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THE IMPACT OF EUROPEAN INTEGRATION PROCESSES ON POLAND'S FOREIGN TRADE

Abstract. This study is concentrated on the analysis of the Polish foreign trade in the period 1995–2005. First the dynamics and the structure of foreign trade were characterized, then the values of Grubel-Lloyd index were presented. This index expressing intra-industry trade intensity was calculated using 3-digit SITC classification to construct five commodity groups (material-intensive, labour-intensive, capital-intensive. Technological-intensive: high-tech and medium-tech) and twelve PKWiU classification groups. Grubel-Lloyd index was rising in analysed period, so it indicates growth of the Polish economy competitiveness. The crucial part of discussed study was the regression analysis testing the hypothesis concerning the influence of some economic factors on Grubel-Lloyd index. This analysis was carried out using time series data or alternatively panel data. The conclusion was, that the intra-industry trade intensity depends on technical progress realize in the Polish economy, expressed by foreign direct investments, relation between investment outlays on machinery and equipment to output, as well as share of new and modified products in the total output.

Key words: foreign trade, Grubel-Lloyd index, foreign direct investments

Economists, politicians and the society in general have been interested in the effects of Poland's integration with the European Union for many years. The first analyses concerning the potential impact of this process on the economy were made in the 90s (see Orłowski 2000). The contemporary changes taking place in the economy are mainly examined from the perspective of how they are influenced by the integration processes. Poland's accession to the European Union on 1 May 2004 was by no means a revolution, especially in the domain of foreign trade one could not observe a sudden increase in the turnover or a change of the goods or geographic structure of trade. It is true that the integration meant changes in the conditions of the trade, which was due to adopting the rules and instruments of the European Union's Common Trade Policy, but the trade liberalisation processes began much earlier i.e. in the early 90s. In the period from 1991 to 1994 three regional integration agreements were signed and later adopted. These were the agreements on the association with the European Union in the Europe Agreement and on the free trade areas of EFTA and

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CEFTA.[1] In 1993 Poland also negotiated new membership terms in GATT as it was classified as an developed country with a market economy.

The analysis presented in this study is not therefore limited to the years of Poland's membership in the European Union but reaches back to the 90s. For a part of the research this period was shortened, due to the lack of earlier statistic data, to the years 1998–2005.

When observing the integration processes in Poland one should pay attention to two important aspects influencing the qualitative changes taking place in our economy. The fact of the association with the European Community and the perspective of the future membership in the European Union made foreigners invest in Poland. In the 90s we were dealing with an intensive growth of foreign direct investment (FDI). The flow of foreign capital into the economy was one of the factors that made it more dynamic, it could have also influenced the magnitude and structure of the foreign trade turnover. The second aspect was the economy's modernisation i.e. the introduction of new technologies and products, but also organisational changes which increased the effectiveness on the micro and macroeconomic scale. The technical progress was, and surely still is, connected with the flow of FDI, but it could be also considered as an individual effect of the integration processes. In the research conducted the impact of these two abovementioned phenomena on the qualitative characteristic of Poland's foreign trade was tested.

When analysing Poland's foreign trade turnover, let us first take a look at the dynamics of the total turnover presented in the Table 1. The imports rose constantly in the whole analysed period, especially rapidly until 1996. It is sure that this was caused by a gradual turnover liberalisation concerning industrial goods which was connected with the Europe Agreement. When compared to the previous years the year 2004 is also exceptional as the import's increase is about 17.3%. In this case one could consider this increase a result of Poland's accession to the EU and the increased accessibility of the Polish market to other countries. The exports was characterised by very varied dynamics: in years 1992–1993 it went down, which was connected with a general slowing down of the economy's activity in the beginning of the transformation period, whereas a particularly substantial increase could be observed in 2000, when the rate of growth was 25.3%.

It is worth noting the fact that since 2000 the dynamics of exports has been higher than the dynamics of imports, which leads to the reduction of the negative foreign trade balance, which was accumulated in the previous years.

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[1] The association of Poland with the European Community in the Europe Agreement was signed on 16 December 1991, it was adopted on 1 February 1994. The EFTA agreement was signed on 10 December 1992 and adopted on 15 November 1993. The CEFTA agreement was signed on 21 December 1992 and adopted on 1 March 1994. (see Żukrowska 1994).

The dynamics of Poland's total foreign trade turnover in constant prices (previous year = 100)

Year	Imports	Exports	Year	Imports	Exports
1992	113.9	97.4	1999	104.4	102.0
1993	118.5	98.9	2000	110.8	125.3
1994	113.4	118.3	2001	103.2	111.8
1995	120.5	116.7	2002	107.3	108.3
1996	128.0	109.7	2003	108.2	118.7
1997	122.0	113.7	2004	117.3	118.2
1998	114.6	109.4	2005	105.2	110.6

S o u r c e: Foreign Trade Statistical Yearbook 2006, t. 46, p. 39, GUS, Warsaw 2007.

Many analyses concerning Poland's foreign trade turnover focus on the trade with the European Union countries. Without undermining this kind of an approach in this research I decided to focus on trade in general, making an assumption that the integration processes are not only connected with shifting the turnover to the member countries, but also with the creation of the exchange with other countries. The data in Table 2 show how insignificantly the participations in the total turnover change. This is especially true in the case of exports to the countries of EU-25. The fall of the participations in the years 2004–2005, which can be observed in all options, is an interesting fact. This could be connected with the fact that, due to the accession to the EU and the adoption of the instruments and rules of the Common Trade Policy, the access to the Polish market for industrial goods coming from other countries (outside the EU) was improved.

The participation of the turnover with European Union countries in Poland's
total foreign trade turnover (in %)

Year	UE-15		UE-25	
	Imports	Exports	Imports	Exports
1999	64.9	70.5	71.8	80.9
2000	61.2	69.9	68.6	80.4
2001	61.4	69.2	69.3	80.3
2002	61.7	68.7	69.3	80.3
2003	61.1	68.8	69.1	80.8
2004	60.7	67.4	68.3	79.2
2005	56.9	65.0	65.6	77.2

S o u r c e: Foreign Trade Statistical Yearbooks GUS from different years.

Of course the increase of exchange presented in the Table 1 was not the same for all groups of goods, in consequence this leads to changes in the turnover structure, which could be observed both in imports and in exports (Table 3). To illustrate these changes a segregation of products into five categories was used. The categories

were created based on the intensity of the factors of production used to manufacture a product. This division is used for testing trade exchange theories, which stress the abundance of factors of production in an economy as a determinant of exportation (the Heckscher-Ohlin model for example) (Budnikowski, Kawecka-Wyrzykowska 1998). It can also be the basis for drawing conclusions on how modern the economy is. As it is thought that in a developed market economy there is a high share of capital-intensive and technology-intensive products.

T a b l e 3

The structure of Poland's foreign trade turnover by product groups (in %)

Name of the group	Imports		Exports	
	1995	2005	1995	2005
Raw material - intensive	22.2	18.4	22.5	16.2
Labour-intensive	24.8	20.1	35.7	27.9
Capital-intensive	14.0	19.6	19.6	24.4
Technology-intensive				
High-tech	15.3	15.9	5.7	7.2
Medium-tech	23.7	26.0	16.5	24.4

The division into abovementioned groups taken from Pluciński 2005.

S o u r c e: own calculations based on data from Foreign Trade Statistical Yearbooks.

The changes we can observe in Poland's trade exchange show that our economy is heading in a good direction i.e. it is becoming more and more modern. The share of the capital-intensive and technology-intensive products is visibly increasing not only in the imports but also in the exports of our country as well.

The structure presented above is not enough to estimate the competitiveness of Poland's economy on the global market. Literature suggests using specific measures to this end (Misala, Pluciński 2000). This study concentrates its attention on the Grubel-Lloyd intra-industry trade intensity indicator, which expresses a percentage share of intra-industry trade in the total Polish foreign trade, calculated as an average value for a certain aggregate (Wysokińska 2001):

$$\overline{G} = \frac{\sum_i (E_i + M_i) - \sum_i |E_i - M_i|}{\sum_i (E_i + M_i)},$$

where: E_i and M_i are respectively the exports and the imports of the "i" group of goods.

This formula was used in a version which enables a comparison of the indicator with other research that was done for Poland, in spite of the fact that it has

a certain flaw connected an underestimation of the intra-industry trade in the event of an unbalanced exchange, which in fact takes place in the case of the Polish foreign trade. The values of the indicator were calculated based on a 3-digit classification SITC (256 groups of goods) aggregated in order to obtain the same five groups that were used when talking about the construction of the trade structure (Table 3). Table 4 presents the values of the Grubel-Lloyd indicator calculated for the total foreign trade in the years 1995–2005.

Table 4

Values of the Grubel-Lloyd indicator for the total turnover (in %)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
G	41.1	42.4	44.4	46.4	48.2	51.4	54.0	56.5	57.6	60.0	59.4

S o u r c e: own calculations.

The importance of the intra-industry trade is determined by the lack of the technology gap and the lack of disproportions in the level of GDP per capita (Kawecka-Wyrzykowska, Michalski, Mroczek, Niemczyk, Szwabe, Władyniak 2005). Therefore, the higher the value of the G indicator the more competitive the economy is. The quality changes expressed by the G indicator for the Polish economy are significant. From a level of 41.1% in 1995 in ten years the share of the intra-industry trade rises to 59.4%. The changes are different for individual groups of products, they are the smallest for the group of the raw material-intensive products, whose participation in the intra-industry exchange is the lowest. The changes are unquestionably the biggest for capital-intensive products (Table 5).

Table 5

Values of the Grubel-Lloyd indicator for product groups (in %)

Name of the group	1995	2005
Raw material - intensive	30.7	39.5
Labour-intensive	43.7	66.0
Capital-intensive	48.5	68.8
Technology-intensive		
High-tech	35.6	43.6
Medium-tech	45.7	66.2

S o u r c e: own calculations.

In order to compare the values of the intra-industry exchange intensity indicator for the total exchange with the one for Poland-European Union exchange,

both characteristics for 2002 were put together in Table 6. The greatest conformity can be observed in the case of capital-intensive products. For the other product groups differences, not always in favour of the exchange with the EU, can be spotted. The total exchange indicator is much higher for labour-intensive products and technology-intensive products which are easy to imitate (medium-tech).

Table 6

Comparison of the Grubel-Lloyd indicator (in %) for Poland's total foreign trade and its exchange with European Union countries in 2002

Name of the group	Total exchange	Exchange with the EU
Raw material - intensive	38.1	42.3
Labour-intensive	62.5	55.2
Capital-intensive	67.0	66.5
Technology-intensive		
High-tech	36.1	49.7
Medium-tech	63.6	51.0

S o u r c e: own calculations for "Total turnover"; for "Turnover with the EU" Pluciński 2004.

Specifying the determinants of the changes observed in Poland's foreign trade is an interesting research problem. Studies presented in the literature on the subject are limited to only enumerating those characteristics of the economy which can contribute to an increase in the intra-industry exchange. The aim of this study was to determine this contribution by using the regression analysis.

Numerous studies point to foreign direct investment (FDI) as the source of many qualitative changes in the Polish economy (Kawecka-Wyrzykowska, Michalski, Mroczek, Niemczyk, Szwabe, Władyniak 2005). In order to test the hypothesis that FDI also affects the economy's level of competitiveness the values of the Grubel-Lloyd indicator had to be determined for the same product classification, according to which information concerning foreign direct investment is presented (i.e. according to 12 sections and subsections of PKWiU (Polish Classification of Goods and Services)). The initial data was taken from the 256 group SITC classification and then adequately aggregated to resemble the desired classification. The values of the G indicator for the 12 groups are presented in Table 7. They show a much larger variety (between individual groups) than it was in the case previous product division. The value of the G indicator is especially low for mining industry and electricity, gas and steam which should not be a surprise considering the nature of these groups. Transportation equipment definitely had the highest indicator score in 2005, which conforms with the general opinion and should be connected with the FDI.

Values of the Grubel-Lloyd indicator for PKWiU group classification (in %)

Name of the group	1995	2005
Agriculture, forestry, hunting, fishing products	42.8	56.7
Mining industry products	11.2	26.4
Alimentary products, beverages, tobacco	45.7	52.3
Textiles, clothes, leathers and leather products	40.9	70.2
Wood and wooden products, pulp, paper	50.9	67.0
Coke, oil refinery products	34.8	57.2
Chemical products	42.1	53.3
Rubber and synthetic products	40.9	59.1
Metals and basic metal products	51.0	62.9
Machines and equipment	48.1	65.0
Transports equipment	47.2	78.7
Electricity, gas, steam	3.7	12.6

S o u r c e: own calculations.

The first estimations, that were made, concerned using 11-period time series (1995–2005) for each of the defined product groups to estimate the parameters of the regression line, where the only explanatory variable was the FDI resource (the results are presented in Table 8).

The quality of the results is quite varied, it is possible to isolate product groups for which there is no influence of FDI on the G indicator (mining industry, coke and oil refinery products and electricity, gas, steam) and those for which the relation is statistically important.

For the first two of the listed groups, the lack of FDI influence might be caused by the fact that there is not much foreign direct investment in those fields. Their share in the overall FDI resources does not exceed 0.5%. For the last group, the explanation could be found in the low value of the intra-industry trade turnover indicator and its large variability (from 3.7% in 1995 to 12.6% in 2005). In all these three groups, where there is no impact of FDI, the explanation measured by the R^2 coefficient is extremely low. The best result was obtained for the machines and appliances group, both from the perspective of the level of explanation of the G indicator's variability (nearly 90% of the variability was explained by the line of regression) and from the perspective of the gravity of the influence of the explanatory variable.

Table 8

Results of the estimation of the equations explaining the formation
of the Grubel- Lloyd indicator in product groups

Name of the group	Const (t)	FDI (t)	R² Gravity
Agriculture, forestry, hunting, fishing products	43.485 (15.49)	33.917 (2.55)	0.420 0.031
Mining industry products	17.825 (5.39)	19.637 (0.71)	0.053 0.494
Alimentary products, beverages, tobacco	43.744 (43.33)	1.273 (4.14)	0.655 0.003
Textiles, clothes, leathers and leather products	36.077 (7.78)	87.015 (4.91)	0.728 0.001
Wood and wooden products, pulp, paper	55.156 (27.42)	3.626 (3.58)	0.587 0.006
Coke, oil refinery products	41.598 (8.21)	232.631 (0.12)	0.284 0.092
Chemical products	40.380 (26.50)	3.257 (3.96)	0.635 0.003
Rubber and synthetic products	41.948 (26.94)	8.856 (6.73)	0.834 0.000
Metals and basic metal products	56.217 (32.87)	2.860 (2.24)	0.359 0.052
Machines and appliances	45.642 (35.31)	8.488 (8.68)	0.893 0.000
Sports equipment	52.411 (11.96)	6.242 (4.39)	0.682 0.002
Electricity, gas, steam	7.768 (6.64)	0.719 (0.92)	0.085 0.384

S o u r c e: own calculations with the use of SPSS program.

An alternative to this approach was using a time-section sample consisting of 132 observations (11 periods multiplied by 12 product groups). The results of this approach are presented below:[2]

Variable	Coefficient	Standard error	t statistics	value of p	
Const	46.3279	1.14197	40.5684	<0.00001	***
FDI	3.2252	0.68778	4.6893	<0.00001	***

Coefficient of determination $R^2 = 0.14468$.

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[2] The parameters were estimated in the GRETL program using the method of weighted least squares for avoiding the influence of heteroscedascity of the random element. The flaw of the model presented was not fulfilling the assumption of the normal distribution of the random element, which could be determined by performing the Jarque-Ber test.

The values of the coefficient of determination for the regression using the time series and the time-section series are incomparable. R^2 in the second case should be evaluated as extremely low. Nevertheless, it is connected with the fact that the variability of the explained variable is relatively low for the time series, therefore it is easier to explain. In the time-section series the variability is very high and using the appropriate estimation method does not solve the problem. Nonetheless, on the basis of this result we can draw an important conclusion that FDI proved to have an important impact on the participation in the intra-industry trade turnover.

The next categories which were taken into consideration as potential determinants of the Grubel-Lloyd indicator were the dynamics of the production sold and the dynamics of investment expenses (both calculated for fixed prices). In the case of the first one, it is possible to assume that in market economy the production must compete with the import. Increasing sales suggest in increase in competitiveness and should trigger an increase of the G indicator. A similar positive reaction of the Grubel-Lloyd indicator can be expected to an increase of the investment expenses, which are often connected with new enterprises or modernisations and should increase competitiveness. Both these hypotheses have not been positively verified for the two variables. Neither in the time series regression, nor in the time-period one.

It is an undeniable fact that the competitiveness of the production, and with it the trade turnover, is determined by the technical progress in the economy. Macroeconomic development is characterised by the research & development expenses (GUS defines several types of R&D activity), the degree of mechanisation and automation of the production process (several ways) or the participation of new products in the total production sold.

In order to use the characteristics of technical progress which are published only for the industry we should eliminate the following from our further analysis: agriculture, forestry, hunting and fishing products. We should also limit our sample to the period of 1998-2005, for which detailed data is accessible. We have decided to abandon the estimations with the time sample for 11 product groups due to its excessively small number of degrees of freedom. The time-section sample has been limited to 88 observations (8 periods multiplied by 11 product groups).

The results of an estimation of an equation, which, apart from foreign direct investment (FDI), includes the relation between the capital spent on machines and appliances and the production sold (Invest) and the participation of new products in the total production sold (Pnew) as explanatory variables, is presented bellow:

Variable	Coefficient	Standard error	t statistics	value of p	
Const	28.0154	3.14136	8.9182	< 0.00001	***
FDI	4.01021	0.77926	5.1462	< 0.00001	***
Invest	0.52143	0.10037	5.1950	< 0.00001	***
Pnew	5.30243	1.43841	3.6863	0.00040	***

Coefficient of determination $R^2 = 0.44985$

All of the three variables show a significant positive influence on the competitiveness of the Polish economy expressed by the intra-industry turnover intensity indicator. The degree of explanation measured by the R^2 coefficient is significantly greater than the one obtained in the first of the presented models. The assumption of the normal distribution of the random element is also fulfilled.[3] Although, one could still have reservations about the low value of the R^2 statistic, it seems that the research has given the answer to the problem presented i.e. it has distinguished the determinants of the scale of the intra-industry trade.

The presented research has also documented the positive changes that have taken place in Poland's foreign trade turnover: the significant increase of the intra-industry turnover intensity indicator implies an increase of the competitiveness of our economy. It is particularly great in the case of transport equipment production, which should be linked with the foreign capital involved in this field (the structure of FDI in the division used in the regression analysis of the group shows the greatest participation of FDI in this field). Foreign direct investment substantially influence the intra-industry turnover in a positive way. The technical progress which can be observed in our economy also has an important impact, which was expressed in the research by the participation of new products in the total production sold and the relation between the capital spent on R&D and the production sold.

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[3] Normal distribution test : Chi-square (2) = 1.30477 ($p = 0.520801$)

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WPŁYW PROCESÓW INTEGRACYJNYCH
NA HANDEL ZAGRANICZNY POLSKI

W opracowaniu dokonano analizy wymiany handlowej Polski z zagranicą w okresie 1995-2005. W pierwszej kolejności scharakteryzowano dynamikę i strukturę obrotów według grup krajów i grup towarowych, a następnie zaprezentowano wartości wskaźnika intensywności handlu wewnątrzgałęziowego Grubela-Lloyda wyznaczone na podstawie danych o 3-cyfrowej klasyfikacji SITC dla pięciu grup towarowych (towary surowcochłonne, pracochłonne, kapitałochłonne oraz intensywne technologicznie łatwe i trudne do imitowania) oraz dwunastu grup klasyfikacji PKWiU. Wskaźnik ten wykazuje wyraźny wzrost w badanym okresie, co świadczy o zwiększaniu się konkurencyjności gospodarki polskiej. Najważniejszą częścią opisywanego badania była analiza regresji testująca hipotezy o wpływie wyspecyfikowanych czynników na zmiany wskaźnika intensywności handlu wewnątrzgałęziowego. Przeprowadzono ją w kilku wariantach, przy wykorzystaniu próby czasowej dla każdej z 12 grup towarowych, a także z zastosowaniem próby przekrojowo-czasowej. Analiza ta wykazała, iż w polskiej wymianie handlowej o udziale handlu wewnątrzgałęziowego decydują czynniki związane z realizowaniem się w gospodarce postępu technicznego, takie jak bezpośrednie inwestycje zagraniczne, relacja nakładów na maszyny i urządzenia do produkcji sprzedanej oraz udział nowych wyrobów w produkcji sprzedanej.

Słowa kluczowe: handel zagraniczny, wskaźnik Grubela-Lloyda, bezpośrednie inwestycje.