new place may result from limits on capacity expansion at existing sites (Audi Hungaria 2014). Also, cost efficiency calculations relating to the production plants are an important factor. As previously mentioned, the assignment of tasks is the result of competitive bidding within the company (Audi Hungaria 2014, Schmid and Grosche 2008).

Figure 6 An example of the complexity of the global value chain: the EA111¹³ motor delivery/production matrix for assembly of the Volkswagen Polo



Source: Eisenberg 2011, p. 13.

Main findings

¹³ The EA111 series is an internal combustion engine series, which was introduced in the mid-1970s by Audi.

Volkswagen is a global company with many brands, a wide model range, and a global production network. The number of production sites is increasing mainly in the South and East Asian Region, expanding capacity at existing production places. The differences in the geographical location of the supply (production) and the demand (market) side require a global distributor network. The company aims to reduce production costs and therefore tries to assemble vehicles close to the market. Its main target is “customer nearness” (customer proximity), in order to not only guarantee supply but also to minimize the geographical gap between production places and target markets. Volkswagen’s entire production chain is not present in one single country but distributed across several (Schmid and Grosche 2008), therefore the network among production places is part of the global value chain. There are linkages between the production places as previously mentioned.

The linkages among the foreign subsidiaries in the global value chain has a direct impact on the potential for economic exchanges between CEE and LAC countries. This **unconventional type of economic relations** plays a role in the changes in revenue of foreign subsidiaries, i.e. the **performance of the local companies**, because cash flow and revenues related to certain markets or affiliates are based not only on sales of vehicles, but stem from “intra-Group transactions” (i.e. exchange of parts, components, licenses, financial supports etc.) as well. In 2010, “intra-Group transactions” amounted to 25 percent¹⁴ of all revenues of the Volkswagen AG (Volkswagen 2011, p. 23). This intra-firm trade is the main source of revenue of Audi Hungaria (see: Audi Hungaria Motor 2013).¹⁵ **Therefore, the regional allocation and potential of these revenues is substantial.**

Based on the empirical analysis of Audi Hungaria, the following conclusions can be drawn regarding the strengths of these linkages:

- **Trade tariffs**, especially tax on imports, are one of the main factors influencing intra-firm trade, as we have seen in the relationship between Volkswagen de México and Audi Hungaria.
- By increasing local content in addition to decreasing export content, **national regulations** have had a decisive role since the 1960s. National regulations in the 1960s in Brazil and Mexico established a minimum proportion of national inputs and a limit on foreign property in auto part manufacturers (Colistete 2010; Fernández 2005).
- The **type of vehicle**, in particular the technological content, and the **size of production/output** influence the import content in production.
- The **position of the production place** among the rank of production facilities and its position in the global value chain are based on **cost-effectiveness calculations**. The position is constantly monitored by internal benchmarks.
- The **scale of local content** (i.e. number of the locally present production stages) compared to the **cost of trade** (i.e. trade of parts, CKD parts, semi-finished products or components) is based on **calculations of revenues vs. costs**.
- **Capacity utilization**, such as economies of scale, causes regional differences concerning production and consumption of the spare parts and components, therefore global value chains within the Group (among its affiliates) make sense in terms of profitability.

¹⁴ In 2010, the total revenue of the Volkswagen AG was 57,243 million Euros, of which 14,481 million Euros accounted for sales related primarily to intra-Group deliveries to subsidiaries and sales of components and parts to third parties (Volkswagen 2011, p. 23).

¹⁵ The revenue (engines and vehicles) of Audi Hungaria is predominantly derived from subsidiaries of the Volkswagen Group (Audi Hungaria Motor 2013 p.11.)

- The **position and role in the value chain** depend on the **current model range** of the Volkswagen Group. In the case of a model change, the role of production plants may change.
- **Introducing new technologies** or **changing work processes** in the organization (platform, modular or MQB¹⁶) also may cause a change in the global value chain.

¹⁶ Modularer Querbaukasten (MQB) the "Modular Transversal Toolkit" platform is the strategy of the Volkswagen Group for shared modular construction of its transverse, front-engine and front-wheel drive automobiles.

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