



**THE GERMAN AUTOMOBILE INDUSTRY AND CENTRAL
EUROPE'S INTEGRATION INTO THE INTERNATIONAL
DIVISION OF LABOUR: FOREIGN PRODUCTION, INTRA-
INDUSTRY TRADE, AND LABOUR MARKET REPERCUSSIONS**

PETER NUNNENKAMP

Kiel Institute for World Economics

nunnenkamp@ifw.uni-kiel.de

ABSTRACT:

Industrial relations in the German automobile industry are tense. The economic transformation of Central European countries has resulted in significantly increased competitive pressure, even though this industry is relatively technology and human-capital intensive and, thus, represents a traditional manufacturing stronghold of advanced countries such as Germany. Especially for low skilled production workers, the competition from Central Europe has intensified pressure on relative wages and impaired employment opportunities. For the industry as a whole, there is no reasonable alternative to innovation and specialization according to comparative

cost advantages. Specialization will help secure employment and income opportunities for skilled workers, but it offers little relief to low skilled workers. Moreover, wage restraint will provide only part of the solution for low skilled workers in the German automobile industry. Unless they succeed to improve their level of qualification, the employment and income prospects of this part of the labour force can be expected to deteriorate.

Key words: German automobile industry, Central European countries, competition, intra-industry trade, labour market.

LA INDUSTRIA AUTOMOBILÍSTICA ALEMANA Y LA INTEGRACIÓN DE LA EUROPA CENTRAL EN LA DIVISIÓN INTERNACIONAL DEL TRABAJO: PRODUCCIÓN EXTRANJERA, COMERCIO INTRAINDUSTRIAL Y REPERCUSIONES PARA EL MERCADO LABORAL

RESUMEN:

Las relaciones en la industria del automóvil alemana están tensas. La transformación económica de los países de la Europa Central ha derivado en una creciente presión competitiva a pesar de tratarse de un sector relativamente intensivo en tecnología y capital humano y que, por tanto, constituye una de las fortalezas de las que tradicionalmente han hecho gala los países avanzados como Alemania. Para al menos una parte de la fuerza de trabajo de la industria automovilística alemana existen razones para estar preocupados por el deterioro de las perspectivas de ingresos y de empleo en el sector. Especialmente para los trabajadores de menor cualificación, la competencia de la Europa Central ha intensificado la presión a la baja sobre los salarios relativos y ha empeorado las perspectivas sobre las oportunidades de empleo. Para la industria en su conjunto, de acuerdo con las ventajas comparativas no hay más alternativa razonable que la innovación y la especialización. La especialización ayudará

a asegurar la oportunidades de empleo e ingresos para los trabajadores cualificados, pero ello supone un escaso consuelo para los trabajadores de menor cualificación. Más aún, la moderación salarial constituye únicamente una solución parcial para éstos últimos; a menos que consigan mejorar su nivel de cualificación, las perspectivas de ingresos y empleo para esta parte de los trabajadores de la industria del automóvil irán previsiblemente deteriorándose.

Palabras clave: industria automovilística alemana, países de la Europa Central, competencia, mercado laboral.

Teléfono 91-3942404

Fax 91-3942499

Dirección postal

Papeles del Este.

Departamento de Economía Aplicada I. Pabellón de 2º Curso.

Universidad Complutense de Madrid. Facultad de Ciencias Económicas y Empresariales.

Campus de Somosaguas. Pozuelo de Alarcón. 28223 Madrid. España.

Correo electrónico

Información general: papeles@ccee.ucm.es

Administrador de Web: papeles@ccee.ucm.es

THE GERMAN AUTOMOBILE INDUSTRY AND CENTRAL EUROPE'S INTEGRATION INTO THE INTERNATIONAL DIVISION OF LABOUR: FOREIGN PRODUCTION, INTRA-INDUSTRY TRADE, AND LABOUR MARKET REPERCUSSIONS

PETER NUNNENKAMP

Kiel Institute for World Economics

nunnenkamp@ifw.uni-kiel.de

I. INTRODUCTION

Industrial relations in the German automobile industry are tense. This appears to be largely because of competitive pressure stemming from Central European countries. Automobile assemblers as well as autoparts producers press hard for labour cost reductions which they deem necessary for Germany to defend this traditional manufacturing stronghold:

- In return for DaimlerChrysler's promise to secure the jobs at its Mercedes car plant in southern Germany for eight years, the workers and their trade union agreed to wage restraint and longer working hours for part of the labour force in July 2004.

- Opel, the German subsidiary of General Motors, decided in mid-2004 to locate part of its Zafira production in Gliwice, Poland, even though the assembly line at the company's headquarter in Rüsselsheim had considerable spare capacity. The decision was based on a comparative analysis that revealed strong competitive advantages of the former location. The next blow came when General Motors demanded from its European subsidiaries, notably from Opel, to cut thousands of jobs.

- At the same time, Volkswagen threatened to lay off about 30.000 workers in Germany unless workers agreed to a wage freeze and a cost reduction of 30 percent by 2011. For newly recruited workers in the production of VW minivans, an agreement on more flexible working hours and lower wages had already been concluded in 2003.

- Low-wage competition from the neighbouring Czech Republic notwithstanding, BMW decided to build its new production site in Saxony. However, Bosch, a major supplier of autoparts, revealed plans to relocate further 800 workplaces to the Czech Republic; the affected workers in Lyon, France, accepted

longer working hours, without extra pay, to prevent this move. Other autoparts suppliers such as Continental, a producer of tyres, demand to extend working hours in Germany in order to reduce labour costs.

Similar developments can be observed in other industries. Yet the automobile industry offers a particularly interesting example to trace the fiercer competition of Central European countries as well as the production, trade and labour market repercussions for traditional locations such as Germany. In contrast to declining or stagnating industries such as clothing, steel or shipbuilding, the automobile industry in Germany continues to play a significant role. In recent years, employment in the production of automobiles and autoparts accounted for 12 percent of employment in the manufacturing sector, and the industry's contribution to investment in manufacturing exceeded 20 percent (VDA b, 2004: 352). Spatz and Nunnenkamp (2002a) show that the German automobile industry performed better than the manufacturing average in terms of employment generation and average wage payments in the 1980s and 1990s. The contribution of exports of road vehicles (SITC 78) to Germany's total exports of manufactures increased from 18.5 percent in 1993 to 23 percent in 2003 (OECD 2004).¹

Industry representatives stress several "signs of strength" of the German automobile industry, especially with regard to assembly operations (VDA 2004a): 2003 marked the sixth year in a row with domestic passenger car production exceeding five million units. At the same time, employment increased and the industry exceeded expectations by exporting an unprecedented number of 3.7 million passenger cars. Since 1992 the exports of automobiles have increasingly surpassed the number of imported automobiles (Nunnenkamp 2004); only Japan and France exported more automobiles than Germany in 2003 (VDA a, 2004: 352). Germany's share in world production of passenger cars, exceeding 10 percent in 2003, was four times the combined share of six Central European countries (Czech Republic, Hungary, Poland, Romania, Slovak Republic, and Slovenia) (VDA a, 2003: 345). The Central European countries are not even listed in this source as major exporters of automobiles.

Nevertheless, the subsequent analysis will show that the economic transformation of Central European countries has resulted in significantly increased competitive pressure. There is reason for at least part of the workforce in the German automobile industry to be concerned about impaired employment and income prospects.² The analytical framework underlying the proposition of labour market repercussions of automobile production by German companies in Central Europe is summarized in Section II. Section III indicates that the relocation of assembly operations affects domestic production by inducing more imports of automobiles and, possibly, also by reducing the growth of exports from the German home base. Section

IV deals with competitive pressure stemming from outsourcing of automotive inputs. Labour market effects are discussed in Section V. We conclude that, even in relatively technology and human-capital intensive segments of manufacturing such as the automobile industry,³ the economic transformation of Central Europe has significant labour market repercussions in more advanced EU countries such as Germany.

II. ANALYTICAL BACKGROUND

Based on standard theoretical models on the distributional effects of the liberalization of trade with, and foreign direct investment (FDI) in lower-income countries, the integration of Central Europe into international production and sourcing networks can be expected to negatively affect the labour market situation of relatively low skilled workers in high-income countries such as Germany (Spatz and Nunnenkamp 2002b: 477).⁴ The recent literature on the motives and effects of FDI offers further insights which help analyse the labour market repercussions of automobile production in countries with relatively low per-capita income. Marin et al. (2003) argue that the wage and employment effects of outward FDI by economically advanced countries in lower-income countries, e.g., in Central Europe, depend on the type of FDI :

- Companies undertaking horizontal FDI produce the same goods and services in their home country and in the host countries.⁵ This type of FDI is often motivated by trade barriers, transportation costs and other transaction costs that discourage exports (Carr et al. 2001). FDI is a means to avoid such costs. Horizontal FDI is driven by market considerations. That is why this type of FDI is also known as market-seeking FDI (e.g., UNCTAD 1998: 91).

- Companies undertaking vertical FDI fragment the production process geographically and locate specific stages of the value chain in countries offering the relevant cost advantages.⁶ This type of FDI is motivated by cost considerations. Investors make use of varying factor endowments and differences in factor prices across countries (Zhang and Markusen 1999). FDI of this type is also known as efficiency-seeking FDI (UNCTAD 1998: 91).

According to Marin et al. (2003), wage inequality or unemployment in economically advanced economies will increase if outward FDI is of the vertical type. This is because the investor relocates the relatively labour intensive stages of production to low-income countries, thereby reducing the demand for unskilled workers in the home country. Unless unskilled workers agree to lower relative wages, they will face deteriorating employment opportunities. By contrast, these authors do not expect horizontal FDI to have effects on wage inequality or employment opportunities in the advanced country.

However, the differentiation between horizontal and vertical FDI is not as clear-cut as it might appear at first sight. On the one hand, the labour market implications of vertical FDI depend on whether the cost reduction associated with such a strategy results in an overall expansion of the investing company, including complementary operations at home (Becker et al. 2004). On the other hand, FDI appears to be horizontal if automobile companies engage in assembly operations in foreign countries and the same final good, namely finished cars, is produced at home and abroad. Yet, under certain circumstances, this engagement may be motivated by cost considerations and can, thus, have labour market repercussions at home. For instance, this may be the case if the automobile company produces higher quality cars at home, but relocates the production of models serving the lower segment of the market to countries offering cost advantages in the assembly of such cars. Even FDI undertaken for the assembly of cars that are similar to those assembled at home can be considered vertical in nature as long as technology intensive and human-capital intensive activities such as the design and development of cars are concentrated in the relatively skill-abundant home country.⁷

In the literature, the composition of sales by the foreign affiliates of multinational companies has been used as a criterion to reveal the type of FDI (Hanson et al. 2001; Marin et al. 2003). FDI is considered horizontal if foreign affiliates sell their output (almost) exclusively in the host country. By contrast, a high share of affiliate sales destined for markets other than the host country is taken as an indication of vertical FDI. Especially if a substantial share of the output of foreign affiliates is exported back to the home country of the investor, the foreign engagement of this investor can be regarded as vertical.

As concerns the engagement of German automobile companies in Central Europe, recent models of vertical and horizontal FDI offer several arguments to expect labour market repercussions in Germany, even though market considerations are typically shown to be important in surveys on FDI in Central Europe (Lansbury et al. 1996: 104). The motive for horizontal FDI to avoid high trade and transaction costs associated with exporting from the German home base should be of minor importance for serving Central European markets.⁸ These markets are fairly close to the home base of German investors (i.e., transportation costs are relatively low), and the protection of these markets is rather weak as trade costs resulting from import barriers have been removed since various countries prepared for EU membership.⁹ Moreover, Central European markets for (new) automobiles are relatively small compared to the German home market.¹⁰ This limits the potential to exploit (plant-level) economies of scale in assembly operations located in Central European countries, which, in turn, should reduce the incentive to engage in horizontal FDI (Carr et al. 2001).

On the other hand, different factor endowments and factor price differentials between Germany and Central Europe, in combination with low trade costs and geographical proximity, provide incentives to undertake vertical FDI in this region. Yet, Central Europe tends to be better endowed of relatively skilled labour than many developing countries. According to Zhang and Markusen (1999: 237), the case for vertical FDI no longer exists if “countries become extremely different”, i.e., sufficiently skilled labour being so scarce in the potential host country that multinational companies will find it difficult to hire local staff such as technicians and administrative employees. Likewise, vertical FDI is supposed to depend on the host country meeting minimum standards with regard to power supply, transport and telecommunication infrastructure as well as legal institutions. In contrast to many developing countries, it can safely be assumed that Central European countries fulfil these basic requirements for vertical FDI to take place.

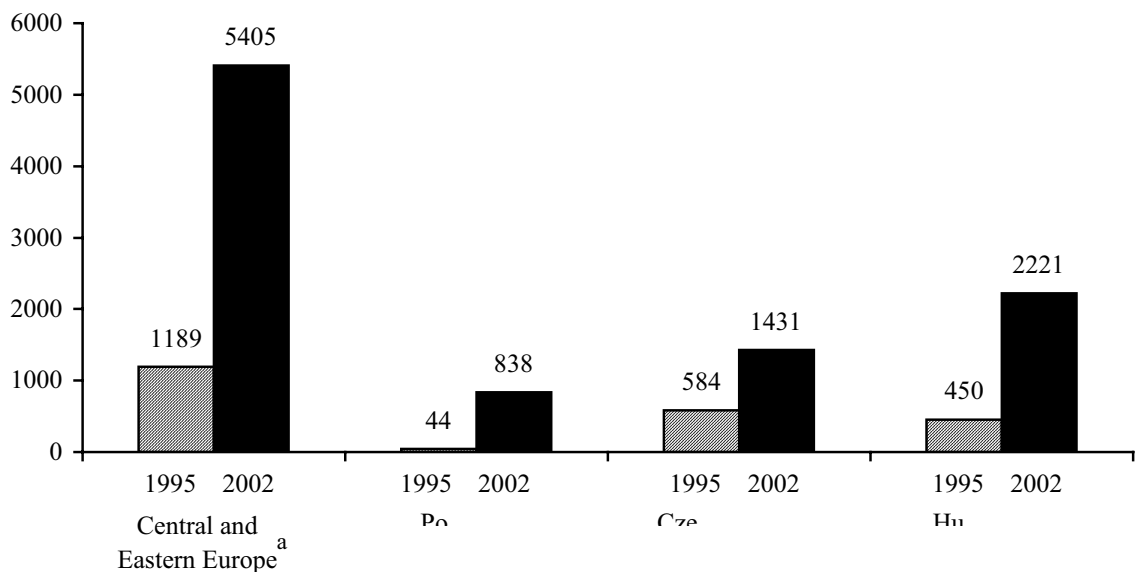
Finally, the expectation of labour market repercussions of the German automobile companies’ engagement in Central Europe is based on previous empirical studies on FDI in this region. The estimation results of Carstensen and Toubal (2003) indicate that both types of FDI exist in Central Europe. These authors find a robust and strong impact of the market potential of host countries on FDI. However, market considerations explain only partly the motivation of multinational companies to invest in the region; relative unit labour costs are also shown to exert a significant influence on FDI. Marin et al. (2003) show that the affiliates of German companies in the machinery and transport equipment sector of Central and Eastern European countries deliver almost 40 percent of production to their German parents, which, according to Hanson et al. (2001), is a clear indication of vertical FDI.

III. CAR ASSEMBLY IN CENTRAL EUROPE AND SUBSTITUTION EFFECTS IN GERMANY

The regime change in Central and Eastern Europe, the region’s opening up to world markets and, in particular, the accession of various countries to the EU promised not only new markets and export opportunities for German automobile producers, but also offered profitable investment opportunities.¹¹ As argued in the preceding section, concerns that automobile production by German companies in Central Europe has labour market repercussions at home are reasonable if host countries are integrated into corporate networks by means of vertical FDI. Data limitations prevent us from clearly identifying the type of FDI in Central Europe. Nevertheless, the evidence we present in this and the subsequent section suggests that the activities of the German automobile industry in this region are not restricted to horizontal FDI.

FDI by the German automobile industry, including autoparts, in Central and Eastern Europe has gained considerable momentum. According to Bundesbank data, FDI stocks soared almost fivefold since 1995 to € 5.4 billion in 2002 (Figure 1). Since the late 1990s, Central and Eastern Europe has hosted higher FDI stocks than Latin America, which had traditionally been the preferred investment location of the German automobile industry outside the advanced OECD area. Hungary, the Czech Republic and Poland accounted for more than 80 percent of FDI stocks in the region in 2002.¹² FDI stocks held by the German automobile industry in Hungary exceeded those in China, even though automobile multinationals consider China to be the most promising market and are eager to build or acquire production capacities there.

Figure 1: Automobiles and Parts Industry: German FDI Stocks in Central and Eastern Europe (million €)



^aIncluding former USSR; for list of included countries, see the source.
Source: Deutsche Bundesbank (2004).

Buch et al. (2003) show that the market size of host countries has a relatively large impact on FDI in the automobile industry. Market opportunities have been a driving force of FDI in Central Europe, too. Bechert and Cellarius (2004) note that “the great majority” of local employees of German subsidiaries in Central and Eastern Europe “are also involved in production that is intended for local markets.” Sturgeon and Florida (1999: 53) find “a large measure of convergence toward building vehicles where they are sold.” In contrast to China and Latin America, however, the

attractiveness of Central Europe is not restricted to local markets. At the same time, Central Europe has emerged as an export platform for German automobile producers.¹³ Production and trade data for passenger cars (units) indicate that the character of German FDI in Central Europe differs from that in China and Latin America (Table 1).

Table 1: Passenger Cars: Foreign Production by German Companies and German Imports and Exports, 1990–2003 (1000 units)

	Central Europe ^a			China			Brazil and Mexico		
	prod.	imp.	exp.	prod.	imp.	exp.	prod.	imp.	exp.
1990	0.0	11.0	6.6	0.0	0.0	2.8	425.8	1.3	1.1
1996	240.1	68.9	126.2	226.4	0.0	4.0	735.0	6.9	11.9
2002	782.4	261.6	100.7	437.6	0.3	22.9	799.8	24.0	33.9
2003	733.9	270.6	115.8	624.8	3.5	44.2	716.4	45.5	28.4

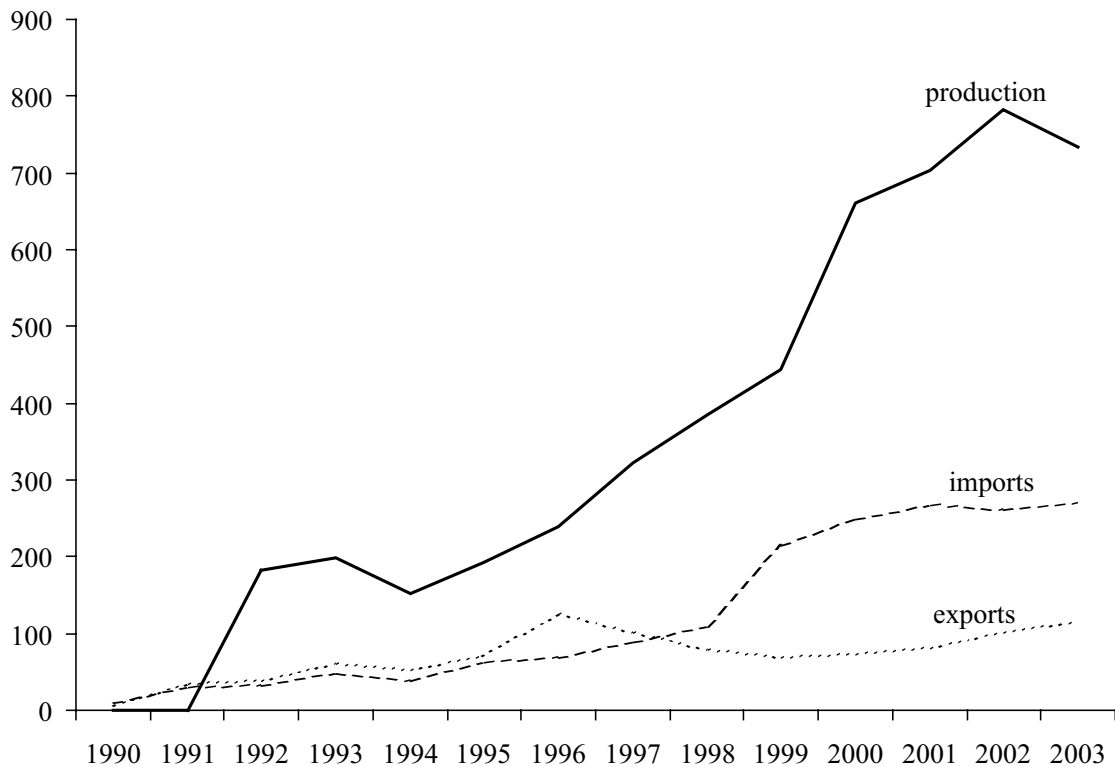
^aCzech Rep., Hungary, Poland and Slovak Rep.

Source: VDA (a).

In China and Latin America (proxied by the most important locations, Brazil and Mexico), car production of German companies developed independently from trade. German car exports to these markets hardly existed before companies invested there; exports were no reasonable option because of high import barriers. As a consequence, labour market repercussions in Germany resulting from exports being replaced by foreign production are highly unlikely. At the same time, German car imports from China and Latin America remained marginal throughout the period under consideration, largely because production in China and Brazil lacked international competitiveness and transportation costs are high. Hence, production in Germany could hardly be affected negatively by rising imports from these locations.

A different situation prevails with regard to Central Europe. About one third of car production by German companies in the Czech Republic, Hungary, Poland and the Slovak Republic was destined for the German market in recent years. German car imports from these countries have quadrupled since 1996 (Figure 2). Van Tulder and Ruigrok (1998: 10) expect this development to have labour market repercussions in Germany, as “the (threat of) reimportations puts the domestic bargaining arena under pressure.”

Figure 2: Production of Passenger Cars by German Companies in Central Europe^a and German Imports and Exports from/to Central Europe, 1990-2003 (1000 units)



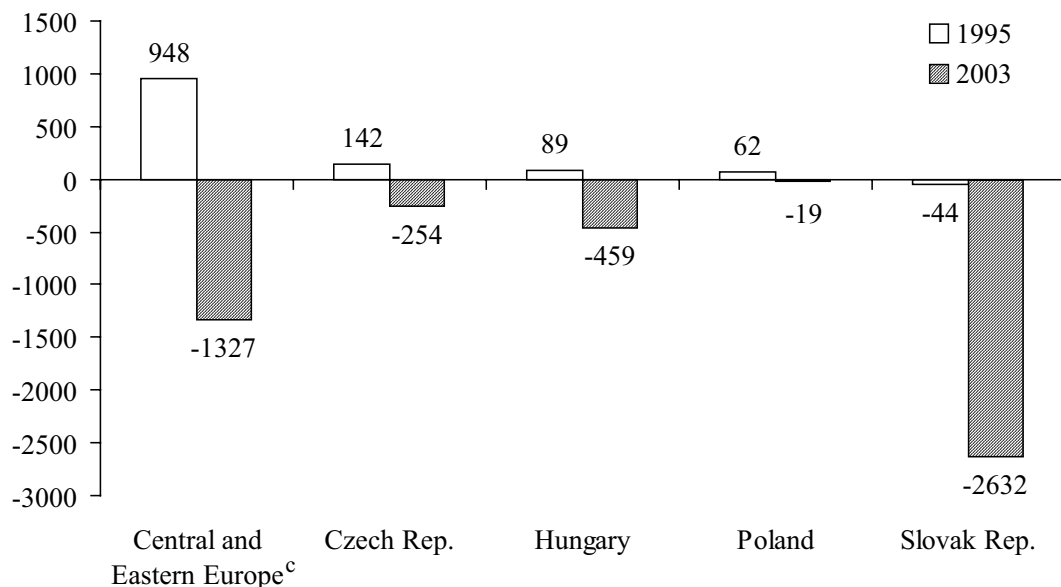
^aCzech Rep., Hungary, Poland and Slovak Rep.
Source: VDA (a).

Labour market repercussions resulting from car imports may be moderate for the time being. The ratio of imports from the four Central European locations to passenger car production in Germany increased substantially from 1.5 percent in 1995/96, but the ratio hardly exceeded the 5 percent mark in 2002/03. Moreover, it might be questioned that assembly operations in Germany were affected significantly since producers such as Volkswagen used production sites in Central Europe to complement their existing product range. As pointed out by van Tulder and Ruigrok (1998), the focus of production in Central Europe was on relatively cheap lower-end cars. Consequently, substitution effects may be minor even though a division of labour of this sort may involve vertical FDI (Section II).

However, German car exports to the four Central European countries increased by much less than German imports. As a result, Germany reported an import surplus of about 170.000 units per annum in 2000-2003. Furthermore, the

import surplus is no longer in terms of units only, as observed in the 1990s by van Tulder and Ruigrok (1998). In value terms, the German trade balance for motor vehicles (including chassis) vis-à-vis Central and Eastern Europe switched from an export surplus of almost € 1 billion in 1995 to a deficit of € 1.3 billion in 2002 (Figure 3). While Germany maintained an export surplus against various countries in the region, notably the Russian Federation, the trade balance turned negative for all four major production locations in Central Europe.¹⁴

Figure 3: Trade Balance^a for Motor Vehicles^b: Germany vis-à-vis Central and Eastern European Countries, 1995 and 2003 (million €)



^aGerman exports minus German imports. ^bIncluding chassis. ^cIncluding Russian Federation; 2002 instead of 2003.

Source: VDA (a).

The pattern of German exports of passenger cars shown in Figure 2 provides further clues to substitution effects. Exports peaked in 1996 and remained almost flat thereafter, i.e., exactly when production by German automobile companies in the region soared from about 200.000 units per annum to about 750.000 units per annum in 2002/03. It is almost impossible to decide how exports to Central European countries would have developed if German companies were not engaged in assembly operations in these countries. Yet, it is striking that the Czech Republic, Hungary, Poland and the Slovak Republic together absorbed less German exports of passenger cars than neighbouring Austria in 2002 (Nunnenkamp 2004). Additional substitution

effects may have occurred on third markets if German companies exported assembled cars from Central European production locations to markets other than the German home market. Due to data constraints, it is not possible to assess the extent to which such exports replaced exports from Germany and, thus, affected domestic production of passenger cars.

Finally, company-specific patterns of assembly operations in Central Europe, domestic production and (overall) exports offer insights on the likelihood, though not the quantitative importance, of substitution effects. In Table 2, we compare the significance of assembly operations in Central Europe by major German producers of passenger cars and utility vehicles in 2003 with the growth of domestic production and the growth of exports from the German home base. The latter two variables are expressed as the ratio of domestic production and exports in 2003 over production and exports in 1990; accordingly, figures below one correspond to shrinking production and exports, respectively. The clearest indication of substitution effects is that Volkswagen, whose passenger car production in Central Europe is outstandingly high (in absolute terms and as a share of domestic production), reported a considerable decline in domestic production as well as shrinking exports of passenger cars from Germany.¹⁵ The same company (slightly) increased domestic production of utility vehicles and reported rising exports in this segment of the automobile market for which assembly operations in Central Europe played a minor role. A decline in domestic production and relatively low export growth is also shown for Opel which ranked second, though by a wide margin, in terms of assembly in Central Europe. On the other hand, the growth of domestic production and the growth of exports from Germany typically turned out to be relatively high for companies which were not engaged in the assembly of cars in Central Europe.¹⁶

Table 2: German Automobile Companies: Assembly in Central Europe, Domestic Production and Exports (1000 units)

	Assembly in Central Europe, 2003 ^c	Change in domestic production, 2003 over 1990	Change in exports, 2003 over 1990
Audi	34.0(4.7)	1.72	2.12
BMW	0	1.44	1.80
DaimlerChrysler ^a			
– passenger cars	0	1.71	2.07
– utility vehicles	0	1.26	1.67
MAN ^b	1.2 (3.2)	1.25	2.77
Opel ^d	76.5 (9.0)	0.82	1.24
Porsche ^b	0	2.12	2.98
Volkswagen			
– passenger cars	623.5 (56.5)	0.73	0.85
– utility vehicles	2.4 (2.4)	1.13	1.48

^aExcluding Chrysler. ^bExports of MAN and Porsche include exports of these companies to third markets from their production sites in Austria and Finland, respectively. ^cIn parentheses: percent of domestic production. ^dPassengers cars.

Source: VDA (a).

All in all, the evidence supports the view that assembly operations of German automobile companies in Central Europe differ from those in other host countries. Spatz and Nunnenkamp (2002a) did not find significant substitution effects between assembly operations in non-European countries with relatively low per-capita income and FDI stocks in these countries on the one hand, and domestic production and exports from the automobile multinationals' home base on the other hand. However, these authors suspected already that the predominance of complementarities over substitution effects shown for the period 1981-1998 would no longer hold once more recent data became available for production locations in Central Europe, which allowed for an internationally competitive assembly of automobiles close to European core markets.

IV. INTRA-INDUSTRY TRADE

Substitution effects at the level of assembled cars are not the only transmission mechanism through which the emergence of Central Europe as an important player in the automobile industry may have repercussions on German labour markets.

Additional labour market effects can be expected to result from outsourcing of automobile parts production to Central Europe, for example through vertical FDI by car assemblers and so-called follow sourcing by parts suppliers.¹⁷ This is even though Kleinert (2003) does not find strong support for the outsourcing hypothesis in time-series data on German FDI. As noted by this author, the finding that it is not so much outward FDI by German companies but rather FDI by foreign companies in Germany which drives German imports of intermediate goods may disguise that the importance of outsourcing differs strongly between industries and host countries. While horizontal FDI probably accounts for the bulk of outward FDI by German companies that enters the analysis of Kleinert (2003),¹⁸ vertical FDI seems to play a prominent role in the case of FDI by the German automobile industry in Central Europe.

Humphrey and Memedovic (2003) argue that changes in the strategies of automobile multinationals, particularly the integration of lower-income countries into corporate strategies, may be most obvious in car assembly, while even more significant changes were taking place in the production of parts and components. At the same time, these authors reckon that the key driving force in the restructuring of the Central European automobile industry was the creation of production networks and a closer division of labour with Western Europe. Van Tulder and Ruigrok (1998) and van Tulder (2004) show that several automobile multinationals, including German ones, aimed at a vertical division of labour with Central Europe and have integrated host countries in this region into international sourcing networks. For instance, Audi's and Opel's investments in Hungary were mainly to supply parts and components (notably, engines) to Germany. In addition, Central European governments requested foreign car assemblers to help establish an advanced local industry of parts suppliers. For these reasons, companies such as Volkswagen developed local supplier bases in Central European host countries "through a mixture of encouraging follow sourcing by major transnational companies in components and the upgrading of existing local suppliers" (Humphrey and Memedovic 2003: 13).

Various important component suppliers located close to the assembly lines of German car assemblers in Central Europe, for example close to Volkswagen's production site in the Czech Republic (van Tulder and Ruigrok 1998: 27). All member firms of the Association of the German Automobile Industry (Verband der deutschen Automobilindustrie, VDA) employ about 160.000 workers in Central European countries that joined the EU recently; about 100.000 of these workers are employed by autoparts suppliers (VDA 2004b: 37).¹⁹ Parts suppliers had little choice but to follow the assemblers to new locations in Central Europe. According to Kinkel (2004), the pressure on parts suppliers to locate in the vicinity of their customers is particularly strong. Hence, it is difficult to argue that labour market conditions in

Germany would be more favourable if parts suppliers had decided to supply the assemblers through exports from the German home base.

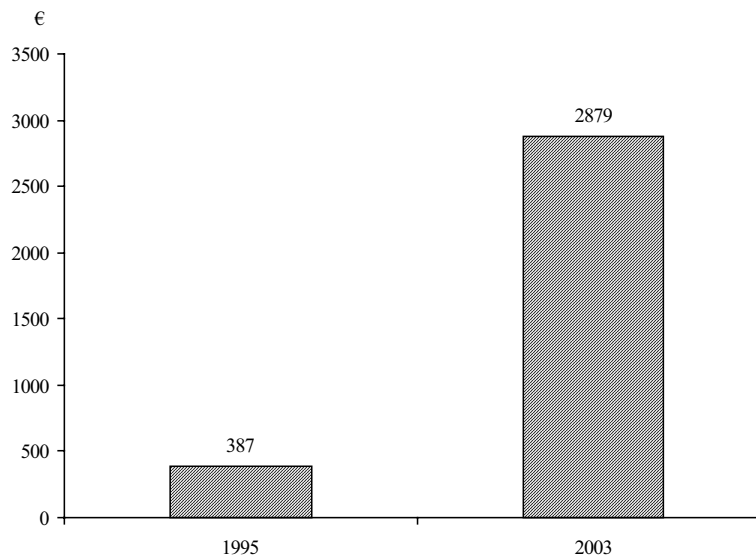
Furthermore, outsourcing does not necessarily result in one-way intra-industry trade from Central Europe to Germany. The fragmentation of the value chain by car assemblers and follow sourcing by parts suppliers through outward FDI of German companies may indeed help sustain employment in Germany, as the analysis of Kleinert (2003) suggests. This is because the host countries of FDI tend to import not only assembled cars from where FDI originates, but also imports of intermediate goods originate predominantly from the home base of foreign investors. For instance, the export-oriented production of engines by German companies in Hungary relies heavily on inputs imported from Germany (Humphrey and Memedovic 2003).

Nevertheless, the significance of intra-industry trade in autoparts between Central Europe and Germany is likely to have added to labour market pressure in Germany. In the remainder of this section, we provide a short summary of intra-industry trade with the four major host countries of German automobile companies in Central Europe (the Czech Republic, Hungary, Poland and the Slovak Republic). To keep the presentation of data within reasonable limits, we portray an overall picture by aggregating the most relevant items, i.e., engines and parts thereof as well as other parts and accessories.²⁰

Figure 4 supports the view that Central Europe has increasingly become integrated into the production networks of German automobile companies. We relate the sum of German exports and imports of engines as well as other autoparts and accessories (in constant € as of 2000) to/from the four most important Central European countries to the volume of domestic automobile production in Germany. By this measure, intra-industry trade in autoparts soared from less than € 400 per car produced in Germany in 1995 to almost € 3000 within just eight years. The integration of Central European countries through intra-industry trade in autoparts is most advanced for Hungary, followed by the Czech Republic and Poland.

The ranking of the four Central European countries is the same with regard to their share in total German imports of engines and other autoparts in 2003 (Figure 5). Taken together, Hungary, the Czech Republic, Poland and the Slovak Republic accounted for almost 30 percent of German imports; their share has increased fivefold since 1995. It is important to note that the steeply increasing imports of autoparts from Central Europe represent additional outsourcing by the German automobile industry, rather than trade diversion to the detriment of other low-cost locations such as Spain and Latin America. As shown in Nunnenkamp (2004), German imports of autoparts from other locations continued to increase (in real terms) when imports from Central Europe gathered momentum.

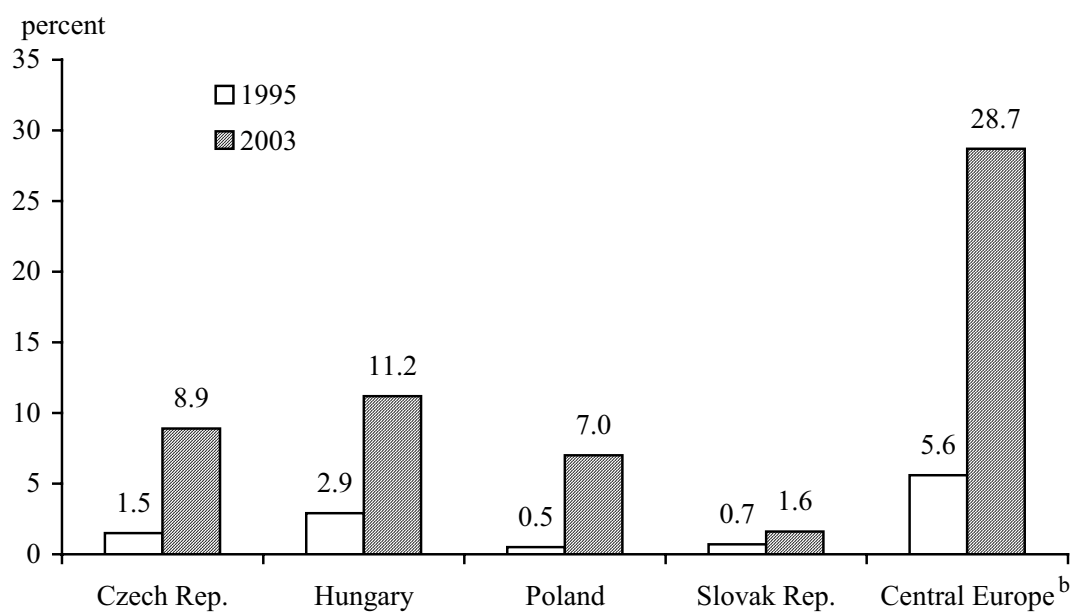
Figure 4 : Importance of Trade in Autoparts^a between Germany and Central European Countries^b, 1995 and 2003 (€ per automobile produced in Germany^c)



^aSum of German exports and imports of engines and other autoparts and accessories to/from four Central European countries. ^bSum of Czech Rep., Hungary, Poland and Slovak Rep. ^cIn constant prices of 2000. Source: VDA (a).

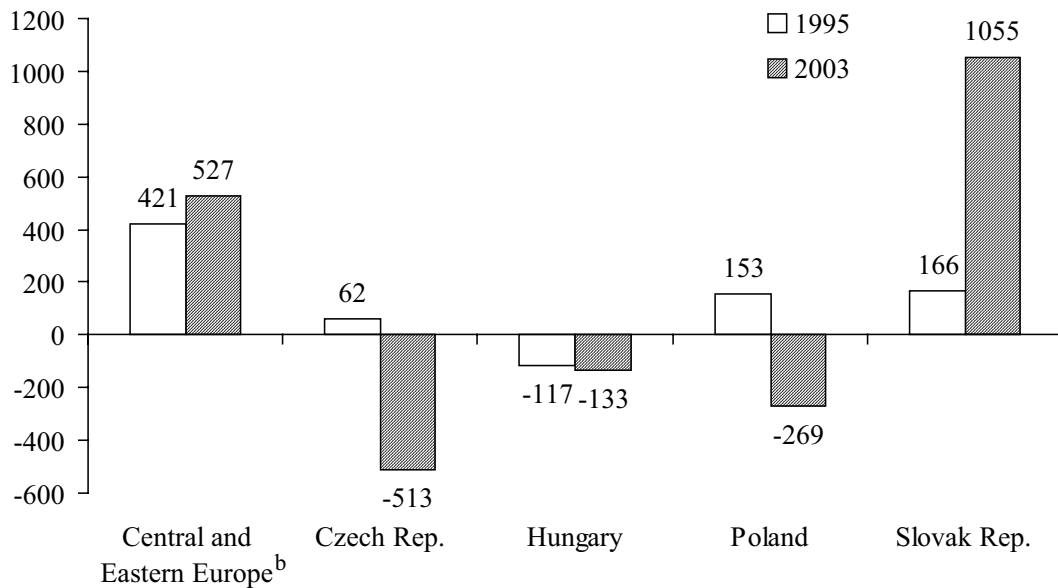
Germany still reported an export surplus in 2002 in trade in autoparts with Central and Eastern Europe as a whole (including the former Soviet Union and other countries in which German automobile companies were less engaged as investors than in the four countries under consideration here). However, similar to trade in assembled cars (see Section III above), it is no longer true what van Tulder and Ruigrok (1998) observed in the late 1990s, namely that Germany has a bilateral trade surplus with all major Central European countries. Rather, the German trade balance turned significantly negative vis-à-vis the Czech Republic and Poland (Figure 6). Moreover, the trade surplus vis-à-vis the Slovak Republic would shrink from € 1.1 billion to € 0.3 billion if car bodies were subsumed under autoparts.

Figure 5: Share of Central European Countries in Germany's Total Imports of Engines and Other Autoparts,^a 1995 and 2003 (percent)



^aCar bodies not included. ^bCzech Rep., Hungary, Poland and Slovak Rep.
Source: VDA (a).

Figure 6: Trade Balance^a for Engines and Other Autoparts: Germany vis-à-vis Central and Eastern European Countries, 1995 and 2003 (million €)



^aGerman exports minus German imports. Car bodies not included. ^b2002 instead of 2003; including Russian Federation.

Source: VDA (a).

V. LABOUR MARKET IMPLICATIONS

The labour market implications of the relocation of assembly lines and the outsourcing of parts production to Central Europe are heavily disputed among German economists. The notion of Germany degenerating into a bazaar economy has been coined by Sinn (2004). Accordingly, companies use outsourcing to overcome the competitive disadvantages at home. This is considered the reason why real value added of the German industry increased by only 5 percent between 1995 and 2003 and industrial employment decreased by 10 percent, even though industrial production increased by 15 percent. Sinn (2004) explicitly refers to the automobile industry to substantiate the argument that German companies remain competitive in international markets only because of “their Eastern European hinterland.” The export of Audi passenger cars whose engines are produced in Hungary is presented as an example of German sales of “high-quality products that were not produced in the

country.” One may add that even the assembly of automobiles is increasingly taking place in Central Europe, as shown in Section III.

Most interestingly, the opponents of this view, too, refer to the automobile industry when stressing positive labour market effects of international production networks and outsourcing. For example, Klodt (2004) argues that employment losses are concentrated in industries that have failed to make use of outsourcing, whereas high outward FDI and imports of autoparts are supposed to have helped a significant increase in employment in the German automobile industry since 1995.²¹ Bechert and Cellarius (2004) point out that in the industry “supplying motor car parts, there is now for every two firms that are shifting production abroad, one that is retransferring it back to Germany.”²² Furthermore, these authors mention “numerous positive examples of outsourcing processes” that went along with rising employment at the companies' German home base. The latter observation tends to support the reasoning of Becker et al. (2004), according to whom vertical FDI may add to employment at home if cost reduction through outsourcing supports an overall expansion of the company (Section II).

Table 3: The German Automobile Industry: Production Value, Value Added, Employment and Wages, 1995–2003

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2003/ 1995
1) Motor vehicles and parts (NACE 34)										
gross prod. value (billion €)	133.6	140.8	152.0	175.9	193.8	210.1	226.8	212.9	216.9	1.62
gross value added (billion €)	44.3	43.0	46.3	51.6	50.3	48.5	57.3	53.6	54.7	1.23
gva/gpv (percent)	33.1	30.5	30.5	29.4	25.9	23.1	25.3	25.2	25.2	0.76
employment (1000)	757	746	770	811	836	856	863	863	870	1.15
wages per person (1000 €)	38.6	39.3	39.3	40.0	41.4	41.8	42.8	44.4	45.7	1.18
2) Assembly and engines (NACE 34.1)										
gross prod. value (billion €)	98.2	105.5	111.6	127.8	144.7	156.6	169.5	161.1	162.7	1.66
gross value added (billion €)	30.4	29.6	31.4	33.7	32.9	30.4	38.2	36.3	36.6	1.20
gva/gpv (percent)	30.9	28.1	28.1	26.4	22.7	19.4	22.5	22.5	22.5	0.73
employment (1000)	482	476	485	509	522	528	527	525	523	1.09
wages per person (1000 €)	41.4	42.1	42.4	43.1	44.9	45.2	46.2	47.9	49.1	1.19
3) Parts and accessories (NACE 34.3)										
gross prod. value (billion €)	29.9	30.2	33.8	39.9	42.5	47.0	50.7	45.5	47.8	1.60
gross value added (billion €)	12.1	11.9	13.1	15.6	15.4	16.3	17.3	15.5	16.3	1.35
gva/gpv (percent)	40.5	39.3	38.8	39.2	36.2	34.6	34.1	34.1	34.1	0.84
employment (1000)	233	231	243	258	270	285	294	297	307	1.32
wages per person (1000 €)	34.7	35.2	34.8	35.6	36.3	37.4	38.5	40.3	41.8	1.20

Source: VDA (b).

The evidence presented in the following qualifies both of these seemingly opposing views. Table 3 underscores that overall employment in the German automobile industry has recovered substantially after the recession in 1993/94. Furthermore, the average wage earned in the automobile industry was 24 percent higher than the average wage earned in the German manufacturing sector at the beginning of 2004 (VDA a, 2004: 323). Earlier wage comparisons reported by Spatz and Nunnenkamp (2002a: 67) suggest that the wage differential in favour of the automobile industry remained fairly stable over the last two decades. The earnings and employment situation does not appear to have suffered so far from relocation and outsourcing if the German automobile industry as a whole is compared to other manufacturing industries. Yet, Sinn (2004) has a point when stressing the gap between production and value-added trends. Table 3 reveals that the share of value added in gross production of the automobile industry (motor vehicles and parts) declined by 8 percentage points in just eight years, to 25 percent in 2003. The President of the Association of the German Automobile Industry considers it an important challenge to reverse this trend (VDA 2004a).

Both sides of the debate tend to ignore diverging developments within the German automobile industry. Spatz and Nunnenkamp (2002a; 2002b) argue that the inter-industry perspective summarized above needs to be complemented in several respects. For a start, the differentiation of the automobile industry into assembly operations (including engines) and the production of parts and accessories in Table 3 reveals striking intra-industry differences:

- The decline in the share of value added in production has been particularly pronounced for assembly operations. The value-added share is considerably higher in parts production, and the decline was less dramatic than in assembly operations.

- Employment growth was by far higher in parts production than in assembly operations. This may have been helped by relatively low wages in the former segment of the automobile industry. However, the wage gap did not widen during the period under consideration.²³

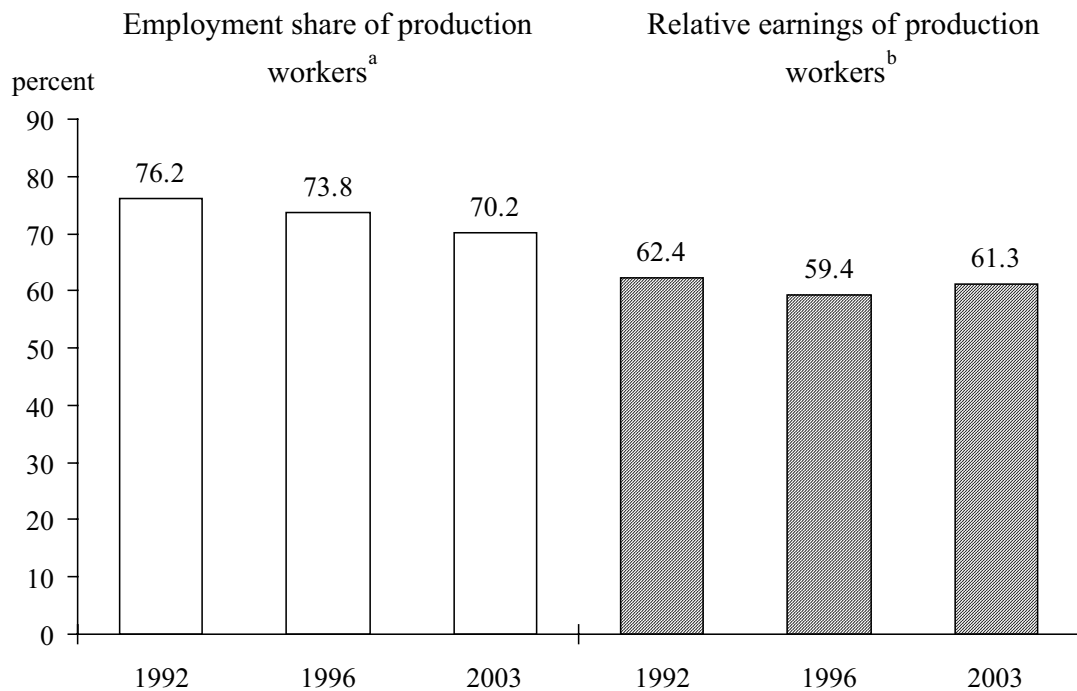
These observations fit into the reasoning of Spatz and Nunnenkamp (2002a: 74) as well as Nunnenkamp (2004: 35), who argue that autoparts producers adjusted quite successfully to fiercer competitive pressure from lower-income countries, including Central European countries, by specializing in production lines in which they enjoyed comparative cost advantages. In this context, it may be noted that Sinn's (2004) reference to Audi engines as exemplifying the trend towards a German bazaar economy is misleading. As shown in the preceding section, trade in autoparts between

Germany and Hungary was almost balanced, not least because German input suppliers exported engine parts in the order of € 500 million to Hungary.

There is another dimension of intra-industry diversity, namely diverging employment and income trends for specific groups of employees. It is in two ways that we try to capture the skill-specific employment and wage effects of relocation and outsourcing: First, we use the dichotomy of production versus non-production workers to proxy for skill levels, applying the conventional assumption that non-production workers are better qualified than production workers. Second, we consider three categories (so-called Leistungsgruppen) of production workers in the German automobile industry to assess whether employment and earnings trends diverged between better paid production workers with more demanding tasks (Leistungsgruppe 1) and production workers with lower pay and less demanding tasks (Leistungsgruppen 2 and 3).

Both approaches to account for skill-specific employment and wage effects reveal that the benefits which relocation and outsourcing may offer to the automobile industry as a whole are not equally distributed within the industry. According to Figure 7, the employment share of production workers has declined by six percentage points since the early 1990s. Employment losses in the first half of the 1990s rested almost exclusively on production workers, whereas the subsequent recovery of overall employment in the German automobile industry benefited non-production workers over-proportionally. Compared to the change in employment shares, the earnings of production workers declined only marginally relative to the earnings of non-production workers.

Figure 7: Production versus Non-production Workers in the German Automobile Industry, 1992–2003



^aPercent of total employment of production and non-production workers. ^bPer-capita annual earnings of production workers in percent of per-capita annual earnings of non-production workers.

Source: VDA (a).

It is debatable, however, whether the labour market situation of production workers deteriorated mainly because German automobile companies discovered Central European countries as competitive suppliers of assembled cars and inputs. Spatz and Nunnenkamp (2002a) compared longer-term labour market trends for production workers and non-production workers and found that the employment and earnings opportunities of the former deteriorated in the 1980s already. Moreover, if the “Eastern European hinterland” (Sinn 2004) had a larger effect on production workers than, for example, the previous integration of Spain into the networks of German automobile companies, changes in employment shares and relative earnings should have been particularly pronounced since 1996, when both the assembly of automobiles in Central Europe and intra-industry trade with the region gathered momentum (see Sections III and IV). This is not the case according to Figure 7.

Our second measure has some limitations, too. Throughout the period under consideration, more than half of production workers are grouped into category 1 and

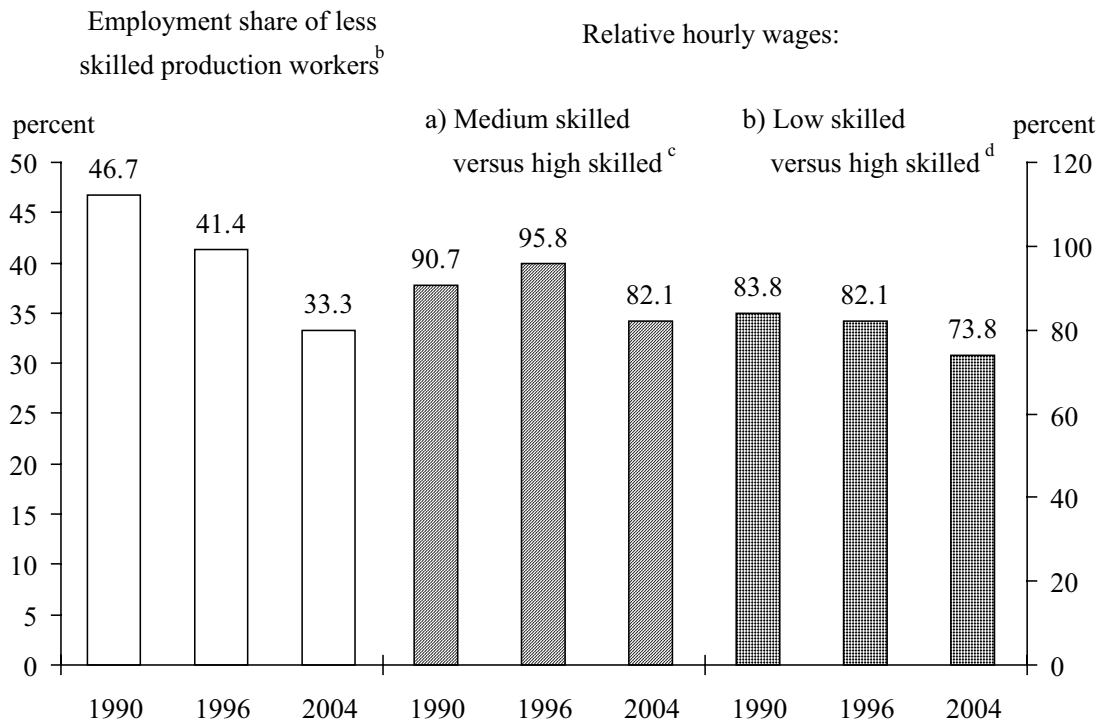
are, thus, considered highly skilled. On the other hand, few production workers are grouped into category 3 (even though their share in overall employment of production workers varied considerably over time)²⁴. This may raise doubts as to whether categories 1-3 adequately reflect skill differentials which we regard as the critical criterion to assess intra-industry distributional effects. These limitations notwithstanding, Figure 8 supports the view that the emergence of Central Europe as an attractive production location and a competitive trading partner significantly affected the labour market situation of specific categories of production workers:

- Less skilled workers (categories 2+3) accounted for a declining share in overall employment of production workers.²⁵ Moreover, this decline was particularly sharp when the assembly of automobiles in, and intra-industry trade with Central Europe developed most dynamically.

- Furthermore, relative wages of less skilled workers declined only modestly (when comparing category 3 with category 1) or even improved (when comparing category 2 with category 1) in the first half of the 1990s. In sharp contrast, a significant drop in relative wages has occurred since 1996.

All in all, the evidence suggests that the different views on relocation and outsourcing, mentioned at the beginning of this section, are not inconsistent with each other. Rather, they refer to two sides of the same coin. On the one hand, the automobile industry as a whole still compares favourably with other manufacturing industries in terms of employment and income opportunities. On the other hand, relocation and outsourcing have resulted in distributional effects within the German automobile industry. The rising human-capital intensity of automobile production in Germany, reflected in the structure of employment, and declining relative wages of less skilled employees are longer-term phenomena that cannot be attributed exclusively to the emergence of Central Europe as an attractive location for assembly operations and autoparts production. Especially for less skilled production workers, however, the competition from Central Europe has added to pressure on relative wages and employment opportunities.

Figure 8: More Skilled versus Less Skilled Production Workers in the German Automobile Industry, 1990–2004^a



^aAs of January. ^bShare of categories (Leistungsgruppen) 2 plus 3 in total employment of production workers; left-hand scale. ^cCategory (Leistungsgruppe) 2 in percent of category 1; right-hand scale. ^dCategory 3 in percent of category 1; right-hand scale.

Source: VDA (a).

VI. SUMMARY AND CONCLUSIONS

The economic transformation of Central European countries has added significantly to competitive pressure in the automobile industry, even though this industry is relatively technology and human-capital intensive and, thus, represents a traditional manufacturing stronghold of advanced countries such as Germany. The relocation of assembly operations has affected domestic production by inducing higher imports of finished cars from Central Europe and, possibly, also by reducing the growth of exports from the German home base of automobile companies. At the same time, competitive pressure is due to outsourcing of automotive parts and

accessories and intensive intra-industry trade between Germany and Central European countries.

The finding that the German automobile industry still compares favourably with other manufacturing industries in terms of employment and income opportunities supports the view that relocation and outsourcing are important means for German companies to remain competitive. This invites the conclusion that the integration of Central Europe into the international division of labour is also in the interest of the workers employed in the German automobile industry. However, the benefits to be derived from relocation and outsourcing are not equally distributed within the industry. Especially for low skilled production workers, the competition from Central Europe has intensified pressure on relative wages and impaired employment opportunities.

Labour market implications for low skilled workers are likely to become more serious in coming years. Heymann (2004) notes that almost all major automobile assemblers have announced plans to establish additional production facilities in Central and Eastern Europe; it is expected that production capacity in the region will double until 2006/07, which would add to the overcapacity problem the automobile industry is facing on an international scale. At the same time, recent industrial disputes, especially the cases of Opel and Volkswagen mentioned in the Introduction, tend to support the reasoning of van Tulder and Ruigrok (1998). The move of German car producers, being confronted with high wages and relatively strong component suppliers at home, to Central Europe is regarded by these authors as a means to improve their bargaining position in Germany. Agreements on wage restraint and longer working hours negotiated in 2004 point to a weakening bargaining position of trade unions in the German automobile industry.

Nevertheless, wage differentials between Germany and Central Europe are likely to remain large in the medium run. In 2003, labour costs in the four major Central European host countries of German automobile companies amounted to only about one sixth of labour costs in Germany (VDA 2004b: 23); and Havas (2000: 241) argued already in 2000 that “the productivity gap has almost been closed.” This suggests that vertical strategies will continue to be attractive. In other words, it will probably take long until “the catching-up process (of Central Europe) will have a tendency to increase investments by horizontal multinationals and depress investments by vertical multinationals” (Carstensen and Toubal 2003: 17).²⁶

It follows that the need for the German automobile industry to adjust to fiercer competition from lower-income countries, notably from Central and Eastern Europe, is unlikely to subside. For the industry as a whole, there is no reasonable alternative to innovation and specialization according to comparative cost advantages.

Specialization will help secure employment and income opportunities for skilled workers, but it offers little relief to low skilled workers. Moreover, wage restraint will provide only part of the solution for low skilled workers in the German automobile industry. Unless they succeed to improve their level of qualification, the employment and income prospects of this part of the labour force can be expected to deteriorate.

REFERENCES

- Bechert, S., and G. Cellarius (2004). "Outsourcing Offers a Chance for the Development of Strongly Competitive European Enterprises". *ifo Schnelldienst* 7/2004 (<http://www.cesifo.de>).
- Becker, S.O., K. Ekholm, R. Jäckle and M.-A. Mündler (2004). "Location Choice and Employment Decisions: A Comparison of German and Swedish Multinationals". Paper presented at the *Kiel Workshop on Multinationals and International Integration*. Kiel, October 8-9, mimeo.
- Buch, C., J. Kleinert and F. Toubal (2003). "Determinants of German FDI: New Evidence from Micro-Data". *Deutsche Bundesbank, Economic Research Centre Discussion Paper 09/03*. Frankfurt a.M.
- Carr, D.L., J.R. Markusen and K.E. Maskus (2001). "Estimating the Knowledge-Capital Model of the Multinational Enterprise". *American Economic Review* 91 (3): 693–708.
- Carstensen, K., and F. Toubal (2003). "Foreign Direct Investment in Central and Eastern European Countries: A Dynamic Panel Analysis." *Kiel Working Papers* 1143. Institute for World Economics, Kiel.
- Deutsche Bundesbank (2004). "Kapitalverflechtung mit dem Ausland". *Statistische Sonderveröffentlichung 10*. Frankfurt a.M.
- Dichtl, E., and P. Hardock (1997). "Auslandsfertigung und Produktionsverlagerung von Unternehmen des Fahrzeugbaus: Ergebnisse einer empirischen Studie". University of Mannheim, *Allgemeine Betriebswirtschaftslehre und Marketing Working Paper* 122. Mannheim.
- Hanson, G., R.J. Mataloni and M. Slaughter (2001). "Expansion Strategies of U.S. Multinational Firms". *NBER Working Paper* 8433, National Bureau of Economic Research, Cambridge, MA.
- Havas, A. (2000). "Changing Patterns of Inter- and Intra-regional Division of Labour: Central Europe's Long and Winding Road." In: J. Humphrey, Y. Lecler and M. Salerno (eds.), *Global Strategies, Local Realities: The Auto Industry in Emerging Markets*. Basingstoke (Macmillan): 234–262.
- Helpman, E. (1984). "A Simple Theory of International Trade with Multinational Corporations". *Journal of Political Economy* 92 (3): 451–471.
- Helpman, E., and P. Krugman (1985). *Market Structure and Foreign Trade*. Cambridge, MA (MIT Press).
- Heymann, E. (2004). "Perspektiven Automobilindustrie", *Bauwirtschaft, Baumaschinenbau. Deutsche Bank Research*. Frankfurt a.M.

- Humphrey, J., and O. Memedovic (2003). *The Global Automotive Industry Value Chain: What Prospects for Upgrading by Developing Countries*. UNIDO Sectoral Studies Series, Vienna.
- Kinkel, S. (2004). "Automobilzulieferer in der Klemme. Stand und Entwicklung der Auslandsproduktion bei deutschen Automobilzulieferern". *Fraunhofer Institut für Systemtechnik und Innovationsforschung*, Karlsruhe, mimeo.
- Kleinert, J. (2003). "Growing Trade in Intermediate Goods: Outsourcing, Global Sourcing, or Increasing Importance of MNE Networks?" *Review of International Economics* 11 (3): 464–482.
- Klodt, H. (2004). "Deutschland: Eine Basar-Ökonomie?" <http://www.uni-kiel.de/ifw/staff/klodt/basaroekonomie.pdf>.
- Lansbury, M., N. Pain and K. Smidkova (1996). "Foreign Direct Investment in Central Europe since 1990: An Econometric Study". *National Institute Economic Review* (May): 104–114.
- Marin, D., A. Lorentowicz and A. Raubold (2003). "Ownership, Capital or Outsourcing: What Drives German Investment to Eastern Europe?" In: H. Herrmann et al. (eds.), *Foreign Direct Investment in the Real and Financial Sector of Industrial Countries*. Berlin (Springer): 147–163.
- Markusen, J. R. (1984). „Multinationals, Multi-plant Economies, and the Gains from Trade". *Journal of International Economics* 16(3/4): 205–226.
- Markusen, J.R., and A.J. Venables (1998). Multinational Firms and the New Trade Theory. *Journal of International Economics* 46 (2): 183-203.
- Markusen, J.R., and A.J. Venables (2000). "The Theory of Endowment, Intra-industry and Multinational Trade". *Journal of International Economics* 52: 209–234.
- Nunnenkamp, P. (2004). Automobilstandort Deutschland unter Wettbewerbsdruck. *ifo Schnelldienst* 57 (7): 28–36.
- OECD (2004). *International Trade by Commodities Statistics*. CD-ROM, Paris.
- Pries, L. (1999). *Auf dem Weg zu global operierenden Konzernen? BMW, Daimler-Benz und Volkswagen: Die drei Großen der deutschen Automobilindustrie*. Munich (Rainer Hampp Verlag).
- Sinn, H.-W. (2004). "Bazaar Economy". *ifo-Vienpoint* 50 (<http://www.cesifo.de>).
- Spatz, J., and P. Nunnenkamp (2002a). *Globalisierung der Automobilindustrie: Wettbewerbsdruck, Arbeitsmarkteffekte und Anpassungsreaktionen*. Kiel Studies 317. Berlin (Springer-Verlag).
- Spatz, J., and P. Nunnenkamp (2002b). "Globalization of the Automobile Industry: Traditional Locations under Pressure?" *Aussenwirtschaft* 57 (4): 469–493.

- Sturgeon, T.J., and R.L. Florida (1999). *The World That Changed the Machine: Globalization and Jobs in the Automotive Industry*. Massachusetts Institute of Technology, Cambridge, MA.
- UNCTAD (1998). *World Investment Report 1998*. New York (United Nations).
- van Tulder, R. (2004). "Peripheral Regionalism: The Consequences of Integrating Central and Eastern Europe in the European Automobile Space". In: J. Carillo, Y. Lung and R. van Tulder (eds.), *Cars: Carriers of Regionalism?* Basingstoke (Palgrave): 96-112.
- van Tulder, R., and W. Ruigrok (1998). "European Cross-National Production Networks in the Auto Industry: Eastern Europe as the Low End of European Car Complex". Berkeley Roundtable on the International Economy, University of California (<http://repositories.cdlib.org/brie/BRIEWP121>).
- VDA (a)(various issues). *Tatsachen und Zahlen aus der Kraftverkehrswirtschaft*. Frankfurt a.M.: Verband der Automobilindustrie.
- VDA (b)(various issues). *International Auto Statistics*. Frankfurt a.M.: Verband der Automobilindustrie.
- VDA (2004a). VDA-Präsident: Appell für mehr Wertschöpfung in Deutschland – Exportrekord – Höherer Dieselanteil. VDA Aktuell-Presse, January 29 (<http://www.vda.de>).
- VDA (2004b). *Die deutsche Automobilindustrie in der erweiterten EU – Motor der Integration*. Frankfurt a.M.: Verband der Automobilindustrie.
- Vickery, G. (1996). "Globalisation in the Automobile Industry": In: OECD, *Globalisation of Industry. Overview and Sector Reports*. Paris.
- Walker, B. (1999). "Der Stellenwert von Auslandsstandorten als Instrument zur Bewältigung von Absatz- und Kostenproblemen in der nordrhein-westfälischen Automobil-Zuliefererindustrie". In: H. Kilper and L. Pries (eds.), *Die Globalisierungspirale in der deutschen Automobilindustrie: Hersteller-Zulieferer-Beziehungen als Herausforderungen für Wirtschaft und Politik*. Munich (Rainer Hampp Verlag): 191–221.
- Weiß, J.-P. (2000). "Die deutsche Automobilindustrie im internationalen Wettbewerb". *DIW-Wochenbericht* 12/00 (<http://www.diw-berlin.de/diwwbd/00-12-2.html>).
- Zhang, K.H., and J.R. Markusen (1999). "Vertical Multinationals and Host-country Characteristics". *Journal of Development Economics* 59: 233–252.

¹ According to VDA (2004b: 59), the German automobile industry achieved an export surplus of € 78 billion in 2003.

² In this paper, we do not address another reason for concern, namely the employment implications of overcapacity problems the automobile industry is facing on an international scale. For

instance, General Motors has announced in the fall of 2004 that assembly operations will be discontinued either at one of Opel's plants in Germany or at Saab's plant in Sweden.

³ Vickery (1996) and Weiß (2000) show that the development and manufacturing of automobiles requires increasing R&D and involves significant fixed costs.

⁴ For details, see the literature given there.

⁵ For an early model of horizontal FDI, see Markusen (1984); more recent models include Markusen and Venables (1998; 2000).

⁶ For an early model of vertical FDI, see Helpman (1984); see also Helpman and Krugman (1985).

⁷ Carr et al. (2001) derive the motive for vertical FDI, i.e., locating knowledge intensive activities such as R&D where skilled labour is relatively cheap and production where unskilled labour is relatively cheap, from two assumptions: (i) knowledge intensive activities can be geographically separated from production and supplied to production facilities at low cost, and (ii) production requires less skills than activities such as R&D.

⁸ In Helpman's (1984) model of vertical FDI, trade costs were assumed to be zero. As noted by Carr et al. (2001), this assumption, in combination with plant-level economies of scale, removes the motive for horizontal FDI.

⁹ Prospective EU member countries had abolished import duties on cars imported from the EU by 2001 (van Tulder 2004: 106).

¹⁰ Even in Poland, i.e., the largest Central European market for automobiles, first registrations of passenger cars in 2003 hardly exceeded one tenth of first registrations in Germany (VDA b).

¹¹ See also van Tulder (2004: 99) and the literature given there.

¹² The Slovak Republic, most likely, accounts for much of the rest, mainly because of Volkswagen's engagement in this country. However, the Slovak Republic is not listed as an individual host country in the Bundesbank statistics (Deutsche Bundesbank 2004).

¹³ Humphrey and Memedovic (2003: 34) reckon: "The initial attraction for...extending production networks from...Western Europe to the peripheral regions was a combination of access to growing markets and reducing costs through the development of low-cost production sites." For a similar line of reasoning with regard to Volkswagen's acquisition of Skoda, see Pries (1999). The survey results of Dichtl and Hardock (1997) reveal that labour costs played an important role in motivating the first waves of relocation to Central Europe. Van Tulder and Ruigrok (1998) as well as van Tulder (2004) point out that European car manufacturers pursued different strategies: Some companies rated Central Europe primarily as a market, some as a production site, and some aimed at both.

¹⁴ For detailed statistical information, see VDA (2004b: 59-68).

¹⁵ Note that 80 percent of the production of Skoda's Octavia was earmarked for exports to West European markets (van Tulder and Ruigrok 1998: 14).

¹⁶ Audi represents an exception in that high growth of domestic production and exports went along with some assembly operations in Central Europe. Note that export figures for MAN and Porsche are not comparable to export figures for other companies as they include exports to third markets from MAN's production site in Austria and from Porsche's production site in Finland.

¹⁷ Follow sourcing results from the preference of car assemblers to use the same suppliers in various locations.

¹⁸ Note that about 85 percent of German FDI stocks were located in industrialized countries in 2002 (Deutsche Bundesbank 2004). Horizontal FDI is likely to dominate in these host countries due to strong similarities in factor endowments.

¹⁹ VDA (2004b) includes an annex which lists major German suppliers engaged in Central European countries.

²⁰ We do not consider car bodies and trailers. For a more detailed picture of intra-industry trade in autoparts between Central European countries and Germany, see VDA (2004b: 59-68).

²¹ For a similar line of reasoning, see VDA (2004b: 9).

²² See also the survey results reported in Kinkel (2004).

²³ Wages paid in parts production amounted to 81-85 percent of wages paid in assembly operations in 1995-2003.

²⁴ Therefore, we combine categories 1 and 2 for calculating employment shares in Figure 8.

²⁵ Walker (1999) shows that less skilled production workers (and also less skilled non-production workers) were affected most when the foreign engagement of German autoparts suppliers went along with declining employment in Germany. Negative employment effects were more frequent when the foreign engagement was motivated by cost considerations, rather than market considerations.

²⁶ In a similar vein, Heymann (2004) posits that Central Europe will enjoy a lasting competitive advantage in labour costs; see also VDA (2004b: 25-26).