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EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN EUROPEAN UNION MEMBER STATES

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Abstract. The main aim of the paper is to analyze the relationship between the export diversification and the economic growth in the European Union in the period 1995–2009. This article consists of two parts. The first part concerns the theoretical analysis of the relationships between the degree of exports diversification (concentration) and the economic growth taking into account main determinants of these relationships. The next section examines the relationship between the degree of exports concentration and the economic growth in European Union member countries using a vector autoregression model (VAR). There have been estimated elasticity coefficients of GDP per capita to changes in the exports concentration on the basis of impulse response functions. This was followed by the decomposition of GDP per capita in order to estimate the impact of changes in GDP per capita and the degree of exports concentration on the variability of GDP per capita in the EU.

Keywords: exports diversification, exports concentration, economic growth

INTRODUCTION

There are two basic diversification types of export goods, i.e. horizontal diversification and vertical diversification. Horizontal diversification refers to diversification of production and exports among different industries, but vertical diversification includes diversification of production and exports within the same industry. Both types of diversification have a positive impact on the economic growth [Kenji, Mengistu 2009]. Commonly used indicator measuring the degree of export diversification is a standardized index of exports concentration proposed by Hirschmann and calculated in accordance with the following expression:

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$$H_{jt} = \frac{\sqrt{\sum_{i=1}^{n}\left(\frac{x_{it}}{X_{jt}}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \quad (1)$$

where: x_{it} – value of exports of product i in period t; X_{jt} – the value of total exports of the country in period t, n – number of products (SITC Revision 3 at 3-digit group level).

Hirschmann index is a measure of the degree of market concentration. It has been normalized to obtain values ranking from 0 (maximum diversification) to 1 (maximum concentration) [Parteka, Tamberi 2008].

From a theoretical point of view, there are three main channels through which export diversification contributes to the economic growth. Firstly, the export diversification leads to higher productivity of production factors through the transfer of knowledge. The authors of new models of economic growth argue that any export diversification is innovation through the inclusion of new goods, which is preceded by a creative effort and requires knowledge concerning a production process of goods. This causes externalities, which economists often refer to knowledge spillovers. This situation helps in the accumulation of the technology. With reference to classical Solow growth model, technology and innovation cause Solow residual and determine the increase in factor productivity.

Secondly, the export diversification in new industries leads to faster economic growth by supporting the production in other industries. With existing and potential links of production, more diversified structure of exports can give an incentive to create new industries and expansion in existing industries within the economy. This situation occurs particularly when the export diversification takes place by incorporating new commodity groups into the existing structure of commodity exports.

Thirdly, the export diversification can lead to greater stability in export incomes. The relationship between a greater degree of diversification and greater stability of income in this case is analogous to that which the portfolio theory indicates. Prices of basic commodities are characterized by a relatively high volatility in short run, hence the countries dependent on exports of these goods may be exposed to high volatility of export incomes. This situation may discourage companies to invest in these countries due to the limited propensity for a risk, it can also cause an increase in macroeconomic uncertainty and be harmful to long-run economic growth [Bleaney, Greenaway 2001].

In the economic literature there are relatively few empirical studies on the relationship between the degree of export diversification and the dynamics of economic growth. Al-Marhubi [2000] conducted a regression analysis between the economic growth and the degree of exports concentration in selected countries and obtained results that confirmed the positive impact of exports diversification on the economic growth. Moreover, the study did by Agosin [2007] suggested that export diversification has a positive impact on the growth in income per capita. Similarly, Lederman and Maloney [2007] conducting panel research found evidence supporting the hypothesis of economic growth led by exports diversification. Related results were obtained by Herzer and Nowak-Lehmann [2006] examining the relationship between

export diversification and the economic growth in Chile. Their analysis results suggested that Chile has benefited substantially from the exports diversification. In turn, Imbs and Wacziarg [2003] studied the impact of changes in export concentration on the level of income per capita using nonparametric methods. Their results showed that the relationship between the degree of exports concentration and the level of economic development takes the shape of a letter "U". At the initial stage of economic development countries are diversifying their exports and then reaching a certain level of economic development are beginning to specialize. Thus, the degree of exports specialization depends on the level of national income per capita. Furthermore, results of a study conducted by Hesse [2008] pointed to the existence of non-linear relationship between the degree of export diversification and the dynamics of economic growth per capita in the period 1962–2000. The research revealed also that developing countries achieve benefits from diversification of their exports, while developed countries achieve higher economic growth rate per capita as a result of export specialization.

A MODEL APPROACH TO EXPORTS DIVERSIFICATION AND ECONOMIC GROWTH IN THE EU

In order to analyze the causal relationship between the degree of exports concentration and GDP per capita in EU member states in the period 1995–2009 were used vector autoregression model (VAR) representing by the following expressions:

$$GDP_{i,t} = \sum_{k=1}^{p} \alpha_k GDP_{i,t-k} + \sum_{k=1}^{p} \beta_k H_{i,t-k} + \mu_{i,t} \tag{2}$$

$$H_{i,t} = \sum_{k=1}^{p} \chi_k H_{i,t-k} + \sum_{k=1}^{p} \delta_k GDP_{i,t-k} + \upsilon_{i,t} \tag{3}$$

where: *GDP* – gross domestic product per capita in constant prices in USD, *H* – Hirschmann export concentration index, μ, υ – residual components, *t* – the period of analysis, *k* – the number of delay variables.

All the above mentioned time series had annual frequency and cover the period from 1995 to 2009.

Before the model estimation it was necessary to specify stationarity of the analyzed time series. To this purpose the Augmented Dickey-Fuller Test (ADF) was used. Among the analyzed data used in the study were time series of integration row 0 and 1. The lack of stationarity of time series has forced a modification of the functional model, which was to replace the size of the analyzed variables by their first differences. The choice of the lag lengths for stationarity testing (two years) was made on the basis of results of the Akaike, Schwartz-Bayesian and Hannan-Quinn information criteria.

Analyzing changes in the average degree of exports concentration in EU member states it can be seen that the highest indices of the exports concentration in 1995 and 2009 were in Malta, Ireland, Cyprus and Lithuania, while the smallest indices had Austria, the

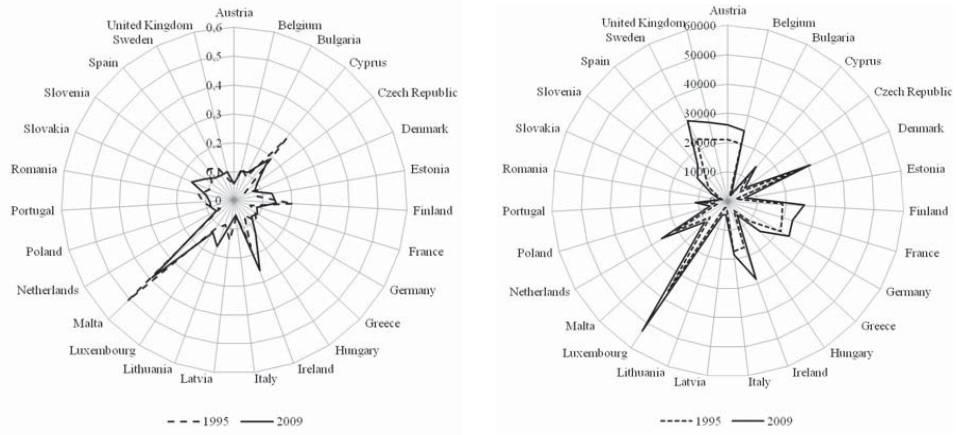

Fig. 1. Indices of exports concentration and GDP per capita in the EU in years 1995 and 2009
Rys. 1. Wskaźniki koncentracji eksportu i PKB per capita w UE w latach 1995 i 2009

Source: Own calculations based on UNCTAD Handbook of Statistics [2010].
Źródło: Obliczenia własne na podstawie UNCTAD Handbook of Statistics [2010].

Netherlands and Italy. The highest levels of GDP per capita characterized such countries as Luxembourg, Denmark and Sweden, while the smallest GDP per capita were in Bulgaria, Romania and Lithuania (Figure 1).

From a theoretical point of view, due to the relatively larger share of standardized goods in exports in developing countries they should have generally a higher degree of specialization than the developed countries. Analyzing data on the degree of exports concentration in EU member states it can be obtained confirmation of the hypothesis, suggesting the presence of higher degrees of exports concentration in the relatively less-developed EU members. However, it was found that the correlation between the degree of exports concentration and GDP per capita is not linear (Figure 2).

In accordance with the Figure 2 it can be identified two threshold levels of GDP per capita beyond which examined countries increased the level of exports concentration (specialization). The first threshold level of GDP per capita for the poorest UE countries amounted to about 6 thousand USD, while the second threshold level of GDP per capita for the richest EU countries amounted to about 20 thousand USD. Thus, the relationship between the degree of exports concentration and GDP per capita in EU member states took on the shape of the letter "W" but not the letter "U" as it was suggested by Imbs, Wacziarg [2003] and Hesse [2008].

In order to define a causal link between changes in the degree of exports diversification and GDP per capita in the EU in the period 1995–2009 it was necessary to estimate the structural parameters of the VAR model. The results of model estimation were shown in the table below (Table 1).

On the basis of estimation results of the equation (GDP) it can be concluded that a factor which significantly determined the size of GDP per capita in the EU in the period 1995–2009 was the degree of exports concentration. Namely, the increase in the exports concentration by 1% led to an increase in GDP per capita on average by 0.33%. On the

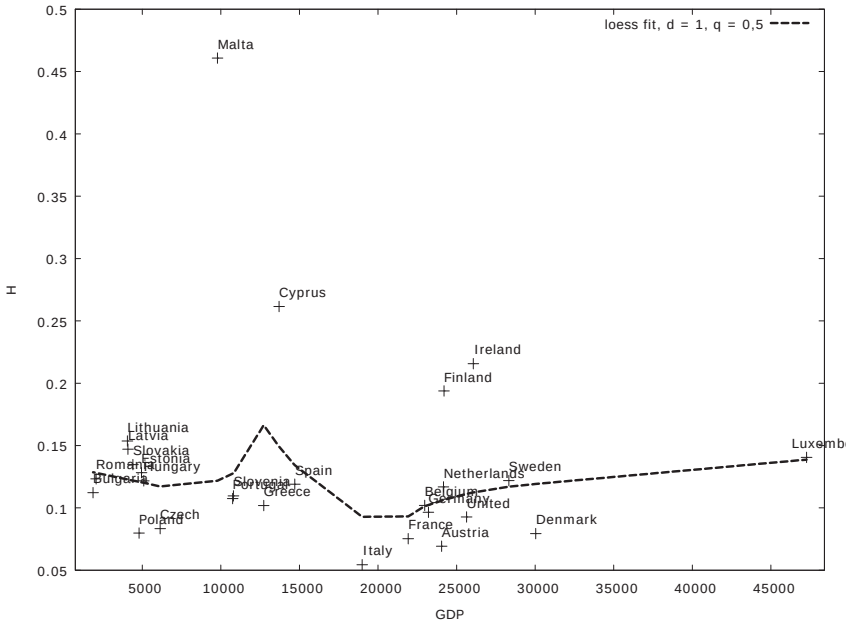

Fig. 2. The degree of exports concentration and GDP per capita in the EU in the period 1995–2009

Rys. 2. Stopień koncentracji eksportu i poziom PKB per capita w UE w okresie 1995–2009

Source: Own calculations based on UNCTAD Handbook of Statistics [2010].

Źródło: Obliczenia własne na podstawie UNCTAD Handbook of Statistics [2010].

Table 1. The results of structural parameters estimation of VAR model

Tabela 1. Wyniki estymacji parametrów strukturalnych modelu VAR

		Equation: GDP			
	Współczynnik	*Błąd stand.*	*t-Studenta*	*wartość p*	
const	0,0406721	0,0292802	1,3891	0,20740	
GDP_1	1,15027	0,442425	2,5999	0,03543	**
GDP_2	–1,87001	0,754928	–2,4771	0,04239	**
H_1	–0,0396517	0,0986773	–0,4018	0,69979	
H_2	0,333858	0,110924	3,0098	0,01967	**
Mean dependent var	0,019317		S.D. dependent var	0,026230	
Sum squared resid	0,001629		S.E. of regression	0,015254	
R-squared	0,784800		Adjusted R-squared	0,661829	
F(4, 7)	6,358478		P-value(F)	0,017489	
rho	–0,277785		Durbin-Watson	2,349247	
		Equation: H			
	Współczynnik	*Błąd stand.*	*t-Studenta*	*wartość p*	
const	–0,0151619	0,0692687	–0,2189	0,83298	
GDP_1	1,4436	1,83334	0,7874	0,45687	
GDP_2	–0,952595	1,45027	–0,6568	0,53228	
H_1	–0,170472	0,285043	–0,5981	0,56864	
H_2	0,136756	0,451301	0,3030	0,77068	
Mean dependent var	–0,003715		S.D. dependent var	0,052404	
Sum squared resid	0,026092		S.E. of regression	0,061053	
R-squared	0,136248		Adjusted R-squared	–0,357324	
F(4, 7)	1,109617		P-value(F)	0,422784	
rho	–0,061787		Durbin-Watson	2,089666	

Source: Own calculations.

Źródło: Obliczenia własne.

other hand, on the basis of estimation results of the equation (H) it can be concluded that GDP per capita was not statistically significant determinant of the degree of exports concentration in the EU in the period 1995–2009.

The next step in the analysis was to measure the impact of the degree of exports concentration on the size of GDP per capita in the EU. It was made using so-called impulse response function, which is the reaction function of GDP per capita to an impulse in the form of a unit change of exports concentration and GDP per capita (Figure 3).

The final stage of analysis was the variance decomposition of residual component of GDP per capita in order to estimate the impact of changes in GDP per capita and the degree of exports concentration on the variability of GDP per capita in the EU (Table 2).

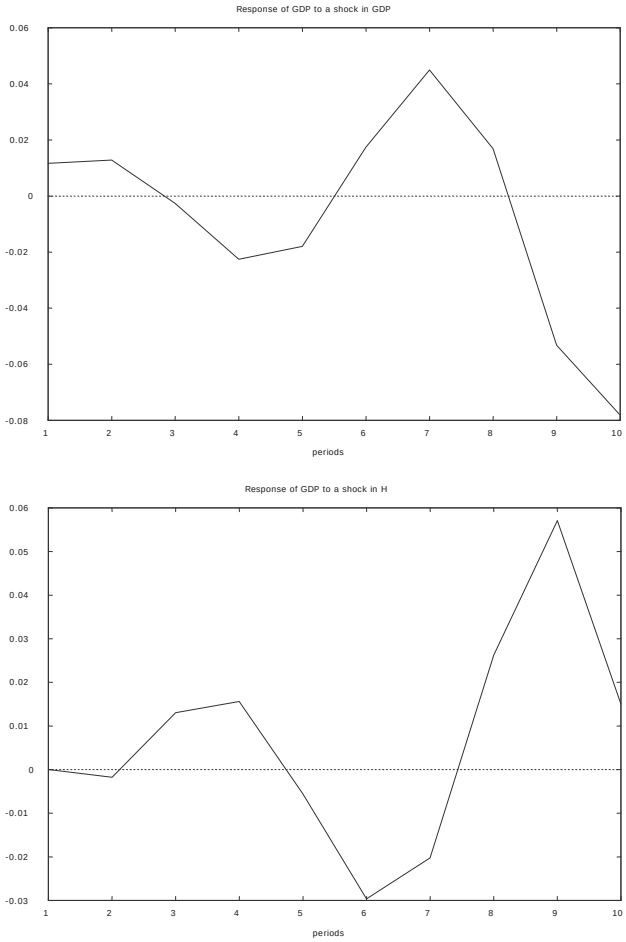

Fig. 3. Impulse response functions
Rys. 3. Funkcje odpowiedzi impulsowych

Source: Own calculations.
Źródło: Obliczenia własne.

Table 2. The error variance decomposition for variable GDP
Tabela 2. Dekompozycja wariancji dla zmiennej GDP

The number of quarter after shock	GDP	H
2	99,0	1,0
4	66,2	33,8
6	52,1	47,9
8	60,7	39,3
10	68,2	31,8

Source: Own calculations.
Źródło: Obliczenia własne.

In accordance with data in above table it should be noted that the changes in GDP per capita explained about 66% of the variation of GDP per capita in the EU in four years after the shock and more than 68% of the variability of GDP per capita after ten years. In turn, changes in the degree of exports concentration in the EU accounted for about 34% of the variability of GDP per capita after four years and almost 32% of the variability of GDP per capita after ten years.

Influence of exports concentration on GDP per capita was significantly varied in a size among the individual EU member countries. Namely, the largest impact coefficients of the exports concentration to GDP per capita were affirmed in Romania and Lithuania. However, in the case of the six countries were found negative values of these coefficients (Table 3).

Table 3. Elasticity coefficients of GDP per capita to changes in the exports concentration in the EU in the period 1995–2009
Tabela 3. Współczynniki elastyczności PKB per capita na zmiany wskaźnika koncentracji eksportu w UE w okresie 1995–2009

Countries	H → GDP
Austria	0,08
Belgium	0,07
Bulgaria	0,01
Cyprus	–0,02
Czech Republic	–0,02
Denmark	0,03
Estonia	0,04
Finland	0,15
France	0,10
Germany	0,06
Greece	–0,02
Hungary	–0,04
Ireland	0,06
Italy	–0,10
Latvia	0,12
Lithuania	0,20
Luxemburg	–0,08

Table 3, cont.
Tabela 3, cd.

Malta	–0,08
Netherlands	0,06
Poland	0,11
Portugal	0,04
Romania	0,69
Slovakia	0,10
Slovenia	0,17
Spain	0,12
Sweden	–0,14
United Kingdom	0,08

Source: Own calculations.
Źródło: Obliczenia własne.

Analyzing the calculated elasticity of GDP per capita to changes in the concentration of exports compared to the average degree of concentration of exports in the various EU member states it can be detected certain regularity in this respect. Namely, in general, the largest positive impact of concentration of exports to changes in GDP per capita are found in those EU countries where the degree of exports concentration was at a level close to 0.15 (Figure 4).

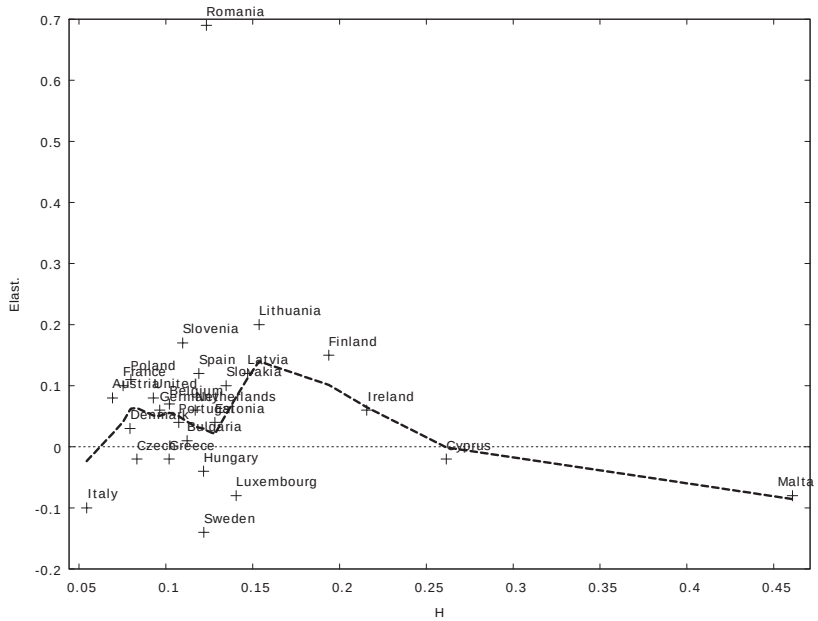

Fig. 4. Elasticity coefficients of GDP per capita to changes in the exports concentration and the average degree of exports concentration in the EU during 1995–2009
Rys. 4. Współczynniki elastyczności PKB per capita na zmiany koncentracji eksportu a średni stopień koncentracji eksportu w UE w okresie 1995–2009

Source: Own calculations based on UNCTAD Handbook of Statistics [2010].
Źródło: Obliczenia własne na podstawie UNCTAD Handbook of Statistics [2010].

Thus, the degree of export concentration close to 0.15 was found to be optimal from the positive impact of the exports concentration on GDP per capita point of view. Countries in which the degree of exports concentration was higher than optimal level recorded a relatively smaller and positive impact of changes in the exports concentration on GDP per capita.

CONCLUSIONS

Based on the analysis concerning the relationship between the degree of exports diversification and GDP per capita in EU member states during the years 1995–2009 it was found that exports diversification (concentration) was one of the most important factors that determined the level of GDP per capita in the EU. Namely, the impact of the exports concentration on changes in GDP per capita amounted to 0.33. It was also calculated that changes in the degree of exports concentration in the EU explained on average over 30% of the variability of GDP per capita in the EU. At the same time it was revealed a nonlinear relationship between the degree of exports concentration and GDP per capita in the EU. The relationship between the degree of exports concentration and GDP per capita took the shape of the letter "W". It meant that the exports diversification increased in countries with relatively low GDP per capita, while the exports concentration increased in countries with relatively high GDP per capita. Results of this study have significant macroeconomic implications for individual EU member states. Depending on the critical level of export diversification it should be taken appropriate actions to achieve the desired structure of exports in the country and thereby to intensify the pro-growth impact of exports.

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DYWERSYFIKACJA EKSPORTU A WZROST GOSPODARCZY W KRAJACH CZŁONKOWSKICH UNII EUROPEJSKIEJ

Streszczenie. Podstawowym celem artykułu jest analiza związków między dywersyfikacją eksportu i wzrostem gospodarczym w Unii Europejskiej w okresie 1995–2009. Artykuł składa się z dwóch części. Pierwsza część dotyczy analizy teoretycznej w zakresie współzależności między stopniem dywersyfikacji (koncentracji) eksportu i wzrostem gospodarczym z uwzględnieniem głównych czynników determinujących te zależności. W następnej części artykułu zbadano związek między stopniem koncentracji eksportu i wzrostem gospodarczym w krajach członkowskich Unii Europejskiej za pomocą modelu wektorowej autoregresji (VAR). Dokonano oszacowania współczynników elastyczności PKB per capita na zmiany koncentracji eksportu na podstawie funkcji odpowiedzi impulsowych. Następnie przeprowadzono dekompozycję wariancji w celu oszacowania wpływu zmian PKB per capita i stopnia koncentracji eksportu na zmienność PKB na mieszkańca w UE.

Słowa kluczowe: dywersyfikacja eksportu, koncentracja eksportu, wzrost gospodarczy

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