Centre for Economic and Regional Studies of the Hungarian
Academy of Sciences – Institute of World Economics
MTA Közgazdaság- és Regionális Tudományi Kutatóközpont
Világgazdasági Intézet

Working paper 253.

May 2019

Tamás Gerőcs – András Pinkasz

CENTRAL AND EASTERN EUROPE'S DEPENDENT DEVELOPMENT IN GERMAN AUTOMOTIVE VALUE CHAINS

WP

Centre for Economic and Regional Studies HAS Institute of World Economics

Working Paper Nr. 253 (2019) 1–41. May 2019

Central and Eastern Europe's dependent development in German automotive value chains

Authors:

Tamás Gerőcs

junior research fellow

Institute of World Economics

Centre for Economic and Regional Studies Hungarian Academy of Sciences

email: gerocs.tamas@krtk.mta.hu

András Pinkasz

head of section

Hungarian Central Statistical Office, Budapest, Hungary

email: andras.pinkasz@ksh.hu

ISSN 1215-5241

ISBN 978-963-301-682-4

Centre for Economic and Regional Studies HAS
Institute of World Economics
Working Paper 253 (2019) 1–41. May 2019

Central and Eastern Europe's dependent development in German automotive value chains[1]

Tamás Gerőcs[2] - András Pinkasz[3]

Abstract

For several decades, the German automotive industry has been under mounting pressure to reorganize its production processes and its modes of value-chain governance. In this paper, we analyze the effects this restructuring has had on the economic development of the Central and Eastern European countries that have specialized in automotive production during the capitalist transition. We focus on two global market forces: the standardization of the production of electric engines and the changing patterns of international trade regulation, mostly under the German neo-mercantilist trade regime. Our hypothesis is that structures of dependent development are reproduced by the forms of vertical specialization that have emerged in the automotive industry in these countries. To prove this, we combine the theory of global value chains with Vernon's product life-cycle theory.

***JEL*:** B5, F6, F4, L6, P1, N1

***Keywords*:** core-periphery, dependent development, global automotive value chains, product life cycle, relocation, vertical specialization

[1] The paper was prepared in the framework of the research project no. 423 titled "Hungary and Estonia - Strongly Connected to Global Value Chains"

[2] junior researcher, Centre for Economic and Regional Studies of the Hungarian Academy of Sciences Institute of World Economics, Tóth Kálmán u. 4, H-1097 Budapest, Hungary Email: gerocs.tamas@krtk.mta.hu

[3] head of section, Hungarian Central Statistical Office, Budapest, Hungary. Email: andras.pinkasz@ksh.hu

Most studies analyzing Central and Eastern Europe's economic dependence concentrate exclusively on interstate economic relations. And while world-system scholars have traced the core-periphery relationship to different nodes of the world economy, including regional and inter-firm levels, the intrinsic linkages between these various levels and the mechanisms through which the multiscale system operates continue to be underexplored. The methodological aim of our paper is to establish a clear set of links between the global and local levels of the international division of labor and the regional**,** inter-firm, and intra-firm levels of production in order to examine the question of dependency from the broadest possible perspective. By exploring the links between these different levels of the system, we intend to describe the ways in which macro-structural dependencies are produced and reproduced by interfirm relationships within the production process. Our emphasis highlights those structural dependencies in which capitalist fractions accommodate themselves to world economic forces by relocating production, restructuring value-chain governance, and instrumentalizing state regulation, among other methods. While dependency scholars have emphasized the dialectical relationship between structure and agency on the state level, our analysis puts the emphasis elsewhere—on the connections between and among the various macro**-** and micro**-**structural levels of the system—in hopes of better understanding the evolution of economic dependencies.

In this paper we suggest a new methodological approach to economic dependency. The theory of dependency is nothing new; it dates back to the interwar and immediate post-war developmental concepts of scholars in Latin American and certain Western and Eastern European countries (Prebisch 1950; Cardoso 1972; Furtado 1976; Gereffi and Evans 1981; Love 1990; Becker and Weissenbacher 2015; Weissenbacher 2017). More recently, scholars in the tradition of Critical Political Economy have introduced the concept of the dependent market economy, which combines the notion of dependency with analyses of the role of the state in different varieties of capitalism (Bohle and Greskovits 2012; Drahokoupil 2009; Vliegenthart 2010; Nölke 2016; Becker 2016; Raviv 2008). Proponents of the 'varieties of capitalism' approach have thoroughly studied the expanding role of foreign manufacturers in Central and Eastern Europe (Šćepanović

2013; Bernaciak 2011), while other institutionalists—for instance, analysts of regulation such as those of GERPISA—have focused more on 'work models' and institutional compromises in the automotive industry (Freyssenet and Lung 1996; Boyer and Freyssenet 2002; Krzywdzinski 2008).

Unlike institutionalists' models of the 'varieties of capitalism,' structural Marxists' analyses have long emphasized the uneven and combined development exhibited by the 'new international division of labor' (Fröbel *et al.* 1981). They have argued that the rise of transnational corporations (TNCs) has created conditions akin to those originally described by classical dependency scholars, conditions which world-systems scholars have referred to as typical of the semi-periphery (Wallerstein 1976; Chase-Dunn 1998). Marxist political economists' studies have also focused on geopolitical phenomena such as the decline of US hegemony resulting from the profitability crisis of manufacturing in the US (Arrighi and Silver 1999; Brenner 2006; Roberts 2016). World-systems scholars have also emphasized the illusory benefits of industrial development on the Southern periphery, arguing that technological transformation plays a pivotal role in the reproduction of core-periphery relationships (Arrighi 1990).

Our analysis is based on a notion of uneven and combined development which resembles these structuralists' concepts. We want to understand how certain forms of vertical specialization in a global value chain contribute to the reproduction of core-periphery relationships. Core-periphery relationships originate in the uneven global distribution of capital and technology (Chase-Dunn 1998). We define the semi-periphery as an interrelational position in the world system where capital and technology are relatively scarce in comparison to the core. We have previously analyzed various forms of external financing—loans, foreign direct investment, and transfers—and the roles such capital has played in Eastern Europe's historically dependent development (Gerőcs and Pinkasz 2018). In this paper, we seek to elaborate further on the role technology has played in the standardization of production processes, and to examine questions of ownership, which we consider more problematic in semi-peripheral countries than in core economies. Thus the crucial questions facing us in this analysis are, 'Who controls the capital and technology necessary for advancements in production?' and 'Who has access to the most advanced technologies?'

We use Vernon's product life-cycle theory (1966) in order to establish connections between hierarchical patterns of interfirm relations and the hierarchies of the international division of labor in which they are embedded. Vernon's concept explains how variations in companies' capacities for innovation are both caused by and result from the uneven distribution of technology within the sphere of production. The theory of standardization demonstrates how the introduction of innovative technologies devalues existing production processes by diminishing their capacity for creating value. Such devaluation affects not only production processes, but also forms of labor organization and the rates of return on older technologies still in operation.

The emphasis on devaluation helps us to avoid focusing solely on incorporation processes. Effects of disconnections and disinvestment in commodity chains are also in the focus of the analysis (cf. the concept of disarticulation by Werner and Bair 2011). Notions of standardization which emphasize technological devaluation are in conflict with the concept of technological upgrading generally embraced by global value-chain scholars. According to Vernon's theory, the constant pressure of devaluation means that transfers of technology do not automatically result in upgraded production processes. Even switching a production line over to a new model can accelerate the life cycle of the given product and push it into decline—a process which tends to be ignored by proponents of the theory of upgrading. The latter concentrate on one particular segment of the production process or on one particular model, the transfer of which they understand as a dynamic improvement in the technological endowments of the given production facility[4]. The advantage of Vernon's theory is that it encompasses both technological shifts and the reorganization of entire production processes, including spatial relocation and the reproduction of geographical hierarchies within the division of labor. Thus, it combines macro- and micro-level analyses. One disadvantage of this theory is that it was initially applied only to US-based firms, and thus generally neglects questions of ownership. We have therefore modified Vernon's product life-cycle theory by incorporating it into a framework including Global Value Chain (GVC) and Global Production Network (GPN) theories (Gereffi and Korzeniewicz 1994; Gereffi *et al.* 2005;

[4] According to Humphrey and Schmitz (2004) captive networks in the value chain provide favorable conditions for process and product upgrading but hinder functional upgrading in semi-peripheral countries.

Henderson *et al.* 2002; Coe *et al.* 2008; Gereffi 2014). GPN scholars have broadened their framework to include labor, regulation, and even class in their analyses of power relations inside and outside interfirm networks (Liu and Dicken 2006; Pavlínek *et al.* 2009; Sturgeon and Van Biesebroeck 2011; Sheppard 2012; Domański *et al.* 2013; Smith 2015). In our framework, the links between Vernon's theory and the GVC/GPN approaches are the different forms of economic rent which various players extract over the course of a product's life cycle.

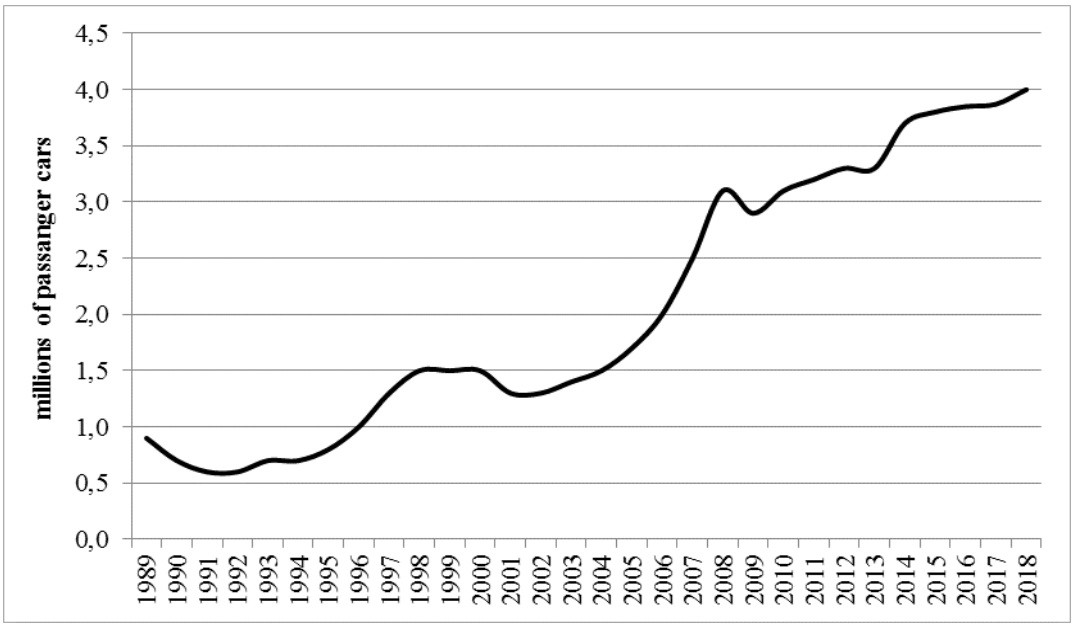
We have also modified another aspect of Vernon's theory in incorporating it into our approach. Given the advancing integration of international trade and the subsequent fragmentation of traditional Fordist production lines in industrial economies (Feenstra 1998), the structure of the international division of labor has changed significantly since Vernon formulated his theory in the 1960s. This theoretical approach—combining Vernon's concepts with the GVC/GPN framework—helps us analyze the hierarchical structures of the new international division of labor at the level of suppliers' inter- and intra-firm relations. The GVC approach is, however, inappropriate for analyzing dependencies on a global scale. Even some early critics of this theory pointed out that it focuses narrowly on business analysis (Bair 2005) and largely omits broader social contexts, despite the aims of the original Global Commodity Chain (GCC) approach out of which GVC theory developed (Smith *et al.* 2002; Henderson *et al.* 2002). GPN theorists' important contribution to analyses of global dependencies is their focus on the ownership structure of the supply chain; GVC/GPN approaches are also useful for analyzing modes of organizing labor and the relationships between production and regulation; in applying GVC and GPN theories, we also incorporate Vernon's notions about the role of technology in the production process. As we noted above, the weakness of the theory of upgrading espoused by GVC/GPN scholars is that it neglects the uneven and contradictory effects new technologies have on the production process as a whole.

We have used this synthetic approach—including elements of the GVC/GPN frameworks and Vernon's product life-cycle theory—to examine the automotive industry in Central and Eastern Europe because international car assemblers have been expanding their production capacity there. This expansion of the car industry—mainly but not exclusively by German firms—has been one of the strongest drivers of the

economic integration of the V4 countries (Poland, the Czech Republic, Slovakia, and Hungary) into wider European production networks, i.e., into the European division of labor.

The significance of the automotive industry is demonstrated by both the growing shares of the V4 economies in European automotive production, and by this industry's share in these countries' industrial output, export sales, employment, and revenue figures (Pavlínek 2015; Barta 2012; Sass and Szalavetz 2014) (Figure 1). Since the early 2000s, automotive TNCs have been forced by dire market conditions to reorganize the governance structures of their expanding value chains and to standardize some of their production processes (Humphrey 2000; Sturgeon and Florida 2000). The aim of our research is to show how the core-periphery relationship between Germany and the V4 countries has been reproduced by a process of vertical specialization during recent expansions of German automotive value chains. In the following paper, we identify two processes which determine the forms of this vertical specialization: first, the unfolding technological transformation – the shift from combustion to electric engines – that is behind the relocation of production from Germany to the V4 countries; and second, the formation of a new regional trade regime based on Germany's neo-mercantilist model.

Figure 1 Car production in Central and Eastern Europe, 1989–2018



Source: OICA, Pavlínek, 2015: 212.

The remainder of this paper consists of five sections. The first is a brief historical overview of the evolution of different automotive value chains with a focus on the formation of the various governance structures within the emerging regional trade regimes. In section two, we revisit the theory of global value chains—augmented by Vernon's product life-cycle theory—in order to analyze the life cycles of two substitute products, combustion and electric engines. We hope to demonstrate a relationship between technological transformation and the geographical relocation of some segments of production. In section three, we highlight the effects of relocation on production and the modes of labor organization inside the value chain. The core-periphery relationship manifests itself in differing modes of labor organization: product development in production centers in Germany is marked by the 'high-road work model,' while specialization in the standardized segments of production in the V4 countries is characterized by the 'low-road work model.' In section four, we explain why the German neo-mercantilist model is important to our understanding of this core-periphery relationship. And finally, in our concluding remarks, we highlight how regional dependencies are reproduced by new forms of vertical specialization in the automotive value chain.

1. Governance structures in the US, Japanese, and German automotive value chains

After the Second World War, industrial production in the capitalist world economy was concentrated in three core regions: the United States in North America, Japan in East Asia, and West Germany in Western Europe. Till the end of the 1960s, the United States was a clear economic hegemon with a vast domestic market representing almost half of global purchasing power. Due to the expansion of productive capacities in Germany and Japan, the global overcapacity crisis began to affect the automotive industry as early as the 1970s (Sturgeon and Florida 2000). Up to that point, expanding international trade had been a positive-sum game, but the crisis suddenly turned it into a zero- or even negative-sum game (Arrighi *et al.* 2003). Deteriorating market conditions forced governments to push the growing costs of unfavorable trade relations back on

each other. Overcapacity resulted in a profitability crisis which put leading automotive companies under growing pressure to adjust to an increasingly competitive market environment. Their strategic efforts included restructuring earlier forms of production with the help of new forms of interfirm governance and technological innovation; these companies also simultaneously asserted their influence over various governments and administrative bodies in an effort to produce favorable trade regulations.

The political efforts to implement trade restrictions[5] did very little to restore profitability (Brenner 2006: 153). Protectionism did, however, inspire reactions from the competitors. The internationalization of the industry accelerated in the 1980s, but emerging automotive value chains retained a regional profile under the slowly diminishing domination of core markets (Freyssenet and Lung 1996; Boyer and Freyssenet 2002). The term 'globalization' is misleading. The industry was instead marked by the regionalization of production systems, with newly emerging vertical specializations deepening the competition among the major industrial hubs. Regional trade regimes emerged around the old industrial centers (Humphrey and Memedovic 2003). These regimes, such as NAFTA, the EU, and ASEAN, can be seen as the consequences of intensified regulatory competition.

Despite similar patterns in their reorganizations of production and trade regulation, we can distinguish the governance structures of the regional value chains (Gereffi *et al.* 2005);[6] the differences between them reflect the original market positions of the American, Japanese, and German TNCs. In case of the United States, assemblers have been expanding their global presence since the 1980s by attempting to create a 'world car'[7] through which to improve their economies of scale. Japanese OEMs' outsourcing strategies targeted trade expansion instead of reorganizing production, for which they needed to comply with local regulations (e.g., local content requirements).

---

[5] As early as 1974, the US introduced the Trade Reform Act, which included protectionist policies aimed at stabilizing the US' position in the world economy (Cardoso and Faletto 1979). In May 1981, in order to combat dumping on the US' domestic market, ameliorate the resulting recession in the American car industry, and restore the industry's profit margins, the Reagan administration introduced the so-called 'voluntary export restraint' (VER) program.

[6] OEMs are the brand-managing, lead firms in global automotive value chains; their supply chains are divided into tier-1 (sometimes called system-integrator), tier-2, and tier-3 participants.

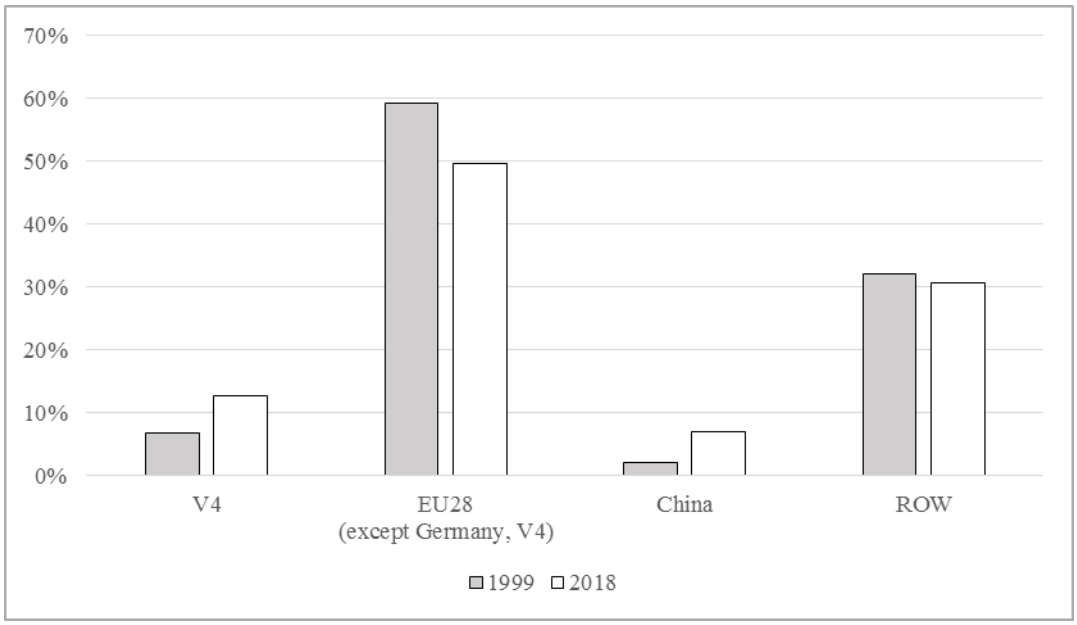
[7] Ford used to be the most internationalized US producer. It launched the '2000 Program,' a major reorganization of its global operations designed to manage excess capacity and produce a variety of models from common platforms (Bartlett and Seleny 1998: 324).

The German automotive value chains developed similarities to both its US and Japanese counterparts (Humphrey and Memedovic 2003; Pavlínek and Janák 2007). It is not only the governance structure that is peculiar to the German automotive value chain, but also the highly advanced trade regime that developed around it in the form of European integration. The Economic and Monetary Union (EMU) and the German automotive value chain co-evolved within the German neo-mercantilist model (Becker *et al.* 2015). This model is understood here to mean that the EMU was structured in accordance with Germany's trade interests, which have historically centered around the uninterrupted accumulation of current-account surpluses. The most advanced form of such trade regulation was the implementation of the single currency and the European Single Market in the early 1990s. The euro was relatively undervalued in comparison with Germany's economic strength, which encouraged German TNCs to expand into less developed satellite markets in the EU in accordance with the fundamentals of the neo-mercantilist model.[8]

The creation of the EMU, however, only temporarily delayed the automotive market saturation brought on by Germany's aggressive, neo-mercantilist strategy of export-expansion. In the 1990s, German automotive TNCs took advantage of monetary integration, but in less than a decade they reached the limits of regional market integration. As a result, by the early 2000s, the geographical destination of Germany's automotive exports gradually shifted from EU to non-EU markets, especially to China (Figure 2). This geographical shift in export destinations has been catalyzed by the recent worldwide financial crisis; the resulting global-market conditions have also forced changes in the German neo-mercantilist model.

[8]In Southern Europe, for instance, local producers trapped in the monetary union could not cope with the new competition; having adopted the new single currency, their governments also lost the ability to devalue, making it increasingly difficult for them to withstand this mounting external pressure (López and Rodríguez 2011; Gambarotto and Solari 2015).

Figure 2 German total gross trade, share, 1999 and 2018



Source: Comext (International Trade / EU Trade Since 1988 By CN8).

For V4, the period after the collapse of Comecon was distinguished by rapid specialization in the newly expanding regional automotive industry,[9] induced by the relocation processes taking place inside the expanding German automotive value chains. Consequently, the V4 region became part of the spine of the German neo-mercantilist model. However, this geographical relocation of production from Germany to the Visegrád region was driven not only by the new realities of global trade relations, but also, significantly, by a technological transformation unfolding in the automotive industry. This reorganization of the automotive value chain would have serious consequences for the form and degree of vertical specialization in V4 countries; in the following section, we analyze the technological forces behind such relocations in order to better understand how the core-periphery relationship between Germany and V4 is reproduced by various types of vertical specialization in the expanding automotive value chain.

[9] See Czaban and Henderson (2003).

2. The relationship between the relocation of industrial production and the product life cycles of electric and combustion engines

In order to understand the effects that vertical specialization in the German automotive value chains have had on V4 countries, we need to look at the forces behind industrial relocation. When profit prospects for combustion engines became bleak in the 1990s, standardized mass production was transferred to new geographical locations. Another major impetus has been the standardization of the production of electric engines, which has helped push the combustion engine further into the mature phase of its life cycle. V4 countries' vertical specialization in the German automotive value chains targets the production of the latter engine type, and therefore the position these economies occupy is increasingly limited to the lower end of the value chain.

As an analytical starting point, we combine Vernon's product life-cycle theory (Vernon 1966) with the GVC/GPN framework. This helps us connect the different stages of product development to the changing profit conditions created by the process of standardization. In each stage of product development, companies seek new strategies to extract various forms of rent from the value-creation process (Henderson *et al.* 2002: 448-449; Kaplinsky 1998). At the end of this section, we will extend Vernon's single-product model to a two-product model to explain the historical relationship between the standardization of electric-engine production for cars and the geographical relocation of the standardized production of combustion engines; though Vernon focused on the perspective of a core country, his theory is applicable to both core and peripheral economies.

In the first stage of Vernon's single-product model, when a new product is introduced commercially, the market price has less to do with initial production costs than with the monopoly position that the pioneering producer has achieved in its market niche. During the early phase of product development, companies are better able to afford high expenditures on innovations because their costs can be covered by this *monopoly rent*.

In the second stage, when new competitors enter the market, the standardization of production processes transforms the type of rent to be extracted. Monopoly rents evaporate as escalating competition puts downward pressure on both prices and profits.

In this stage, production costs tend to determine prices. In order to sustain their rates of profit, companies must find technologically innovative ways to standardize their production processes. Their rents are almost directly associated with the degree of standardization they achieve. Any advances in its processes of standardization will allow a company to reap extra benefits without changing prices—at least until their innovative technologies are emulated by competitors. This source of profit, *technological rent,* cannot be sustained over the long run if competition intensifies.

During the standardized stage of production, profits come under increasing pressure and price competition will ultimately regulate the market. When standardization cannot be intensified at the same speed with which competition is accelerating, the material costs of production, including raw materials and labor, become the most important arenas for price competition. In this sort of competitive environment, companies are encouraged to seek new strategies, such as geographical relocations of the standardized segments of their production processes. This leads to the final stage of the product life cycle, in which a third type of rent arises from strategies like geographical relocation. We call this *exploitative rent.*

Nevertheless, product development and the geographical division of production are not necessarily directly related to core-periphery relationships. Before they are integrated into standardized production systems, important technological innovations are fostered in various locations irrespective of the host country's position in the international division of labor. In fact, domestic start-ups and garage firms all over the world conduct some of the most important technological experiments in the early stages of product development. A new division of labor emerges as production is adapted to standardized production systems. In addition, the geographical extension of production accelerates as larger multinationals acquire such technologies and integrate them into their established production networks.

The structural hierarchy of production, therefore, crystallizes only when a product's development reaches the final stage. It is only when standardized production is relocated to a new geographical region that companies are able to generate exploitative rents. The more standardized the production process of a given product becomes, the more likely its production is to be relocated to the periphery. Thus the hierarchical,

core-periphery structure of a production process crystallizes not at the beginning of a product's life cycle, but as the culmination of its standardization.

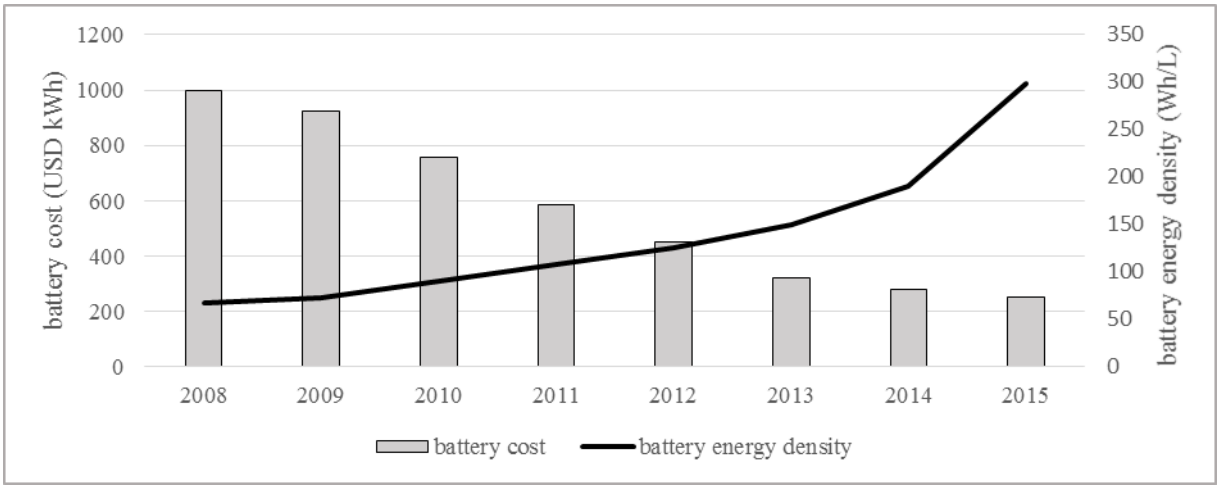
In the following, we expand Vernon's one-product model to cover two substitute products. Even in the case of a single product in the standardized stage, its price cannot drop at a continuous rate if improvements in the scale efficiency of its production slow down. Thus, despite continuous downward pressure on prices, the speed at which they fall decreases over time. Thus for two substitute products, each of which may be in a different stage of its life cycle, the price process described above results in a price convergence which accelerates over the long run. Therefore, at a later stage of development, the competition between the two substitute products will intensify.

For incumbent companies facing growing price competition in a market for substitute products, this raises two questions. First, to which product will the company allocate more of its limited investment and development funds? And second, how will it reorganize the production process for the product with bleaker prospects for technological rents in the more standardized phase of its life cycle? The mechanism through which the two substitute products' life cycles interact in a price competition is the allocation of investment funds, which follows the shifts from one form of rent to another. More funds tend to be allocated to the less-mature product with higher expected returns on technological investments, leaving less capital to be put into the standardized product with the declining rate of return. In both cases, we see an acceleration of such interaction processes. The more funds are allocated to a product in the process of standardization, the faster its standardization proceeds. At the same time, as less capital remains to be invested in the standardized product, the faster such a product tends to decline into the final stage of its life cycle. For the less-mature product, this process will bring an acceleration of its standardization, while the product already in the standardized stage will move rapidly toward a market exit. In the latter case, companies can still slow down this exit process, and thus minimize their losses on previous investments by pushing down material costs and seeking exploitative rents through strategies like geographical relocation, as described above.

In case of the geographical relocation of the German automotive industry, we find an underlying interaction between the life cycles of the combustion engine, which is in its

standardized phase, and the electric engine, which is now in the process of rapid standardization. We assume that the combustion engine originally had a stronger and more direct influence on companies' investment strategies than did the development of the electric engine. The direction of influence, however, has changed over time. As the standardization of the less mature electric engine proceeds, while the more standardized combustion engine moves toward 'over-maturity,' with very little room for further development,[10] investment has begun to shift toward the former. The electric engine, as it enters its more standardized phase, tends to attract more and more of a company's limited investment funds, effectively drawing them away from the combustion engine. We can see the evolution of the cost and energy density of electric batteries in Figure 3; the average cost of an electric battery tends to fall as its efficiency gradually increases.

Figure 3 Electric battery cost and battery energy density



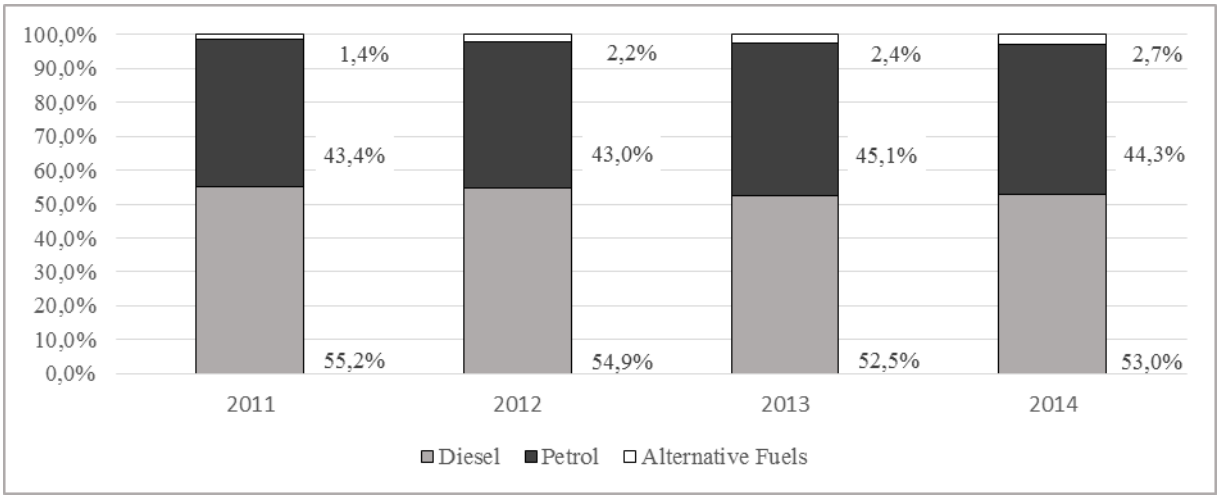
Source: Comext (International Trade / EU Trade Since 1988 By CN8).

Even though electric cars have only recently become available commercially, the early stages of their product life cycle stretch back to the 1920s, just after the revolutionary innovation of the moving assembly line, which Henry Ford first installed in 1913. The initial stage of the electric car's life cycle lingered on for almost a century because the

[10] VW Group CEO Matthias Müller, who was appointed after the diesel scandal, made a telling remark in observing that diesel engines are going to disappear over time. http://www.handelsblatt.com/unternehmen/industrie/vw-und-dieselgate-mueller-sieht-nur-die-fehler-der-anderen/14472000.html

prospects for its development were determined by the life cycle of the combustion engine or Otto motor. Despite the existence of several prototypes, none of these electric models reached the stage of standardized production,[11] largely because of Ford's revolutionary innovations in the production of combustion engines a decade earlier. The rapid standardization of the Ford model attracted a great deal of investment, kick-starting a boom in the life cycle of the Otto motor. It took less than a decade for this model to conquer the US and world markets, and even today, the widespread standardization of electric models is still largely dependent on the evolution of the Otto motor's life cycle. In other words, the standardization of electric-car production will speed up when the life cycle of the Otto motor approaches its end. Although this process has begun to accelerate since the oil-price shocks of the 1970s (at which point the Otto motor reached the stage of maturity), there is still a long road ahead (Figure 4).

Figure 4 Market share of fuel types for newly registered cars in the EU, 2011–2014



Source: own collection based on ACEA, BMI database.

The world economic crisis of 2009 seems to have accelerated the movement of the combustion engine into the declining phase of its life cycle. One consequence has been that companies in the German automotive value chain have accelerated the relocation of

[11] Several attempts have been made to develop plug-in electric and hybrid cars, most of which have failed to gain adequate market share. See the examples of Tucker in the 1940s, DeLorean in the 1970s, and Fisker Automotive in the 2000s. Interestingly, Fisker had to suspend production after its main battery supplier went bankrupt in 2012. http://www.economist.com/news/business/21695012-tesla-becomes-more-regular-carmaker-it-faces-bumpier-ride-charge

their production to V4 in hopes of generating exploitative rents. Returns on technological investments—those aimed at super-standardization and efficiency gains, especially in the downsizing of diesel engines—have dropped to historically low levels. As a result, returns on investments aimed at improving electric cars' efficiency tend to threaten companies that lag behind in this technological transformation.[12] We assume that the standardization of the mass production of electric engines has been underway since the aftermath of the 2009 crisis.[13] However, because of the influence investments in electric and combustion engines have on each other, OEMs' attempts to continue generating returns on their investments in the sinking combustion segment create strong tailwinds for relocation.[14] Some of these investments might still turn a profit if production is relocated to regions where value can be created by generating exploitative rents. The global semi-periphery – including Central and Eastern Europe – is the best possible choice for expanding the production of standardized models that are moving toward the ends of their life cycles because of the low cost of material inputs there, most notably cheap labor.

3. Core-periphery relations in the German automotive value chain

As a result of vertical specialization in the German automotive industry, both the share of V4 in global automotive production (Table 1) and that industry's share in those economies' manufacturing output (Figure 1), export sales, FDI stocks, and employment figures have been climbing steadily since the middle of the 1990s (Pavlínek 2015: 212). As we have demonstrated in section two, this relocation process has been driven largely by the accelerating standardization of electric-engine production and the consequent

[12] A global survey conducted by KPMG found that a majority of responding managers of OEMs in the US, EU, and Japan had shifted their investment priorities away from the efficiency gains of downsizing combustion engines and started allocating more funds to innovation in electric and hybrid fuel systems (KPMG 2015: 17).

[13] The emergence of Tesla's Model 3 and the growing number of technological innovations introduced by traditional OEMs—such as Renault-Nissan's Leaf, BMW's i3, and GM's Chevrolet Bolt—provide evidence for an increasingly intense interaction between the life cycles of the two substitute engines. Major German OEMs have lagged behind in this transformation, possibly as a result of the more traditional governance structure of their value chains. Very recently, however, both Daimler and VW have launched massive, multi-billion-dollar initiatives in hopes of catching up in this fiercely competitive race. See, for instance, Daimler's 'Ecolux project' and VW's 'Together-Strategy 2025.'

shift of the combustion engine—the production of which V4 has specialized in—into the declining stage of its life cycle. In this section, we analyze how automotive-industry relocation has affected the core-periphery relationship between Germany and V4 in the following three areas: labor productivity and capital intensity; modes of labor organization; and opportunities for capturing value in the context of local property relations and interfirm governance structures (Henderson *et al.* 2002: 449).

Table 1 Share of CEE in global automotive manufacturing

	Number of vehicles produced		**Share of countries in CEE and global automobile manufacturing**			
	1000 units		**CEE=100%**		**Global=100%**	**Global=100%**
	2000	**2018**	**2000**	**2018**	**2000**	**2018**
Germany	5 525	5 120	81,2%	61,3%	9,5%	7,0%
Czech Republic	456	1 345	6,7%	16,1%	0,8%	1,8%
Poland	505	452	7,4%	5,4%	0,9%	0,6%
Slovakia	182	1 009	2,7%	12,1%	0,3%	1,4%
Hungary	137	431	2,0%	5,2%	0,2%	0,6%
Aggregate	**6 805**	**8 357**	**100,0%**	**100,0%**	**11,7%**	**11,4%**
Global Aggregate	**58 374**	**73 457**			**100,0%**	**0,0%**

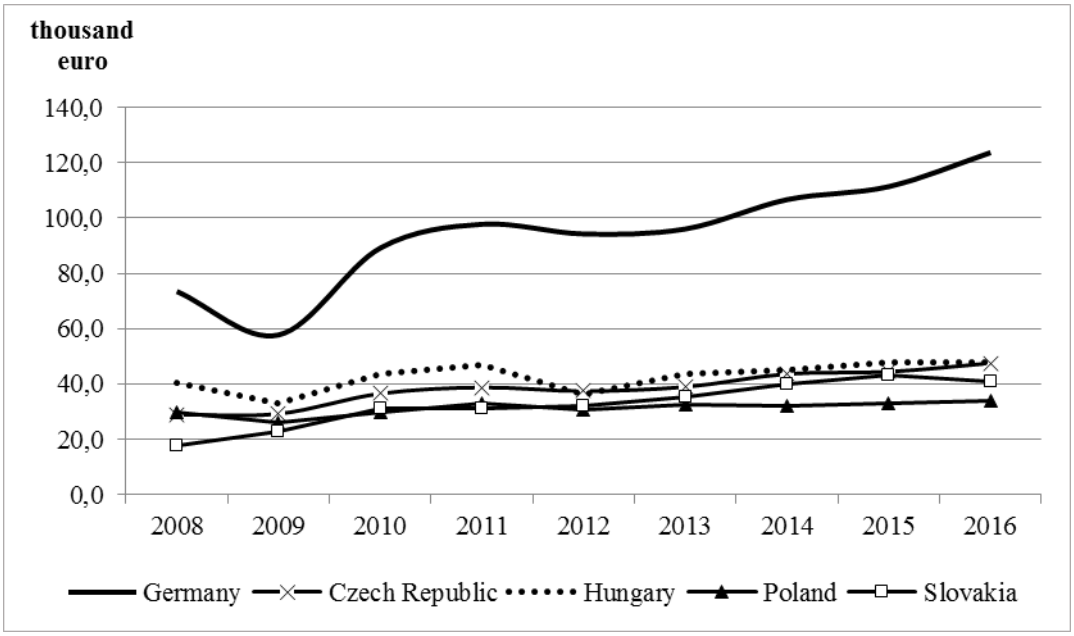
Source: OICA database.

Labor productivity and capital intensity

To understand the hierarchical nature of the German automotive industry, we need to analyze labor productivity and capital intensity in various phases of the production process (Figure 5). For this purpose, we use world-systems scholars' definition of the core-periphery relationship: 'a continuous variable between constellations of economic activities which vary in terms of their average relative levels of capital intensity versus labor intensity' (Chase-Dunn 1998: 207). Capital intensity means a high level of investment in non-standardized, i.e., relatively monopolistic spheres of production that usually erect barriers to prevent competitors from entering the market. Thus, high capital intensity also means monopoly rents and a relatively high proportion of skilled workers. On the other end of the theoretical spectrum, we find more standardized

activities with declining productivity rates and a relatively larger share of unskilled labor, which we regard as the labor-intensive segment of the market. It is important to note that the terms of this analytical dichotomy cannot be used to describe any particular activity over a long period of time as the profile of any of such activity is prone to change due to the process of standardization. What we regard as a capital-intensive activity with high labor productivity on the day a product is introduced will soon be transformed into a more standardized, labor-intensive activity.

Figure 5 Labor productivity (GVA/employment) in the automotive industry in Germany and CEE (thousand euro)



Source: Eurostat.

We turn our focus to the German automotive value chains to identify aspects of a core-periphery relationship among the various activities in the production process. In the German center of production, specialization occurs in new product development and other capital-intensive activities, e.g., producing special machine tools in the service of mass production (Krzywdzinski 2014: 6). The production of such machinery requires a relatively large proportion of highly qualified workers for whom there is competition in the labor market. It is more difficult to relocate skilled labor and – according to Beblavý

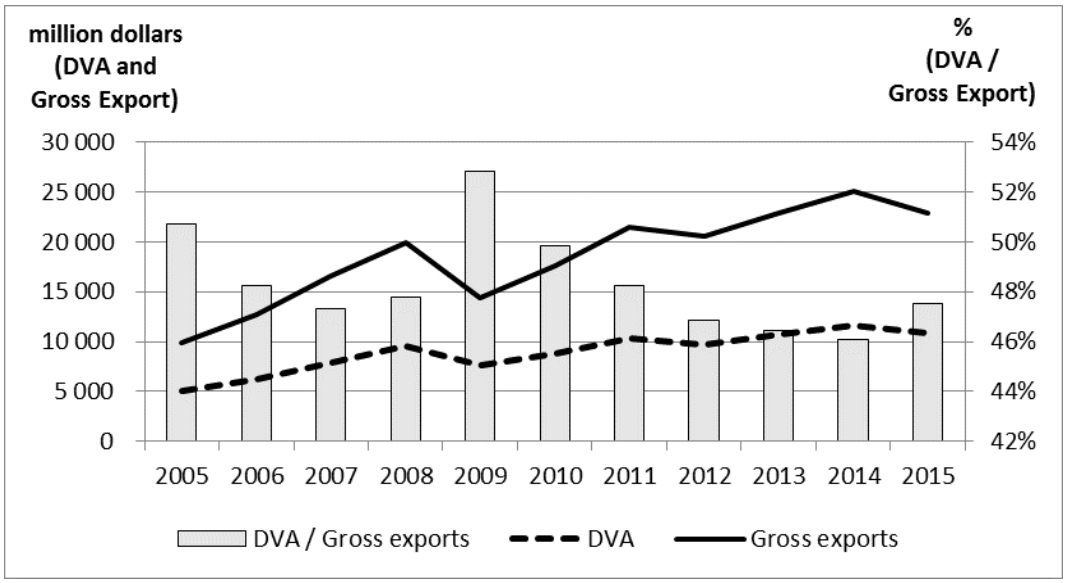
et al. (2012: 28) – that is the reason for the continued concentration of basic R&D activities in core areas. Technological innovation associated with product development is usually also retained in the headquarters under the strict control of OEMs and tier-1 firms' global operations. The R&D activities relocated to the Visegrád countries, on the other hand, assure that local suppliers will be able to keep up with the uninterrupted flow of technological adaptations.[15] Central and Eastern European countries serve as an 'adopter region' in the platform based production in which competencies are developed by the transfer of technologies from the core (ibid). Moreover, available information on export portfolios also suggests that none of the Visegrád countries have specialized in the production of goods and activities associated with new products' development or trade linkages to the 'upstream' segment of the value chain.

Indeed, most of the activity recorded as R&D is supporting production of standardized components in assembly plants which Beblavý *et al.* (2012) calls incremental innovation. Pavlínek (2012) argues similarly, that it is not basic research which would be in charge of developing completely new type of motors, e.g. electric or hybrid engines. Instead, as is also stressed by the IMF (2013: 3), a large proportion of foreign value-added content in a country's total volume of exports indicates that it is a 'downstream' participant in the supply chain, usually specializing in processing and assembly functions.[16] In short, there have been no major innovations in the automotive industry in the region, but incremental changes and product adaptations conducted by companies' headquarters are registered as R&D.

[15] These adjustments are necessitated by periodical model upgrades in already established lines of production. One recent example is the transfer of Audi's Q3 model to the Hungarian VW-plant in Győr between 2016 and 2018. Four models were previously assembled there: the TT Coupe, TT Roadster, A3 Limousine, and Cabrio. These models became outdated as they reached the midpoint of a medium-sized car's average life cycle, which industry experts estimate at 6 years. After a model reaches middle age, its sales tend to drop, a process catalyzed for some of these vehicles by the 2015 diesel scandal. http://www.portfolio.hu/vallalatok/autoipar/decembertol_atmenetileg_kevesebb_autot_gyart_a_gyori_audi.235412.html

[16] Advanced economies tend to be upstream in the supply chain, using relatively limited quantities of foreign value-added content in their exports. Upstream segments manage intangible activities like marketing and design (IMF, 2013).

Figure 6 Domestic value added (DVA) and gross export in the automotive industry in CEE and Germany, 2005-2015



Source: TiVA.

Although the modes of vertical specialization in CEE differ somewhat, the overall tendency toward a stagnant environment—one which produces little growth in value added in car production—applies to the countries under investigation here. We argue that there is no clear link between the growth of the automotive industry in CEE economies and improvements in their capacity to increase the share of value added. In fact, an inverse relationship seemed to apply before the world economic crisis. Prior to 2008 the share of domestic value added (DVA) produced by local enterprises slowly decreased and could only be compensated for by larger volumes of output.[17] Between 2005 and 2007, the share of domestic value added in gross automotive export dropped by 4 percentage points in the Visegrád countries, despite the tendency to show increases in nominal export volumes. After the crisis in 2008 the share of DVA rose sharply due not to increasing value added but the sudden and hectic drop of gross export figures (Figure 6). We assume that the value added production adjusted slower to the crisis

[17] The gross value added share in the automotive industrial output is extremely low in the V4 countries because of the strong import demand in the production. One notable example is Hungary where the production of one additional unit of gross value added in the automotive industry generates 3.22 additional units in the country's total import (Kazimir *et al.* 2016: 10).

than gross export as workers and wages could not be reduced at the same pace with the sudden drop in exports. There has been no adequate data to show a clear tendency since the end of the crisis, but diminishing share of DVA in the gross automotive export seems to have resumed once again after 2010 (Gerőcs and Pinkasz 2019). The region's increase in foreign value added is related to the growth of German value added in both nominal and relative terms (IMF 2013: 11). In the case of Germany, CEE represents the bulk of the growing share of foreign value added in the automotive export. As Cieślik has noted, the V4 countries' relatively large share of foreign value added in the automotive export indicates a low position in the value chain, i.e., with respect to downstream market segments (Cieślik 2014).

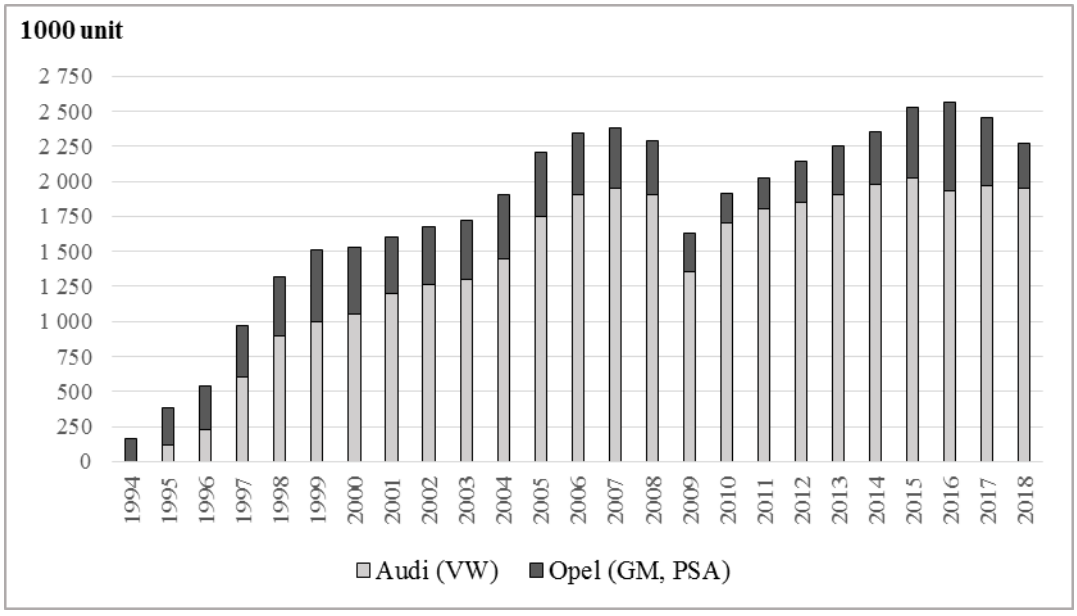
More thorough statistics highlight the fact that such specialization does not always result in complementarities; the overall trend suggests an incoherently integrated intra-regional division of labor. Export statistics on product portfolios differentiate between two forms of specialization: supplying intermediate goods and assembling final goods (Molnár 2012; Kopint 2011). Incoherence arises as a result of parallel and competing activities that depend on commands from German headquarters.[18] Vertical specializations involve activities in which Germany exports intermediate goods to be processed in downstream facilities in V4, then re-exported directly or indirectly to the rest of the world (IMF 2013: 12). In Slovakia, for example, semi-final assembly dominates automotive export activity, whereas in the Czech Republic there is a more balanced combination of final-product assembly and the supplying of parts (Beblavý *et al.* 2012: 8-9). Interestingly, the supply of important intermediate goods for further processing elsewhere seems to dominate the Hungarian and Polish export portfolios (Ambroziak 2016: 36).

Because the process of standardization induces relocation, one of the most important export products of V4 automotive industries is the combustion engine (diesel and gasoline). The VW group, the biggest automotive investor in all the Visegrád countries, had already relocated much of the production of these engines to V4 even before the diesel scandal began to haunt it, which suggests that the combustion engine has been in

[18]Parallel production of the same components in several plants creates opportunities for management to play production locations against each other (Pulignano 2007, cited Krzywdzinski 2014: 5).

the final phase of its life cycle for some time. The restructuring of the production process induced by this scandal and the consequent relocation of various models provide further evidence of this type of vertical specialization. According to Krzywdzinski (2008), the direct relocation of production has not resulted in an East-West division of labor, but rather in the renegotiation of product allocation to various European sites, which usually takes place with each new generation of products. In 2016, Audi (part of the VW group) decided to outfit its Brussels plant for the production of electric cars and transfer its older A1 models from Belgium to the Martorell plant in Spain. Audi's Q3 model, formerly produced at the Spanish factory, was then transferred to Győr, Hungary as a part of the process of model upgrades described above. Groupe PSA's Opel division (former General Motors), the only other manufacturer of engines in Hungary, also recently upgraded its motor fabrication plant in Szentgotthárd.[19] Figure 7 shows the increase in engine production at Audi's and Opel's Hungarian plants. Audi's plant in Győr was in 2015 the single biggest engine factory in the world.

Figure 7 Engine production in Hungary, 1992–2018 (per 1000 unit)



Source: own collection based on company reports.

[19]Győr is the largest combustion-engine facility in the VW Group; it provides engines for all the brands in VW Group, including Škoda, Seat, Audi, and Porsche. Audi Hungária Zrt. produced more than 2 million engines in 2015, making it the single biggest engine factory in the world. Between 2014 and 2016, Opel's Flex factory in Szentgotthárd expanded its engine production to 600,000 units. http://www.hrportal.hu/c/2016-ra-lesz-teljes-az-uzem-szentgotthardon-20130609.html

Similar restructuring has occurred in Daimler's Mercedes division. The core factory in Bremen has been dedicated to the future production of electric cars, whereas the production of older models of compact (B-class) and sub-compact cars is being relocated to its newly built engine plant in Jawor, Poland and its expanded body plant in Kecskemét, Hungary.[20] The VW Group has yet to make a final decision about the specialization of its global factories, but as of late 2017, company managers in Germany have hinted, after negotiating a massive lay-off with labor unions, that the electric engines and batteries will be developed in the Kassel and Braunschweig factories, respectively (Dudenhöffer 2016).

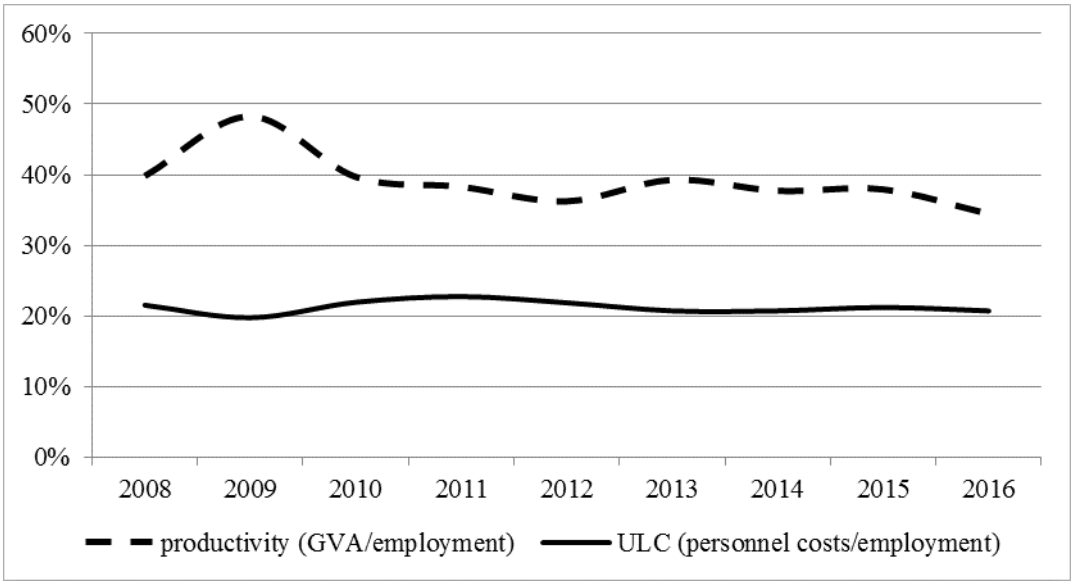
Modes of labor organization

Modes of labor organization are determined by the exploitative rents which can be siphoned off from peripheral to core sites. One notable result of relocation is that wages tend to lag behind labor productivity (Krzywdzinski 2008: 14; Cieślik 2014; Drahokoupil and Piasna 2016) (Figure 8). The source of exploitative rent is thus the constant gap between wages and productivity in the German automotive value chain. Profit consolidation presupposes this gap and results in sharply contrasting modes of labor organization in Germany and in V4. This core-periphery relationship produces forms of labor organization that industrial sociologists call 'high-road' and 'low-road' work models (Pyke and Sengenberger 1992, cited Jürgens and Krzywdzinski 2008, 2014). Despite higher unit labor costs, the high-road model in Germany benefits from cutting-edge technological innovations that help it to sustain high levels of productivity (Jürgens and Meissner 2005: 15). In addition, the protection of this model—which in many cases enjoys the support of trade unions—includes concessions in which lower-paying, lower-quality work is relocated to lower-wage countries. All in all, wages and the resultant purchasing power remain higher in Germany than in those countries trapped in the low-

[20] Mercedes management has decided to expand and renovate its Kecskemét facility by 2020. This overhaul will equip the factory to assemble bodies for 'alternative cars' as well, in case management decides in the future to transfer the production of its current models abroad—a decision made likely by the process of standardization.

road model, where their types of vertical specialization result in much lower levels of unionization.

Figure 8 Gap between productivity and unit labor costs in the automotive industry in CEE countries (average) compared to Germany (100%)



Source: Eurostat.

The relative size of the highly skilled, white-collar workforce employed in what we call capital-intensive activities[21] depends not only on continuously increasing numbers of skilled laborers, but also on declining numbers of unskilled workers. The latter has been a long-term trend in the German auto industry as a whole, and this process has accelerated considerably since the 2000s as a result of increasing relocation (Krzywdzinski 2008: 23). The more certain segments of production become standardized, the more blue-collar workers employed in those activities become exposed to relocation. As Krzywdzinski has demonstrated with regard to the supplier segment, labor-intensive mass production with relatively low skill requirements has almost completely disappeared from Germany; the standardized production of spare parts and components has also been affected by relocation. The recent drop in the number of blue-collar workers has contributed to a re-structuring of the whole German

[21] 'The increase in the number of highly skilled employees would indicate an increasing specialization in complex high-quality products and on human-capital-intensive parts of the value chain.' (Krzywdzinski 2008: 22).

workforce.[22] Losses caused by relocation have been counterbalanced by successful specialization in premium, high-tech, and high-quality products (Krzywdzinski 2014: 15). One consequence is that the bargaining power and wages of blue-collar workers have been constantly undermined in comparison with the improving position of more advanced skilled workers, which state of affairs several authors have dubbed the 'dualism' of the German automotive workforce or the segmentation of the employment structure.[23]

Labor-market conditions for un- or semi-skilled labor in V4 are already marked by intense competition and insecurity. The labor market consists of flexible fixed-term contractors, a largely non-unionized labor force, and temporary agency workers[24] who can be easily integrated into production lines during reorganizations and model upgrades and whose employment is thus the most sensitive to the business cycles (Meszmann 2016; Gerőcs et al., 2019; Drahokoupil and Piasna 2018). Job security is generally limited to a thin stratum of the workforce. Interestingly, jobs in the automotive industry are not even among the top three highest-paying forms of employment in Hungarian manufacturing (Figure 9), one reason for which, industry experts suspect, is the relatively large share of unqualified, semi-skilled workers employed by auto manufacturers. Average wages have also been pulled down by the growing number of underpaid young interns whose employment is supervised by the so-called dual-vocational school system, originally based on the German model of apprenticeship training (cf. Fichter *et al.* 2005). The growing share of such interns curbs wage demands even when there is a growing need for semiskilled workers.[25]

---

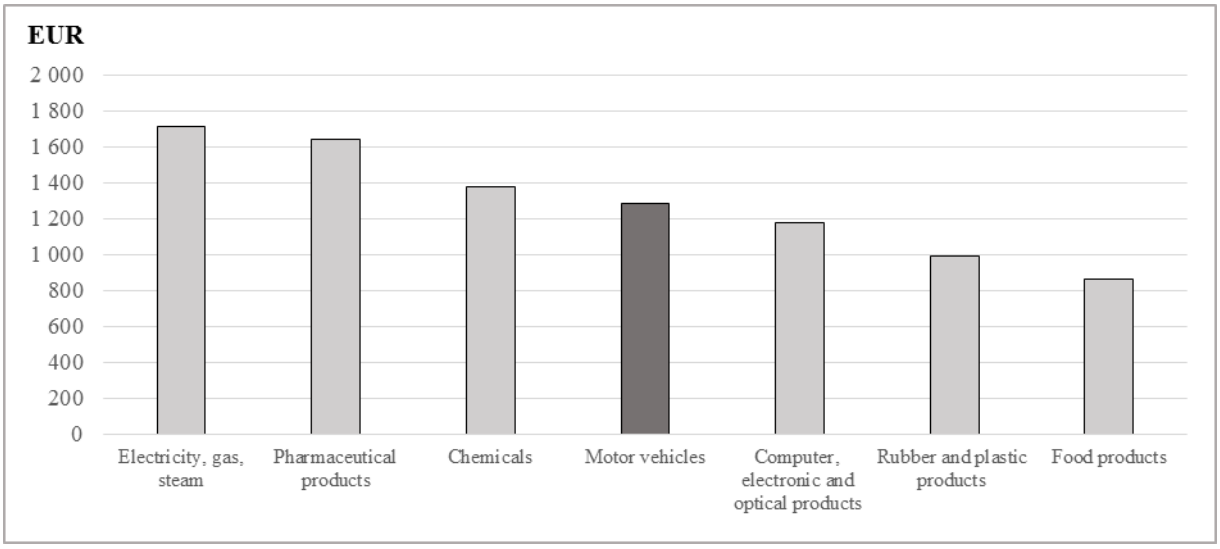
[22] 'The stability of employment in the German automotive industry during the first half of the current decade conceals a fundamental change in the employment structure: a loss of blue-collar jobs and a gain of white-collar jobs.' (Krzywdzinski 2008). Low-skill production with no educational requirements—e.g., the assembly of wire-harness systems and the simple, high-volume production of automobile seats—was the first to be removed from Germany to low-wage countries (Krzywdzinski 2014).

[23] The so-called 'vertical disintegration' of the German automotive industry and its labor relations implies the increasing use of insecure forms of employment such as agency work for non-core employees and an emerging dichotomy between core and non-core employees. In expanding their deployment of agency workers, automotive companies have caused segmentation in their employment conditions, differentiating between secure, well-paid and insecure, low-wage workers (Bernaciak 2011; Bernaciak and Šćepanović 2010; Krzywdzinski 2014).

[24] Volkswagen's share of temporary agency workers, for instance, is about 10-20% of its V4 workforce, compared to an average of 2% at its German sites (Krzywdzinski 2008: 13).

[25] Strikes and boycotts in the V4 automotive industry are extremely rare. They have happened on two interesting occasions, however, both of which were caused by labor shortages resulting from industrial

Figure 9 Average monthly gross salaries in different Hungarian industries (Euro), 2018



Source: Hungarian Central Statistical Office, Hungarian Central Bank.

Different modes of vertical specialization give rise to differences in the allocation of technologically advanced activities among the Visegrád countries, which in turn affect some aspects of labor organization, e.g., the type of labor required for a given task. Simple assembly usually needs more semiskilled labor and less advanced technology than the production of sophisticated parts like engines. The latter requires more technological investment, fewer workers (however skilled), and in many cases, high levels of technologically advanced automation. These differences, however, do not mean that specialization in more technologically automated activities will create better conditions for value capture. On the contrary, in comparing the Czech Republic and Hungary, we see that labor-intensive manufacturing—to which several local supplementary activities are attached—has achieved better embeddedness in the local economy due to its greater reliance on diverse sources of local labor inputs,[26] including highly qualified engineers, which it employs at greater rates than do the mobile

mass migration. One such example occurred at the VW facility in Poland in the early 2000s, the other at the Hungarian Mercedes plant in Kecskemét in the autumn of 2016. In both cases, management refused workers' wage demands despite exhaustive negotiations and mounting pressure to improve labor relations.

[26] The biggest Czech auto manufacturer, the formerly state-owned Škoda Automobilova, was purchased by the VW Group in 1991. During the privatization process, the Czech government insisted on local-content requirements and protections for a vast network of local suppliers, which terms VW agreed to in the privatization contract. See Bartlett and Seleny for differences between VW's brownfield investments in the Czech Republic and its greenfield investments in Hungary (1998: 329).

technological enclaves used for standardized and automatized production with much lower local content (Bartlett and Seleny 1998; Sadler and Swain 1994). This might explain why domestic value added in the Czech automotive export has grown in contrast to other V4 economies.

Value capture

Vertical specialization circumscribes a firm's ability to capture value in the automotive value chain. According to Henderson *et al.*, 'it is one thing for value to be created and enhanced in given locations, but it may be quite another for it to be captured for the benefit of those locations' (Henderson *et al.* 2002: 449). The possibility of value capture in a local context is determined by property relations and the value chain's governance structure.

Assessing property relations involves analyzing the number and strength of TNCs *vis-á-vis* domestic firms both inside the value chain and in a local economy. The property structures of the V4 automotive industry are characterized by a surprisingly high level of concentration, which has tended to grow over time (Kopint-Tárki 2008). Foreign corporations with a global presence dominate the value-chain hierarchy from the top level—lead firms or OEMs—down to the mid-bottom of tier-2.[27] Companies with significant domestic ownership of operations above tier-2 are very rare in the Visegrád countries. In fact, the share of domestic suppliers is decreasing even among tier-3 firms in some of the countries under consideration. In Hungary, for instance, the Hungarian Central Statistical Office's database shows that the number of domestic companies in the automotive industry decreased from 98 to 63 between 1998 and 2015. Similar trends are at work in the Czech Republic and Slovakia. As Pavlínek (2015) has shown, this declining share of domestic suppliers in the value chain has had a significant impact on overall economic development. TNCs in the Czech and Slovakian automotive industries

[27] In Hungary, for instance, around 90% of the assets in the industry are foreign owned (Kopint-Tárki 2008: 48).

have reacted differently to the economic downturn, responding with different employment policies and making much greater use of profit repatriation.[28]

The governance structure of the German automotive value chain reflects the hierarchies inherent in vertical specialization. The profitability crisis in the automotive industry has forced lead firms at the top of the value chain to delegate tasks and competencies that have been devalued as a result of standardization, and thus the possibility of capturing value has changed accordingly. Companies at lower levels in the chain face growing costs because new competencies have been delegated to them. Companies that are unable to perform these new tasks lose their positions in the chain and are forced either to leave the market or to re-position themselves at lower levels. Profits are thus distributed unevenly over the length of the value chain.

Tier-3 firms have suffered most from the profitability crisis. On the one hand, tier-3 companies tend to improve their capabilities by developing financial and technological dependencies on their higher-level partners (Pavlínek and Janák 2007). On the other hand, growing costs and intensifying competition have made value capture more and more difficult; the resulting pressure has forced many tier-3 companies to exit the market, which has contributed to the growing concentration of foreign ownership in local property structures. The governance structure at the lower levels of the value chain has become captive and hierarchical, with rigid dependencies and growing price competition caused by lead firms' strong control over suppliers (Beblavý *et al.* 2012: 10). The effects of this pressure, such as low profitability and difficulties in capturing value, have not been distributed evenly, even among tier-3 companies. In the captive structure, foreign TNCs and their domestic suppliers are affected differently. Despite growing pressure, TNCs can still generate exploitative rents. Domestic suppliers, who are typically trapped at tier-3, have limited access to technological innovations and financial resources, and therefore remain financially more dependent on their higher-level partners to cover the costs of the technological and labor investments they will

[28] TNCs' strategies for generating exploitative rents affect peripheral locations in two particular ways. First, value is transferred to the core through profit repatriation and other techniques, including transit pricing, purchases of intellectual property rights, and accounting operations (UNECE 2015). Secondly, profits can be reinvested locally in order to extend or modify production. Classical 'dependencia' scholars underline the fact that local authorities cannot easily influence any of the above-mentioned alternatives (Gereffi and Evans 1981).

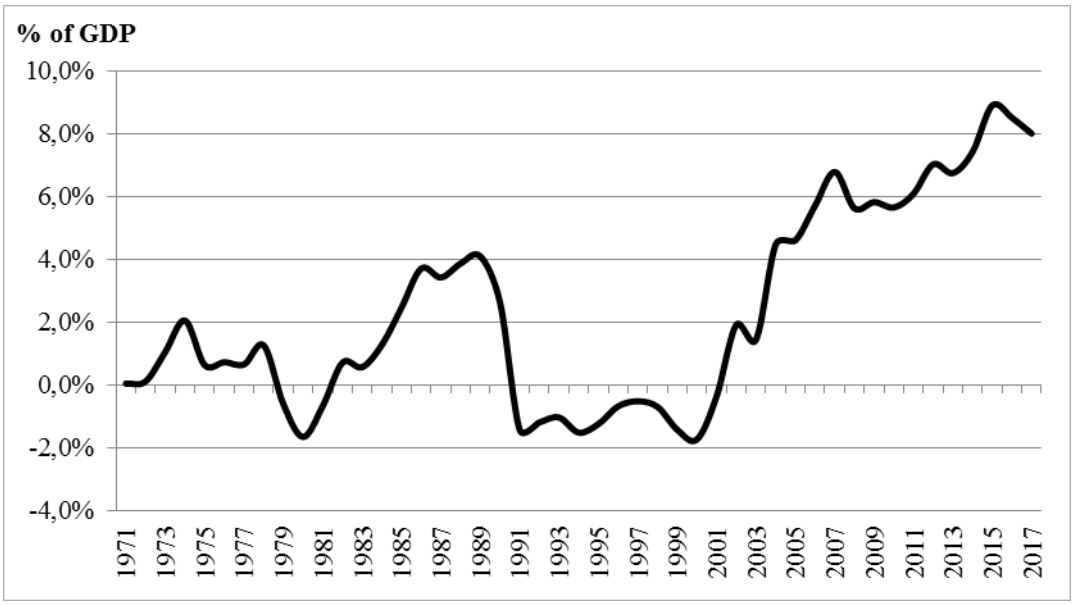
need to make in order to master new competencies, carry out new tasks, and capture value (Kopint-Tárki 2008: 49). When competition intensifies, they face a greater risk of bankruptcy. The head of the Association of the Hungarian Automotive Industry has expressed concern that domestic suppliers have 'almost no chance of becoming tier ones.'[29]

4. The position of V4 in the German neo-mercantilist model

As we noted in section one, if we wish to understand how the structures of dependent development in V4 are reproduced by these production processes, it is important to expand the scope of this analysis from vertical specialization in the German automotive industry to include the European trade regime, and we therefore turn our focus to Germany's neo-mercantilist model. The *sine qua non* of this model is the sustainability of Germany's current-account surplus (Figure 10). This surplus has increased considerably since the implementation of the euro and the accession of the new member states, despite the fact that German companies have been increasingly challenged by growing competition inside and outside of Europe. However, since European markets have reached their saturation point, the geographical destination of Germany's exports has begun to shift from the EU to non-European markets, especially to China (see Figure 2).

[29]István Pintér, president of the Association of the Hungarian Automotive Industry (MAGE) and CEO of the largest Hungarian tier-2 supplier, Rába Járműipari Holding Nyrt. (a majority stake in which is held by the state), has also mentioned the overcapacity of the European automotive industry and the need for downsizing: http://autopro.hu/gyartok/Pinter-Istvan-strukturalis-munkaerohiany-van-a-jarmuiparban/7066/
In a panel dedicated to Hungarian SMEs in April 2016, company representatives shared their bleak experiences with competency struggles. http://gepjarmuipar.hu/english/ahai/

Figure 10 Germany's current-account balance (% of GDP), 1971–2017



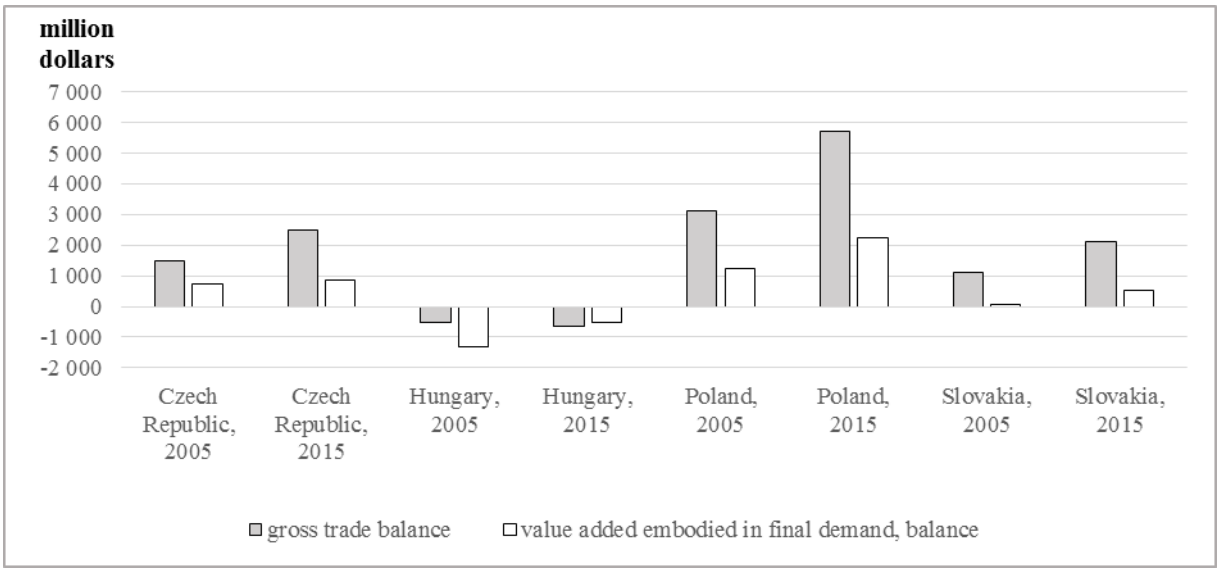
Source: The World Bank.

Despite the fact that the German neo-mercantilist model has had various and diverse effects on the V4 economies, we will continue to focus on trade as it relates to the automotive industry. German corporations' relocation to the geographical proximity of Visegrád countries has helped them to keep production costs in check, an important tactic for withstanding the pressure from growing global price competition. V4's share of German trade has grown significantly since the late 1990s, despite Germany's overall trend of de-Europeanization. On the one hand, shifting the geographical destinations of German exports to sustain current-account surpluses has been largely limited to trade in finished products. On the other hand, however, the shift to V4 primarily affected its trade in intermediate goods. Due to this reorientation of trade relations, Germany is currently accumulating fairly significant trade deficits with V4 (Figure 11) which, according to the OECD database, are caused by the growing share of foreign value-added content in German exports.[30] However, the exploitative rents derived from the

[30] Between 1995 and 2011, the share of foreign value added in German exports increased to 37%, compared to 11% in the US and a global average of 28%. Germany's export re-orientation has had a direct impact on the composition of intra-European trade as well. Prior to the crisis, it was dominated by the distribution of final goods (either durable consumer goods or investment products); since 2009, intermediate inputs have achieved a dominant share of such trade (Kopint 2011).

relocation of production and the growing demand from non-European markets have helped Germany maintain its massive current-account surpluses.

Figure 11 Trade balance with Germany in V4 (gross trade vs. trade in value added) million dollars

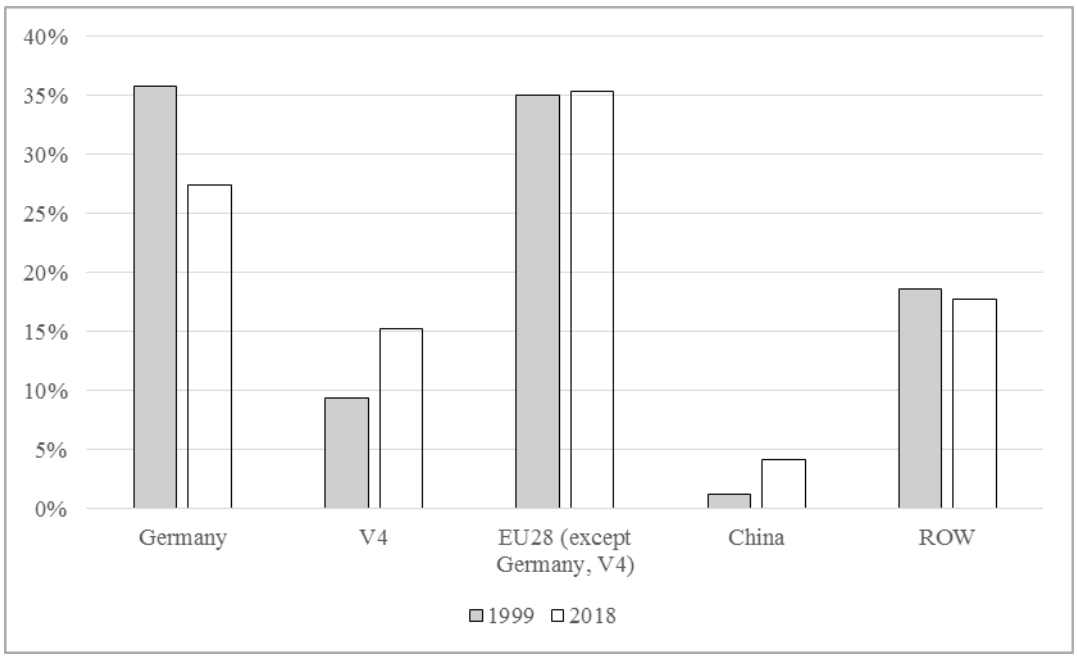


Source: TiVA.

Surprisingly, despite these processes, Germany's share of V4 exports has been decreasing for some time, according to gross-trade statistics (Figure 12). In contrast, there has been a spectacular upsurge in China's share of V4 exports, as well as significant growth in intra-regional trade. These developments have made up for the declines in the German share of V4 countries' exports. Considering that China's growing share of V4 exports includes an increasing volume of intermediate goods, and that V4 domestic suppliers have been losing their positions in the value chain, we presume that China's rise as a destination for V4 exports is related to the increasing activity of German companies in that country. Thus, in reality, the rise of China has further intensified V4's trade-dependence on Germany. Germany not only accounts for a dominant share of the V4 countries' trade, but, contrary to what we see in the gross trade statistics, German companies' share of the V4 countries' exports has continued to increase, which is at least partly due to the influence of the automotive industry. One notable illustration is Hungary; Eurostat data suggest that around 20% of its annual exports to China between 2012 and 2015 consisted of shipments of combustion engines. These engines are

produced and then re-exported for further processing inside the value chains of VW's Audi and GM's Opel. There is a similar logic behind the trend toward increased volumes of intra-regional trade. In reality, this rising volume of cross-border trade activity is the result of complementarities in the vertical specialization of the German automotive value chains which boost intra-regional shipments—as we saw, for example, in case of the cooperation between Mercedes' engine and body plants in Poland and Hungary.

Figure 12 V4 average total gross trade, share, 1999 (first) and 2018 (second)



Source: Comext.

What is remarkable in these gross trade statistics is not only V4's increasing dependency on German trade, which has continued to rise despite the decline of Germany's share in the gross statistics. A surprising asymmetry also appears when we compare gross trade data with value-added statistics based on OECD TiVA tables (Figure 11). Despite the fact that in gross terms (as shown above), V4 countries produce surprisingly high trade surpluses *vis-á-vis* Germany, value-added statistics show something remarkably different. In Slovakia, the Czech Republic, and Poland, these surpluses drop significantly, whereas Hungary had deficit in gross trade and in value-added terms both in 2005 and in 2015; this might be attributable to the relatively large

share of engine production in V4 exports, since the production of such technologically sensitive components requires significant imports of value-added content.

The asymmetric trade relations described above emerged within the European trade regime, and thus we assume that the regulatory framework of the EU will continue to serve the changing needs of the German neo-mercantilist model. Germany's current-account surplus is now primarily the result of global trade, and thus the protection of the European Single Market benefits German industrial exporters less than it used to. Nevertheless, market protection *per se* has not lost its appeal; the EU's regulatory framework is now shifting toward the protection of its expanding value chains. This tendency might lead to the emergence of new mega-regional trade regimes driven by the global ambitions of TNCs (Yoshimatsu 2002). We expect the German neo-mercantilist model to continue to develop as it is integrated into a future Transatlantic trade regime[31] which will intensify V4's vertical specialization as part of its automotive value chains. From V4's perspective, the overall process will simply reproduce its patterns of dependent development in the context of a new trade regime.

Conclusion

In this paper we have analyzed uneven and combined development in the automotive industry by focusing on the emergence of core-periphery relationships in the production processes between Germany and the V4 countries. For the purpose of this structural analysis we needed to address a new methodological aspect of economic dependencies. We combined the macro level of the international division of labor to the micro sphere of production when we applied the framework of GVC/GPN together with Vernon's product life-cycle theory.

We have highlighted with our empirical query that the major force behind V4's vertical specialization in the German automotive value chain has been the unfolding technological transformation in the production of automotive engines. The

[31] Mega-regional trade regimes—such as the TTIP in the Transatlantic region and the TPP in the Pacific region—were expected to come into being in near future (Juutinen and Käkönen 2016), though their prospects have become very bleak as a result of massive changes in the political landscapes of some key participants including the United States.

standardization of electric engines and batteries, along with the subsequent over-maturity of the combustion engine—the production of which V4 countries have specialized in—has provided a framework for the core-periphery relationship apparent in these production processes. This relationship has had notable consequences for labor productivity and capital intensity, modes of labor organization, and methods of capturing value.

Beyond the production process, asymmetrical trade relations dominated by German neo-mercantilist trade interests have further enhanced the core-periphery relationship between Germany and V4. While automotive manufacturing depends more and more on export destinations outside the EU, and overall trade dependency in the industry continues to increase, the costs and benefits of such trade relations are distributed unevenly along the value chain and among the local economies it comprises. Much of the value of these automotive export surpluses is produced in Germany, while the value created by the labor-intensive segments of the chain in Visegrád countries are siphoned off in the form of exploitative rents, which more than compensate for the accompanying trade deficits accumulated in Germany. As a result, Germany's current-account surplus—the basis of its neo-mercantilist model—has grown almost continuously over the last 15 years (see figure 10).

References

Ambroziak, Ł. (2016): 'FDI and Intra-industry Trade in the Automotive Industry in the New EU Member States', *International Journal of Management and Economics,* 52 (1), pp. 23-42.

Arrighi, G. (1990): 'The Developmentalist Illusion: A Reconceptualization of the Semiperiphery', in W.G. Martin (ed.), *Semiperipheral States in the World-Economy (*Westport, CT: Greenwood Press), pp. 11-42.

Arrighi, G. - Silver, B. J. (eds) (1999): *Chaos and Governance in the Modern World System* (Minneapolis, MN: University of Minnesota Press).

Arrighi, G., Silver, B. J., Brewer, B. D. (2003): 'Industrial Convergence, Globalization, and the Persistence of the North-South Divide', *Studies in Comparative International Development,* 38 (1), pp. 3-31.

Bair, J. (2005): 'Global Capitalism and Commodity Chains: Looking Back, Going Forward', *Competition and Change,* 9 (2), pp. 153-180.

Barta, Gy. (2012): 'Central and Eastern European Automotive Industry in European Context', in J. Rechnitzer and M. Smahó (eds), *Vehicle Industry and Competitiveness of Regions in Central and Eastern Europe* (Győr: Universitas-Győr), pp. 33-71.

Bartlett, D. - Seleny, A. (1998): 'The Political Enforcement of Liberalism: Bargaining, Institutions, and Auto Multinationals in Hungary', *International Studies Quarterly,* 42 (2), pp. 319-338.

Beblavý, M., Kureková, L., Drahokoupil, J., Myant, M., Domonkos, S. (2012): 'Linking Labour Regimes and Technological Innovation In Central and Eastern Europe: The case of Autmotive and Software Industries', *Neujobs Working Paper,* (6.2.).

Becker, J. (2016): 'Europe's Other Periphery', *New Left Review,* (II/99), pp. 39-64.

Becker, J., Jäger, J., Weissenbacher, R. (2015): 'Uneven and Dependent Development in Europe: The Crisis and Its Implications', in J. Jäger and E. Springler (eds), *Asymmetric Crisis in Europe and Possible Futures: Critical Political Economy and Post-Keynesian Perspectives* (London: Routledge), pp. 81-93.

Becker, J. - Weissenbacher, R. (2015): Changing Development Models: Dependency School Meets Regulation Theory, presented at the Colloque international Recherche & Régulation 2015, Paris, 10-12 June.

Bernaciak, M. (2011): *Trade Union Responses to Cross-Border Competition in the Enlarged EU: Evidence from the Automotive and the Construction Sectors,* unpublished PhD thesis, Central European University.

Bernaciak, M. - Šćepanović, V. (2010): 'Challenges of Upgrading: The Dynamics of East Central Europe's Integration into the European Automotive Production Networks', *Industrielle Beziehungen,* 17 (2), pp. 123-146.

Bohle, D. - Greskovits, B. (2012): *Capitalist Diversity on Europe's Periphery* (Ithaca, NY: Cornell University Press).

Boyer, R. - Freyssenet, M. (2002): *The Productive Models: The Conditions of Profitability* (London: Palgrave).

Brenner, R. (2006): *The Economics of Global Turbulence: The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945-2005* (London: Verso).

Cardoso, F.H. (1972): 'Dependency and Development in Latin America', *New Left Review,* (I/74), pp. 83-95.

Cardoso, F. H. - Faletto, E. (1979): *Dependency and Development in Latin America* (Berkeley, CA: University of California Press).

Chase-Dunn, C. (1998): *Global Formation: Structures of the World-Economy, Updated Edition* (Lanham, MD: Rowman and Littlefield).

Cieślik, E. (2014): 'Post-Communist European Countries in Global Value Chains', *Ekonomika,* 93 (3), pp. 24-38.

Coe, N. M., Dicken, P., Hess, M. (2008): 'Global Production Networks: Realizing the Potential', *Journal of Economic Geography,* 8 (3), pp. 271-295.

Czaban, L. - Henderson, J. (2003): 'Commodity Chains, Foreign Investment and Labour Issues in Eastern Europe', *Global Networks,* 3 (1), pp. 171-196.

Domański, B., Guzik, R., Gwosdz, K., Dej, M. (2013): 'The Crisis and Beyond: The Dynamics and Restructuring of Automotive Industry in Poland', *International Journal of Automotive Technology and Management,* 13 (2), pp. 151-166.

Drahokoupil, J. (2009): *Globalization and the State in Central and Eastern Europe: The Politics of Foreign Direct Investment* (Abingdon: Routledge).

Drahokoupil, J. - Piasna, A. (2018): 'Dependent Market Economies and Wage Competition in Central and Eastern Europe'. In: Gerőcs, T. – Szanyi, T. (eds): *Market Liberalism and Economic Patriotism in the Capitalist World-System.* London: Palgrave.

Dudenhöffer?', *Börse Online,* 23 November. Available from: http://www.boerse-online.de/nachrichten/aktien/Ist-VW-jetzt-der-Befreiungsschlag-gelungen-Herr-Professor-Dudenhoeffer-1001532981 [accessed 12 October 2017].

Feenstra, R.C. (1998): 'Integration of Trade and Disintegration of Production in the Global Economy', *Journal of Economic Perspectives,* 12 (4), pp. 31-50.

Fichter, M., Frybes, M., Meardi, G., Marginson, P., Stanojevic, M., Toth, A. (2005): 'Varieties of Multinationals: Embedding Foreign Investors in Central Europe', paper for the 7th European Sociological Association Conference, Toruń, 9-12 September.

Freyssenet, M. - Lung, Y. (1996): 'Between Globalization and Regionalization What is the Future of the Automobile Industry?', *Actes Du GERPISA,* (18), pp. 39-68.

Fröbel, F., Heinrichs, J., Kreye, O. (1981): *Krisen in der kapitalistischen Weltökonomie* (Reinbek: Rowohlt Verlag).

Furtado, C. (1976): *Economic Development of Latin America: Historical Background and Contemporary Problems* (Cambridge, UK: Cambridge University Press).

Gambarotto, F. - Solari, S. (2015): 'The Peripheralization of Southern European Capitalism Within the EMU', *Review of International Political Economy,* 22 (4), pp. 788-812.

Gereffi, G. (2014): 'Global Value Chains in a Post-Washington Consensus World', *Review of International Political Economy,* 21 (1), pp. 9-37.

Gereffi, G. - Evans, P. (1981): 'Transnational Corporations, Dependent Development, and State Policy in the Semiperiphery: A Comparison of Brazil and Mexico', *Latin American Research Review,* 16 (3), pp. 31-64.

Gereffi, G., Humphrey, J., Sturgeon, T. (2005): 'The Governance of Global Value Chains', *Review of International Political Economy,* 12 (1), pp. 78-104.

Gereffi, G. - Korzeniewicz, M. (eds) (1994): *Commodity Chains and Global Capitalism* (Westport, CT: Praeger).

Gerőcs, T. - Pinkasz, A. (2018): 'Debt-Ridden Development on Europe's Eastern Periphery', in M. Boatcă, A. Komlosy and H.-H. Nolte (eds), *Global Inequalities in World-Systems Perspective: Theoretical Debates and Methodological Innovations* (New York, NY: Routledge), pp. 131-153.

Gerőcs, T. - Pinkasz, A. (2019): 'Relocation, Standardization and Vertical Specialization: Core-Periphery Relations in the European Automotive Value Chain', *Society and Economy*, forthcoming.

Gerőcs, T., Meszmann, T. T., Pinkasz, A. (2019): 'Uneven Development in Labour Relations: Fragmentation and Flexibilization in the Hungarian Automotive Industry'. In: Komlosy, A. – Musić, G. (eds): *Global Commodity Chains and Labour Relations.* Leiden: Brill, forthcoming.

Henderson, J., Dicken, P., Hess, M., Coe, N., Yeung, H. W.-C. (2002): 'Global Production Networks and the Analysis of Economic Development', *Review of International Political Economy,* 9 (3), pp. 436-464.

Humphrey, J. (2000): 'Assembler-Supplier Relations in the Auto Industry: Globalisation and National Development', *Competition and Change,* 4 (3), pp. 245-271.

Humphrey, J. - Memedovic, O. (2003): *The Global Automotive Industry Value Chain: What Prospects for Upgrading by Developing Countries* (Vienna: United Nations Industrial Development Organization).

Humphrey, J. - Schmitz H. (2004): 'Chain governance and upgrading: Taking stock', in H. Schmitz (ed.), *Local enterprises in the global economy: Issues of governance and upgrading* (Cheltenhem: Edward Elgar), pp. 349-381.

IMF [International Monetary Fund] (2013): *German-Central European Supply Chain: Cluster Report* (Washington, D.C.: International Monetary Fund), IMF Country Report 263.

Jürgens, U. - Krzywdzinski, M. (2008): 'Relocation and East-West Competition: The Case of the European Automotive Industry', *International Journal of Automotive Technology and Management,* 8 (2), pp. 145-169.

Jürgens, U. - Meissner, H.-R. (2005): *Arbeiten am Auto der Zukunft: Produktinnovationen und Perspektiven der Beschäftigten* (Berlin: edition sigma).

Juutinen, M. - Käkönen, J. (2016): *Battle for Globalizations? BRICS and US Mega-Regional Trade Agreements in a Changing World Order* (New Delhi: Observer Research Foundation).

Kaplinsky, R. (1998): *Globalization, Industrialization and Sustainable Growth: The Pursuit of the Nth Rent* (Sussex: Institute of Development Studies), IDS Discussion Paper 365.

Kazimir R.I., Murai, B., Anwar, K., Száraz, A., Salamon, A. (2016): 'Analysis of Productivity Trends in "Manufacture of Motor Vehicles" Industry in Hungary', presented at the International Association for Research in Income and Wealth General Conference, Dresden, Germany, August 25. Available from: http://www.iariw.org/dresden/kazimir.pdf [Accessed 12 October 2017].

Kopint (2011): *A magyar kis és középvállalatok beszállítói szerepének erősítéséről szóló stratégia kidolgozása a gép- és gépjárműipari ágazatban: A jelenlegi helyzet tanulságai és a lehetőségek kihasználásának eszközei* [Policy for Strategic Adaptation for Enhancing the Role of Hungarian SME Suppliers in the Automotive Industry: Lessons from the Current Situation] (Budapest: Kopint).

Kopint-Tárki (2008): *A járműipari ágazati stratégia kialakítását megalapozó szakmai átvilágító tanulmány* [*Strategy Monitoring for the Automotive Industry*] (Budapest: TÁRKI).

KPMG (2015): *KPMG's Global Automotive Executive Survey 2015: Who Is Fit and Ready to Harvest?.* Available from: https://home.kpmg.com/content/dam/kpmg/pdf/2015/04/global-automotive-executive-survey-2015.pdf [Accessed 12 October 2017].

Krzywdzinski, M. (2008): 'Work Models Under Strain of Offshoring East-West Competition in the European Car Industry,' paper for the 16th GERPISA International Colloquium, Turin, 19 June.

Krzywdzinski, M. (2014): 'How the EU's Eastern Enlargement Changed the German Productive Model: The Case of the Automotive Industry', *Revue de La Régulation,* 15 (1), pp. 1-20.

Liu, W. - Dicken, P. (2006): 'Transnational Corporation's and "Obligated Emneddedness": Foreign Direct Investment in China's Automobile Industry', *Environment and Planning A,* 38 (7), pp. 1229-1247.

López, I. - Rodríguez, E. (2011): 'The Spanish Model', *New Left Review,* (II/69), pp. 5-29.

Love, J. L. (1990): 'The Origins of Dependency Analysis', *Journal of Latin American Studies,* 22 (1), pp. 143-168.

Meszmann, T. T. (2016): *The Rise of the Dual Labour Market: Fighting Precarious Employment in the New Member States Through Industrial Relations (Precarir) Country Report: Hungary* (Bratislava: Central European Labour Studies Institute), CELSI Research Report 12.

Molnár, E. (2012): 'Kelet-Közép-Európa az autóipari nemzetközi munkamegosztásban [Central East Europe in the International Divison of Labor of the Automotive Industry]', *Tér és Társadalom* [*Space and Society*], 26 (1), pp. 123-137.

Nölke, A. (2016): 'Finanzialisierung als Herausforderung der Demokratie in Westlichen Industriegesellschaften', in D. Brühlmeier and P. Mastronardi (eds), *Demokratie in der Krise. Analysen, Prozesse und Perspektiven* (Zürich: Chronos Verlag), pp. 107-118.

Pavlínek, P. (2015): 'Foreign Direct Investment and the Development of the Automotive Industry in Central and Eastern Europe', in B. Galgóczi, J. Drahokoupil and M. Bernaciak (eds), *Foreign Investment in Eastern and Southern Europe After 2008: Still a Lever of Growth?* (Brussels: European Trade Union Institute), pp. 209-255.

Pavlínek, P., Domański, B., Guzik, R. (2009): 'Industrial Upgrading Through Foreign Direct Investment in Central European Automotive Manufacturing', *European Urban and Regional Studies,* 16 (1), pp. 43-63.

Pavlínek, P. - Janák, L. (2007): 'Regional Restructuring of the Škoda Auto Supplier Network in the Czech Republic', *European Urban and Regional Studies,* 14 (2), pp. 133-155.

Pavlínek, P. (2012): 'The Internationalization of Corporate R&D and the Automotive Industry R&D of Central and Eastern Europe', *Economic Geography,* 88 (3), pp. 279-310.

Prebisch, R. (1950): *The Economic Development of Latin America and Its Principal Problems* (Lake Success, NY: United Nations Department of Economic Affairs).

Pulignano, V. (2007): 'Going National or European? Local Trade Unions' Politics in Multinational Business Context', in K. Bronfenbrenner (ed.), *Global Unions: Challenging Global Capital Through Cross-Border Campaigns* (Ithaca, NY: ILR Press), pp. 137-154.

Pyke, F. - Sengenberger, W. (1992): 'Industrial Districts and Local Economic Regeneration: Research and Policy Issues', in W. Sengenberger and F. Pyke (eds), *Industrial Districts and Local Economic Regeneration* (Geneva: International Labour Organisation), pp. 3-29.

Raviv, O. (2008): 'Central Europe: Predatory Finance and the Financialization of the New European Periphery', in J. Robertson (ed.), *Power and Politics After Financial Crisis: Rethinking Foreign Opportunism in Emerging Markets* (Basingstoke: Palgrave Macmillan), pp. 168-186.

Roberts, M. (2016): *The Long Depression: Marxism and the Global Crisis of Capitalism* (Chicago, IL: Haymarket Books).

Sadler, D. and Swain, A. (1994): 'State and Market in Eastern Europe: Regional Development and Workplace Implications of Direct Foreign Investment in the Automobile Industry in Hungary', *Transactions of the Institute of British Geographers,* 19 (4), pp. 387-403.

Sass, M. - Szalavetz, A. (2014): 'R&D-Based Integration and Upgrading in Hungary', *Acta Oeconomica,* 54 (supplement1), pp. 153-180.

Šćepanović, V. (2013): *FDI as a Solution to the Challenges of Late Development: Catch-Up Without Convergence?,* unpublished PhD thesis, Central European University.

Shanan, Z. (2016): 'Tesla's Battery Prices Falling Faster than Everyone Else's, - Who Knew?' *Clean Technica,* June 8. https://cleantechnica.com/2016/06/08/teslas-batteries-cheaper-everyone-elses-knew-cool-ev-battery-charts/

Sheppard, E. (2012): 'Trade, Globalization and Uneven Development: Entanglements of Geographical Political Economy', *Progress in Human Geography,* 36 (1), pp. 44-71.

Smith, A. (2015): 'The State, Institutional Frameworks and the Dynamics of Capital in Global Production Networks', *Progress in Human Geography,* 39 (3), pp. 290-315.

Smith, A., Rainnie, A., Dunford, M., Hardy, J., Hudson, R., Sadler, D. (2002): 'Networks of Value, Commodities and Regions: Reworking Divisions of Labour in Macro-Regional Economies', *Progress in Human Geography,* 26 (1), pp. 41-63.

Sturgeon, T. J. - Biesebroeck, J. Van (2011): 'Global value chains in the automotive industry: an enhanced role for developing countries?', *International Journal of Technological Learning, Innovation and Development,* 43 (123), pp. 181-205.

Sturgeon, T. J. - Florida, R. (2000): *Globalization and Jobs in the Automotive Industry* (Cambridge, MA: MIT), Industrial Performance Center Working Paper Series MIT-IPC-00-012.

UNECE [United Nations Economic Commission for Europe] (2015): *Guide to Measuring Global Production* (New York, NY: United Nations).

Vernon, R. (1966): 'International Investment and International Trade in the Product Cycle', *The Quarterly Journal of Economics,* 80 (2), pp. 190-207.

Vliegenthart, A. (2010): 'Bringing Dependency Back In: The Economic Crisis in Post-Socialist Europe and the Continued Relevance of Dependent Development', *Historical Social Research / Historische Sozialforschung,* 35 (2132), pp. 242-265.

Wallerstein, I. (1976): *The Modern World-System: CapitalistAgriculture and the Origins of the European World-Economy in theSixteenth Century* (New York, NY: Academic Press).

Werner, M. - Bair, J. (2011): 'Loosing our Chains: Rethinking Commodities through Disarticulations', *Environment and Planning A,* 43 (5), pp. 998-1015.

Weissenbacher, R. (2017): 'Peripheral integration and disintegration in Europe: the "European dependency school" revisited', *Journal of Contemporary European Studies,* published online: 17 March.

Yoshimatsu, H. (2002): 'Preferences, Interests, and Regional Integration: The Development of the ASEAN Industrial Cooperation Arrangement', *Review of International Political Economy,* 9 (1), pp. 123-149.