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The Hungarian automotive sector – a comparative CEE perspective with special emphasis on structural change

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Summary: Based on the example of the automotive sector the paper investigates some quantity and quality aspects of FDI-driven upgrading and analyzes in a comparative perspective – with the help of industry level data – selected aspects of competitiveness in Central and Eastern Europe.
The first group of the surveyed quality indicators includes the evolution of value added over output, and changes in the product mix: we examine whether these two indicators are suitable proxies to assess the extent of quality upgrading with. We conclude that the second group of our surveyed indicators: the import intensity of local production; labor productivity; and the skill content of local activities are more relevant to evaluate quality-type upgrading. Since the broadening of local business functions is a good proxy for quality upgrading, we also tackle this issue in our regional comparisons. The countries covered are Hungary, the Czech Republic, Slovakia, Poland and in some cases also Romania, Bulgaria and Slovenia. Analyzing selected aspects of upgrading, we compare CEE data with the ones of a benchmark country: Germany.
We conclude that in spite of several subsequent foreign direct investment deals, which has produced non-negligible expansion and structural upgrading, and irrespective of the fact that local actors have all stepped on the path of slow quality upgrading, CEE automotive actors have been stuck in cost-based competition. The Czech Republic is a partial exception in this respect. We develop predictions about the industry's regional perspectives following the global financial crisis.

Zusammenfassung: Anhand des Beispiels Automotive Sektor untersucht diese Abhandlung einige quantitative und qualitative Aspekte der Aufwertung anhand von angetriebenen ausländischen Direktinvestitionen und analysiert in einer vergleichenden Perspektive – unter Zuhilfenahme von Angaben der Industrieebene- ausgewählte Gesichtspunkte von Wettbewerbsfähigkeit in Zentral- und Osteuropa.
Die erste Gruppe der untersuchten Qualitätsindikatoren beinhaltet die Entwicklung der Wertschöpfung über die Produktionsmenge und Veränderungen im Produktmix. Wir untersuchen, ob diese zwei Indikatoren geeignete Vertreter zur Beurteilung des Ausmaßes an Qualitätserweiterung sind. Wir schlussfolgern, dass die zweite Gruppe unserer untersuchten Indikatoren, also die Importintensität der lokalen Produktion, Arbeitsproduktivität und der Befähigungsgehalt lokaler Aktivitäten, zur Auswertung der qualitativen Aufwertung relevanter sind. Da die Ausbreitung von lokalen Unternehmensfunktionen ein guter Vertreter für Qualitätsaufwertung ist, gehen wir auch dieses Thema in unseren regionalen Vergleichen an. Die untersuchten Länder sind Ungarn, die Tschechische Republik, die Slowakei, Polen und in einigen Fällen auch Rumänien, Bulgarien und Slowenien. Durch Analyse ausgewählter Aspekte von Aufwertung vergleichen wir Daten von Mittel- und Osteuropäischen Ländern mit Daten des Bezugslandes Deutschland.
Wir schlussfolgern dass trotz mehrerer, anschließender ausländischer Direktinvestitionen, welche nicht unerhebliche Aufwertungen in Ausdehnung und Struktur produzierten, Mittel- und Osteuropäische Automotive Akteure in einer Kosten- basierenden Konkurrenz stecken, ungeachtet der Tatsache dass alle lokalen Akteure den Weg der langsamen Qualitätsaufwertung eingeschlagen haben. Die Tschechische Republik ist diesbezüglich eine partielle Ausnahme. Wir entwickeln Vorhersagen über die regionalen Perspektiven der Industrie nach der globalen Finanzkrise.

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1. Introduction and overview

The past decades and especially the last two years was marked by sweeping changes in the global automotive industry. In the maturity phase for a long time, this industry does not only show trends that characterize overall consolidation, but also features signs of revitalization (at least up until the global financial crisis and the collapse of the automotive markets). On the one hand, this has included major shifts in the global geography of production (DICKEN, 2003); increasing market segmentation and fragmentation; new entrants from emerging economies; large global merger and acquisition deals; rationalization and restructuring; on the other hand, continuous product, process and organizational innovations, and the incorporation of emerging technologies into the maturing product characterize the present evolution phase of the industry.

Global competition increases consumer choice and expectations not only in the small high-end segments characterized by affluent and environmentally conscious buyers, fascinated with new technical and design solutions. In the low-end segments competitive pressure has also substantially increased: offensive new entrants, the so-called dragon multinationals (MATHEWS, 2002) capture an increasing global market share with their better-than-the-average ability to keep a tight grip on costs. Producer efforts at cost cutting at the time of falling car prices is thwarted by rising material and capital costs – increasing complexity of the products themselves – and by the ever stricter environmental and safety regulations with which car manufacturers must comply. These phenomena trigger continuously and rapidly increasing R&D efforts both in product, process and organizational senses.

One key aspect of innovation efforts – impacting products, processes and the global organization of operations – is modularization and outsourcing (HOETKER, 2006). Outsourcing has provided enormous impetus to low cost peripheral locations that have been trying to attract efficiency-seeking foreign investors willing to transfer technology and know-how together with relocated production. The relocation of car assembly and of automotive parts and components production has not only improved recipient countries' macroeconomic performance indicators, but has led to significant capability accumulation in the case of actors newly integrated into global production networks.

Following the change of the regime, CEE countries have rapidly become integrated into European automotive production networks (*LUNG*, 2004; RADOSEVIC–ROZEIK, 2005). European investors – many of which have had long established ties with local car manufacturing companies – have immediately recognized the significant market potential of these countries (in contrast to their saturated markets, here they encounter immense unsatisfied demand – note that during the socialist regime, consumers had to wait five to ten years to buy a new car).[1] Furthermore, investors have recognized the opportunity

[1] Nevertheless, as several analysts noted, the growth of local demand was unstable, which soon made market-seeking investors turn into efficiency-seeking ones. Investors have reoriented the production and the sales of their local facilities to export markets. As a complementary strategy, they have "stepped back" along the value chain and specialized on high-volume, labor-intensive part & components production for export, instead of or complementary to the final assembly of cars designated for the domestic market (Domanski–Lung, 2009).

offered by major privatization deals[2] as well as by the generous investment promotion programs (subsidies, tax holidays, customs free zones, etc.) with which CEE governments tried to attract investors. However, economic and political alignment was present not only in FDI-recipient CEE economies. As summarized by TULDER (2008), investor companies' governments were also heavily involved in these deals in the first phase of entry, as bilateral governmental negotiations of the highest level tried to support investor firms' entry.

On the other hand, non-European investors' rush to CEE was prompted by these countries' prospective integration with the European Union which allowed them to overcome European trade barriers by establishing/acquiring local production facilities. Moreover, a highly important opportunity the opening of CEE offered to western investors was to cut production costs by relocating labor-intensive processing phases to transforming economies,[3] many of which have had significant historical legacies in automotive production or at least in related industries.

As for Hungary, its historical legacy with respect to the automotive industry is ambiguous. On the one hand, cars assembled from imported kits had already been produced in the first decade of the 1900s[4] (A Hungarian designer, János Csonka, designed and built a car in 1905.); buses have been produced since 1909. The world wars boosted the local manufacturing of both military vehicles and car parts.

On the other hand, Hungary stopped car production after WWII. Within the CMEA division-of-labor, Hungary was assigned the production of buses[5] and lorries, but not that of cars.[6] Car assembly and parts production were reestablished in Hungary after the change of the regime as a result of foreign investors' location decisions.

This paper explores the role automotive investors have played in the structural upgrading and modernization of the Hungarian economy in a comparative (CEE) perspective. We examine whether Hungarian stakeholders (local subsidiaries; supporting organizations/institutions, local suppliers etc.), following several subsequent investment decisions, have managed to upgrade their activities or if they have instead been stuck in cost-based competition. Another objective of the paper is to review the policy efforts and the evolution of policy instruments by exploring the manner by which quantity and quality type development of the industry has been promoted and supported.

Section two presents the current status of the industry in Hungary in a CEE perspective. Section three reviews the industry's evolution after the change of the regime and its

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[2] The opportunities privatization deals offered cannot be restricted to efficiency seeking ones. TULDER (2008) provides several examples to demonstrate that the market-seeking motive was equally important, here I quote only one: "Acquiring Dacia in Romania resulted in an immediate market share of more than 70% in 2000 (for Renault) and an additionally dominant position in the imported car market" (p. 588).

[3] With the establishment of Hyundai's Nosovice plant in the Czech Republic in 2008 and Mercedes's Kecskemét plant in Hungary in 2009, practically all the major manufacturers have carried out greenfield car manufacturing investments in the region. Relocation decisions allowed older and more expensive plants to be closed such as such as PSA's Ryton and GM's Luton plants in the UK (PSA opened new plant in Slovakia and GM in Poland).

[4] This paragraph draws on HAVAS (2000)

[5] Ikarus was on the other hand the largest bus manufacturer supplying the whole CMEA with a yearly production of over 14,000 buses in the 1980s.

[6] Manufacturing of some car parts and components continued during the socialist era – delivered mainly to Western manufacturers for hard currency.

contribution to Hungary's and other CEE economies' structural upgrading. Section four is concerned with the general and specific policy measures that have had, or are expected to have, an impact on the sector's performance in Hungary. Section five develops predictions about the industry's perspectives following the global financial crisis. Section six outlines our main conclusions.

Our research is based on three pillars. First, we compile, summarize and analyze secondary sources (international academic literature) related to the situation and to the perspectives of the Hungarian and CEE automotive industries. The second pillar is the compilation and analysis of industry-related statistics, and the third is field research. In November 2009, we carried out an interview-based investigation at a German-owned local subsidiary of a first-tier automotive supplier, a large transnational corporation. We inquired about the evolution and quality upgrading of the local subsidiary's activities. We conducted three interviews with selected representatives of the management. The incorporation of case study findings into this descriptive paper does not intend to prove, rather to illustrate our arguments.

2. Current status of the automotive industry in CEE

With the incorporation of CEE automotive actors into global production networks and massive production relocation to the newly integrated regions, Central and Eastern Europe has become a production location of major importance. Privatization has brought about the spectacular turnaround of ailing and inefficient car factories, for example, in the case of the Czech Skoda, acquired by Volkswagen or the Romanian Dacia, acquired by Renault.[7] Furthermore, with respect to assembly facilities, many of the local parts suppliers were also taken over by foreign investors. Local components supply capacity was also expanded by key global actors' greenfield investments.

The Czech Republic, Poland and Slovakia have become the major hubs of OEM-assembly (Hungary will catch-up following the start of Mercedes' production), but all other CEE countries[8] have foreign-owned OEM manufacturing facilities. While FDI in car assembly was mainly privatization-driven, many local automotive supplier firms were also created through greenfield investment by efficiency-seeking foreign investors. Parts makers set up operations partly in order to be close to local assembly plants and partly with the purpose

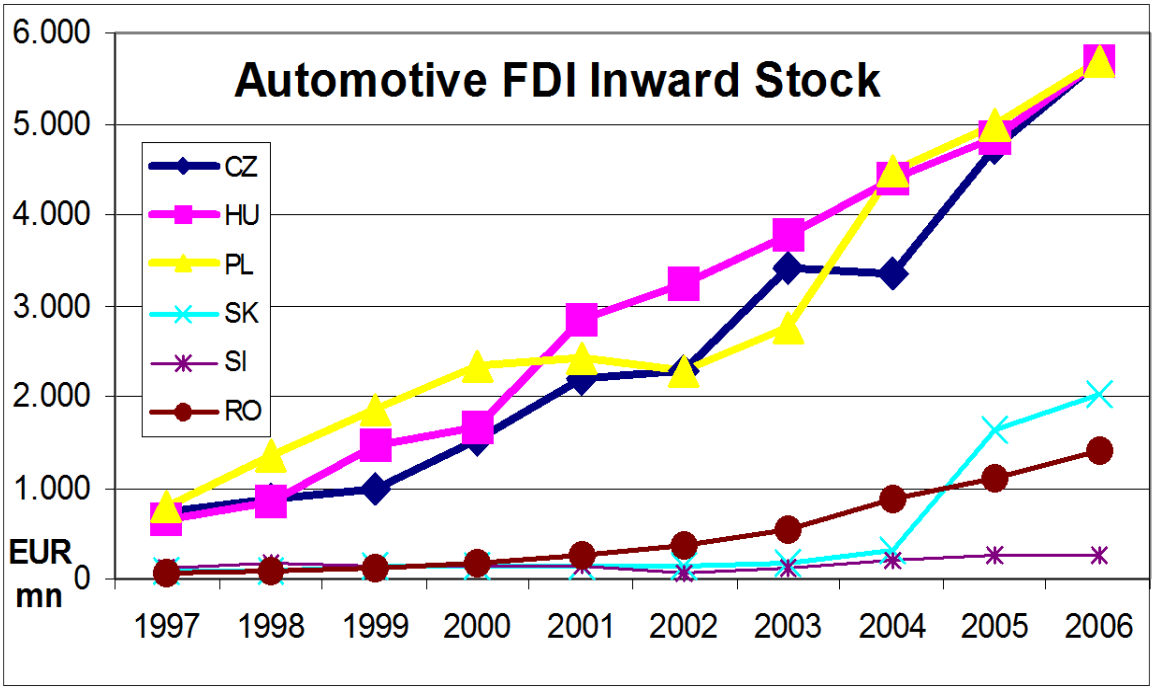
[7] Similar turnaround stories can be mentioned in Serbia, where Zastava was acquired by Fiat, in Romania, where Automobile Craiova was recently acquired by Ford (following a short period in the ownership of Daewoo that has also invested in turning around the inefficient plant), and earlier in Poland, where FSM was taken over by Fiat (for a detailed elaboration of this latter story as well as the analysis of Fiat's internationalization strategy, see DALLAGO (2000)).

[8] The most recent country to join the 'club of OEM manufacturers' is Bulgaria. So far Bulgaria specialized only in automotive parts & components manufacturing – a strong growth industry with producers including EPIQ Group (Belgium – electronic modules); VW Electric Systems (Turkey – cables), Grammer (Germany – seats), Yazaki Corp. (wire harnesses), Melexis (microelectronics) etc. Local final assembly of passenger cars is expected to start in 2010. OEM manufacturing will start as a result of the investment of Great Wall Motor Co. Ltd. a Chinese sport-utility vehicles manufacturer.

of achieving flexibility and cutting costs through outsourcing. This process has accelerated what analysts refer to as "the Europeanization of automotive manufacturing" (PAVLÍNEK et. al. (2009)).[9]

Figure 1 depicts changes in the FDI stock in CEE countries' automotive sectors.

Figure 1: Increasing stock of automotive FDI in CEE countries (1997-2006, EUR million)



Source: HAISS et al. (2009), p. 117

Table 1 overviews the increase of automotive production in Central and Eastern European economies in unit terms.

Table 1: Automotive production statistics

Country	Number of cars		Total number of vehicles	
	2000	2008	2000	2008
Hungary	134,029	342,359	137,398	346,055
Czech Republic	428,224	933,312	455,292	945,822
Poland	481,689	840,000	504,972	950,908
Slovakia*	181,333	575,776	181,783	575,776
Romania	64,181	231,056	78,165	245,308

[9] A number of comprehensive surveys tackle the evolution of the national automotive industries in selected CEE countries (see e.g. HAVAS (2000) and SOMAI (2002) for Hungary; PAVLÍNEKP (2008) for the Czech Republic; Domanski et al. [2008] for Poland).

Source: OICA Statistics
* According to PAVLÍNEK et al.'s (2009) calculations, at present Slovakia has the largest passenger car production per capita in the world (106 cars per capita in 2007).

As for Hungary, the overwhelming share of assembled vehicles was passenger cars: 282,000 Suzukis and 60,000 Audis.[10] This number is expected to double with the starting and rapidly-expanding production of Mercedes-Benz Manufacturing Hungary Ltd. as of 2011 (by 2013, its output is expected to be 300,000 cars annually). On the other hand, the number of assembled buses keeps shrinking: while in 2000, 800 buses were assembled in Hungary, this number decreased to 629 in 2008 (Ikarus stopped bus production. At present the main bus manufacturers are NABI and Kravtex).

In a comparative, CEE perspective, Hungary can be considered an automotive parts and components producer country, rather than one specialized in the assembly of passenger cars. Hungary is strongly specialized in manufacturing engines (in 2007 1.9 million Audi engines and 450,000 GM engines were manufactured in Hungary),[11] brake systems, steering systems and the like. Beyond passenger cars as well as their parts and components, Hungary has become the production location of several first-tier suppliers of light truck and heavy-duty truck manufacturers. Major first-tier suppliers include, among others, Rába[12], Knorr Bremse, Bosch, ZF, Luk Savaria (Schaeffler Group), ZF Lenksysteme, Visteon, and Denso Corporation. Table 2 presents the top 15 Hungarian automotive producers.

Table 2: Top 15 automotive producers in Hungary (net sales in HUF million), 2008

No.	Producer	Net sales	No.	Producer	Net sales
1	Audi Hungária Motor Kft.	1,484,507	9	Rába Holding Nyrt.	58,863
2	Magyar Suzuki Kft.	609,414	10	Hammerstein Bt.	57,484
3	Lear Corporation Kft.	142,969	11	ZF Hungária Kft.	48,639
4	Denso Kft.	110,788	12	SMR Automotive Mirror Technology Bt.	46,967
5	Luk Savaria Kft.	104,309	13	Knorr Bremse Fékrendszerek Kft.	34,283
6	Visteon Hungary Kft.	82,251	14	Delphi Thermal Hungary Kft.	32,869
7	BorgWarner Turbo Systems Kft.	69,721	15	Knorr Bremse Vasúti Jármű Kft.	32,758
8	BPW-Hungária Kft	61,374	…19	GM Powertrain Kft.	26,796

Source: Figyelő TOP 200, 2009

[10] GM used to have Opels assembled in Hungary but this activity stopped in 1998. Altogether 90,000 Opels were assembled in Szentgotthárd between 1992 and 1998.

[11] According to the Polish Information and Foreign Investment Agency, the respective figure for Poland was: 1.8 million engines in 2007. The main engine manufacturers are: Volkswagen Motor Polska; Toyota Motor Industries, Poland; Toyota Motor Manufacturing Poland; Isuzu Motor Polska and Fiat–GM Powertrain.

[12] Rába also assembles military trucks.

Specialization in parts and components and especially the presence of first-tier suppliers is especially important because of the modular organization according to which global production is restructured. As DOMANSKI–GWOSDZ (2009, p.454) remarked, value creation in the car industry is partly shifting away from original equipment manufacturers to first-tier suppliers – system integrators – who deliver complete modules, and further "down" in the hierarchy to second-tier suppliers. Structural upgrading (in terms of higher value-adding activities, competence improvement and broadened corporate mandates – see section 3) is therefore often easier at parts & components manufacturing local subsidiaries than at local OEM facilities entrusted with final assembly.

In the following paragraphs, we present some detailed performance data for Hungary. Gross output of the transport equipment (TE) industry[13] amounted to HUF 3597.2 billion in 2007 (~EUR 14.5 bn), 90% of which was exported (source: CSO). The share of TE value added in total manufacturing value added is the fourth highest in Europe; in 2007, it amounted to 15.4 %, preceded by Germany (17.4 %), the Czech Republic (16.1 %) and Slovakia (16.0 %). [14]

Table 3 presents the export intensity of the automotive industry in a comparative perspective. High values reflect that a dominant part of local production capacities has been established with efficiency-seeking objectives as well as the fact that the growth of local markets has remained below the expectations, so part of local production had to be converted. The manufacturing of export-oriented products was substituted for local market-oriented ones. Skoda, as reflected by the Czech data, is an exception with higher-than-average local market orientation. Furthermore, in contrast to the export orientation of Hungarian and Polish component manufacturing, a larger-than-CEE average share of components manufactured in the Czech Republic are assembled into passenger cars within the country (PAVLÍNEK et al., 2009, p. 51)

Table 3: Export intensity (export over production) of the TE industry (%), 2008

Czech Republic	71.3
Hungary*	89.8
Poland*	81.5
Slovakia	83.85

Source: Author's calculations based on OECD STAN Database, 2009
* = 2007

The number of registered limited liability companies and joint stock companies (in TE) in 2008 was 602 and 26, respectively. Foreign capital was involved in 127 TE companies in 2007. A dominant portion of foreign-owned companies is in 100% foreign ownership, which is well reflected by the equity data; total equity of companies with foreign capital was HUF 1667.5 billion in 2007, (approximately EUR 6.5 billion), of which foreign equity capital is HUF 1638.7 billion.

[13] In this paper we use automotive industry and transport equipment industry (ISIC 34-35) as synonyms.

[14] Source: Zoltán Pitti's data, based on Eurostat Data Bank data services (October, 2009). The respective value of this indicator was 9.6 in Poland and 13.1 in Romania (source: ibid.). Compare these data with the EU 27 average of 11.6 %.

The TE industry had 63,500 employees in 2007, which represents 2.3% of the total workforce. Of course this number understates the size of the workforce related to this industry, since the number of people employed in the automobile value chain[15] is much higher than that which is directly employed. (According to DICKEN (2003), the number of total automobile related employment is five to six times higher than the number of those directly employed – p. 355.)

Zoltán Pitti's data, based on Eurostat Data Bank data services, are slightly different from CSO's official figures, yet they nevertheless provide an adequate basis for comparison. Table 4 summarizes the basic corporate demographic and employment data of the automotive sector. It is interesting to compare the rapid sectoral employment growth of the countries in question, which is in sharp contrast to Romanian performance. In the first half of the 2000s, employment in this latter country reflected the results of downsizing and restructuring efforts, and the expansionary effects of FDI inflows became manifest only gradually, after 2005.

Table 4: Number of companies and employment in the TE industry

Country	Number of companies			Number of employees		
	2000	2005	2007	2000	2005	2007
Hungary	289	824	804	40,466	51,664	65,162
Czech R.	735	896	979	102,057	125,539	143,690
Poland	3,270	3,583	5,133	163,954	178,499	209,165
Slovakia	90	144	198	24,106	31,044	41,393
Slovenia	223	222	274	10,878	11,018	12,744
Romania	562	1,011	1,119	143,688	121,411	124,744

Source: Zoltán Pitti's data, based on Eurostat Data Bank data services

Table 5 presents performance comparisons, providing data on output and value added. In order to put CEE data in a comparative perspective, we provided respective German data as well.

Table 5: Gross output and gross value added in CEE automotive industry (EUR mn, current prices)

Country	Gross output			Gross value added		
	2000	2005	2007	2000	2005	2007
Hungary	5,996.1	9,868.1	14,604.3	1,263.6	1,920.1	2,885.7
Czech R.	7,678.4	15,781.8	23,228.9	1,537.6	3,196.6	4,781.0
Poland	11,034.5	18,423.9	25,158.7	2,147.8	4,071.3	5,207.5
Slovakia	2,399.5	5,652.3	11,615.2	323.2	629.1	1,356.4
Slovenia	1,409.5	2,015.6	2,444.5	157.7	325.2	446.3

[15] The automotive value chain includes both downstream and upstream activities: the former is represented mainly by knowledge-intensive services such as car financing, sales, marketing, insurance, logistics and maintenance.

Romania	1,611.1	3,905.2	6,970.2	559.2	874.4	1,806.0
Germany	236,658.3	294,140.0	346,877.1	57,191.6	71,760.3	84,270.9

Source: Zoltán Pitti's data, based on Eurostat Data Bank data services

In the case of Poland and Slovenia, the relation between country size and output is conspicuous. The data demonstrate an outstandingly rapid expansion of output in the case of all CEE economies. Nevertheless, the German comparison is telling; despite the tripling of output in the Czech Republic (and the more than fourfold increase in Romania) as well as the spectacular expansion both in Poland and in Hungary, CEE economies' automotive output is just a fragment of that of Germany – note that the latter is rapidly increasing its performance despite all de-industrialization and 'bazaar economy' complaints. If we add up the surveyed economies' output, it still represents less than one-fourth that of Germany (in 2007).

Despite being a mature industry, the automotive industry is highly research-intensive, since its complex products make use of various emerging technologies and incorporate the innovative results of several emerging industries. The share of the industry in total R&D is significant in Hungary, In 2007, HUF 13.7 billion was spent on R&D, which represents 11.8 % of total BERD. The industry employed 890 researchers (FTE), and there were 18 patent applications in the motor vehicles branch.[16]

For a comparative perspective (absolute values of R&D expenditures), we rely on ANBERD database (table 6).

Table 6: Research and development expenditures in the automotive industry (millions of PPP USD, current prices, ISIC 34-35)

	2006
Czech Republic	625.4
Hungary	52.6
Poland	161.2

Source: Author's calculation from OECD ANBERD Database, 2009

Absolute values are telling, though they should be compared to production values. Since these latter indicators are in euros, we calculated ratios instead. Table 7 presents R&D and production ratios utilizing the Czech Republic as a benchmark economy. This table makes the qualitative superiority of the Czechs, as well as Hungary's relative backwardness – measured in terms of the local research-intensity of local production –, even more obvious than the absolute values in table 6.[17]

[16] The numbers in these paragraphs were taken from CSO's 2008 Yearbook on Hungary as well as from the 'Action plan to promote the Hungarian transport equipment industry', prepared by the Ministry for Development and the Economy and accepted in July, 2009.

[17] Nevertheless, in CEE economies, the R&D-intensity of production (R&D over net sales) is far below that of the industry average of advanced economies. According to NSF data for example, in the U.S., company R&D expenditures over net sales in motor vehicles trailers and parts industry was 2.4 % between 2003 and 2007 (2.5 % in 2005). Companies in this industry reported performing $16 billion of

Table 7: Production (Y) and R&D comparisons in the automotive industry (Czech Republic = 100)

	Y	R&D
Country	**2006**	**2006**
Czech Republic	100	100
Hungary	59.7	8.4
Poland	109.0	25.8

Source: Author's calculations based on Zoltán Pitti's data (Eurostat Data Bank data services) and on OECD ANBERD Database, 2009

Comparisons of the local research-intensity of production are strongly related to the issue examined in section 3, namely the contribution of the FDI-based rapid expansion of the automotive industry to CEE countries' structural upgrading.

3. Contribution of automotive industry to structural upgrading in CEE

3.1 Quantity aspects

The contribution of the industry to CEE's structural upgrading performance can be analyzed not only with respect to the changing industry mix and changes in production and export specialization, but also from the vantage point of the quality of structural transformation.

As for the quantity aspects, statistics show a rapidly increasing share of the transport equipment industry within total manufacturing value added. Figure 2 quantifies the increasing value-added shares and illustrates in a conspicuous manner the rapid growth of the industry's weight and thereby the extent of structural change.

company-funded R&D in 2007. We have also calculated data for Germany. Automotive companies reported performing EUR 12,392 million of R&D in 2006 (ANBERD Database, 2009). Production value amounted to EUR 315,820.5 million (Zoltán Pitti's data based on Eurostat Data Bank data services) which results in an R&D-intensity of 3.9 %.

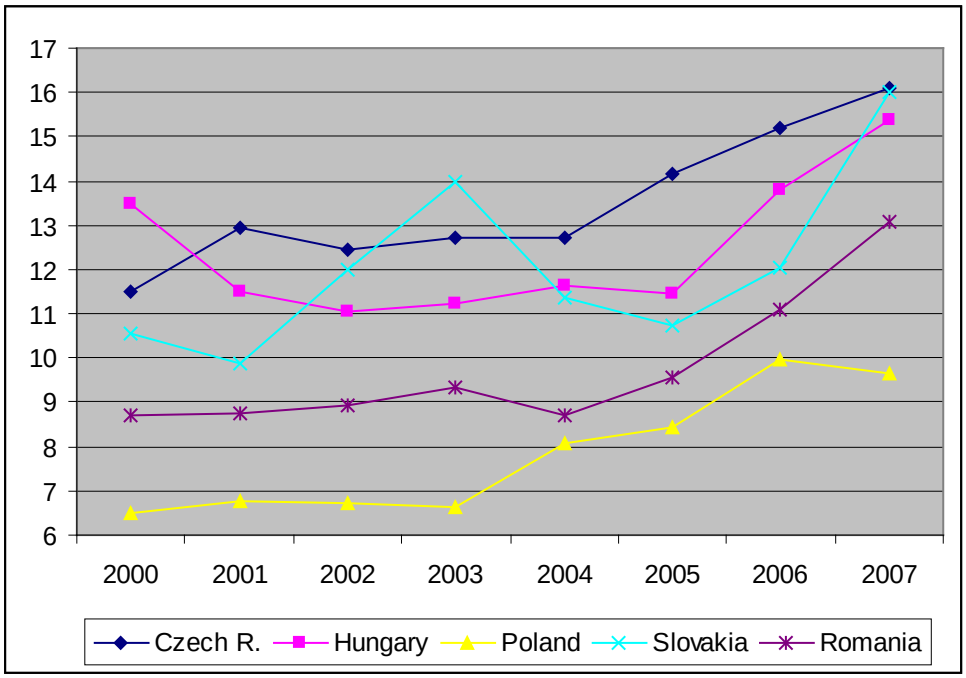


Figure 2: The share of the automotive industry in manufacturing value added (%)

Source: Author's calculations from data made available by Zoltán Pitti

For a non-misleading evaluation of the data presented in figure 2, recall that differences between transforming economies in the extent of structural change have been subject to a large number of analytical papers that related these countries' restructuring and competitive performance to FDI involvement by branches and to the technological features of both the new industry mix and trade specialization (e.g., GUERRIERI, 1999; LANDESMANN–STEHRER, 2002) Early papers usually praised the countries with extensive structural change. The performance of transforming economies with an increasing specialization in high-technology industries and in some mature ones like the automotive industry was particularly acknowledged. This latter industry is considered of key importance because of its strong linkages with other industries, which thereby facilitates technology spillovers. Structural-upgrading performance has been measured, among others, by the degree of export similarity (compared to the export structure of advanced economies). High values of export-similarity index suggested an advanced stage in the catching-up process.

Later papers, however, have pointed to substantial quality differences hidden behind the surprisingly high values of export-similarity indices of transforming countries (*e.g.*, DULLECK ET AL., 2005; WELFENS–BORBÉLY, 2009). The similarity of the production structure may hide important quality differentials. Hence, these papers used other indicators to measure quality differences: export-unit values, quality-segment indicators, and indicators referring to the prevailing and very slowly diminishing productivity gap between the transforming and the advanced economies. It is now a widely shared view that *what* countries/regions produce cannot be assessed as good or bad in itself. Instead, it is rather *how* they produce it that matters. It is not what countries/regions

specialize in, but rather the quality indicators of the production activity that have explanatory and predictive power concerning performance. (FESER, 2003).

Since the expansion of the automotive industry in the CEE economies has been related to foreign investors' successive location decisions and to the run-up of their local production – it is important to explore whether this quantity type of expansion, which has of course produced spectacular structural upgrading in a quantity term, has been accompanied by quality upgrading as well. Does these countries' specialization in the automotive sector reflect quality upgrading, or does the similarity between advanced and CEE economies' production and export specialization continue to hide importan quality differentials?

3.2 Quality aspects

International academic literature distinguishes between high-road and low-road catching-up and adaptation strategies (PYKE–SENGENBERGER, 1992). While low-road adaptation seeks restructuring based on cost-competitiveness mainly through low labor costs, high-road strategies are based on efficiency enhancement, long-term skill development and innovations. Following the change of the regime, CEE countries successfully reoriented their exports and upgraded their production and export structures through low-road adaptation by attracting relocated production. This implied non-negligible investment into technological modernization, learning and capability accumulation – this latter mainly in terms of production capability.

However, cost competitiveness started to erode in line with improved overall economic performance and catching-up. By the early 2000s, the spectacular improvement of CEE countries' structural upgrading performance slowed. The more advanced an economy was, the earlier this process happened. Changes in the adaptation strategy and a switch towards high-road approaches have become increasing urgent.

As for the industry subject to our present investigation, these changes were prompted also by transformations in the division of labor within the automobile systems: In order to maintain their position within the global production network they are integrated in, suppliers nowadays have to move up the value chain and assume responsibility of not only the physical operations but also of design, logistics and supply chain management.[18] A high-road strategy in this respect refers to the extension of the local value chain by assuming additional corporate functions beyond production and by increasing local value added through the integration of an increasing number of local suppliers.

In the following sections we investigate the state of and changes in selected aspects and indicators that refer to CEE economies' quality upgrading performance in the automotive sector.

[18] These requirements apply to suppliers at all levels, while first-tier suppliers also assume responsibility of the design and development of whole modules.

3.2.1 Value added over output

Figure 3 depicts the extent of local automotive producers' quality upgrading, measured by the indicator of value added over output. Problems related to the use of this indicator in the transformation period are well reflected by the large fluctuations the values show. Instead of a linear growth, which would refer to gradual quality upgrading and increasing local content, each consecutive investment decision pushed the values down, because output (i.e., the denominator) increased sharply and the high import-intensity of production caused value added to follow suit. Nevertheless, substantial inter-country differences are well represented. Slovakia's values are lower than the CEE average, which can be explained by a higher-than-average share of import-intensive assembly operations within total output. Note that value added is also influenced by the rate of profit, which is determined by companies' transfer pricing strategies. This may also cause some inter-country differences.

It is interesting to compare CEE performance with one of selected advanced economies (figure 4). In the case of this latter group, it is the shift to a modular production accompanied by increasing outsourcing that accounts for a more or less stagnating value of the indicator (i.e., it compensates for the increase of the value added share as a result of high-road strategies). In summary, although the qualitative evolution of the two country groups is not similar,[19] the values of the indicator are not significantly different, which calls for caution with respect to hurried and misleading interpretations based on this single indicator.

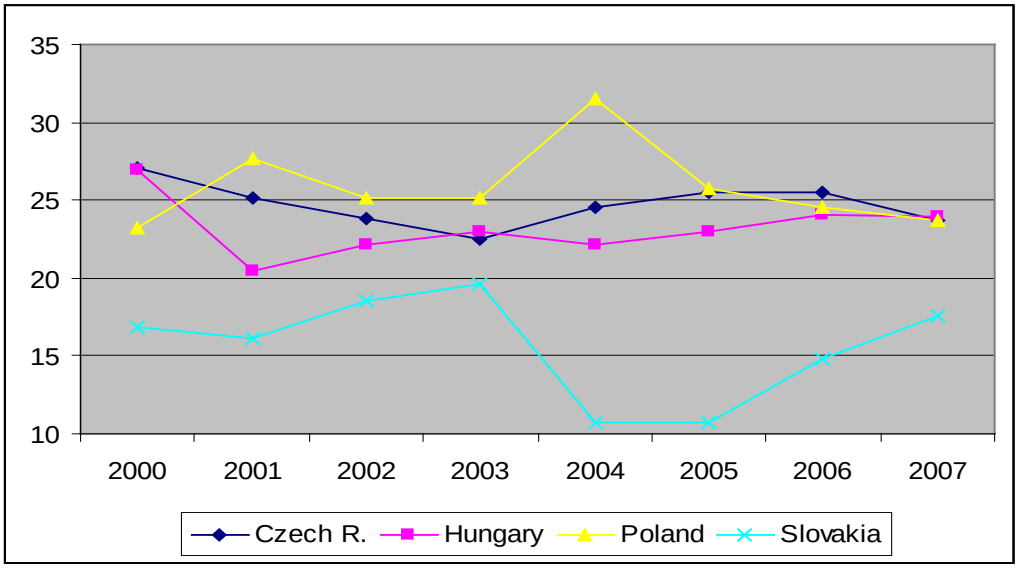


Figure 3: Value added over output in CEE automotive industries (%)

Source: Author's calculations from data made available by Zoltán Pitti

[19] Both country groups upgrade, but their respective development trajectories are divergent.

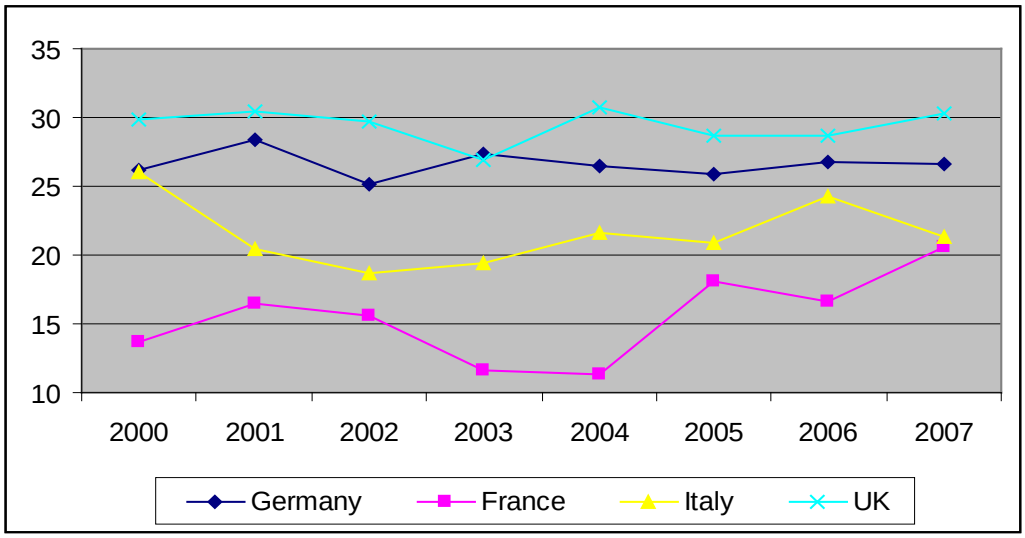


Figure 4: Value added over output in advanced economies' automotive industries (%)

Source: Author's calculations from data made available by Zoltán Pitti

3.2.2 Changes in the product mix and the technological level of production

While academic literature usually mentions the diversification of production and the moving into up-market (or at least middle-market) niches (from cost-based mass production of cars for low-price segments) as key elements of a high-road strategy, we do not consider these indicators adequate. With the shortening of product cycles and the acceleration of peripheral subsidiaries' learning curves (LUNG, 2004), the geographic division of labor is no longer determined by the 'mature and low-end products to the periphery, new and high-end products to the center' scheme.[20]

In line with PRIES–DEHNEN'S (2009) arguments, we claim that decisions concerning the location where individual new products will be manufactured within the multinational companies' global production network is much more complex than the above-described scheme, influenced by several strategic, technical, political and institutional factors (not least by the entrepreneurial behavior of local subsidiaries, cf. BIRKINSHAW [2000]). Therefore, product diversification into upmarket niches does not necessarily reflect the results of high-road strategies.

Similarly, in the case of automotive components, the shift to increasingly sophisticated products reflects only apparent upgrading (but not necessarily a high-road strategy). In a thorough analysis, PAVLÍNEK et al. (2009) demonstrate the spectacular structural change that has taken place in CEE's automotive component export mix between 1996 and 2006. The share of high value added, technologically sophisticated products (e.g., steering systems, braking systems) has greatly increased at the expense of low value added ones (e.g., wire harnesses, seats, bodies, exhaust pipes, windscreen wipers). The most

[20] Although CEE economies "mainly specialize in the assembly of high-volume, low-end, inexpensive vehicles and engines, they also host the manufacturing of a number of high-end, low-volume niche products." (FRIGANT–LAYAN, 2009, p.16).

spectacular change occurred in Poland and Hungary[21] (a more than eightfold increase – to 33.3 % – in the share of high value added components within total component exports, and a nearly fourfold increase to 58.4 %, respectively) while in Slovakia, the share of high value added components has even decreased slightly within total component export (figure 5, p. 49). Nevertheless, in an era within which highly automated, sophisticated production equipment reduces the knowledge and skill intensities of the production process, changes in the composition of the product mix cannot be regarded as a trustworthy proxy for local high-road integration strategies. Neither the knowledge intensity of local production nor the local value added ratio increases automatically in line with the shift to the production of technologically more sophisticated products.

In a similar vein, in contrast to DOMANSKI et al. (2008) who draw positive conclusions from the fact that selected investors have introduced capital-intensive, advanced technologies in the Polish automotive industries, we do not consider technological level and capital intensity good proxies for local high-road integration strategies, albeit changes therein are somewhat more telling (though they still may refer to industry-specific tendencies and not to the results of local adaptation and skill accumulation).

3.2.3 Local content

Instead, three other indicators can be considered reliable proxies for the assessment of local adaptation and integration strategies: local content; labor productivity; knowledge-, (skill-)intensity of local production. First, in line with PAVLÍNEK et al. (2009), we acknowledge that analysis of import-intensity data or rather the local content of production (as well as changes therein) is indispensable for a reliable assessment of FDI-recipient countries' upgrading performance. However, these latter data are unavailable at the product level. Figure 5 presents industry level import to export data. Note that CEE-Germany bilateral import/export ratios are higher than the average depicted in figure 5, ranging from 76.9 % (Czech Republic, 2008) to 118.1 % (Slovakia, 2008). (The respective figure for Hungary is 80.7 %, for Poland 112.5 % – source: author's calculations based on OECD STAN bilateral trade database).

[21] The relatively low value of this indicator in the Czech Republic (10 %) can be explained by the (already mentioned) fact that in contrast to the export orientation of Hungarian and Polish high value added component manufacturing, high-value added components manufactured in the Czech Republic are assembled into passenger cars within the country (PAVLÍNEK et al., 2009, p. 51). Again, this explanation underlines the necessity of being cautious with conclusions drawn from indicators referring to the composition of or changes in the product mix.

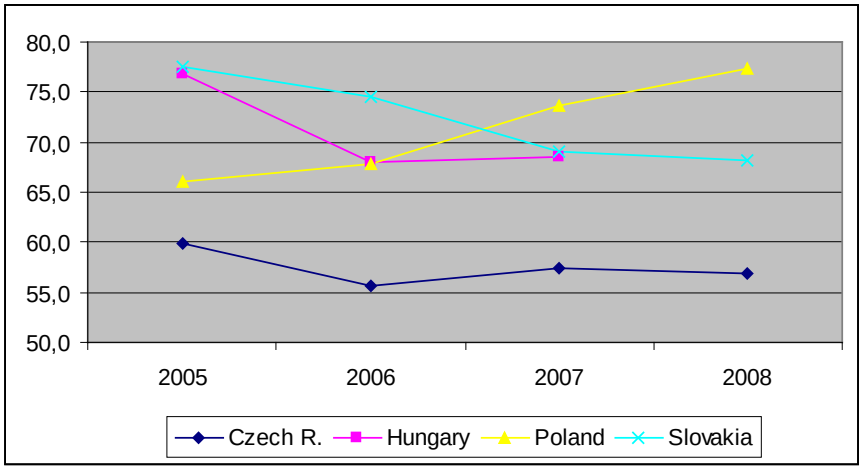


Figure 5: Import over export in CEE's automotive industry (%)

Source: Author's calculations based on OECD STAN bilateral trade database

Table 8 provides industry level import-intensity (import to production) data. Skoda's extensive local supplier base is well reflected by the numbers.

Table 8: Import intensity (import over production) of the TE industry (%), 2008

Czech Republic	40.6
Hungary*	61.5
Poland*	60.0
Slovakia	57.2

Source: Author's calculations based on OECD STAN Database, 2009
* = 2007

For a non-misleading interpretation of the data, it is important to recall PAVLÍNEK et al.'s (2009) arguments. Although the authors develop the argument below based on the case of VW Slovakia, it can be applied to a larger or smaller extent to each major OEM manufacturer operating in a CEE economy.

*„VW Slovakia switched its sourcing strategy from imports of the vast majority of components to local sourcing from its established Western suppliers in order to accommodate an increase in the scale of its car assembly. However, these suppliers in many cases assemble modules from imported components on site rather than manufacture components in host countries … What this means is that high local content does not necessarily translate into strong supplier linkages with domestic companies." (*PAVLÍNEK et al., *2009, p. 54)*

The results of our field investigations[22] support the claim that, irrespective of the value of local content, linkages with domestic suppliers are weak in the case of most automotive companies operating in CEE economies, and this is bound to change very slowly.

[22] The interviewed German company, a first-tier system supplier insisted on not revealing its name.

The interviewed company has been making considerable 'localization efforts'. Out of its 140 suppliers there are on the average 10 new ones each year, partly because of inclusion of new products and partly as a result of localization efforts, when changes in suppliers lead to cost cutting. At the MNC's level only 75 % of procurement is centralized. Similarly to other local facilities, the Hungarian subsidiary has also acquired the competence of purchasing, i.e. carrying out the lengthy formal process of supplier selection, audit, monitoring etc. The results of ambitious localization efforts are however meager from the point of view of Hungarian domestic SMEs. On the one hand, the initially 99 % share of German suppliers has been reduced to 80 % since the establishment of the local subsidiary in 2003. However, the majority of new suppliers are not Hungarian ones but Italian, French and Spanish companies – this is also referred to as localization! The Hungarian subsidiary has one Czech and one Slovakian supplier and three Hungarian ones (though the formal selection and audit process is still going on in the case of five additional Hungarian companies). None of the three Hungarian suppliers are domestic SMEs (there is a Hungarian owned large company and two Hungary-based subsidiaries of a Swedish and a German automotive companies).

Major exceptions include the Czech Skoda (as well as some other non passenger car manufacturing companies as surveyed by (PAVLÍNEK et al., 2009, p. 56), Fiat in Poland, and Suzuki in Hungary – each with relatively strong domestic market orientation, and historical local ties (with the exception of Suzuki, for which investor's country of origin and its European sales orientation forced it to increase local content).

3.2.4 Labor productivity

One of the most telling and easily quantifiable measure of quality upgrading is the increase (and level) of labor productivity. Tables 9 and 10 present the evolution of these indicators in a comparative perspective. It is obvious that countries which started from a comparatively low productivity level showed an above-average productivity improvement during their catching-up process. CEE data also reflect the results of know how transfer and the absorption of modern techniques to increase productivity and quality (e.g., kaizen, continuous development, etc.). Still the gap between CEEs' and advanced EU economies' productivity levels is strikingly huge: with the exception of Hungary productivity levels are below 50 % of the benchmark case (Germany). The gap was too large to be significantly narrowed even after one decade of higher than average productivity growth of the former country group.

Table 9: Value added per employee in the TE industry (EUR '000)

Country	2000	2007	Country	2000	2007
Belgium	60.2	68.9	UK	63.9	85.2
Germany	57.8	84.9	Czech R.	15.1	33.3
France	65.5	72.8	Hungary	31.2	44.3
Italy	45.0	55.6	Poland	13.1	24.9
Netherlands	50.9	100.3	Slovakia	13.4	32.7
Portugal	31.6	31.0	Slovenia	14.5	35.0
Spain	47.0	59.8	Romania	3.9	14.5
Sweden	76.7	70.4	Bulgaria	1.9	8.2

Source: Zoltán Pitti's calculations, based on Eurostat Data Bank data services

Table 10: Comparative levels (Germany = 100) of value added per employee in the TE industry

Country	2000	2007
Czech Republic	26.1	39.2
Hungary	54.0	52.1
Poland	22.7	29.3
Slovakia	23.2	38.6
Slovenia	25.1	41.2
Romania	6.7	17.0
Bulgaria	3.3	9.6
Italy	77.9	65.4
UK	110.5	100.3
France	113.2	85.7

Source : Author's calculations from data made available by Zoltán Pitti

3.2.5 Skill-intensity of local production

As for the skill distribution, table 11 demonstrates that the largest gap between CEE and core EU economies is in terms of the share of high-skilled workers in total employment. The remarkably large values of this indicator in Germany, France and the UK show that although the relocation of low value labor-intensive production has hit the automotive industries of these countries, it has nevertheless prompted the quality upgrading of the workforce, which ensures sustainable competitiveness in the longer term.

For a non-misleading evaluation of the data presented in table 11, analysts have to bear in mind that the content of qualifications may show a large inter-country variation: the skills of employees with tertiary education attainment may be different in different countries, as well as the content of their occupations.

Table 11: Average share of high-skilled, medium skilled and low-skilled workers in total employment of the transport equipment industry (in per cent), 1998-2004

Country	High-skilled	Medium-skilled	Low-skilled
Czech Republic	6.5	84.7	8.8
Hungary	8.0	77.1	14.9
Poland	11.8	82.2	6.0
Slovakia	5.0	90.1	4.8
Slovenia	9.1	66.8	24.1
Portugal	5.2	17.9	76.9
Spain	31.4	20.1	48.5
Germany	20.5	53.5	26.0
Italy	5.8	41.1	53.1
UK	21.3	52.8	25.9
France	20.7	50.5	28.8

Source: LANDESMANN et al. (2009), pp. 16-17

A method to investigate quality changes in the labor input (and thereby qualitative structural upgrading) is to compare the increase of labor services – an indicator that combines both the quality and the quantity of labor as a production input – with that of the pure quantity indicator of labor input (hours worked). *In cases of skill upgrading (i.e., quality changes in employees' skill mix), increases in labor services exceed increases in hours worked*. Similarly, if in a given industry total labor input decreases but in the meantime skill upgrading occurs, the reduction of labor services is inferior to the decrease in hours worked (SZALAVETZ, 2007). Table 12 compares the gap between the increase of labor services and that of hours worked in CEE and advanced economies' automotive sectors. It is interesting to observe the differences between CEE and advanced economies with respect to hours worked. The data do suggest some loss of employment in advanced economies and substantial expansion as a result of the relocation of production in CEE (with Slovenia and Spain as outliers). Nevertheless, in contrast to the expectations, changes in advanced economies' labor composition have not always been significantly larger in advanced economies than in CEE (though France and the UK could boast higher-than-average performance in this respect).

Table 12: Labour services and hours worked (by persons engaged), volume indices, 2007 (1995 = 100)

	Labour services	Hours worked
Czech Republic	150.1	147.2
Hungary	217.6	215.4
Slovakia	166.2	161.3
Slovenia (2006)	93.8	88.7
Spain	120.2	114.3
Germany	102.0	99.4
Italy	95.6	94.0
UK	97.8	89.1
France	97.1	90.3

Source: EU KLEMS Database, November, 2009 release, author's calculations

3.2.6 Local site competence

Beyond the dynamics of labor input quality, qualitative upgrading can be approached by examining the evolution of local subsidiaries mandates (site competence). Are local corporate functions still limited to pure physical processing, or have subsidiary mandates become more diversified, including logistics, purchasing, process engineering, product development and other R&D functions, as well as various other production related services functions?

According to JÜRGENS–KRZYWDZINSKI (2009) there was some broadening of CEE site competence in the automotive sector, however its extent remained quite limited, especially with respect to knowledge intensive, high value adding activities, like R&D.

According to our past and recent interviews, local production facilities are quickly (after inception) assigned auxiliary corporate functions, including HR, accounting, payroll calculation, controlling, customs management etc. Later on, more sophisticated functions, including IT, logistics, inventory management and process engineering are usually also located to the subsidiaries, and expatriates taking part in these processes are called home or sent to other, newly opened subsidiaries.

Other tasks including purchasing and after-sales services may also become to some extent localized – at least this is the main finding of our interview-based investigation. In a continuous effort to save costs, the purchase of selected parts and components is expected to be localized, which reduces not only material costs, but also logistics and transportation costs. Local subsidiaries assume the knowledge-intensive task of supplier selection and audit, which implies substantial learning both from the part of the subsidiaries themselves and from that of local suppliers.

3.2.7 The local research-intensity of local production

As for the cream of production related strategic corporate functions – R&D –, both the number of local R&D facilities is increasing in CEE as well as the depth of the research undertaken by individual R&D units. This is in contrast to JÜRGENS–KRZYWDZINSKI'S (2009) above claim (concerning the limited extent of site competence). In our view, investors do try to profit from local (low cost) engineering skills. If an FDI-recipient country invests in technical (engineering, manufacturing and science) education and in developing local innovation potential, it can quickly profit from the virtuous circle provided by investors' broadening local commitment (cf. BELDERBOS et al. (2009).

In the first phase of integration, engineers in local manufacturing facilities were entrusted only with technical support and process engineering tasks. Later, they could also take part in the design of cars and car parts, the manufacturing of which bring entrusted to the given local subsidiaries.[23] Nowadays nearly all local automotive facilities employ engineers entrusted with process engineering, testing and with other smaller-scale applied (routine) R&D tasks.[24] R&D departments are in most cases co-located with manufacturing facilities. However, although engineers do carry out R&D-type of tasks – in several cases they are not labeled as 'R&D employees' and their departments as R&D department –, formal denomination is often related to specific fiscal incentives tied to R&D activity.[25]

Sizeable automotive R&D activity is rather carried out in stand-alone R&D centers.[26] Investors have gradually recognized that the wage gap between highly skilled engineers and researchers in advanced and in CEE economies is even larger than the gap in the case

[23] One example: At VW Poznan's R&D center in Poland engineers participate in the development of special purpose vehicles (e.g. VW Caddy Tramper, fire brigade cars).

[24] Even Audi, with an evil reputation among Hungarian analysts of having one of the lowest local content ratios and refraining from any expenditures that would contribute to site competence broadening and quality upgrading of its local subsidiary – highly important for Hungary in a quantity term – recently invested into the establishment of a testing laboratory. This evil reputation is to some extent exaggerated: Audi invests considerable amount in local human capital development. One example is the establishment of an "Audi-Faculty" at the Széchenyi University of Győr with an initial investment of EUR 40,000. Academic curriculum includes production technology, aspects of product development, mechatronics etc. (For an overview of automotive companies' investments in human capital development see JÜRGENS-KRZYWDZINSKI, 2009, p. 37).

[25] The interviewed automotive company also employs process engineers: to improve material flows, rationalize the production process etc. Furthermore its project engineers take part in the design of new products, the manufacturing of which the local company will be entrusted. Note, that in most cases the term 'new product' refers to small incremental changes (some new parameters) within the existing product. All changes relating to the process or the products have to be incorporated in the information system: this is the task of local software developers. Nevertheless, this company would answer with 'no' to questionnaires inquiring, whether it carries out local R&D, employs R&D staff, or whether it has an R&D department.

[26] Nevertheless, the claim that co-located R&D and manufacturing implies small-scale applied research, while stand-alone centers carry out prospective, basic research would be oversimplified: Visteon Autopal's (two local) R&D center are located within the premises of its manufacturing facility in the Czech Republic and these centers are the mother company's *European* R&D centers for lighting and air conditioning systems. Similarly, Tenneco's, Wabco's and Valeo's R&D centers in Poland are co-located with the manufacturing facility and they carry out important R&D tasks (PAVLÍNEK et al., 2009). On the other hand both Knorr Bremse and Bosch established stand-alone research centers in Hungary, research tasks carried out there are of a higher level and of a more strategic character than the ones carried out at R&D departments co-located with local automotive subsidiaries.

of blue collar production workers, and investments into local R&D capacity offer good return. In addition to firms' own R&D centers, industry–university relations (i.e., formal research contracts and the existence of automotive-related centers of excellence) should likewise be analyzed to assess the importance and the depth of R&D.

PAVLÍNEK et al. (2009, pp. 51-53) survey the specialization of major CEE automotive R&D and design & technology centers. The authors' 2006 data can be updated by Czechinvest's more recent information (Automotive Industry in the Czech Republic. Czechinvest, 2009). According to both sources, the Czech Republic hosts the largest number of automotive R&D and technology centers, which can be explained by a strong local engineering tradition and a high tertiary enrolment in engineering and manufacturing studies. There are nine automotive-related faculties in the Czech Republic. The most notable research co-operations include the Josef Bozek Research Center of Automotive technology at the Czech Technical University and the Jan Perner Transport Faculty at the University of Pardubice. The former center focuses on thermodynamics, aerodynamics, turbocharging and supercharging of engines, emissions reduction, etc. Its industry partners include Bosch, AVX, Cadence and the like. The main research areas of the latter center are driving dynamics/stability; tire properties, etc., with industry partners including, among others, Skoda and Continental Teves.

As for Poland, DOMANSKI–GWOSDZ (2009) present data on the increasing importance of local R&D and the expansion of automotive technology centers, the most notable being Delphi Corporation's center in Cracow.[27] The authors' data can be complemented and updated by the Polish Information and Foreign Investment Agency's most recent figures. According to their data, in addition to the above-mentioned facility, major R&D centers include Wabco's center in Wroclaw, where engineers are engaged in the development of pneumatic braking systems and suspension parts and Valeo's center in Skawina, focusing on the development of engine cooling systems. Furthermore, several investors have established product related incremental development facilities (TRW: seatbelts and airbags; Remy Automotive: starters and alternators; Tenneco: exhaust systems, etc.).

When describing the Hungarian situation with respect to automotive R&D, analysts usually mention some individual outstanding cases which conceal an overall meager performance with respect to local R&D. The fist case usually mentioned is Knorr Bremse's commitment to local basic research. It established a stand-alone research center in Budapest employing currently 120 researchers who develop software and brake control systems. Knorr Bremse's local R&D activity (see details in SZALAVETZ, 2000) can really be labeled home-base augmenting (KUEMMERLE, 1997). Furthermore, the company has large-scale joint R&D projects with Budapest University of Technology and Economics (BUTE) and cooperates with five additional Hungarian tertiary educational institutions. Knorr Bremse's manufacturing facility in Kecskemét also employs engineers entrusted with the design and technical support of electro-pneumatic brake systems.[28] Another significant stand-alone R&D center is that of Robert Bosch (its Budapest Engineering Center), which focuses on software development and product development.

[27] The main research areas include software development, electric solutions for vehicle control systems, and suspension solutions.

[28] Knorr Bremse expands its local activities even at time of crisis, its Rail System Division is in the process of building a new manufacturing facility in Budapest.

Hungary has two automotive-related, university-based centers of excellence: the Advanced Vehicles and Vehicle Control Knowledge Center[29] at BUTE, and the Regional University Knowledge Center for the Vehicle Industry (JRET) at Széchenyi University in Győr, with industrial consortium partners including Rába Axle Manufacturing Ltd.; Schefenacker Automotive LP. (currently Visiocorp LP.), and Borsodi Műhely Ltd. This list shows that other than a few outstanding cases, there are other companies, even Hungarian owned SMEs, that are engaged in automotive R&D. These two centers are the main drivers of regional innovation efforts in the automotive industry. Nevertheless, these research efforts remain below a critical mass[30] which would allow for attractive individual scientific results, which however remain too sporadic to push the Hungarian automotive sector on a knowledge and innovation-driven, high-road development path.[31]

4. Policy measures to promote expansion and quality upgrading in the CEE automotive industry

Throughout the history of the 'industry of industries' (as DRUCKER, 1993, p. 176 labeled it), the catalyzing and promoting role of the state has always been indispensable, irrespective of time, economic thinking and the geography of production.

In the FDI-driven restructuring, expansion and upgrading of the CEE automotive industry, the primary role of the state was to attract investors. The main channels of early state intervention were privatization and investment promotion. Early movers (in terms of opening) and countries whose automotive actors have had historical ties with western automotive producers were particularly successful in attracting frontrunner investors. By the end of the first decade of transformation, locational competition for automotive investment among CEE economies has considerably intensified, and governments offer increasingly generous investment incentives in order to capture additional investments.

In fact the mentality of CEE governments, even those of the relatively most advanced economies, is still one-sided; most incentives are aimed at attracting new investors rather than at improving the upgrading potential of existing facilities. This is understandable since the establishment of a new manufacturing site is an easy-to-document political achievement, while the increase of the local innovation potential and/or the augmentation

[29] Beyond Knorr Bremse, industrial consortium partners include ThyssenKrupp Presta (this company itself has a stand-alone development center in Budapest specialized in the development of steering systems), Inventure Automotive Electronis R&D Inc. (a Hungarian-owned private automotive R&D firm), a Hungarian consultancy company (Informin.Hu Ltd.) specialized in automotive-related IT solutions and TÜV-NORD KTI Ltd. established by the German TÜV Nord Group and the Hungarian Institute for Transport Sciences.

[30] State's support together with consortium partners' own contribution at JRET amounted to ~ EUR 2 million in 2008. (Source: JRET's Annual Report).

[31] Although the automotive sector in the Czech Republic features R&D outlays that are nearly by an order of magnitude larger than the ones of Hungary (see table 6), it is still far from a par excellence high-road strategy as well.

of automotive-related graduates' number and skills as a result of sizeable investments in research and education are difficult to measure; positive consequences are not immediate.

The first measures that went beyond promoting the expansion of automotive production through new investments were aimed at increasing automotive subsidiaries' local embeddedness, that is at promoting the integration of local SMEs into subsidiaries' production networks. There were several programs aimed at improving suppliers' capabilities and developing linkages between foreign firms and domestic suppliers. Programs supported the establishment of electronic data interchange and corporate information systems at SMEs, their acquisition of the necessary quality control certificates, the marketing of their products and capabilities and the like. Some of the supplier programs even supported existing or potential suppliers' investment into technological upgrading. SMEs were also granted support in the frame of export promotion or job creation. Similar programs were decided upon in practically all CEE economies. A common feature of these programs is that they do not specifically target the automotive industry, with programs instead formulating horizontal objectives (job creation, export promotion, development of supply capability, human capital development etc.).

Recently, in line with similar efforts in advanced economies, however, CEE economies try to identify 'strategic industries' in the case of which industry-specific development policies are acceptable alongside to horizontal ones. The automotive industry figures in each country's list of strategic industries, which makes targeted developmental interventions possible, include such things as negotiations about the specific requirements of selected large automotive investors and the formulation of support schemes.

A related targeted policy effort is investment into industry-specific human capital. Surveys have identified increasing skill gaps, which hinder both the expansion and the upgrading of the industry. Improvement of technical education (engineering and manufacturing faculties as well as secondary level educational institutions) has therefore been recognized as indispensable, as well as the targeting of students into the given educational institutions instead of the ones that are specialized in related occupations (especially in Hungary, where the gap between observed and required education is one of the largest in CEE – cf. SZALAVETZ, 2010).

A skill formation initiative bound to become best-practice is the pilot automotive education center scheme in Slovakia (there are already 13 centers in Slovakia). The Automotive Industry Association of the Slovak Republic and the Slovakian Association of Dealers and Motor workshops provide professional expertise and contribute to the upgrading of existing secondary educational institutions' curriculae according to potential automotive employers' requirements.

A further policy objective aimed at the upgrading of local subsidiaries was to increase the local research-intensity of local production. This coincided with automotive investors' aim at decentralizing at least routine R&D tasks. Demand-oriented measures aimed at encouraging local R&D activity, specifying R&D-related tax allowances, additional tax deduction possibilities etc. However, the bulk of R&D-oriented measures targeted supply and supported existing research centers engaged in automotive-related research. As for Hungary, several policy measures were adopted in the 2000s seeking to increase university commitments to engage in industrially relevant applied research, commercialize

technological findings and enhance industry-academia collaboration (for an overview of the programmes see HAVAS-NYÍRI, 2007). Cooperation-based research centres (CRCs) and regional university knowledge centres (RUKCs) were established with the government's financial support. Funding was allocated to co-finance industry-university research programmes. Investment into universities' R&D infrastructure also received financial assistance.

Finally, a key automotive-related support mechanism targets clusters, i.e. geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions in particular fields that both compete with each other and co-operate (PORTER, 1998). Clustering tendencies and cluster policies in CEE automotive industry are detailed in SZANYI'S (2010) paper prepared in the frame of this project.)

5. After-crisis perspectives

Although dependence on TNCs' activity and the automotive sector's GDP share (i.e., the dependence of the business cycle on the performance of the automotive sector) is the highest in Slovakia, the plunge in the automobile sector that accompanied the global financial crisis and the consecutive recession was one of the strongest in Hungary within the CEE region; demand shrunk particularly rapidly.

In 2008, new car sales fell by 10.4 % to 158,628 – according to the statistics of the Hungarian Association of Vehicle Importers. Demand continued to fall sharply in the 2009. Table 13 shows a cross-country comparison for the first half-year results.

Table 13: Falling new car sales in the CEE region

Country	H1 2009	H1 2008	Difference	% Change
Poland	168,888	168,645	243	0.1%
Czech Republic	85,608	93,765	-8,157	-8.7%
Romania	70,612	144,988	-74,376	-51.3%
Slovakia	45,728	44,118	1,610	3.6%
Slovenia	29,446	39,070	-9,624	-24.6%
Hungary	39,613	82,003	-42,390	-51.7%

Source: www.just-auto.com

The crisis of the sector proved particularly strong in Hungary, because governments in other countries (e.g., in the Czech Republic, Slovakia,[32] Romania) have launched car scrapping bonus schemes to lift the market and help the auto industry recover (OECD, 2009). Because of its large budget deficits, Hungary could not afford this type of intervention.[33] As a result, around 110-120 car showrooms have been forced to close so far this year out of a total 600 nationwide. Overcapacity[34] forced local manufacturers to cut working hours (some of them like Audi decided on shorter or longer production halts), and many of them introduced four-day-week shifts. Despite substantial layoffs, no major divestment has occurred thus far.

Overcapacity problems emerged of course not because of declining *local* sales. Up until the crisis, local sales showed little correlation with local production (the crisis has only apparently increased the value of this indicator). In contrast, local production shows strong correlation with local GDP – note that "automobile and business cycles usually move in line with each other" (OECD 2009, p. 109).

In this respect, countries with relatively low GDP levels and thereby a higher 'automotive industry value added over GDP' indicator are harder hit by the collapse of the automotive market. Consider a recent news post on the Slovakian situation: "A fall in car production in local plants run by Volkswagen, PSA Peugeot Citroen and Kia Motors - now seen as the engine of the local economy – of 10.1 percent year on year in October, after a 19.1 drop in September, contributed to a 3.8 % overall dip in Slovakia's industrial output." (SLOVAKIA: Car output fall contributes to industrial dip, 8th, December, 2009, www.just-auto.com)

Although a rebound in car sales is likely in the medium run in selected advanced economies (OECD, 2009), medium-term projections do not foresee a rapid recovery in the Central and Eastern European automotive sector. Quoting the findings of CSM Worldwide Automotive Forecasting, BURSA (2009) claims that it will take more than half a decade for CEE car production to recover to pre-recession levels. Amidst a massive shakeout of the sector with large-scale global mergers and acquisition deals and further streamlining of the production, CEE economies will gradually lose their cost competitiveness – especially new EU member states. In this latter country group, wage increases are bound to erode the attractiveness of the locations.

Table 14 quantifies the increase of labor costs (measured by average gross earnings) in selected CEE economies.

[32] The total amount spent on scrapping schemes in Slovakia was EUR 55.3 million in 2009. 44,200 cars with an average age of 21 years were scrapped. Up to 30 May 2009 31589 cars with subsidy from this scheme were sold or ordered (OECD, 2009, table 2.3)

[33] Furthermore, Hungary's rocketing consumer credit stock denominated in foreign currency aggravated the crisis. Recession was accompanied by a sharp currency crisis at the end of 2008, early 2009 in Hungary. The Hungarian Forint weakened rapidly which increased consumers' debt burden.

[34] According to the most recent Commission Staff Working Document (Commission, 2009, p. 9) substantial investments in capacity in Central and Eastern Europe have created sizeable overcapacity. Whereas capacity utilization in previous years was around 80%, it has dropped to 65% at the beginning of 2009.

Table 14: Average monthly gross earnings (MGE) and increases over preceding year, 2008

Country	MGE (EUR)	% change 2008/2007
Bulgaria	267	21.4
Czech Republic	969	24.1
Hungary	791	7.5
Poland	856	20.45
Romania	472	11.8
Slovakia	698	17.3
Slovenia	1,398	8.8

Source: BURSA (2009), p.11

Although wages (except Slovenia) are still much lower than in old EU member states, both the shakeout of the industry and the slowly converging wage levels will prompt CEE countries to accelerate their quality upgrading efforts and their switch to a high-road strategy. As for Hungary, its present switch to "survival mode" - according to which both innovation financing and regional cluster-based development are subordinated to the objective of improving the fiscal position – hinders local actors' entrepreneurial moves upwards along the value chain.

Since the dominant trend in the geography of production is regional integration (STURGEON AND VAN BIESEBROECK, 2009) and only some segments are global, overseas locations with lower operating costs are still not likely to capture the production tasks from CEE economies with the coming reconfiguration of the existing geographical division of labor. Within Central and Eastern Europe, however, major shifts of production are likely, from relatively high labor-cost locations to the lower ones.

Relocation of labor-intensive, low value added component production (e.g., wire harnesses) from Central Europe to relatively backward low-cost Eastern locations will be accelerated by increasing labor scarcity (especially in Hungary, the Czech Republic and Slovakia), which at present hinders existing investors' further local expansionary moves. In the future, this can already influence decisions to relocate production.

Consider the analogous example of Spain and to a lesser extent that of Portugal. Following a period of growth and successive efficiency-seeking foreign investments, both countries experienced massive losses (i.e., the relocation of car components production and import orders mainly by German investors & car manufacturers whose outsourcing moved to the newly opened CEE facilities (JÜRGENS–KRZYWDZINSKI, 2009).[35]

Although in-depth analyses suggest that the dynamics of location decisions within the automotive sector are quite complex and cannot be simply described as 'from the north and west towards the south and east',[36] and later: 'from the east towards further to the east', since several recent examples of location decisions point to the opposite sense (PRIES–

[35] According to the cited authors, the share of CEE in German automotive component imports rose from 9 percent to 37 percent between 1995 and 2005 (JÜRGENS–KRZYWDZINSKI, 2009, 32).

[36] Include also the moves from the south (i.e. the southern periphery of advanced Europe) to the east, i.e. to the advanced eastern (Central European) periphery.

DEHNEN, 2009), these general structural shifts in the geographical division of labor are likely to continue. Furthermore, even some North African countries could challenge CEE's assembly position in the near future (DOMANSKI–LUNG, 2009). Neither Hungary nor other, relatively high-cost CEE locations should try to withstand these tendencies. Instead, efforts to accelerate quality upgrading ought to be increased and local suppliers' ambitions to establish linkages with regional production clusters promoted.

6. Conclusions

In this paper we have explored the contribution of the automotive industry to the structural upgrading and modernization of the CEE economies. We found that the surveyed economies could benefit spectacularly from their cost-based competitiveness and have accomplished non-trivial FDI-driven structural upgrading. They all experienced a dynamic expansion of production, export and employment in the automotive industry.

Despite non-negligible policy efforts and irrespective of the fact that local actors have all stepped on the path of slow quality upgrading, the CEE automotive industry – with some country-specific variations – has been stuck in cost-based competition. Local actors have been slow to develop dynamic capabilities that would allow them to enter into dynamic competition conducted in non-price terms. Local research resources have remained fragmented.

In the automotive industry, there is limited opportunity for autonomous development in the sense of HOBDAY'S (1994) "climbing the ladder of technological complexity" model.[37] Nevertheless, *within* TNCs' global production networks, there is sizable opportunity to increase local value added, local content, local productivity, local subsidiaries' site competence, and last but not least the knowledge-intensity of local production. This presumes, however, the development of dynamic localized capabilities (DOMANSKI–GWOSDZ, 2009), which actors in CEE were slow to develop.

This claim needs some further clarification in order to avoid charges of oversimplification. Local actors were successful in understanding, assimilating and applying new technologies and knowledge transferred by their TNC owners. Their *technological learning and absorption capability* proved impeccable. On the other hand, they were not required to

[37] According to HOBDAY'S (1994) „stages of technological capability accumulation" model, autonomous development implies the acquiring and upgrading of technical and engineering skills in the course of original equipment manufacture (OEM). While local subcontractors manufacture complete, finished products following the exact technological specification of the buyer (often their transnational corporation owner), they assimilate and improve existing technology (process engineering). The next stage is marked by the acquiring of design capabilities and the shift from OEM to ODM (own design manufacture). While ODM implies minor product development skills, in the next, OBM stage (own brand manufacture: the most advanced stage of technology recipient firms' capability development), local firms become capable to carry out R&D activities for new product or process innovation. They assume all production related corporate functions, market their own brands autonomously and compete head on with established lead producers.

develop *technology acquisition capability* (identification, selection and acquiring of appropriate technologies), as in most cases, embodied technology was identified and selected either by their owners or contractors.

What local actors were weak at, does not fit in the taxonomy of the 'technological capabilities' literature (e.g. BELL–PAVITT, 1993). According to this taxonomy, the missing element in CEE actors' upgrading would be the transformation and the exploitation capabilities of the transferred technology (i.e., new product development, organizational and marketing innovations). Nevertheless, the most advanced stage of this taxonomy cannot be applied to CEE automotive actors. While this type of development may be possible in certain electronics industries in specific South-East Asian economies, it is very rare in the automotive sector and requires not only huge developmental interventions by the state, but also huge domestic markets like those in China and India. Without *both* of these preconditions, national automobile projects end up failing and must be dropped.[38] CEE economies have neither the economic wherewithal nor sufficiently large domestic markets to establish and sustain indigenous, autonomous automotive industries – not even the upstream parts of it (i.e., automotive supplier industries). Only through the value chains of established transnational players can they enter into international markets.

Therefore, the dynamic capabilities local actors were slow to develop can be described rather in terms of quality upgrading and position improvement within the TNC owners' networks, mainly through the broadening of site competence (subsidiary mandates).

Local subsidiaries' capability accumulation can in principle be stimulated through partnerships between TNCs and government agencies, if these latter elaborate well-designed incentives that increase TNC commitment to local quality upgrading. However, government agencies in most countries refrained from becoming collaborative facilitators of existing subsidiaries' quality upgrading and considered the number of newly attracted FDI ventures the only indicator of success.

Drawing upon its long-standing engineering and automotive tradition, well-designed privatization and FDI-promotion policies and the systematic development of local design, technological support and R&D capabilities, the Czech Republic is unique in its ability to switch to a partially knowledge-driven growth path in the automotive sector in the medium term. Even in the Czech case, the relatively outstanding local research efforts may remain below the critical mass for such a switch. Other CEE economies will have to contend with individual outstanding R&D achievements and small (in terms of the volume of research expenditures) university-based automotive centers of excellence which are unable to ensure sustained regional innovation.

[38] cf. WAD'S (2009) comparison of the Thai and the Malaysian automotive industries that have been pursuing different integration strategies: integration through foreign MNCs' value chains versus a national champion policy.

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