INTEGRATION OF POLAND'S REGIONS WITH THE EUROPEAN UNION – ASSESSMENT OF INTRA INDUSTRY TRADE RELATIONS

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The purpose of the study is to present and assess international trade relations of Poland's regions, with focus on the intensity of intra industry trade (IIT) with the EU countries. This kind of trade is treated as a measure of integration of Poland's region's economies with the EU market. The particular tasks addressed in the paper are: description of inspirations to deal with international trade at regional level; formulation of a concept of region as a small, open economy; assessment of intra industry trade links in static and marginal formula - at regional level for Poland's regions. The proposed approach is a novelty in both ways: (a) studies on international trade for Poland's regions are not so much developed; (b) intra-industry trade at regional level is a new topic that sheds light on real integration with the EU markets. The method used in the research is a standard formula of IIT as proposed by Grubell and Lloyd, weighted according to product's shares in trade volume. Also the marginal IIT formula is used, as proposed by M. Brülhart. Calculations were done for four-digit Combined Nomenclature groups of products. As expected, intensity of IIT for regions is lower than for the whole country. There are important differences observed for Poland's regions. As regions differ per se, also in terms of IIT one observes differences that reflect: proximity to the EU internal market, GDP per capita differences, role of foreign direct investments in region's economies, structure of industry and exports as well as overall competitiveness. Five groups of countries have been distinguished. IIT intensity is the highest for relations with "the old" EU member states. Also for the "new" member states is relatively high. It corresponds to the main message of IIT theory, that predicts stronger IIT among integrated economies.

Keywords: *Poland's regions, intra-industry trade, foreign direct investment, integration, regional differences.*

Introduction

International trade analyses are conducted in regard to countries, groups of countries (for example groups of integrated countries, such as the EU); or at the level of particular branches of industry. It is usually overlooked in theory and in empirical research that streams of exports (and imports) come from specific locations (see more in K. Gawlikowska-Hueckel and S. Umiński, 2013). The nature of those streams determines the form of trade relations established by economic entities with foreign markets.

A couple of issues inspired my interest in the topic of international trade in regard to regions:

- an increase in the role of regions' in contemporary economic processes,
- integration of Poland's economy (with the EU) under the conditions of free flow of goods, capital, services and labor,
- subsidiarity as the fundamental principle of relationships within the European Union, but also as an encouragement to decentralization,
- observed processes of polarization in regional development,
- furthermore, "transfer" of the discussions and empirical research devoted to competitiveness into the regional level.

In recent years, an increase can be observed in the interest of regional authorities in export-related issues. It is primarily due to a realization of the fact that economic situation of a region depends more and more upon relations with international markets. In the eyes of regional authorities, especially after Poland joined the European Union, international aspect of interdependence gained new meaning – as a factor that influences mainly the labor market. Secondly, local self-governing authorities take part in promotion of exports. The effectiveness of such promotion requires an appropriate diagnosis of the situation and trends.

Region as a small, open economy

In classic economic models the processes of reasoning and concluding were based on "single-point" economy, without any spatial dimension. Crucial issues such as "how to produce", "who is producing" or "for whom the production is" – were analyzed in the world where problems such as distance or transport costs do not exist, neither do the spatial dimension. Our intention is not to thoroughly present various concepts and definitions of a region, because it is a subject of numerous elaborations and much research (see for instance J. Zaucha, 2007, p. 185). Above all, it is about pointing out a relatively new role in which regions appear. This new role is participation in international economic relations (see more in S. Umiński 2012). Regions are perceived most of all as parts of a country (that is in the internal aspect), whereas their external aspect of functioning is overlooked and goes unnoticed. This

dimension gains importance, because of the development of globalization and intensification of international economic relations between countries, which implicates a growing dependence of socio-economic situation in the region on international economic processes (see more in: J. Zaucha, D. Ciołek, T. Brodzicki, E. Głazek, 2014, p. 206–244).

Overview of definitions and ways of perceiving regions and their functions leads to a conclusion that their participation in international economic processes is being neglected. One dimension of this participation is the role of a **region as an exporter and an importer.** The realization of the fact that a region functions as an exporter, inclines us to accept the concept of a **region as so-called small, open economy.** It is, in a way, a direct transfer of an approach represented by international economics in regard to countries to the regional dimension. The idea of region as an example of a small, open economy is applied to theoretical deliberations and to empirical research (M. Eswaran, A. Kotwal, B. Ramaswami, W. Wadhwa 2007, p. 11; M. Llop, A. Manresa, 2007; K.N. Harilal, K.J. Joseph 2000, p. 8). J. Zaucha and J. Szlachta (2012, p. 21) show how region can prepare to react to global economic shocks.

Intra-industry trade – a concept applied to regions

Accepting a concept of region as an exporter and an importer, as well as region as a small, open economy – allows us to apply international trade theory to interpret trade relations between a region and foreign countries. The subject of research in this elaboration is an intra-industry trade (IIT). It is one of the most important trade theories. **It has been chosen primarily because it proves to be an adequate tool used in research of the nature of trade between the integrating countries (regions).**

The second reason to study the IIT is the apparent lack of elaborations on that topic – which is a serious incentive to research IIT in Poland's regions (NUTS 2). At the same time, the intensity of trade connections with the European Union market can be investigated.

It is IIT theory that explains trade overlap phenomenon, in which country/region is both exporter and importer of the same goods (or their variants).

According to A. Zielińska-Głębocka (1997, p. 95-96), there are three basic factors that constitute a base for IIT. These include: product diversification, economies of scale and imperfect competition. IIT happens between similar countries (especially the industrialized ones) that are close in the level of development and have similar consumers' preferences. Above all, it is significant for the European Union member states that removed trade barriers and between which integration of markets occurs.

Another extremely important factor conductive to IIT intensification is emphasized in the literature. Aforementioned factor is the **fragmentation of production** between countries (P.R. Krugman 1979, OECD 2002, Y. Yoshida 2008, C. Marrewijk 2008) with the use of foreign direct investment (FDI), especially by supranational corporations. More and more often, FDI is taken into consideration in research in regard to IIT intensity. Still, the type of IIT (whether vertical or horizontal) that is determined by FDI, is the matter of discussion. FDI that is taken into account as an explanatory variable in modeling, mirrors the fact that IIT is being looked at

differently. It is perceived by economists not in a "traditional" way anymore, a phenomenon derived from "demand for variety", but as a result of the fragmentation of production, meaning locating particular parts of added value chain in different countries. The introduction of distinction between horizontal and vertical, investment and trade linkages created a vast area to interpretation of relations between trade and FDI, especially between intra-industry and intra-firm trade (OECD 2002).

In the case of Poland, similarly to the countries of East-Central Europe, intensification of trade links with other countries was accompanied by FDI inflow. A consequent thesis can be formulated as follows: due to the high share of enterprises with foreign capital in exports and imports, FDI was one of the main determinant of changes in international trade, its growth, structural changes and competitiveness. Therefore, we can expect positive correlation between share of enterprises with foreign capital in foreign trade and the intensity of IIT, because it is the activity of foreign investors (mostly supranational corporations) that leads to the growth of the fragmentation of production between countries.

The literature on the subject points to horizontal diversification (in terms of features), and to vertical one (in terms of quality). It was as early as 1979 that P.R Krugman (1979) pointed out that the development of vertical IIT is stimulated by international fragmentation of production, whereas horizontal by "demand for variety". According to L. Fontagne and M. Freudenberg (1997, p. 10), countries that differentiate in economic structure or in income level, will engage in IIT (in the range of products diversified vertically). On the other hand, very similar countries will experience high intensity of IIT in the range of products that are also similar, but differ only in variants (horizontal diversification). The above statement is, in some sense, contradictory to the fundamental message concerning the nature of IIT, as it allows the opportunity of IIT between countries that differ considerably (see also: J. Caetano and A. Galego 2007, p. 169).

The analysis of research on IIT, that has been produced over the past few years, allows us to formulate a conclusion that these reflections considered two main movements. First of them, represented by already mentioned L. Fontagne, M. Freudenberg and N. Peridy (1997). Not only did they call attention to the necessity of consideration of so called simple overlapping of imports and exports streams within one branch, but also to horizontal and vertical IIT. The second movement is represented by M. Brülhart, who is an author of many publications devoted to problems of IIT measures. M. Brülhart is a supporter of using so-called dynamic measurement of this kind of trade. He is the author of IIT computing methods in marginal terms. In his works, he refers to the previous proposals of C. Hamilton, P. Kniest and D. Greenway (D. Greenway, et.all., 1994), which take into account changes in trade volume between particular moments in time.

M. Brülhart makes a distinction between traditional IIT measures (static) and dynamic, and at the same time also singles out quasi-dynamic measurement, which concerns changes in IIT intensity over time and change in marginal intra-industry trade (MIIT) under conditions of balanced trade turnover. The idea of MIIT concerns investigating the meaning of IIT in the trade change, not the IIT itself.

What can we expect while analyzing IIT at regional level

The availability of detailed statistical data poses a great encouragement to examine IIT intensity at the level of regions. The diversification of economic structures, industrial base of particular regions, and different profiles of specialization in international trade that result from this, force us to expect that we deal with different IIT intensity in particular regions. What can be further anticipated is that in each region different products are characterized by its high/low intensity. For example in the region, where both exports and imports are oriented towards the car industry, we may expect that in this branch IIT indices will be on high level. Studying IIT on regional level means that we analyze the scale and nature of the fragmentation of production with greater probability, than if we were to analyze it traditionally; as is done on the level of a country "demand for variety".

When wondering about the nature of IIT analysis at the regional level, a few hypotheses can be stated:

1. At region level, lower IIT intensity can be expected. Lower than it is for the whole country. With a definite level of data aggregation (according to product groups) for the whole country, IIT indices are usually higher. Imports and exports overlap, although the analysis concerns trade of business entities that have their head offices in various locations (Y. Yoshida, 2008, p. 1 and next).

The following situation can happen at national level if we examine the trade of different entities: one entity is, for example, only the importer of a given product, and the other one only is the exporter, but is located in a different region. In that case, the analysis considers "demand for variety".

As we are interested in production or cooperation linkages, the regional level of analysis should be more appropriate. IIT relations appear if the trade takes place within the same companies, or as a part of their group. From that point of view, it would be optimally if we could examine IIT nature not in, so to say, artificially separated/ "imposed" administrative regions, but referring to the idea coined by P.R Krugman and A.J. Venables (1995). Their concept of seamless world suggests IIT examination in naturally separated areas, where companies cooperating with the world and with each other (creating specialized clusters) are located.

2. We may expect (due to the differences between regions in regard to the level of economic development) that we will deal with dissimilar levels of IIT intensity. More developed regions should be characterized by higher IIT intensity than those on the lower level of development.

3. Moreover, we may expect that IIT intensity is positively correlated with the participation of the companies with foreign capital in regions' international trade. It is a result of the role that FDI plays in international trade development in general, but mostly in the fragmentation of production between countries.

4. Because IIT refers mostly to the countries that are in strong economic integration (trade partners), following thesis can be formulated: high IIT intensity will be a domain of those regions that are characterized by strong trade linkages with the EU countries, in which we deal with advanced trade liberalization (in formal and practical sense).

IIT intensity for Poland's regions

Data of Customs Chamber and Polish Central Statistical Office (from the extrastat/intrastat system) have been used to assess IIT nature in this paper. The location of the seat of the entity that exports and/or imports is criterion for assigning exports and import flows to a particular region. The resulting image of export at regional level should be treated as approximate. We must be aware of such distracting factors as: intermediate trade, as well as the cooperation between enterprises beyond the boundaries of the regions. The data are provided according to the headquarters localisation of a subject declaring international trade transactions.

The intensity of IIT in total trade, registered for regions, has been measured with the use of the Grubell-Lloyd index due to following formula[1]:

$$R_i = \sum_{i=1}^{n} a_i \frac{(Ex_i + Im_i) - |Ex_i - Im_i|}{(Ex_i + Im_i)} \tag{1}$$

Where:
- $(Ex_i + Im_i)$ – represents global value of foreign trade of i branch in region,
- $|Ex_i – Im_i|$ – is the absolute value of difference between exports and imports of i branch in the region,
- a – means participation of i branch in the sum of exports and imports of region.

Figure 1 presents G-L indices for Poland's regions (this is overall IIT intensity, not broken by groups of countries). Firstly we conclude that – as it was expected – IIT intensity is lower for particular regions, than for Poland as a whole. Highest G-L indices are observed for regions that are regarded as top exporters (Wielkopolskie, Śląskie, Małopolskie, Mazowieckie and Pomorskie), have high share of automobile industry products in exports (Wielkopolskie, Śląskie, Małopolskie) and have strong trade links with the EU markets (mostly Germany): Wielkopolskie, Śląskie, Opolskie. Podkarpackie does not belong to a group of leading exporters, however it reveals high share of high-tech products due to aircraft industry presence in the region. On the other hand, lowest intensities of IIT are observed for regions situated in a distance from the EU-15 member states. These are: Podlaskie, Świętokrzyskie, Warmińsko-Mazurskie and Kujawsko-Pomorskie. They are generally regarded as less competitive exporters, with relatively high share of agricultural products. It shall be stressed however that IIT intensity is strongly influenced by region-specific factors, mainly being industrial structure and presence of foreign direct investors that determine pattern of trade relations.

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[1] While approaching the practical analysis of IIT, one has to be aware of the fact that there are many measures of its intensity. Our goal is not to present them in detail, because they have been broadly described and applied in theoretical literature on the subject as well as in their practical aspect. The diversity concerns global measurement formulas, as well as those applied to the level of particular branches. See more in: T. Brodzicki (2011 and 2013).
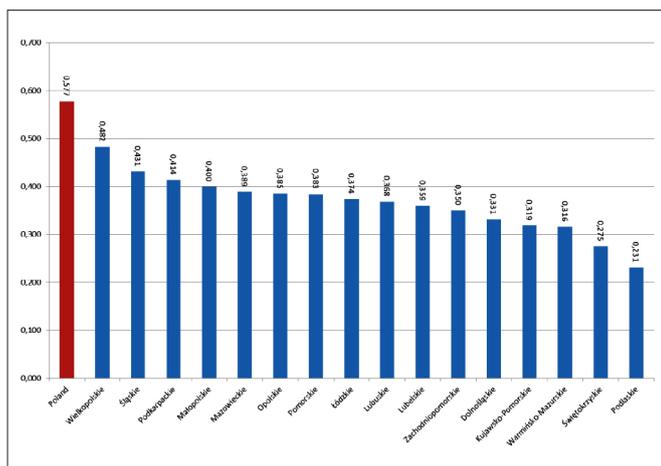
Figure 1. IIT intensity measured by G-L index for Poland's regions (2011)
Source: Own calculations based on Customs Chamber data

As it was expected, intensity of IIT is not the same in trade relations that enterprises established in particular regions have with different groups of countries. Apart from EU-15 and new UE member states, the following groups were distinguished: Far East, Russia+Ukraine+Belarus and "other countries". Figure 2 depicts IIT intensity differences for groups of countries. IIT indices were calculated as averages for 16 regions.
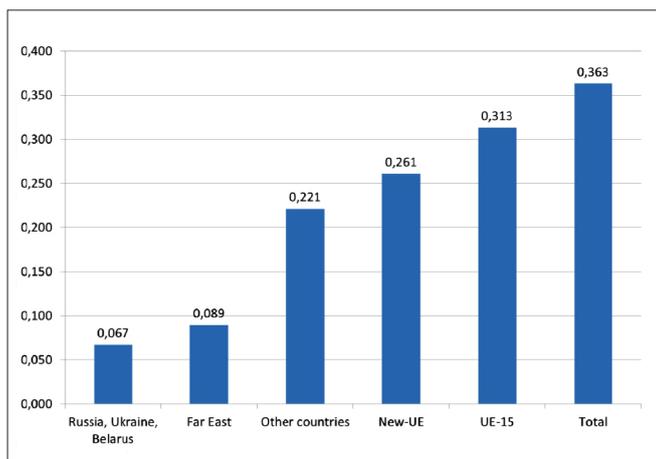

Figure 2. IIT intensity measured by G-L index for Poland's regions by group of countries (2011)
Comments: G-L index has been calculated for each group of countries as an average of IIT indices for 16 regions of Poland
Source: Own calculations based on Customs Chamber data

The ability to join international cooperation networks is the basis for IIT to exist. Although, in the traditional approach; due to the basic message of IIT theory, it is mostly about the similarity of demand and so-called "demand for variety". Therefore – as most of the foreign trade of Poland's regions is with countries with higher GDP per capita – regions' high GDP per capita shall positively contribute to IIT intensity. We see a positively correlation indeed (see figure 3).
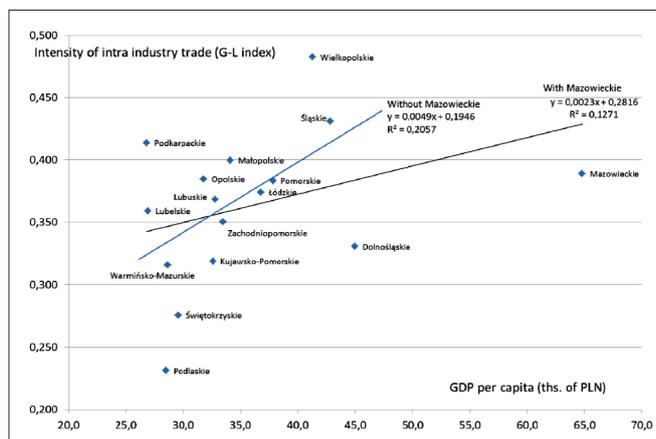

Figure 3. Correlation between GDP per capita of region (nominal value, ths. PLN) and IIT intensity (G-L index) for 2011
Source: Own calculations based on Customs Chamber data

In the open economy, especially under conditions of intensive inflow of FDI, the high level of development is correlated with the inflow of foreign capital. It is essential to remember that IIT is often equated with intra-firm trade. The dependency between share of enterprises with foreign capital in exports and IIT intensity is presented on figure 4. An interesting regularity can be observed. Correlation is higher in case of regions, where foreign enterprises share exceeds 45 per cent. It may indicate that a greater role of FDI in IIT stimulation is possible after achieving a specific FDI involvement limit in region's economy (a definite "critical mass"). The same regularity has been identified for MIIT static index (see S. Umiński 2012, p. 240).
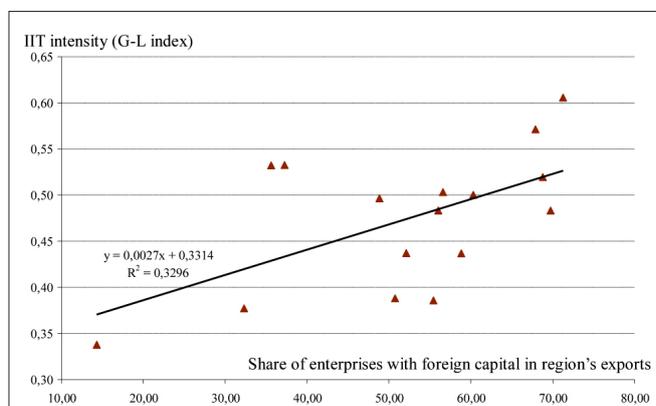

Figure 4. Correlation between the share of enterprises with foreign capital in region's exports and intensity of IIT (2008)
Source: Own calculations based on Customs Chamber data

MIIT assessment

So-called marginal formulas are used in the IIT dynamic dimension. Thanks to their application, role of IIT in trade's change can be assessed, and not a change in trade itself. So, the MIIT provides us with very interesting information on the evolution of trade relations.
MIIT intensity has been measured for years 2009–2011 according to the M. Brülhart's formula (2009, p. 407) for particular four-digit groups of CN classification:

$$MIIT_{it} = 1 - \frac{|\Delta Ex_{it} - \Delta Im_{it}|}{|\Delta Ex_{it}| + |\Delta Im_{it}|} \qquad (2)$$

and next aggregated for each region due to the formula considering products groups' participation in overall trade change:

$$MIIT_t = \sum_{i=1}^{n} w_i \, MIIT_t \qquad (3)$$

where:

$$w_{it} = \frac{|\Delta Ex_{it}| + |\Delta Im_{it}|}{\sum_{i=1}^{n} (|\Delta Ex_{it}| + |\Delta Im_{it}|)} \qquad (4)$$

and $t = T_{2011}$ and T_{2009}
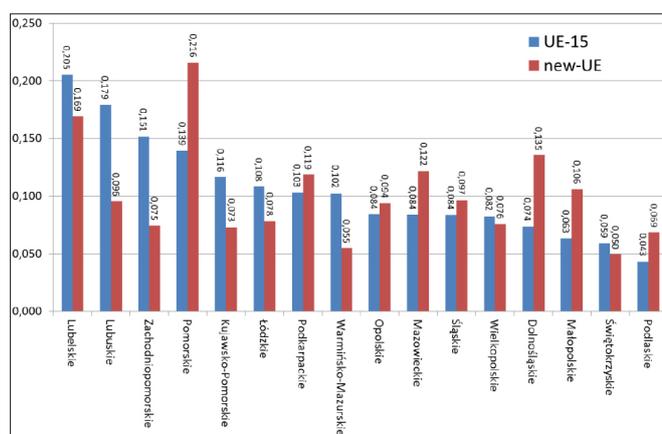
The results are presented on figure 5.

Figure 5. MIIT indices for Poland's regions for period 2009–2011 for EU-15 and new-UE member states
Source: Own calculations based on Customs Chamber data

According to M. Brülhart, MIIT should be interpreted in such a way that the change in trade between particular years (2009–2011) is of totally inter-industry character (then index is close to zero) or totally intra-industry character (index is close to one).

MIIT shows the dynamic nature of trade relations. Thus the results of research based on MIIT indices can be volatile from period to period. Moreover, they are heavily dependent on the disaggregation level of data that we use. MIIT indices presented on figure 5 take lower values than the ones calculated with static G-L formula. The results achieved show changeable nature of IIT – as MIIT relates to the share of MIIT in change of total trade volume between 2009 and 2011. The picture is really mixed – thus it is difficult to draw any non-tentative conclusions. For many regions with relatively high G-L indices (that show static picture of IIT) we observe relatively high MIIT levels. This might prove a catching up process in which regions less advanced in IIT have chance to come closer to the leaders. Product structure of international trade seems to determine the MIIT. For regions that are top exporters and at the same time reveal high share of automobile industries in exports and imports – since 2009 one can observe low MIIT indices. This is because of crisis that hit those regions' economies. Another phenomenon than can be observed is that for 8 out of 16 Poland's regions we have MIIT indices higher for new-UE member states than for EU-15. This clearly shows geographical pattern shifts in trade.

During last years, Poland's trade relations have been strongly intensified with the EU new member states. Analysis of trade data for regional level allows to see how these shifts are diversified. It is hard to formulate more in-depth conclusions on the basis of such relatively short period of time (3 years). It may be assumed that because of the diverse IIT participation in trade changes, the situation of particular regions in this matter will be polarizing in upcoming years.

Conclusions

The above presented paper sheds light on how international economics concepts might be useful for analysis done for regions. Here, the focus is on foreign trade assessed for sixteen NUTS-2 regions of Poland. IIT was chosen – as it reflects trade relations that happen predominantly between integrating countries (as of the EU) and their regions.

The results of IIT calculations indicate that its intensity is greater for the whole country than for separate regions. Analyzes of that type of trade are sensitive towards the level of aggregation of statistical data in the system of products, but also in the territorial system. Regional level of analysis seems to be relevant; it refers to the process of fragmentation of production. Consequently, it is – to a certain extent – a departure from the traditional approach towards IIT, as a phenomenon reflecting "demand for variety".

IIT intensity and its changes (reflected by MIIT) seem to be an important aspect of diversities among regions. The highest intensity of IIT for regions is observed in relations with the EU countries. However specific factors (regional industrial structure, FDI activity) play important role in determination of IIT intensity. It remains in positive correlation with the regions' GDP per capita. These stay in accordance with the expectations, as well as with the main message of the theory.

Deepened analyses of IIT profiles for each of the regions, both in static and marginal aspect, can be seen as a prospective direction in research. The gravity concept used in international trade theory shall be put into analyses of IIT. Undoubtedly IIT is of less usefulness for the practical side of foreign trade analyses (compared with other aspects of divagation over the nature of international trade at regional level, such as i.e. promotion efficiency). However, from the perspective of scientific studies, it would have significant cognitive value.

Due to the fact that entities which are located in different regions of Poland are characterized by specific exports and imports structure (in the aspect of products, but also in the geographical one), the economic crisis shall have negative impact on IIT intensity in a different way. Following scenario should be expected especially in regions in which car industry plays an important role. It is a branch which was afflicted with the crisis in the first place, moreover in two different ways: through reduced demand for new cars and through delocalization of production and cases of taking it "back" to the foreign investors "home" countries.

IIT in the traditional aspect is determined by similarities of income, demand preferences or demand structure. Economic crisis contributed to the diversification of dynamics of economic growth in the European Union member states. Poland, compared with other countries, is characterized by the rapid pace of growth. Moreover, this tendency results in "catching up with" the European Union standards. Poland GDP per capita in 2007 (due to PPS) formed 54 per cent of the EU average and till 2011 increased to 63 per cent (Eurostat).

The above-mentioned tendency should positively contribute to the growth of IIT intensity of Poland's regions with the EU.

An essential question needs to be posed: why is it proper to analyze intra-industry exchange? The theoretical approach suggests that IIT influences redistribution of income to far lesser extent than the trade based on the model of comparative advantage and factors' intensity. Moreover, its high intensity indicates its greater maturity, defined by the ability to join the international labor division on the basis of economies of scale or product diversification.

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