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FDI and Intra-industry Trade in the Automotive Industry in the New EU Member States

Abstract

This paper investigates the extent to which foreign direct investment (FDI) influenced intra-industry trade (IIT) in automotive products in six New EU Member States (the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia) in the 1995–2014 period. Changes in IIT intensity are analysed using the Grubel-Lloyd indices. To examine the IIT pattern, IIT indices are divided into two types of trade: IIT in vertically differentiated products (low and high quality VIIT) and IIT in horizontally differentiated products (HIIT). The research indicates that IIT in automotive products allowed manufacturers and consumers from the new EU Member States to benefit more from international trade. FDI inflow to the automotive sector of the NMS has been a key factor shaping IIT in automotive products.

Keywords: foreign direct investment (FDI), intra-industry trade (IIT), automotive industry, new EU Member States **JEL:** F14, F15

Introduction

The automotive industry plays an important role in the European Union in terms of output, employment and trade flows. Over the past two decades, significant changes to the automotive map of the EU have occurred. Since the early 1990s several new EU Member States (NMS) have attracted substantial foreign direct investment (FDI) into

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their automotive industries. At the beginning, FDI inflows to the automotive sector were consisted mainly of acquisitions of existing industrial plants by foreign investors to restructure them (brownfield investment) and start joint ventures. Apart from Western European corporations (Italian Fiat, German Volkswagen, French Renault), foreign investors also included South Korean Daewoo (in a joint venture with Fabryka Samochodów Osobowych – FSO in Warsaw and in Lublin in Poland).

The factors conducive to investment inflows from both directions were different. Automotive company involvement from the EU was driven by the expectation of benefits related to fragmenting production processes. Central European countries were selected as investment locations based on such factors as the long tradition of car production (FSO in Poland, Skoda in the Czech Republic, Dacia in Romania), a skilled workforce, and relatively low labour costs. Investment inflow to the automotive sector was also fuelled by the economic cooperation of those countries with the European Union (which commenced in the 1990 s) and prospects of their future EU membership. Asian investors were primarily motivated by the desire to evade tariff barriers and maintain previous export markets (the so-called tariff jumping investment).

In addition to brownfield investment, greenfield investment played an important role in foreign direct investment (FDI) inflows to the examined countries. This consisted of building enterprises 'from scratch' to produce motor vehicles, rather than buying an existing plant. Such investors consider factors such as the labour availability, proximity to suppliers and outlets, and transport infrastructure levels. Consequently, more attractive conditions in the Czech Republic and Slovakia resulted in lost car factory opportunities for Poland with Japanese Toyota, which owns the plants in Kolín (the Czech Republic), French PSA Peugeot Citroën (manufacturing in a factory in Trnava, Slovakia) and Korean Hyundai (which owns plants in Žilina, Slovakia, and in Nošovice, the Czech Republic).

The largest inflow of foreign direct investment in the transport equipment sector went to the Czech Republic (Table 1). As of the end of 2014, the stock of inward FDI in the transport equipment industry exceeded 10.6 billion EUR and accounted for nearly one-third of FDI in Czech manufacturing and over 10% of inward FDI in the entire Czech economy. The second largest recipient of foreign investment was the transport equipment industry in Poland (9.2 billion EUR as at the end of 2014). However, FDI in this sector played a lesser role than in the Czech Republic. In Hungary, Slovakia and Romania the stock of inward FDI in the transport equipment industry as of the end of 2014 was below 4 billion EUR, whereas in Slovenia, was – 0.5 billion EUR. Importantly, in Slovakia the transport equipment industry accounted for as much as 27% of foreign manufacturing capital.

Foreign direct investment inflows into the automotive industries of new EU Member States increased trade flows of automotive products and changed trade patterns. A growing share of overall trade represents intra-industry trade (IIT), i.e. the simultaneous export and import of products within the same industry. Per theory, the existence of IIT increases the benefits of trade in relation to inter-industry trade for both producers and consumers. Growing economies of scale reduce production costs and prices while contributing to product diversity. This benefits consumers since lowering production costs leads to decreasing prices. In addition, a diversified range of products allows consumers to have a wider choice of goods and better satisfy their expectations. Producers also benefit from this situation as they are likely to increase sales.

| | FDI in transport equipment | | |
|----------------|----------------------------|---------------------|------------------------|
| Country | value in million EUR, | share in total FDI, | share in manufacturing |
| | in percent | in percent | FDI, in percent |
| Czech Republic | 10621.8 | 10.6 | 31.7 |
| Hungary | 3819.4 | 4.7 | 18.8 |
| Poland | 9221.5 | 5.4 | 18.3 |
| Romania | 3244.0 | 5.4 | 16.8 |
| Slovakia | 3650.0 | 8.6 | 27.0 |
| Slovenia | 495.0 | 4.9 | 15.0 |

 TABLE 1. Inward FDI in the transport equipment industry in the NMS (as at the end of 2014)

Source: own elaboration based on wiiw Database on Foreign Direct Investment.

This paper investigates the extent to which FDI influenced intra-industry trade in automotive products in six New EU Member States (the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia) in 1995–2014 period. Changes in IIT intensity are analysed with the use of the Grubel-Lloyd indices. When examining the IIT pattern, IIT is divided into two types of trade: IIT in vertically differentiated products (low and high quality VIIT) and IIT in horizontally differentiated products (HIIT).

The paper begins with the theoretical aspects of FDI impacts on intra-industry trade and a review of research studies. Furthermore, ITT changes in automotive industry products in the NMS are analysed. Trade in automotive products are comprised of final goods (motor vehicles) and intermediate products (parts and accessories).

The Impact of Foreign Direct Investment on Intra-industry Trade²

The theoretical analysis of ITT determinants in the literature is substantial. Originally, Loertscher and Wolter [1980] noted that IIT between countries was intense if gross domestic product (GDP) *per capita* of the trading countries was high, given that the difference in this indicator was relatively small and the average size of their aggregate outputs was high and

similar. According to the above-mentioned literature, IIT can also be influenced by such factors as geographical proximity (measured as the distance between capitals of countries or the existence of a common border), membership in a free-trade area and the presence of multinational enterprises (MNEs). Since the 1980 s, the presence of MNEs has significantly affected international trade and, consequently, also IIT. Dunning [1993] defined a multinational or transnational enterprise as an enterprise that engaged FDI and owned or in some way controlled value-added activities in more than one country. This is the threshold definition of MNE. Thus, the concept of 'MNEs' is intrinsically connected with the concept of 'FDI'. Later in this section, special attention is paid to the theoretical impact of FDI on IIT. Notably, the theory dealing with the FDI impact on IIT is only a part of a larger attempt to describe mutual relations between FDI and trade flows. Those depend on the character of capital flows. Based on theory, horizontal foreign direct investment (HFDI) displaces trade and is positively related to trade costs (Box 1). Furthermore, vertical foreign direct investment (VFDI) complements trade and is facilitated by low trade costs.

Box 1. Horizontal versus vertical FDI

Horizontal FDI – horizontal MNE serves consumers in both home and host markets locally. Instead of incurring costs associated with trade, these companies set up a production facilities both at home and abroad. Horizontal MNEs are likely to come into existence if markets are large (enabling the exploitation of economies of scale at the company level), plant set-up costs are low, and trade costs are high. Therefore, horizontal MNE activity (horizontal FDI) and goods export are substitutes.

Vertical FDI – vertical MNEs are characterised by the complete unbundling of headquarter services (in a skilled labour abundant country) and production (in an unskilled labour abundant one, where variable costs are high). In this way, they save money thanks to fixed plant set-up. Vertical MNEs engage in commodity trades. They are more likely to come into existence if the parent-to-host country skilled-to-unskilled labour (capital-to-unskilled labour) endowment ratio is high, and both trade costs and foreign fixed plant set-up costs are low. Consequently, vertical MNE activity and goods trade are complementary.

Source: [Baltagi, Egger, Pfaffermayr, 2007, pp. 262–263].

The pioneering work to attempt to explain FDI's impact on intra-industry trade was done by Helpman and Krugman [1985]. They found that the presence of multinational enterprises (including those vertically integrated) removes any unambiguous relationship between the share of intra-industry trade and differences in relative factor endowments. The volume of trade and the share of intra-corporate and intra-industry trade grow as differences in factor endowment increase until such differences exceed the critical point. Such findings suggest a hypothesis that the greater the engagement of multinational corporations in the world economy, the weaker the effect of changes in differences in factor endowment (equated with differences in GDP *per capita*) on the share of intra-industry trade.

Markusen [1984, 2002] and Markusen and Venables [1998, 2000] concentrated on horizontal foreign direct investment. In a situation of constant economies of scale and no trade costs such investments will not be made. They are attracted by the existence of noticeable trade barriers to market access, which a multinational enterprise seeks to evade by investing in a production plant in the country where the products are sold. Therefore, horizontal FDI substitutes for trade flow, i.e. it replaces exports and consequently contributes to decreasing the share of intra-industry trade.

Markusen and Maskus [2002] noted that trade liberalisation could contribute to an increase in the intra-industry trade index of the trading countries. However, the liberalisation of investment activities can reduce the intensity of intra-industry trade where trade costs are either too high or too low. Therefore, the intra-industry trade index will be high if 1) the countries involved in trade are of similar size or the smaller country is better endowed with skilled labour; or 2) trade costs are low, whereas the costs of investment activities are high. Similar conclusions were drawn by Fukao, Ishido and Ito [2003].

Recently, in the literature special attention has been paid to modifications of the traditional model with multinationals formed in 2 × 2 × 2 model (2 countries, 2 factors of production and 2 goods). Those modifications consisted in adding another factor of production [Egger, Egger and Greenaway, 2007], another country [Ekholm, Forslid and Markusen, 2007] or these two variables simultaneously [Baltagi, Egger and Pfaffermayr, 2007]. The modifications were induced by the continuously changing form of multinational activities. The division of multinational enterprises into horizontal (market-seeking production) and vertical integrated FDI (resource-seeking investments) does not fully reflect the investment strategies of such enterprises. More and more frequently, multinationals apply complex investment strategies, e.g. export-platform FDI. According to Ekholm, Forslid and Markusen [2007], export-platform FDI is defined as investment and production in a host country where output is largely sold in third-country markets, and not the parent or host-country markets.

Previous considerations were summarised by Ambroziak [2012a] and presented in Figure 1. Although some authors suggest that in the global economy there is no clear division into horizontal and vertical FDI (HFDI and VFDI respectively), this division enables us to better understand the mutual relationship between FDI and IIT. Horizontal FDI, stimulated mainly by high trade costs, substitutes trade flows and, as a result, also IIT. HFDI can also indirectly lead to growth in horizontal IIT because it influences economic development in the host country and diminishes differences in the market potential and level of development between the host and home countries.

Vertical FDI, also identified with the fragmentation of production processes, is of great importance to IIT development. It is very difficult to indicate which part of vertical FDI has a typical vertical character and which part adopts the form of export-platform FDI. In general, both types of vertical FDI promote mainly vertical IIT. Typical VFDI complements trade flows, thus influencing the intensity of vertical specialisation. In the case of export-platform FDI, its impact on IIT intensity depends on the market to which goods produced in the relevant plant are exported [Ambroziak, 2012a]. Assuming the import of parts and accessories to the host country, ITT growth occurs if final goods are exported to the home country. However, if final goods are exported to third countries, ITT falls. Next, in the case of the so-called global platform FDI (wherein final goods are exported to third countries as well as to the home country), the scale of IIT growth depends on the portion of exports reaching the home market. An increase in IIT intensity will result from vertical IIT as differences between unit values in export and import will be significant. It is worth stressing that intra-industry trade in final and intermediate goods can only occur if those goods are defined as the same industry. Vertical FDI can theoretically generate intra-industry trade in horizontally differentiated goods. It can happen with the simultaneous export and import of intermediate goods exhibiting no significant differences in unit values between the home and host countries [Ambroziak, 2012a].



FIGURE 1. The impact of FDI on IIT - summary of the theoretical considerations

The Literature Review

Intra-industry trade in the new EU Member States has been analysed by a number of authors. However, only a few examined intra-industry trade in the NMS in the context of foreign direct investment. Hoekman and Djankov [1996] were the first to study that

Source: Ambroziak [2012a].

topic. They concluded that 'FDI inflows are highly correlated with export performance and intra-industry trade levels. However, existing data do not allow an investigation of the direction of causality or the relative contribution of foreign affiliates or joint ventures to the volume of trade'. Aturpane, Djankov and Hoekman [1997] analysed ITT determinants between the European Union and eight Central and Eastern European countries (CEECs) during the period 1990-1995. They found that after controlling for country-specific factors, we find a positive and significant relationship between FDI and product differentiation and both vertical and horizontal IIT'. Kaminski [2001] showed that CEECs receiving relatively high FDI inflows in the 1990s also experienced expanded IIT. Caetano and Galego [2006] found that determinants of horizontal and vertical IIT within the enlarged EU (25 EU Member States) differed, although both had a statistically significant relationship with the size of the country and foreign direct investment. Kang [2010] examined the evolution and determinants of intra-industry trade in the period before and after accession of the Central and Eastern European countries (CEECs) to the EU. The author showed that 'FDI stock from a trading partner is positively correlated to the level of IIT in most cases and its coefficients are statistically significant. This means that share of IIT in bilateral trade between European countries is higher, when importing countries invested more in exporting countries'

Czarny and Śledziewska conducted a number of empirical studies on changes of Polish IIT from since 2000. They stressed that rapid and positive changes led to an increasing role of high quality VIIT and HIIT. These changes resulted from a modernisation of Poland's economy, aided by FDI inflow, Polish producers' gradual adjustment to EU technical standards, trade liberalization before EU accession and, finally, Poland's entry to the Single European Market [Czarny and Śledziewska, 2009]. The impact of FDI on IIT in the Visegrad countries was examined by Ambroziak [2012a]. The author identified a statistically significant positive correlation between intra-industry trade (both, of horizontal and vertical type) and foreign direct investment in those countries. Contrary to most studies, a very low interrelationship between FDI and IIT was found in Polish foreign trade by Cieślik [2008], who found that although the activity of multinational companies is positively related to the volume of bilateral trade between Poland and EU-15 countries, at the same time these companies do not seem to contribute to the development of the intra-industry-trade'.

Several authors conducted research on intra-industry trade in automotive industry goods produced by the specific countries or groups of countries. Leitão, Faustino and Yoshida [2010] studied vertical IIT within the Portuguese automobile parts and components industry during the 1995–2005 period. The authors concluded that 'income difference, representing factor endowments difference, is driving force for international fragmentation of production process. However, income difference effect on VIIT is non-linear via size of automobile production. Income difference effect is positive only for small size of automobile production countries'. Türkcan [2011] examined IIT in Austria's auto parts

trade between 1996–2006. The results showed that 'a substantial portion of IIT in the Austrian auto-parts industry is vertical IIT'. Vertical IIT in auto-parts was positively correlated with FDI. Kawecka-Wyrzykowska [2009], who analysed IIT in automotive industry products of the new EU Member States in the period 2000-2007, confirmed a positive relationship between FDI and intra-industry trade. The author also concluded that 'trade in the automotive sector is not, as suggested by some previous studies, mainly of vertical character. In some countries, an increase of horizontal intra-industry trade in the automotive sector has been recorded mirroring a fast catching up process and the involvement of transnational corporations'. Similar findings were reached by Ambroziak [2011], who analysed IIT in automotive products of the new EU Member States between 2000–2009. Ambroziak [2012b] also studied IIT in the automotive industry in the European Union during the period 1995–2010. The research results showed that a progressive specialisation by some of the new EU Member States in small car production and export led to changes in IIT patterns. 'The share of low quality VIIT in trade of motor vehicles increased, while the share of high quality VIIT in trade of automotive components grew significantly'. Surugiu and Surugiu [2015] examined the determinants of intra-industry trade in the Romanian automobile parts and accessories sector in the period 1995-2012. The results of their econometric analysis indicated that 'economic growth' had a direct influence, and 'physical capital endowments' an indirect influence, on Romanian IIT.

The Research Method

The intensity of intra-industry trade was measured by a simple Grubel-Lloyd index, computed on the basis of bilateral trade flows [Grubel and Lloyd, 1975]. One reason for selecting this index was that it was the most frequently used measure in such analyses. In addition, the application of bilateral (rather than multilateral) trade eliminates the phenomenon of so-called geographical bias in measuring intra-industry trade [Fontagné and Freudenberg, 1997]. The GL indices for specific industries were then aggregated using three variables, i.e.: trading country *k*, trading partner *k*' and industry *i*, in accordance with the following formula:

(1)
$$GL_{t} = 1 - \frac{\sum_{k=1}^{K} \sum_{k'=1}^{K'} \sum_{i=1}^{N} \left| X_{i,t}^{kk'} - M_{i,t}^{kk'} \right|}{\sum_{k=1}^{K} \sum_{k'=1}^{K'} \sum_{i=1}^{N} \left(X_{i,t}^{kk'} + M_{i,t}^{kk'} \right)}$$

where:

 $X_{i,t}^{kk'}$ – exports from country k to country k' of product group i (here: 4-digit HS code level) in year t;

 $M_{i,t}^{kk'}$ – imports of country k from country k' of product group i (here: 4-digit HS code level) in year t;

N – number of product groups in the automotive industry (3 groups here: products of the automotive industry, finished goods and parts and components) in trade between countries k and k,

K' – total number of trade partners or number of trade partners in specific groups of countries, i.e. the EU-15, the EU-12 and third countries,

K – number of trading countries, i.e. the six new EU Member States as a whole.

The calculations were based on data at the 4-digit HS (*Harmonised System*) code level. The *GL* index takes on values from the interval <0;1>. The higher it is the greater the share of intra-industry trade between two countries.

The division into intra-industry trade in horizontally differentiated products (offering diverse products of the same quality) and intra-industry trade in vertically differentiated products (offering the same products or very close substitutes of different quality) was made in accordance with the concept developed by Greenaway, Hine and Milner [1994], as subsequently modified by Fontagné and Freudenberg [1997]. Intra-industry trade was divided into horizontal and vertical IIT on the basis of the so-called unit values of specific products.

Horizontal intra-industry trade (HIIT) is considered IIT when it satisfies the following criteria:

(2)
$$\frac{1}{1+\alpha} \leq \frac{UV_{ij}^{x}}{UV_{ij}^{m}} \leq 1+\alpha$$

whereas vertical intra-industry trade (VIIT) is IIT when the following conditions are met:

(3)
$$\frac{UV_{ij}^{x}}{UV_{ij}^{m}} < \frac{1}{1+\alpha} \text{ or } \frac{UV_{ij}^{x}}{UV_{ij}^{m}} > 1+\alpha$$

where:

 UV_{ij}^{x} – the unit value of exports of product *i* from industry *j*, UV_{ii}^{m} – the unit value of imports of product *i* from industry *j*,

 α – the deviation of relative unit values in exports $(\frac{UV_{ij}^x}{UV_{ij}^m})$ In the literature it is assumed

that $\alpha = 0.15$ [e.g. Dautovic, Orszaghova and Schudel, 2014; Caetano and Galego, 2006].

The method presented above assumes that price differences (the so-called unit value) reflect differences in quality. Products with roughly the same unit values should be treated

as similar. According to Greenaway, Hine and Milner [1994], based on the assumption that perfect information exists, a product range sold at a higher price must be of a higher quality than a product sold at a lower price. Stiglitz [1987] argued that even in conditions of imperfect information product price would reflect its quality. According to Oulton [1990], only in the short-term can consumers buy products at prices higher (lower) in relation to their quality, due to omission, inertia or the high cost of shifting to other suppliers.

In this paper intra-industry trade will be divided into four types of trade:

- a) low quality VIIT low quality vertical intra-industry trade when *x* < 0.87; meaning that the unit value of exports is relatively lower than the unit value of imports (country *k* exports low-quality goods and imports high-quality ones);
- b) HIIT horizontal intra-industry trade when $0.87 \le x \le 1.15$; meaning that within the same industry country *k* exports and imports goods which are of the same price (quality) but differ in some other features such as colours, country of origin, etc.
- c) high quality VIIT high quality vertical intra-industry trade when x > 1.15; meaning that the unit value of exports is relatively high in comparison to the unit value of imports (country *k* exports high-quality goods and imports low-quality ones);
- d) non-allocated IIT means that the relative unit value of exports and imports is impossible to be computed. There can be various reasons for it, e.g. the lack of data for export quantity or import quantity.

The automotive industry is defined as the manufacturer of motor vehicles, trailers and semi-trailers (ISIC 34 rev. 3). For automotive trade data the corresponding table between ISIC rev. 3 and SITC rev. 3 and between SITC rev. 3 and HS 1996 was used. Products of the automotive industry include the following groups of goods at the 4-digit HS code level: 8702, 8703, 8704, 8705, 8716 (motor vehicles) and 8407, 8408, 8409, 8706, 8707, 8708, 8709 (parts and accessories). As an exception, data for FDI are related to the entire transport equipment industry, i.e. the automotive industry and the other transport equipment industry. This was due to the lack of more detailed data. However, in the NMS the prevailing share of FDI was located in the automotive industry.

The source of trade data was the UN Comtrade database, whereas investment figures are based on the *wiiw Database on Foreign Direct Investment*.

Changes in the Intensity of IIT in the Automotive Industry of the NMS

The buoyant inflow of FDI to the new EU Member States has contributed to an increased degree of production processes fragmentation in the European automotive industry. The division of production processes into specific stages, frequently located in several countries, created trade flows: between plants producing parts and components, between

the plant making semi-finished products and the car assembly plant, and between the assembly plant and the outlet for the cars produced. A major part of those trade flows was intra-industry in nature³. In 2014 the intensity of intra-industry trade in automotive industry products was 44% (Figure 2), which was 9 percent higher than in 1998, but 1 percent lower relative to 2004.

From the late 1990 s the intensity of intra-industry trade in parts and accessories in the NMS rose, being higher than for motor vehicles. This resulted from greater possibilities to differentiate intermediate goods than final products. Semi-finished goods can be differentiated at every stage of vehicle production. One example is the manufacture of petrol and diesel engines of various cubic capacity on the one hand, and the manufacture of such engines parts on the other hand (e.g. pistons, valves, filters). The greater the number of plants producing automotive parts and accessories in a country and the higher the number of car models assembled on the basis of intermediate goods manufactured, the greater the potential for growth in intra-industry trade in automotive parts and accessories. In 2014 IIT accounted for more than half (nearly 53%) of the trade of the NMS in such goods. Therefore, the share was 10 percent higher than in 1995 and almost 20 percent higher than in late the 1990 s. After 2004 the intensity of intra-industry trade started to decline, particularly from 2011. In 2014 IIT accounted for as little as 33% of the trade of the NMS in motor vehicles.

FIGURE 2. The intensity of intra-industry trade (GL) in automotive product industries of the new EU Member States (as a whole), in percent of total trade in automotive products



According to the literature at times high IIT indices can result from an incorrect aggregation of trade data [Ambroziak, 2012b]. From the point of view of calculating and interpreting intra-industry trade indices, the concept of an industry is important. Defining it correctly allows the phenomenon of two-way trade to be reliably measured. However, this is not an easy task. In practice, it is reduced to the selection of an appropriate classification of trade data (the HS or SITC classification) and a proper degree of details. The adopted level of data aggregation (e.g., grouping products into certain sets), is not always tantamount to the grouping of products in particular industries. The higher the number of goods in a distinguished data aggregate, the greater the likelihood of intra-industry trade. In the case of automotive parts and accessories, a particularly numerous group of products treated as an industry is subheading HS 8708, i.e. parts and accessories for motor vehicles. This group includes bumpers, safety belts, brakes, gearboxes, drive axles with differential, wheels, suspension shock absorbers, radiators, silencers, clutches and steering wheels. For instance, simultaneous export of gearboxes by a country and import of shock absorbers will be registered as an intra-industry trade.

Within the examined period individual NMS intensity of intra-industry trade in products of the automotive industry varied widely. However, factors influencing horizontal IIT in motor vehicles and in automotive parts and components were different. The intensity of intra-industry trade in motor vehicles in a specific country resulted from both supply and demand for such vehicles. The lesser the differences between such supply and demand, the greater the potential for growth in intra-industry trade in such goods. The main determinant of the level of IIT in motor vehicles was which country the plant producing such vehicles was located. Manufactured cars could be sold in foreign markets or in the domestic market. The higher the share of export-oriented production, the greater the possibilities of growth in intra-industry trade.

As for demand-side factors affecting development of IIT, the level of demand for vehicles and its composition depended on incomes and consumer preferences for the vehicles type purchased. Consumers could buy cars manufactured domestically (new or used) and vehicles imported from foreign countries (new or used). A higher share of imported vehicles in the sales of a country implies a greater intensity of IIT in that group of goods. However, it does not refer to cases when a country does not produce vehicles.

In 2014 the lowest indices of intra-industry trade in motor vehicles were found in Slovakia and the Czech Republic, being 18% and 25% respectively (Figure 3). In the 1995–2014 period the intensity of intra-industry trade in such goods showed a marked decrease, especially after the financial and economic crisis of 2008/2009. After EU accession, the involvement of foreign investors allowed, the Czech Republic and Slovakia to begin specialising in manufacturing vehicles – mainly low-emission urban cars, regarding which they became the unquestionable leaders in Central Europe. In 2002 Japanese Toyota launched production in its factory in Kolín (the Czech Republic) and in 2006 French PSA Peugeot Citroën began car production in Trnava (Slovakia), Korean Hyundai in Žilina (Slovakia) and Nošovice (the Czech Republic). In 2014 1,251,000 vehicles were manufactured in the Czech Republic, whereas the output in Slovakia was 971,000 units [OICA, 2015]. The vast majority of this production was exported. At the same time, both countries domestically registered fewer than 300,000 new cars, some of which had been imported [OICA, 2015]. The increasing differences in demand and supply for vehicles pushed down ITT indices.

Compared to the late 1990 s, the intensity of intra-industry trade in motor vehicles increased in Poland, Hungary and Romania. In the period of EU membership, no automotive firm made any new investment in a car assembly plant. During the 2008–2014 period, production of vehicles in Poland dropped from 952,000 to 593,000 [OICA, 2015]. Of total car sales after the financial and economic crisis of 2008/2009 (which were below 400,000 units, and largely imported vehicles), more than half of Polish trade in motor vehicles was intra-industry in nature (56% in 2014). In the last years the respective share was below 50% in Romania. During Hungary's first years of EU membership it exceeded 50%, but steadily decreased after 2011 to a mere 34% in 2014. The fall in IIT indices stemmed largely from an investment by German Daimler in a plant producing Mercedes cars in Kecskement (where production was launched in 2012). In 2014 Hungary manufactured 438,000 vehicles, i.e. double the 2011 figure. At the same time, new car sales did not exceed 90,000 units [OICA, 2015]. A relatively high index of IIT in motor vehicles characterised Slovenia, but from the late 1990 s it went down by nearly 20 percent and in 2014 it was 35%.

A significant role in the foreign trade of the NMS, and thus in their intra-industry trade, was played by used car imports. This phenomenon intensified after the NMS joined the European Union. For instance, in 2014 Poland imported nearly 750,000 second-hand vehicles [Ministry of Finance, 2015], but only some of them were recorded in trade statistics. Those excluded cars were brought by private individuals. Therefore, considering the actual scale of the phenomenon, in many countries, primarily in Poland, the intensity of IIT in motor vehicles would probably be higher.

At the same time, the intensity of intra-industry trade in automotive parts and accessories mainly depended on the development level of the automotive components manufacturing industry, as well as the presence of vehicle assembly plants in a country. Due to highly fragmented automotive industry production processes, factories that produce parts supplied car assembly plants in many other countries. For instance, the Toyota factory in Wałbrzych delivered engines and gearboxes to plants in Valenciennes, France, and Kolín, the Czech Republic. A single factory assembling vehicles could be supplied with parts and accessories by many sub-suppliers from various countries. Therefore, the motor vehicle production process created trade flows between countries participating in the production chain.





Source: own elaboration based on UN Comtrade.

The highest indices of IIT in parts and accessories were noted in the Czech Republic. This resulted, in part from the large scale of vehicle assembly, which used both domestic and imported parts and components. It was also the result of a well-developed automotive parts and components industry. The supply of such intermediate goods was sufficient for enough production to sell the product to export markets. During the period in question, however, the intensity of intra-industry trade in parts and accessories in the Czech Republic was on the decline. This fall is related to greenfield investment in vehicle assembly plants. A rising share of parts and components manufactured in the subject country was used at such plants. In addition, it was necessary to supplement the domestic offer with imported parts and components. Nevertheless, in 2014, 56% of Czech trade in parts and accessories was still intra-industry in nature. IIT indices in the group of parts and components also dropped in Slovakia. As with the Czech Republic, this can be explained by specialisation in the manufacturing (export) of passenger cars, which relied on imported components to an even greater extent than did Czech factories. In 2014 the index of IIT in such goods was slightly over 40%, whereas in the late 1990 s it sometimes even exceeded 60%.

The case in Poland and, to a lesser degree, other NMS was the opposite. Between 1995–2014 the Polish index of IIT in parts and accessories increased by a factor of 2.5, to 58%. From the early 2000s major investments of automotive companies (such as car assembly factories) were located outside Poland, which became the leader in attracting investment and exhibited particularly robust growth after the financial and economic crisis. Plants manufacturing parts and components supplied their output to domestic assembly factories (which produced a small number of cars) and exported their products. The main recipient of intermediate goods for the automotive industry was Germany, to which Poland exported domestically manufactured engines for Volkswagen vehicles. A clear majority of those parts was sold to the Chinese market. Due to Poland's participation in the global value chains of the automotive industry, its IIT in parts and accessories is influenced by the import needs of countries other than those to which exports are sold.

Horizontal Versus Vertical IIT

During the examined period, the automotive trade of the NMS was dominated by intra-industry trade in vertically differentiated products. This means that differences in unit prices of exports and imports were significant enough to indicate differences in the quality of traded products. From the late 1990 s there has been a clear decline in relative unit values in the export and import of motor vehicles. Thus, low quality vertical IIT and horizontal IIT gained importance (Figure 4). Most the NMS producing motor vehicles, i.e. the Czech Republic, Slovakia, Poland, Romania and Slovenia, exported vehicles with decreasing unit values. This stemmed from the ongoing specialisation of those countries in the manufacture and export of low-emission and economical cars. Unit prices of exports were lower than sale prices of vehicles with higher engine capacity in foreign markets. Rapid growth in the production of urban cars pushed down the share of larger vehicles in NMS exports, thus decreasing the relative unit values of export and import of such goods.

At the same time, due to the high import-intensity of export in these countries, unit value changes in exports and imports were closely interrelated. Specialisation in the manufacturing of low-emission cars reduced unit prices in imports of parts and accessories used in that production. Consequently, there was an increase in the relative unit price of exports of parts and components, which was reflected (with a few exceptions) in the growing importance of high quality vertical intra-industry trade. This was particularly evident in 2009 during the financial and economic crisis. After the introduction of support for acquiring new vehicles, a number of the EU-15 countries experienced growth in demand for urban cars manufactured in some NMS. As a result, in 2009 the share of low quality vertical IIT in motor vehicles in the NMS showed a visible rise relative to the prior year, whereas trade in parts and components witnessed an increase in the share of high quality vertical IIT.





Source: own elaboration based on UN Comtrade.

The composition of IIT in products of the automotive industry varied between NMSs. Low quality vertical IIT played the most important role in the trade in motor vehicles of Romania, Slovenia and Poland. Exports of those countries were dominated by low engine capacity cars. In addition, Poland was characterised by significant imports of used vehicles with relatively low unit values and in the Czech Republic horizontal IIT accounted for more than half of intra-industry trade at the end of the discussed period, implying trade in vehicles of similar quality but different non-qualitative features, e.g. the colour, the country of origin, equipment, etc. In Hungary, high quality vertical IIT played an important role, as exported cars were of higher quality than imported cars. Hungary exported vehicles such as Audi, manufactured in the Győr plant, and Mercedes have been produced in Kecskement since 2012.

Less significant differences in the composition of IIT were found in trade in parts and accessories. High quality vertical IIT dominated the trade of Romania, Slovakia, Hungary and the Czech Republic. Horizontal IIT formed the highest share of Polish trade, whereas in Slovenia low quality vertical IIT was the most significant.

Conclusions

The study demonstrated that FDI inflow to the automotive sector of the NMS has been an important factor shaping intra-industry trade in automotive products. The inflow of capital for the launch of a product in vehicle assembly plants increased domestic supply. Access to the large EU market enabled producers to specialise in manufacturing specific varieties, i.e. models of vehicles. The intensity of IIT in such cars depended on consumer demand for imported vehicles (both new and used) in individual NMS. If demand was high (e.g. in Poland), the indices of IIT in vehicles were also relatively high. In countries where demand for imported vehicles was low (e.g. in the Czech Republic and Slovakia) a greater share of the trade of such countries was inter-industry in nature.

Thus, high intensity of IIT in motor vehicles means more benefits for both manufacturers and consumers from the new EU Member States. Economies of scale contributed to cutting production costs, whereas a greater differentiation of goods enabled producers to open new outlets, e.g. to the EU Member States with relatively high-income consumers. At the same time consumers, thanks to a wider range of available products, could choose from more differentiated varieties, satisfying their diverse needs.

FDI inflow to plants producing automotive parts and accessories pushed forward the domestic supply of such articles. The level of production of motor vehicles in a country determined IIT in parts and accessories. A high level of production involves lesser prospects of IIT growth since some production of components is absorbed by domestic plants manufacturing vehicles (e.g. the Czech Republic and Slovakia), whereas only a limited

number of output is exported. It is frequently accompanied by an increased import of parts and components. In a situation where vehicle production in a country is limited, a higher proportion of manufactured parts and accessories can be exported to other countries (e.g. Poland). This usually involves a decline in import demand from domestic producers of vehicles for parts and components, which are later used in producing those vehicles.

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Notes

² The impact of foreign direct investment on intra-industry trade was examined in previous publications of the author [Ambroziak, 2012a, 2013].

³ One example illustrating the investment and trade relationships in the automotive industry is the cooperation of the South Korean factories of KIA and Hyundai in the border regions of the Czech Republic and Slovakia. Some of the gearboxes produced in the factory of Hyundai in Nošovice, the Czech Republic, are delivered to the car assembly plant of Hyundai in the same locality, whereas others are supplied to the Slovak factory of Kia Motors (90 km away) where models of Kia Cee'd are made. At the same time, engines manufactured by Kia in the Slovak Žilina are dispatched not only to its own car assembly factory, but also to the Czech Nošovice.

References

Ambroziak, Ł. (2011), Intra-industry trade in the Visegrad Countries: the case of the automotive industry, paper presented at the conference "ETSG 2011 Copenhagen," Copenhagen Business School and University of Copenhagen, Copenhagen, September, pp. 8–10.

Ambroziak, Ł. (2012a), FDI and intra-industry trade: theory and empirical evidence from the Visegrad Countries, *International Journal of Economics and Business Research*, Vol. 4, No. 1–2, pp. 180–198.

Ambroziak, Ł. (2012b), The impact of the economic crisis on an intra-industry trade in the automotive industry in the European Union, in: B. Cerović, M. Jakšić, Z. Mladenović, A. Praščević (Ed.), *From Global Crisis to Economic Growth. Which Way to Take?*, University of Belgrade, Faculty of Economics, Belgrade, pp. 195–220.

Ambroziak, Ł. (2013), Wpływ bezpośrednich inwestycji zagranicznych na handel wewnątrzgałęziowy państw Grupy Wyszehradzkiej [The impact of foreign direct investment on intra-industry trade in the Visegrad Countries], IBRKK, Warsaw.

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Aturpane, Ch., Djankov, S., Hoekman, B. (1997), Determinants of Intra-Industry Trade between East and West Europe, *The World Bank: Policy Research Working Paper*, No. 1850.

Baltagi, B., Egger, P., Pfaffermayr, M. (2007), Estimating models of complex FDI: Are there third-country effects?, *Journal of Econometrics*, Vol. 140, No. 1, pp. 260–281.

Caetano, J., Galego, A. (2006), In Search for Determinants of Intra-Industry Trade within an Enlarged Europe, *University of Évora. Economics Working Papers*, Vol. 2.

Cieślik, A. (2008), Multinational firms and international fragmentation of production in Poland, *Working Papers* of International Business, University of Gdańsk, Sopot.

Czarny, E., Śledziewska, K. (2009), Poland's Intra-Industry Trade with the European Union in years 1999–2007, in: M.A. Weresa (Ed.), *Poland. Competitiveness Report 2009. Focus on Human Resources*, World Economy Research Institute, Warsaw School of Economics, Warsaw.

Dautovic, E., Orszaghova, L., Schudel, W. (2014), Intra-Industry Trade Between CESEE Countries and the EU 15, *European Central Bank Working Paper Series*, No. 1719, August.

Dunning, J.H. (1993), Multinational Enterprises and the Global Economy, Addison - Wesley Company, Wokingham.

Egger, H., Egger, P., Greenaway, D. (2007), Intra-industry trade with multinational economics, *European Economic Review*, Vol. 51, No. 8, pp. 1959–1984.

Ekholm, K., Forslid, R., Markusen, J. (2007) Export Platform Foreign Direct Investment, *Journal of the European Economic Association*, Vol. 5, No. 4, pp. 776–795.

Fontagné, L., Freudenberg, M., Gaulier, G. (2006), A Systematic Decomposition of World Trade into Horizontal and Vertical IIT, *Review of World Economics*, Vol. 142, No. 3, pp. 459–475.

Fukao, K., Ishido, H., Ito, K. (2003), Vertical Intra-Industry Trade and Foreign Direct Investment in East Asia, *Journal of the Japanese and International Economies*, Vol. 17, pp. 469–506.

Greenaway D., Hine R.C., Milner, C. (1994), Country-Specific Factors and Pattern of Horizontal and Vertical Intra-industry Trade in the UK, *Weltwirtschaftliches Archiv*, Vol. 130, pp. 77–100.

Grubel, H.G., Lloyd, P.J. (1975), Intra-Industry Trade: the Theory and Measurement of Intra-Industry Trade in Differentiated Products, Macmillan, London.

Hoekman, B., Djankov, S. (1996), Intra-industry trade, foreign direct investment, and the reorientation of Eastern European exports, *The World Bank: Policy Research Working Papers*, No. 1652.

Kang, Y-D. (2010), Intra-industry Trade in an Enlarged Europe: Trend of Intra-industry Trade in the European Union and its Determinants, *KIEP Working Paper*, No. 2.

Kaminski, B. (2001), How Accession to the European Union has Affected External Trade and Foreign Direct Investment in Central European Countries, *The World Bank Policy Research Working Paper*, No. 2578.

Kawecka-Wyrzykowska, E. (2009), Evolving pattern of intra-industry trade specialization of the new Member States (NMS) of the EU: the case of automotive industry, *European Economy. Economic Papers*, No. 364, March.

Leitão, N.C., Faustino, H.C., Yoshida, Y. (2010), Fragmentation, Vertical Intra-Industry Trade, and Automobile components, *Economics Bulletin*, Vol. 30, No. 2, pp. 1006–1015.

Loertscher, R., Wolter, F. (1980), Determinants of Intra-Industry Trade: Among Countries and Across Industries, *Weltwirtschaftliches Archiv*, Vol. 116, pp. 280–293.

Markusen, J.R. (1984), Multinationals, Multi-plant Economies, and the Gains from Trade, *Journal of International Economics*, Vol. 16, No. 3–4, pp. 205–226.

Markusen, J.R. (2002), *Multinational firms and the theory of international trade*, M.I.T. Press, Cambridge Mass. Markusen, J.R., Maskus, K.E. (2002), A Unified Approach to Intra-Industry Trade and Direct Foreign Investment,

in: P.J. Lloyd, H.-H. Lee (Ed.), Frontiers of Research in Intra-Industry Trade, Palgrave Macmillan, New York.

Markusen, J.R., Venables, A.J. (1998), Multinational Firms and the New Trade Theory, *Journal of International Economics*, Vol. 46, pp. 183–203.

Markusen, J.R., Venables, A.J. (2000), The Theory of Endowment, Intra-Industry and Multinational Trade, *Journal of International Economics*, Vol. 53, No. 2, pp. 209–234.

Ministry of Finance, Poland (2015), Statistics on imports of used cars in Poland, http://www.mf.gov.pl/sluzbacelna/dzialalnosc/publikacje/-/asset_publisher/1EtN/content/samochody-osobowe, accessed: July 10, 2016.

OICA (2015), Motor vehicle production and sales statistics of the International Organization of Motor Vehicle Manufacturers, http://www.oica.net/, accessed: July 15, 2016.

Oulton, N. (1990), Quality and Performance in United Kingdom Trade 1978–1987, *NIESR Discussion Paper*, No 197.

Stiglitz, J.E. (1987), The Causes and Consequences of the Dependence of Quality on Price, *Journal of Economic Literature*, Vol. 25, No. 1, pp. 1–48.

Surugiu, M-R, Surugiu, C. (2015), Analysis of the Intra-Industry Trade for the Motor Vehicle Parts and Accessories Sector from Romania, *Procedia Economics and Finance*, Vol. 22.

Türkcan, K. (2011), Vertical Intra-Industry Trade and Product Fragmentation in the Auto-Parts Industry, *Journal of Industry, Competition and Trade*, Vol. 11, No. 2, pp. 149–186.