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Sławomir I. Bukowski[1], **Robin Gowers**[2]

THE DEGREE OF INTEGRATION OF EQUITY MARKETS IN CENTRAL EUROPE (NEW MEMBER EU COUNTRIES) WITH THE US AND UK EQUITY MARKETS

Abstract

The aims of paper are to aanalyze how closely Central European stock markets are integrated with the stock markets in the US,UK and the euro area and to investigate the correlation of changes in the US S&P500, UK FTSE100, DJ EUROSTOXX 50 yields on the yields of the Polish and other main Central European stock exchange markets. The authors has formulated following hypothesis: Czech, Hungarian and Polish equity markets are more integrated with the US and UK equity markets then with the euro area market. What are the implications of such close integration. What are the implications of such close integration. The econometric methods are applied in analysis. The analysis has confirmed hypothesis.

JEL Classification Code: **O52**.

Keywords: international financial market integration, financial markets, measures of financial markets integration, equity market, news-based measures.

Introduction

A key concept at the heart of every introductory economics text book is the issue of scarcity and the need to make choices. Every choice made has costs associated with it and agents make decisions based on all the available information to them at that point in time (Sloman, et.al 2014). In terms of financial markets this basic economic idea has become increasingly important as the ease of mov-

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ing funds between locations has improved dramatically. If capital markets are efficient then we will see an optimal allocation of money and credit as it searches out opportunities that will yield the maximum return compared to the related risks involved. Transactions costs will thus fall and growth potential will increase.

Up until the financial crisis that came to head 15 days after Lehman Brothers became the world's largest ever bankruptcy, markets had increasingly become more correlated. However, after September 29th 2008, this level of integration has gone into reverse. Added to this, central bank intervention has potentially distorted how financial resources are allocated by affecting the price of money (interest rates) and the free functioning of related markets.

This paper looks at how a number of stock markets in Eastern Europe have performed in relation to the major markets of the US, UK and the euro area. We consider how well integrated they became and analyse the impact of shocks across these financial markets over the period 1999 to 2015. We then consider the links relating to the respective yields of each market. Finally we analyse the actual and potential implications of these developments on the capital markets involved and how resource allocation (diversification) decisions might be affected.

The two main research aims of this paper are:

1. Analyse how closely Central European stock markets are integrated with the stock markets in the US, UK the euro area.
2. Investigate the correlation of changes in the US S&P500, UK FTSE100, DJ EUROSTOXX 50 yields on the yields of the Polish and other main Central European stock exchange markets.

The hypothesis tested is: Czech, Hungarian and Polish equity markets are more integrated with the US and UK equity markets then with the euro area market.

What are the implications of such close integration?

With financial deregulation that emerged initially in the UK and the US under the Thatcher and Reagan regimes and was further driven by globalisation forces after 1989, there has been increased integration between financial centres and capital flows (see Authers J. 2010). These more open markets coupled with central bank interventions have driven a number of coordinated global asset bubbles that reflect the increased integration and herding of capital flows. Our analysis into the linkages between stock markets will assist the development of understanding into issues over diversifying across different capital markets to mitigate risks. As Keynes wrote in 1934 it is important to understand in detail what you are investing and in where rather than just relying on diversification. As his biographer Harrod states (1951) „He selected investments with great care and boldly adhered to what he had chosen through evil days." This study, over the period 1999-2015, allows us to investigate how such correlations between two of the major financial centres could be related to some of the lesser developed ones. By analysing such

markets and correlations allows investors to understand how risk management techniques (such as diversification) can amplify risk rather than mitigate it. The role of regulators can also be questioned given the fact that it is so hard to know and understand what is going on in the markets that they cover and the interlinkages involved. Post Lehman Brothers many market participants are still using old ideas and past behaviours. The political risks involved are rising.

1. The concept and measures of the international stock market integration

To understand what the future might hold one must analyze the risks and opportunities within markets. If markets are mispricing risk it is vital to understand where we currently are, how we arrived here and what the future might hold. All major financial crises have been followed by political, social and cultural changes as societies take time to understand and adapt to the events and alterations occurring (see Ferguson 2008). This is especially true for the former communist countries who are still adapting to the market forces of capitalism that emerged just a generation ago. A result of this is that their stock markets are still evolving as a way of offering companies the opportunity to list and raise money to fund growth plans.

Well-functioning and well regulated markets still provide the best mechanism for organizing, valuing and allocating scarce resources. Thus it is important to understand how different stock markets work and interact with each other. At times markets can become overly synchronised and overshoot. Our analysis will help us to understand how markets can be made to work better and thus improve national and global welfare.

The so called 'great moderation' which saw the longest periods of uninterrupted economic growth in the US and the UK led to the belief that macroeconomic policy could manage the business cycle and lead to an end of 'boom and bust.' As a result the correlation between asset classes within and across countries rose.

The following chart from Haldane (2013) illustrates one measure of global market integration over the past 100 years – „the correlation between national saving and investment rates in a set of countries. A value of one signals financial autarky – countries fully reliant on domestic saving to finance investment. A value of zero signals perfect financial integration – countries financing local investment globally." Up until the 1980s global financial integration was limited. Post 1980 with increased financial liberalization correlations between national saving and investment began falling. In 2007 they reached zero, „bliss point for global capital market integration." Since then this trend has gone into reverse as nation states brought money home.

Haldane (2013) then comments on the possible costs of such a retreat with reference to the impacts in the aftermath of the First World War when „trade barriers were erected, capital flows restricted, [and] immigration controls imposed."

Globalisation had appeared to have led to liquid markets that could accurately price risk and these risks could then be traded and passed on to those willing to take them on. Correlations rose across different markets and not just across stock exchanges. Up until 2000 such correlations were rare as stocks were mainly just traded and owned by those within that country. Authers (2010) claims that such diverse markets should not have shown such close correlations „as they should have nothing in common, this implies that neither market is being priced effectively. Instead, these entangled markets are driven by the same investors, using the same flood of speculative money."

Despite the level of correlation falling many financial markets remain highly correlated by historic standards. Often these correlations are driven by the actions of unelected central bankers. The events of September 2008 can be claimed to be the first truly global event as all markets crashed together. Thus if increased integration is being artificially enforced the consequences of any correction/s could be extremely severe as capital makes a flight to liquidity and 'safe' havens. This investigation will consider the integration between a number of Central European markets and those in the UK and the UK so to give insights into this process over the period 1999 to 2015.

If central bank intervention is driving asset prices away from their fundamental values then it is only a matter of time before the next global crash. Quantitative easing and a zero interest rate policy could be leading to a misallocation of scarce resources and further booms and busts. The end results could have huge social costs. So understanding the linkages between stock markets will offer insights for risk management and the protection of value at a national and individual level. If all markets are correlated then the ability to diversify and manage risks becomes more limited.

Fundamentals should drive asset prices (Malkeil 2008). This paper will consider whether such fundamental drivers of value such as yields have changed across nations, and whether increased correlations are a concern.

Financial integration has costs as well as benefits but most studies agree that the benefits outweigh the costs (see Agenor 2003). With the launch of the euro this is of increasing importance. Work on optimal currency areas (OCAs) led by Mundel (1961) state that for a currency area to work there has to be significant integration and synchronization between participating nations. Financial integration is a key requirement. As Babecky et al. (2008) state, „The more integrated financial markets are, the more effectively monetary policy is transmitted through the financial system."

With integration and synchronization macro shocks can be countered by common monetary policy. „In the case of new EU member states, which are committed to adopting the euro at some point, it is especially important to analyze the alignment of their markets, including financial ones, with those of the euro area countries." (Babecky et al. 2008).

The example of recent events in Greece illustrate the huge social costs if such integration is not in fact there (for example see Basu & Stuckler, 2014)

The concept of financial market integration and its degree is widely defined. All stock markets differ in terms of maturity, liquidity, openness, size, regulation, etc. Baele et al. (2004) propose to quantify financial integration using three different dimensions. Firstly, price based methods which involves a direct check of the law of one price on the condition that the compared assets have similar characteristics. Secondly by news-based methods that makes possible the identification of existing market imperfections such as frictions and barriers. Lastly via quantity based methods which qualifies the effects of mainly legal and other non-price barriers from both the demand and supply sides of the investment decision making process.

In this paper we will use a price and news based approach but it is important to understand that other methods are possible.

Stock market integration can be defined in the narrow way according to the law of one price. Application of the law of one price means that the assets generating identical monetary flows have the same price (rate of return/yield). In the case of shares in two countries (regions) the price of the capital raised on financial markets by issuing shares should be the same (see: Adam et. al., p. 4). In accordance with the broader definition of the financial market integration put forward by Baele et.al (see: Baele et. al, 2004, pp. 6-7), stock markets are considered fully-integrated if all the possible economic agents involved in transactions at the same price:

– are governed by the same rules when they decide to participate in share trading,
– have equal access to shares,
– are treated equally when they operate on the market, that is all have equal access to the information available.

Such a broad approach to financial market integration implies also the functioning of the law of one price. The law of one price states that assets are characterized by identical risks and yields. The quoted definition comprises the law of one price. If the law of one price is not met then there is room for arbitrage which restores validity of the law (on condition there are no barriers for the financial market integration) (see: Baele et.al., 2004, p. 7; Kowalak, 2006, pp. 34-38).

The following measures of the stock market integration degree can be distinguished:

– price and yield based measures,
– news-based measures.

Price and yield based measures include measures of spreads between prices and yields on assets across different national financial markets. The theoretical basis for the construction of such indices is the law of one price. The indices let us test the degree to which the law is implemented on the international scale. If assets have the same or similar characteristics then we can directly compare prices or yields. Otherwise, the measures of this type must also reflect the influence of factors specifically related to the markets in particular countries, differences in the systematic risk levels and the degree of liquidity.

News-based measures analyse the impact of information concerning shocks on financial markets and the investment risk related to them. In fully integrated markets investment portfolios should be well-diversified. The information coming from local markets should not have a significant effect on prices of assets contrary to global news concerning the entire integrated market, which has a significant effect on price changes. The degree of systematic risk is the same in different countries whose markets have become integrated. Thus, the measures from this group indicate to what extent the information specific for the local financial market is essential for the remaining markets in comparison to the effect of the information of global nature that impacts all markets (see: Baele et.al, 2008, p. 20; Kowalak 2006, p. 38 and onwards). In the case of the stock market, a model of the „increased impact of the common news component on stock market yields" is such a measure. The „common news component" is the news concerning changes in yields from the US stock market indices (global news). In the euro area the common news component is the news concerning changes in yields from the broad stock exchange index DJ EUROSTOXX corrected by the influence of the global „news" impact, i.e. from the US stock market. Similarly with regards the UK stock market, Europe's largest and most developed. The higher the degree of particular countries' stock market integration with the global market, the lower the impact of local (domestic) turbulences on shaping the yields on assets in that country but the higher is the impact of global factors (information, signals) coming from the United States.

In the case of the euro area countries, the larger the impact of common factors (the common „news" component) for the euro area than the local (specific for the particular countries of the euro area) ones on shaping the yields in the domestic stock markets, the higher the integration degree for these countries is. Similarly, if the examined countries are from outside the euro area, then the larger the impact of the common component for the euro area on shaping the stock market yields in these countries, the higher the integration degree between their markets and the euro area market. On the other hand, the impact of the „news" from the US market will define the integration degree between a given market and the global market (see: Bukowski 2011, p. 46-47).

The model of the „increased impact of the common news component on stock market yields" assumes the following form (see: Baele et.al., 2004, p. 20-21; Baltzer et. al., 2008, p. 8-10):

$$R_{i,t} = \mu_{i,t} + \varepsilon_{i,t}$$

where: $R_{i,t}$ – is the rate of return on assets (yield from the stock exchange index) for a country i at time t, expected yield element $\mu_{i,t} = \alpha_{i,t} + \gamma R_{i,\,t-1}$,
$\varepsilon_{i,t}$ – unexpected yield element.

The unexpected element ($\varepsilon_{i,t}$) can be further decomposed into a purely local shock $e_{i,t}$ at the stock exchange of a given country i at time t and the stock exchange response in a given country i over time t to the information from the euro area stock exchanges ($e_{eu,t}$) and global stock exchanges ($\varepsilon_{us,t}$) (from the US stock exchanges):

$$\varepsilon_{i,t} = e_{i,t} + \beta_{i,t}^{eu} e_{eu,t} + \beta_{i,t}^{us} \varepsilon_{us,t}$$

where: $\beta_{i,t}^{eu}$ and $\beta_{i,t}^{us}$ indicate dependent on a country i at time t sensitivity to information concerning yields in the euro area and the United States (global), respectively. The magnitude of both coefficients is a measure of the intensity with which the shocks originating in the euro area and the United States (global shocks), respectively, spread to the markets of a country i.

To compare the relationship between shocks in the euro area and in the United States and the yields in particular countries we calculate the proportion of yield variances in the market of a given country explained by the shocks in the euro area and the United States.

Assuming that local shocks in a country i are of idiosyncratic nature (they are not correlated with shocks in other countries or indices in the euro area and the United States, adopted as a benchmark), we can calculate the variance for a country i.

$$\sigma_{i,t}^2 = h_{i,t} + (\beta_{i,t}^{eu})^2 \sigma_{eu,t}^2 + (\beta_{i,t}^{us})^2 \sigma_{us,t}^2$$

where $h_{i,t}$ is the conditional variance of the local shock element, $\sigma_{eu,t}^2$ is the conditional variance for the euro area market, $\sigma_{us,t}^2$ – is the conditional variance for the US market. On this basis the following ratios are computed which give, respectively the proportion of variance for country i equity returns explained by euro area wide and global factors:

– Euro area variance ratio

$$VR_{i,t}^{eu} = \frac{(\beta_{i,t}^{eu})^2 \sigma_{eu,t}^2}{\sigma_{i,t}^2} = \rho_{i,eu,t}^2$$

– Global variance ratio

$$VR_{i,t}^{us} = \frac{(\beta_{i,t}^{us})^2 \sigma_{us,t}^2}{\sigma_{i,t}^2} = \rho_{i,us,t}^2$$

The conditional variances for the euro area, the United States and the local stock market are obtained from the standard GARCH(1,1) model.

The higher the value of the yield variance proportion (the higher the ratio of the euro area or the US shock to the local shock impact), the higher the degree of stock market integration.

2. Analysis of the equity market integration – USA, UK, euro area and Central European new EU member countries including Poland

2.1. Data and model

In our examinations we used monthly data for the period: 1990:1 – 2015:8 concerning yields of the following indices:

1. S&P 500
2. DJ EUROSTOXX 50
3. FTSE 100
4. CECE EUR
5. WIG 20

Changes in yields on the S&P 500 were treated as global news (signal/shock), as in the case of the investigations and statistics of the European Central Bank concerning equity market integration (see: Financial Integration in Europe, April, Statistical Annex. ECB 2015). The DJ EUROSTOXX 50 is an index based around 50 euro area blue chip companies. The CECE EUR is a proxy of equity markets in Central European countries. This index covers the main companies from Poland, Hungary and the Czech Republic. The FTSE 100 represents the UK equity market and the WIG 20 the Polish stock market. The data sources utilised were the ECB database (Statistical Data Warehouse) and data from the Warsaw Stock Exchange[3].

To measure the degree of stock exchange integration we applied the measures based on a model of the „increased impact of the common news component on equity market yields" i.e. the above mentioned measures of the global shock spillover and yield variance proportion. We constructed the following 6 models:

1. US - euro area v CE which covers the integration of the US and the euro area markets with the Central European equity market.

[3] www.stooq.pl and www.stoxx.com

2. US - UK v CE which covers the integration of the US and the UK markets with the Central European equity market.
3. US - euro area v PL which covers the integration of the US and the euro area markets with the Polish equity market.
4. US - UK v PL which covers the integration of the US and the UK markets with the Polish equity market.
5. US – euro area- UK v CE which covers the integration of the US and the UK markets with the Central European equity market.
6. US - euro area- UK v PL which covers the integration of the US, euro area and the UK markets with the Polish equity market.

The models were estimated in three stages by means of the GARCH (1,1) process[4]. Firstly, the equation for the US market yields was estimated[5]:

$$R_{us,t} = \mu_{us,t} + \varepsilon_{us,t}$$

where: $R_{us,t}$ – equity market yield (on the stock exchange index) in the US over time t,
the expected yield component $\mu_{i,t} = \alpha_{i,t} + \gamma_i R_{us,t-1}$,
$\varepsilon_{i,t}$ – the unexpected yield component.

Secondly the conditional variance for the US market was estimated:

$$E(\varepsilon^2_{us,t}) \equiv \sigma^2_{us,t}$$

where $E(.)$ is the expected value operator.

Then we establish an estimation of the euro area market yield equation and UK yield equation:

Euro area market yield equation:

$$R_{eur,t} = \mu_{eur,t} + \varepsilon_{eur,t}$$

where: $\mu_{eur,t} = \alpha_{eur,t} + \gamma_{eur} R_{eur,t-1}$,
and $\varepsilon_{eur,t} = \beta^{us}_{eur}\, \varepsilon_{us,t} + e_{eur,t}$,
$e_{eur,t}$ – pure local shock.

The conditional variance takes the form of:

$$E(\varepsilon^2_{eur,t}) \equiv \sigma^2_{eur,t}$$

[4] With regards the subject of the GARCH (1,1) model application for examining the relationships between the yields on equity market indices see more in: (Brzeszczyński, Kelm, 2002: 95-119; Jajuga, 2008; Mills, Markellos, 2008: 182, 323 and onwards).

[5] With regards the model of the „increased impact of the common news component on the equity market yields" see more: (Baele et al., 2004: 20-21; Baltzer et al., 2008: 8-10, Bukowski, 2011: 46-47).

UK market yield equation:

$$R_{uk,t} = \mu_{uk,t} + \varepsilon_{uk,t}$$

where: $\mu_{uk,t} = \alpha_{uk,t} + \gamma_{uk} R_{uk,t-1}$,

and $\varepsilon_{uk,t} = \beta_{uk}^{us} \varepsilon_{us,t} + e_{uk,t}$,

$e_{uk,t}$ – pure local shock.

The conditional variance takes the form of:

$$E(\varepsilon_{uk,t}^2) \equiv \sigma_{uk,t}^2$$

In the last stage the yields for the Central European market (eur) and the Polish (pl) equity market were estimated (i= ce, pl respectively):

$$R_{i,t} = \mu_{i,t} + \varepsilon_{i,t}$$

where: $\varepsilon_{i,t} = \beta_i^{us} \varepsilon_{us,t} + \beta_i^{eur} e_{eur,t} + e_{i,t}$,

$\mu_{i,t} = \alpha_{i,t} + \gamma_{i,t} R_{i,t-1}$,

or if UK market is included:

$$\varepsilon_{i,t} = \beta_i^{us} \varepsilon_{us,t} + \beta_i^{eur} e_{eur,t} + \beta_i^{uk} e_{uk,t} + e_{i,t}$$

$\mu_{i,t} = \alpha_{i,t} + \gamma_{i,t} R_{i,t-1}$,

$e_{i,t}$ – pure local shock and the conditional variance $E(\varepsilon_{i,t}^2) \equiv \sigma_{i,t}^2$.

$\beta_{i,t}^{eur}$ and $\beta_{i,t}^{us}$ indicate a dependence on the Central European or Polish market over time t sensitivity to information concerning yields in the euro area and the United States, respectively. The magnitude of both coefficients is a measure of intensity with which the shock originating in the euro area and the United States (global shocks), respectively, spillover into the Polish or Central European equity markets.

Then the variance ratio was computed:

$$VR_{i,t}^{eur} = \frac{(\beta_{i,t}^{eur})^2 \sigma_{eur,t}^2}{\sigma_{i,t}^2} = \rho_{i,eur,t}^2, \quad VR_{i,t}^{us} = \frac{(\beta_{i,t}^{us})^2 \sigma_{us,t}^2}{\sigma_{i,t}^2} = \rho_{i,us,t}^2, \quad VR_{i,t}^{uk} = \frac{(\beta_{i,t}^{uk})^2 \sigma_{uk,t}^2}{\sigma_{i,t}^2} = \rho_{i,uk,t}^2$$

Conditional variances for the euro area, the United States, UK and the local equity market are obtained from the standard GARCH (1,1) model.

The higher the value of the yield variance ratio (the higher the ratio of the euro area or US shock to the local shock impact) implies the higher the Polish and Central European equity market integration degree with the one or the other equity market is.

2.2. Results

2.2.1. Time series cointegration

The Engle-Granger cointegration test indicates that time series of the yields of S&P 500 Index (R_{us}), DJ Eurostoxx 50 Index(R_{eur}), WIG 20 – Warsaw Stock

Exchange 20 Index (R_{pl}), over the period 1999:1-2015:8 are cointegrated. Time series of yields of S&P 500 Index (R_{us}), DJ Eurostoxx 50 Index (R_{eur})and yields of CECE EUR index (R_{ce}) are also cointegrated. The same concern the time series of S&P 500 Index (R_{us}), DJ Eurostoxx 50 Index (R_{eur}), FTSE 1000 (R_{uk}), time series of yields from S&P 500 Index (R_{us}), FTSE 100 (R_{uk}), CECE EUR index (R_{ce}), of yields from S&P 500 Index (R_{us}), FTSE 1000 (R_{uk}), WIG 20 – Warsaw Stock Exchange 20 Index (R_{pl}) (see table below).

Table 1. Results of Engle-Granger cointegration tests for periods: 1999:2-2015:8, sample N = 199

Period	1999:1-2015:8
Time series	R_{us}, R_{eur}, R_{ce}
Model:	(1-L)y = (a-1)·y(-1) + ... + e Test with constant and linear trend
Autocorrelation of first rank =	0,0024
Estimated value (a-1) =	-0,85596
Test statistics tau =	-3,45684
Asymptotic value p =	0,2152
Critical value tau = (Dickey-Fuller tables)	-3,43 with significance level = 0,05
Time series	R_{us}, R_{eur}, R_{pl}
Model:	(1-L)y = (a-1)·y(-1) + ... + e Test with constant and linear trend (first differences)
Autocorrelation of first rank =	0,026
Estimated value (a-1) =	-0,84465
Test statistics tau =	-3,59784
Asymptotic value p =	0,1651
Critical value tau = (Dickey-Fuller tables)	-3,43 with significance level = 0,05
Time series	R_{us}, R_{uk}, R_{ce}
Model:	(1-L)y = (a-1)·y(-1) + ... + eTest with constant and linear trend (first differences)
Autocorrelation of first rank =	0,066
Estimated value (a-1) =	-0,948103
Test statistics tau =	-5,27356
Asymptotic value p =	0,001063
Critical value tau = (Dickey-Fuller tables)	-3,43 with significance level = 0,05
Time series	R_{us}, R_{uk}, R_{pl}
Model:	(1-L)y = (a-1)·y(-1) + ... + eTest with constant and linear trend (first differences)
Autocorrelation of first rank =	0,011
Estimated value (a-1) =	-0,960073
Test statistics tau =	-5,35751
Asymptotic value p =	0,0007546
Critical value tau = (Dickey-Fuller tables)	-3,43 with significance level = 0,05

Table 1 continued.

Time series	R_{us}, R_{eur}, R_{uk}
Model:	(1-L)y = (a-1)·y(-1) + ... + eTest with constant and linear trend (first differences)
Autocorrelation of first rank =	0,018
Estimated value (a-1) =	-0,853134
Test statistics tau =	-3,46054
Asymptotic value p =	0,2138
Critical value tau = (Dickey-Fuller tables)	-3,43 with significance level = 0,05

Source: own calculations.

2.2.2. The yields in the first glance

The analysis of fig. 1 substance indicates interesting results about correlations in yields of indexes. First of all, we can observe that yields of S&P 500 DJ Eurostoxx 50 Index and FTSE 100 are highly correlated. The yield of the CECE EUR index, WIG 20 are less correlated with the yields of the S&P 500, DJ Eurostoxx 50 Index and the FTSE 100.

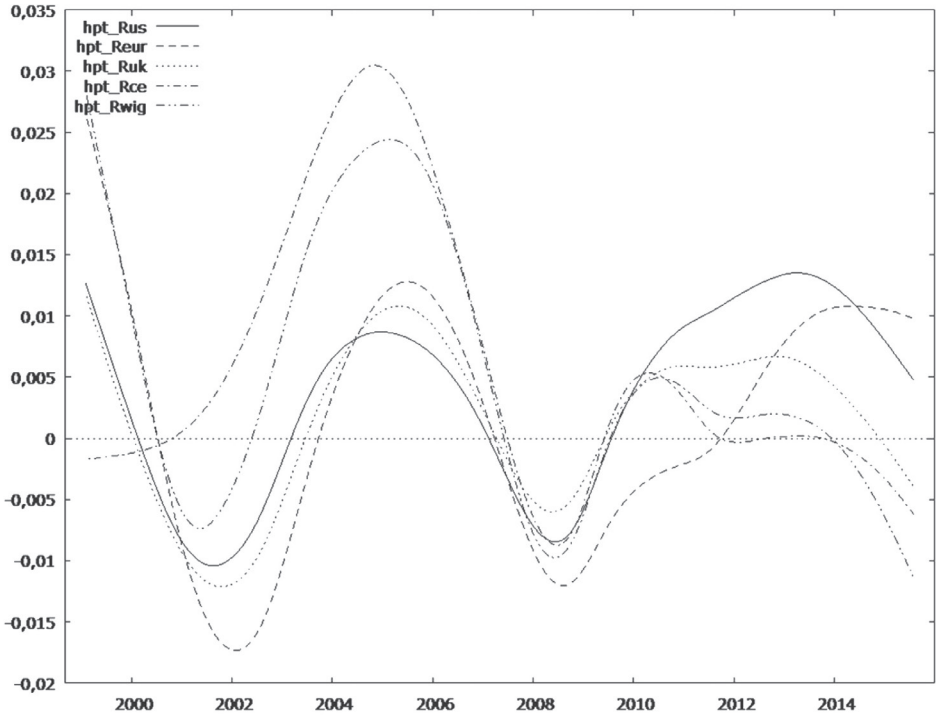

Figure 1. Yields of S&P 500 (R_{us}), DJ Eurostoxx 50 Index(R_{eur}), FTSE 100 (R_{uk}), CECE EUR index (R_{ce}), WIG 20 (R_{pl}), ver the period 1999:2-2014:12, smoothed by means of the Hodrick- Prescott (λ=14400) filter

Source : own.

2.2.3. Model: US – euro area v CE. The integration of the US and the euro area markets with the Central European equity market

The analysis of the results of this model emphasise that the intensity of US shock spillover effects are stronger then the intensity of euro area shock spillover effects (see fig. 3).

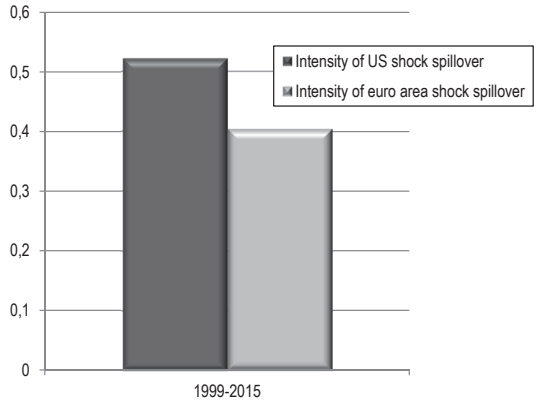

Figure 2. Intensity of the global shock spillover (from the United States) and the euro area shock spill-overs on the Central European market – new members equity market, measured by $\beta_{ce,t}^{us}$, $\beta_{ce,t}^{eur}$ coefficients in the period of 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

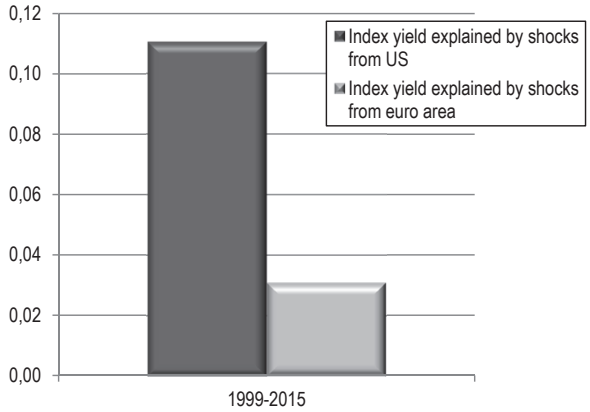

Figure 3. Central European – new member countries equity market – variance ratio for the CECE EUR index yield explained by shocks from the euro area ($VR_{ce,t}^{eur}$) and the United States ($VR_{ce,t}^{us}$) in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

The yields of the index for the CECE EUR is explained generally by the changes in the yields of S&P 500 index. Only in about 3,5% of the changes in the yields of DJ EUROSTOXX is explained in the research period due to the changes of the yields of the CECE EUR index (see fig. 2).

2.2.4. Model: US –UK v CE which covers the integration of the US and the UK markets with the Central European equity market.

It is interesting to note that shocks from the UK market (measured by the changes of yields of FTSE 100) have a much stronger influence on changes of yields in Central European Countries (Poland, Hungary, Czech) compared with shocks from the US market (see fig. 4 and 5).

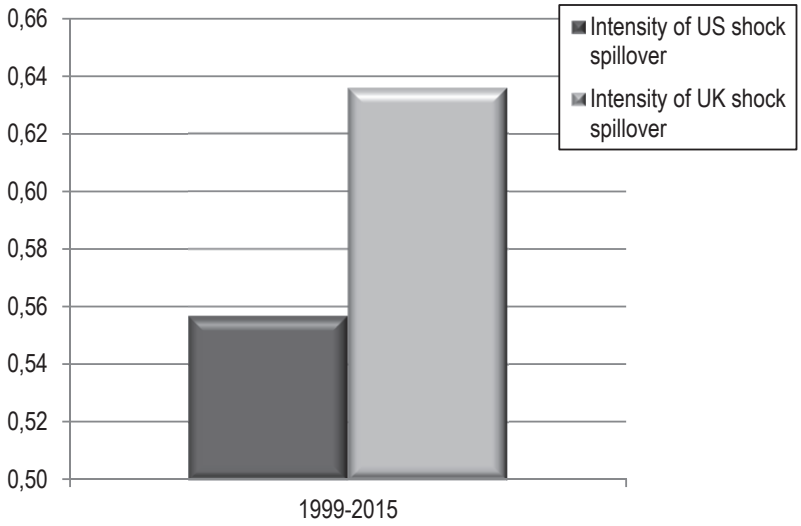

Figure 4. Intensity of the global shock spillover (from the United States) and the UK shock spillover on the Central European market (new members equity market) measured by $\beta_{ce,t}^{us}$, $\beta_{ce,t}^{uk}$ coefficients in the period of 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

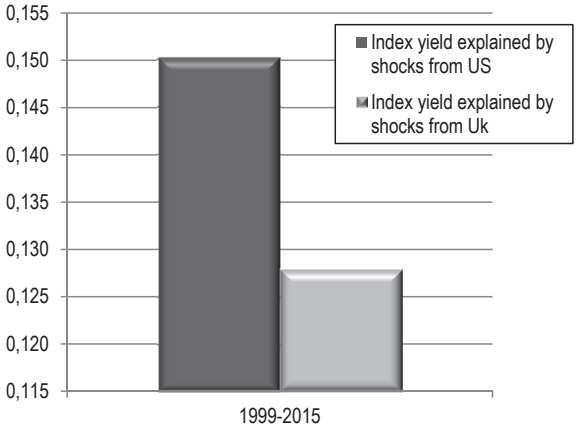

Figure 5. Central European – new member countries equity market – variance ratio for the CECE EUR index yield explained by shocks from the United Kingdom ($VR^{uk}_{ce,t}$) and the United States ($VR^{us}_{ce,t}$) in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

2.2.5. Model: US - euro area v PL which covers the integration of the US and the euro area markets with the Polish equity markets

In the case of Poland the situation is similar. The intensity of US shocks spillover is higher then the intensity of euro area shocks (see fig. 6 and 7).

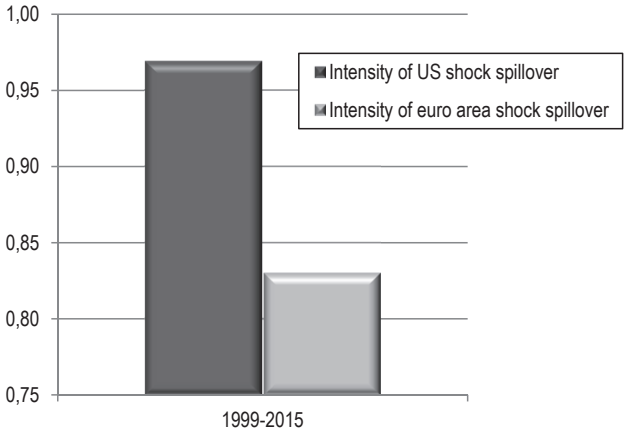

Figure 6. The intensity of global shock spillover (from the United States) and the euro area shock spillovers on the Polish equity market, measured by $\beta^{us}_{pl,t}$, $\beta^{eur}_{pl,t}$ coefficients in the period of 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

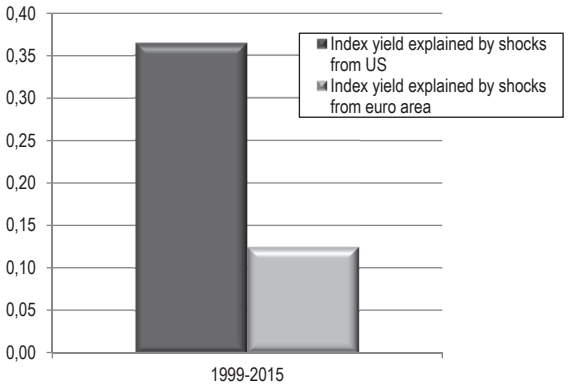

Figure 7. Polish equity market – variance ratio for the WIG 20 index yield explained by shocks from the euro area ($VR^{eur}_{pl,t}$) and the United States ($VR^{us}_{pl,t}$) in the periods 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

Changes of the yields of WIG 20 are explained especially by shocks from US. The influence of those shocks is much stronger then shocks from euro area.

2.2.6. Model: US-UK v PL which covers the integration of the US and the UK markets with the Polish equity market

The intensity of shocks from the UK market impacting the equity market in Poland is much higher than for shocks from the US (see fig. 8).

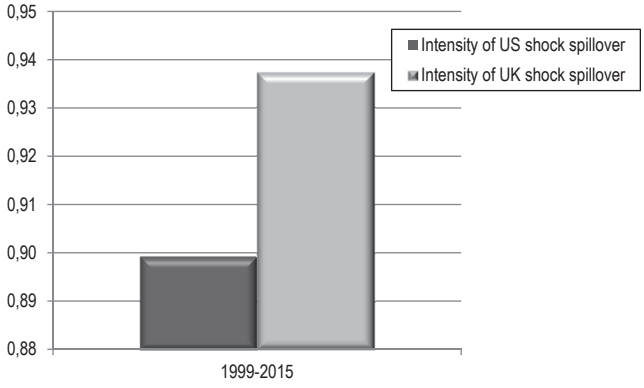

Figure 8. Intensity of global shock spillovers from the United States and the United Kingdom on the Polish equity market, measured by $\beta^{us}_{pl,t}$, $\beta^{uk}_{pl,t}$ coefficients in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

The changes in the yields of the WIG 20 are in higher degree explained by shocks from US then from UK (see fig. 9).

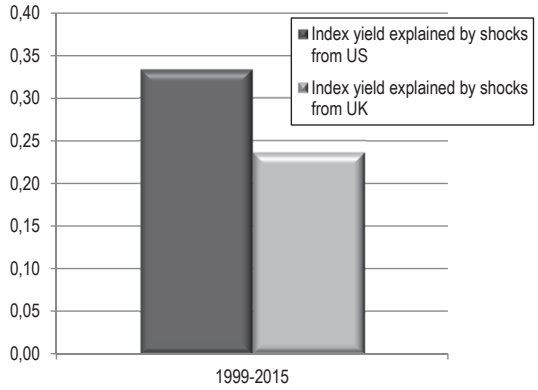

Figure 9. Polish equity market – variance ratio for the WIG 20 index - yield explained by shocks from the United Kingdom ($VR_{pl,t}^{uk}$) and the United States ($VR_{pl,t}^{us}$) in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

2.2.7. Model: US – euro area – UK v CE which covers the integration of the US, the UK and the euro area markets with the Central European equity market

In this model the whole influence of shocks from the US, the UK and the euro area markets has been taken into account (see fig. 10 and 11).

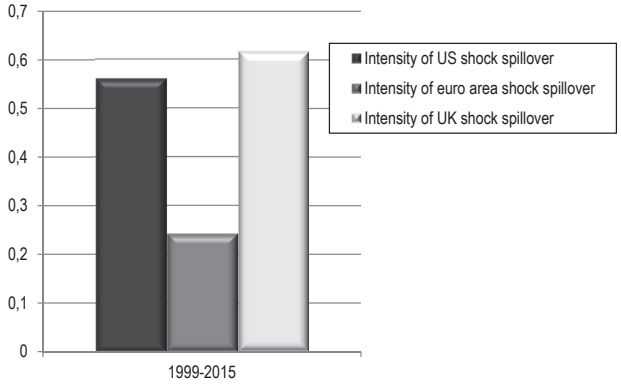

Figure 10. The intensity of global shock spillover (from the United States), the euro area and the United Kingdom on the Central European, new members, equity markets, measured by $\beta_{ce,t}^{us}$, $\beta_{ce,t}^{eur}$, $\beta_{ce,t}^{uk}$ coefficients in the period of 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

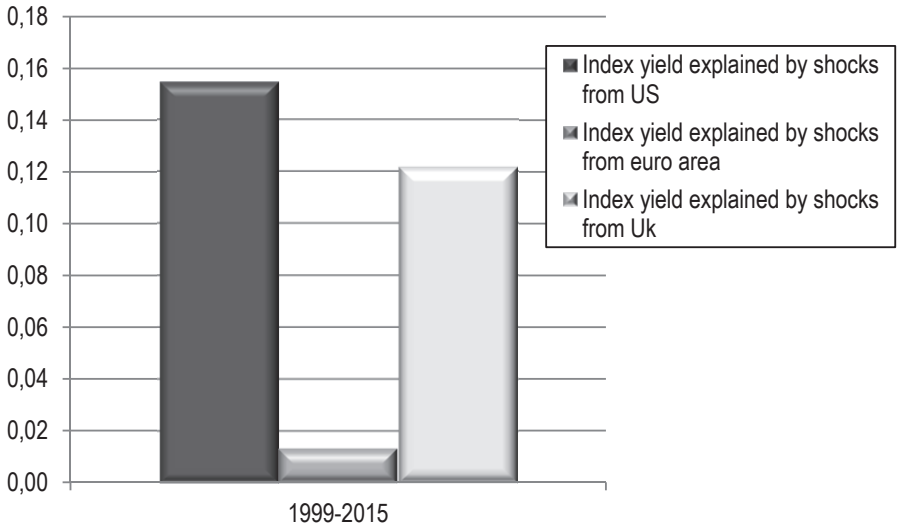

Figure 11. Central European – new member countries equity market – variance ratio for the CECE EUR index yield explained by shocks from the euro area($VR^{eur}_{ce,t}$), United Kingdom ($VR^{uk}_{ce,t}$) and the United States ($VR^{us}_{ce,t}$) in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

The intensity of the UK shock spillover is higher than the intensity of the US and the euro area shock spillovers.

It is remarkable that the intensity of euro area shock spillover is much lower then in the influence of US shocks and UK shocks given the expected closer integration in this area due to the closer locations. This results illustrates the importance of the developed markets in the US and the UK in influencing other markets and capital flows. The changes of the yields of CECE EUR index are explained in the main part by the shocks from US and UK.

2.2.8. Model: US - euro area- UK v PL which covers the integration of the US, euro area and the UK with the Polish equity market

In the case of Poland situation is similar to that described above (see fig. 12 and 13). There is a clear domination intensity of the strength of the US and UK shock spillovers when compared to those spillovers emanating from the euro area markets.

The changes in the yields of WIG 20 are explained generally by the shocks from US and UK. The influence of the shocks from euro area is very low.

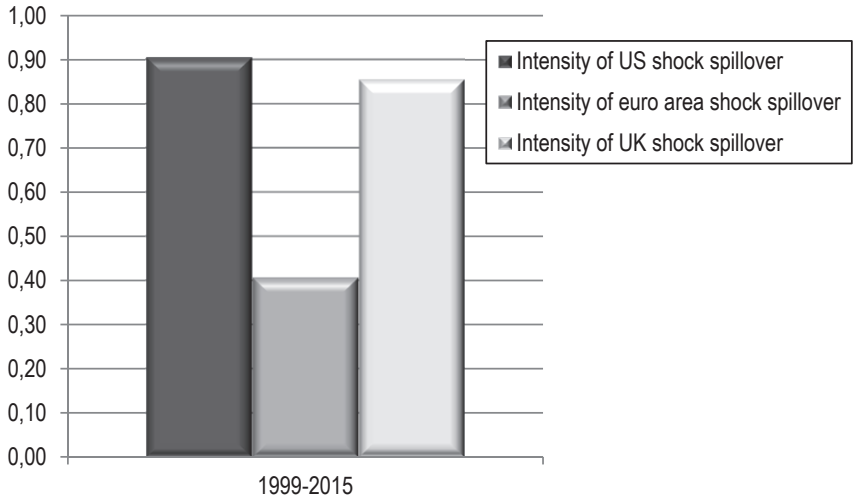

Figure 12. The intensity of global shock spillovers (from the United States), the euro area and the United Kingdom on the Polish equity market, measured by $\beta_{ce,t}^{us}$, $\beta_{ce,t}^{eur}$, $\beta_{ce,t}^{uk}$ coefficients in the period of 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

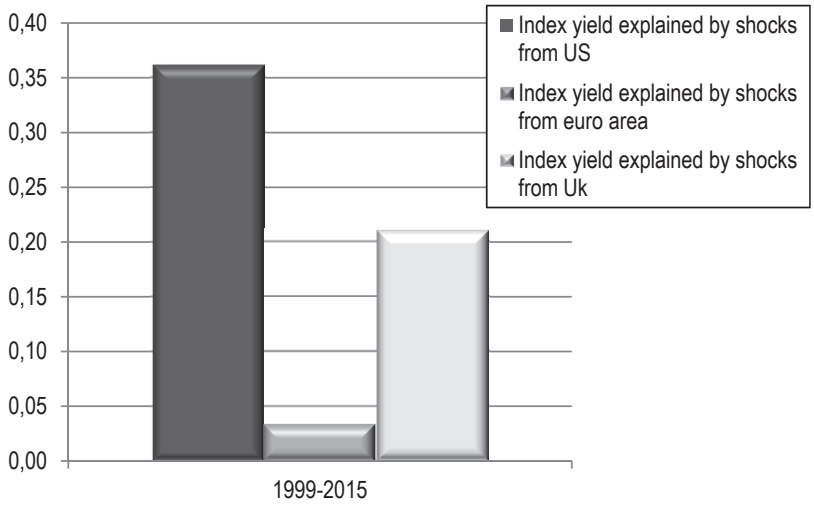

Figure 13. Polish equity market – variance ratio for the CECE EUR index yield explained by the shocks from the euro area ($VR_{ce,t}^{eur}$), United Kingdom ($VR_{ce,t}^{uk}$) and the United States ($VR_{ce,t}^{us}$) in the period 1999-2015

Source: author's own compilation on the basis of the estimation of the model of the „increased impact of the common news component on the equity market yield" with the use of the GRETL program.

Conclusions

The hypothesis tested within this paper analysed the linkages between the Polish, Hungarian and Czech equity markets with those in the US, the UK and the euro area. The key finding is that these emerging markets stock markets are more closely integrated with US equity market and UK equity market then with the euro area equity market, their closer neighbour. What are the possible reasons?

It is very difficult to find answer in regards to the framework of the classical theories of finance. Also, as stated, it is hard to fully compare markets due to differences in their composition, liquidity and regulation. Further investigation in the realms of behavioural finance (complex adaptive systems) and the psychology of financial markets could offer deeper explanations. The increased importance of the US market could also be explained by the power of the Federal Reserve and the policies that it has followed after the collapse of Lehman Brothers on 14-9-15.

Investors can be relatively firmly convinced of the determined big financial markets' news significance and its impact on the financial instruments yields, especially equities. The signals from American market are treated as signals from the global market. The American economy is a very attractive economy with specific features: a high level of competition and economic freedom, property law protection, high levels of technology, labor mobility, market flexibility and a relatively high dynamics of economic growth. Those features explained the dollar's role as the world's primary reserve currency. It is very important that American sovereign debt is denominated in American dollars. 80% of official central bank reserves in the world are denominated in American dollars. As a result investors treat information and signals from American market as a most important for their investment decisions. This role of possessing the world's reserve currency also gives America an „exorbitant privilege" that could explain it's influence. Investors from Czech Republic, Hungary and Poland can be convinced that many changes in the financial markets across the world are caused by changes in the global, American market. Similarly it can be said in the case of the influence of the UK equity market. Investors from those countries can be convinced that one of the main and broad international equity market based in the City of London has a stronger impact on other equity markets in the Europe then the markets of the euro area.

It is interesting that the same situation exists in Slovenia. The degree of equity market integration in that country with the American equity market is higher than with the euro area equity market. The case of Slovenia is important as it is a member of euro area (see: Bukowski, 2013).

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Małgorzata Janicka[1]

LUCAS PARADOX IN THE LIGHT OF NEOCLASSICAL THEORY[2]

Abstract

In their analyses devoted to the directions of international capital flows, economists dealing with the subject often make references to conclusions reached by R. Lucas Jr, i.e., to the so called Lucas paradox. In literature, Lucas paradox provides the starting point for considerations on how neoclassical model works when it comes to the directions and volume of capital flowing among countries in modern global economy. This paper aims at discussing the rationale behind the study conducted by R. Lucas Jr and, consequently, the justification for his conclusion. Lucas paradox is considered in two approaches: classical, i.e., consistent with conclusions drawn by R. Lucas: capital flows between countries in amounts smaller than suggested by differences in marginal products of capital in individual countries and the flow does not equalise them; and contemporary: directions of capital flows in global economy are not consistent with those delineated by the neoclassical model, capital flows from poor (developing) countries to rich (developed) ones. Taking account of neoclassical model assumptions, in both approaches to Lucas paradox drawing „hard" conclusions with respect to directions of capital flows in contemporary economy based on quoted studies does not seem justified.

JEL Classification Code: **G32, G34, H41, L93**.

Keywords: Lucas paradox, international capital flows, neoclassical theory.

Foreword

In their analyses devoted to the directions of international capital flows, economists dealing with the subject often make references to conclusions reached by R.

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Lucas Jr, i.e., to the so called Lucas paradox. In literature, Lucas paradox provides the starting point for considerations on how neoclassical model works when it comes to the directions and volume of capital flowing among countries in modern global economy. This paper aims at discussing the rationale behind the study conducted by R. Lucas Jr and, consequently, the justification for his conclusions.

Neoclassical theory

Until the outbreak of the worldwide financial crisis (2008), the question of free movement of capital in global economy was clearly dominated with conclusions drawn from neoclassical economics. They served as a foundation for practical recommendations, in accordance with which countries should abolish the existing restrictions as quickly as possible. However, seeking to apply the conclusions of neoclassical theory to our contemporary reality, we need to realise that economic circumstances, on which theoretical model was built were very much diverse from our contemporary reality.

Neoclassical economic theory emerged in the age of the gold standard (1870-1914), where free flows of capital among countries were natural. The theory was consistent with the economic practice of those times – it unambiguously confirmed benefits resulting from international free movements of capital. In accordance with the neoclassical model, global economy may experience only one optimum condition, i.e., full liberalisation of capital flows. Any other option (partial or no liberalisation) were, and still are, perceived as suboptimum. It means that countries, which maintain any restrictions reap benefits below their potential. Changes that take place in domestic markets following the abolishing of restrictions vis-a-vis capital flows can be easily observed on the example of two countries in a static partial equilibrium model (Fig. 1, 2, and 3). Assumptions of the neoclassical model provide the starting point for this analysis[3].

Country A has got less capital than country B and the price of capital is higher in country A than in country B. When markets of both countries are isolated, higher price of capital in A is maintained. In B the price of capital is lower than in A due to the existing restrictions.

Supply of capital (C) is marked on the abscissa, while its price, the interest rate (r), is marked on the ordinate. Curves DC_A and DC_B represent demand for capital in both countries at a given price of capital (respectively, rA and r_B). Capital supply at prices r_A and r_B is represented by curves SC_A and SC_B. If there are barriers to the flow of capital between countries A and B, price of capital r_A is higher than the price of capital in country B – r_B. The situation continues until

[3] Such as: two countries, no impact of other external factors, perfect competition and all factors of production are fully employed; 0-1 game (0-closure, 1-openning).

barriers to capital flows between A and B are removed. As a result, capital from country B will move to country A until prices of capital in both countries are equal $r_A = r_B = r$. Supply of capital in country B will drop from C_B to $C_{B'}$,while supply in country A will increase from CA to $C_{A'}$, accompanied by appropriate adjustments in demand resulting from the changes in the price of capital. The process is illustrated in Fig. 2.

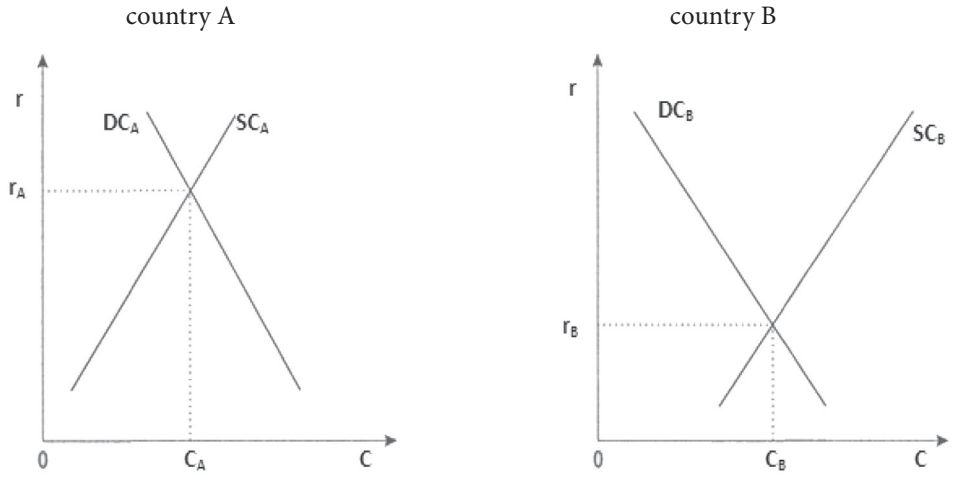

Figure 1. Situation before restrictions in capital flows in both countries have been abolished; partial analysis

Source: A. Czarczyńska, K. Śledziewska (2003), p. 66, McDonald, Dearden (1999), p. 52.

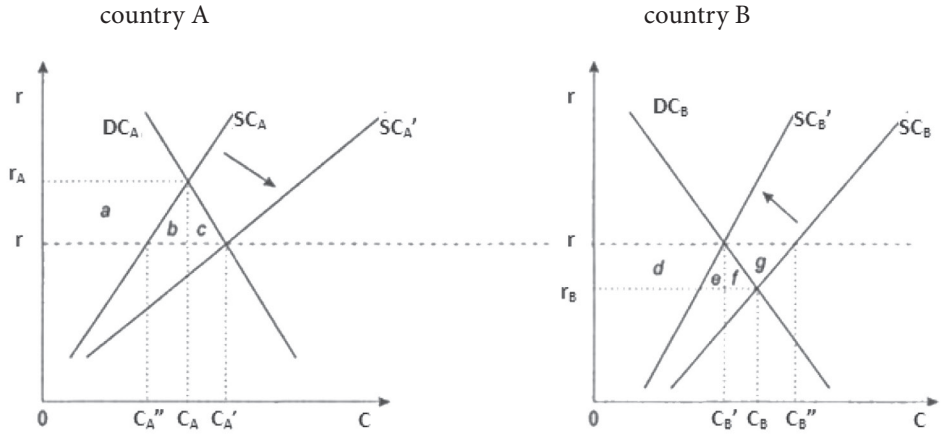

Figure 2. Full liberalization of capital flows, full convergence of prices, partial analysis

Source: A. Czarczyńska, K. Śledziewska (2003), p. 67, McDonald, Dearden (1999), p. 52.

Besides changes in the price of capital and the resulting change in demand for capital, changes will be observed in the welfare in countries A and B measured with economic rent of capital lenders and borrowers. Due to the inflow of capital into country A, the country receives net benefit delineated by areas b and c. It is the difference between the increase in economic rent of capital borrowers, who use more of cheaper capital (areas a+b+c) and reduced economic rent of capital lenders who receive smaller income although they lend the same amount of capital (area a). Welfare changes also in country B. Since the interest rate increased, economic rent of capital owners also increases (areas d+e+f+g), while the value of employed capital and economic rent of capital borrowers (area d+e+f) decrease. Net welfare in country B increases with g area, while combined welfare of both countries involved in liberalisation increases with the area b+c+g. As we can see, liberalisation of capital flows contributes to the increase in net welfare in both countries, however, the situation of capital lenders from countries relatively better equipped with capital will improve while in countries where this factor is relatively more scarce, capital lenders will experience the worsening of their financial performance.

Effects of partial liberalisation of capital flows are presented in Fig. 3.

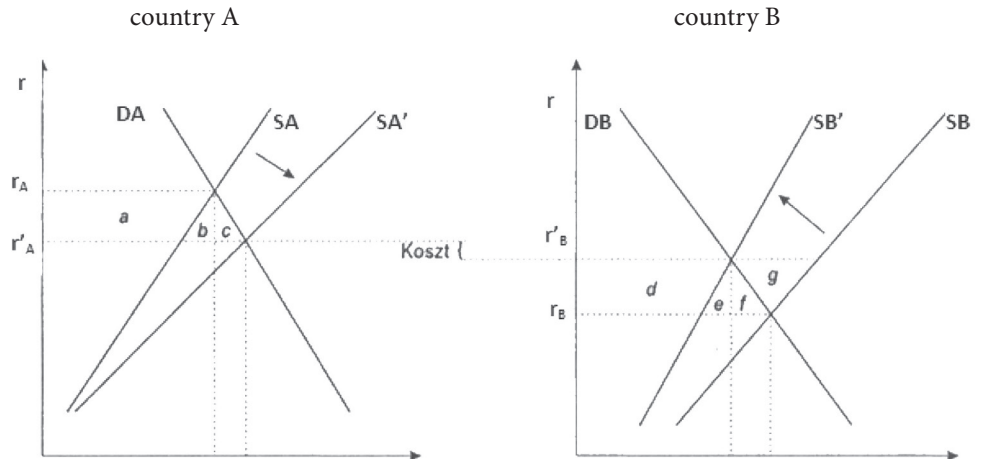

Figure 3. Partial liberalisation of capital flows, incomplete price convergence, partial analysis

Source: A. Czarczyńska, K. Śledziewska (2003), p. 68.

Under such circumstances, there will be no full convergence of the prices of capital – interest rate in country A will be reduced compared to its initial level but it will remain higher than the interest rate in country B. Analogous situa-

tion will be experienced in country B – the interest rate will increase from r_B to r'_B, remaining, however, at the level lower than the interest rate in country A – r'_A. Similarly to the situation when prices of capital are equal in both countries (Fig. 2), incomplete convergence of prices impacts the welfare in both countries. The area representing net welfare (b+c+g) is nevertheless smaller than when price convergence is full. It means that also under incomplete convergence of prices of capital total net welfare increases in countries engaged in liberalisation although it is smaller than when prices of capital are equal.

Neoclassical model, built on many unrealistic assumptions, reflects an ideal situation unattainable in contemporary real economy. Taking account of the fact that the model explained economic processes in the period of gold standard system, its main characteristics are worth recalling. Brief analysis presented below clearly demonstrates that differences between the model and our present reality are relevant enough to prevent any direct import of model solutions, which derive from the gold standard system, to our reality:

1. Primarily, in the gold standard monetary system, gold, or its substitutes that could be converted to gold, fulfilled the role of national and international currency – all forms of money in circulation were only symbols that made references to a particular commodity (commodity money).
2. No country, at least theoretically, was privileged when it comes to issuing money, which was strictly dependent on reserves of gold it owned.
3. All countries established a parity of their national currencies in gold, while the exchange rates resulted from the relation between parities. It means the problem of fluctuating exchange rates and oversupply of money did not exist; each country could supply only as much money as much gold it had in its reserves.
4. Capital was flowing freely among countries.
5. In gold standard system there were no profits connected with changing exchange rates and interest rates, size and directions of capital flows were primarily the function of:
   – private financial resources accumulated in individual countries
   – derivative of the balance of trade of countries.

From the point of view of our analysis, three aspects are essential: absence of active monetary policy and exchange rate policy (system of fixed parity-based exchange rates, commodity currency) of the state, genuinely free capital flows at international scale and the lack of public resources in international financial markets.

Neoclassical model built on the experiences of gold standard monetary system, clearly and unambiguously identifies directions of international capital flows: capital flows from the surplus country to the deficit country until marginal products of capital (or, to put it simply, rates of return) become the same. In the gold standard monetary system the surplus „rich" countries were developed countries while deficit, „poor" countries were developing countries. The direction of in-

ternational capital flows under this system, in line with neoclassical model, i.e., from developed to developing countries, is confirmed by the study[4] conducted by M. Schularick (2006).

Modern foreign exchange system, referred to as the multi-currency one, is based on completely different principles, e.g., there is fiat money, capital flows are not liberalised globally, countries pursue active exchange rate/monetary policy. Why should we come back to the neoclassical model as a basis to explain directions of capital flows in global economy? It is connected with processes that started in the global economy in the 1980s (the beginning of the so called second wave of liberalisation of financial markets) and a change in dominant theoretical trend (from Keynesism to monetarism), return to liberal ideas and the belief that free market is better than state interventionism. These ideas revived the conviction that, both from the point of view of countries and all of the global economy, full liberalisation of capital flows is beneficial. Interestingly, economists who explore processes in global economy using the neoclassical model relatively rarely, if ever, would ask a question fundamental from the point of view of these analyses: in the face of diverse operating conditions of modern global economy, can we justify „overlapping" contemporary economic processes with the neoclassical model?

At this very point, I wish to explain that the problem does not lie in model assumptions, which cannot be met *ex definitione*, as in the model global economy consists of only two countries, there is perfect competition, no external impact, etc. The issue, which from the point of view of our study on directions of international capital flows is fundamental concerns the existence of full freedom of capital flows among countries. One needs to bear in mind, however, that restrictions imposed on this freedom, which started in the 1930s, intensified after WWII while elimination of restrictions that accompanied the second wave of financial market liberalisation did not cover all countries equally and took place mainly in developed countries.

3. Famous study by R. Lucas Jr

In 1990 R. Lucas Jr published a paper, in which he questioned the applicability of conclusions from the analysis of theoretical neoclassical model (Lucas 1990, pp. 92-96). „Contrary to what is suggested by neoclassical economy, global resources do not flow from rich to poor countries but are invested mainly in rich, but also in the richest, countries e.g., the United States." (Singh 2002, p. 20). The

[4] We also need to note that studies on gold standard period are hampered by very limited data resources and difficult access to them.

incoherence of theory and practice is known as Lucas paradox. Against our expectations, capital does not flow from rich to poor countries or, more precisely, it flows in amounts much smaller than what differences in marginal products of capital in these countries would suggest.

In his research, R. Lucas compared two countries: United States and India. Adopting standard assumptions of neoclassical theory he proved that in 1988 marginal product of capital in India was 58 times bigger than that in the U.S. Under such circumstances, in accordance with neoclassical theory, capital should flow from India to the United States until marginal products of capital in both countries would be the same. In practice that did not happen at all, neither were there premises for claiming that the process has ever taken place. Conclusions reached by R. Lucas helped challenge the applicability of marginal product of capital as a factor explaining directions of global capital flows and opened up a discussion that has been going on until now about what is their main determinant. Economists made an attempt to identify reasons, why economic theory diverges, as R. Lucas demonstrated, from economic reality. Lucas himself rejected the most probable option: higher than the average risk of investing in developing countries, in this case in India. However, justification for this rejection is not easy to digest. He claimed that because many developing countries were colonies of developed economies before WWII, colonial empires imposed their legal orders upon them and, thus, risk connected with legal and organisational infrastructure in countries covered by the study is very similar. According to him, the major reason for the divergence between theoretical and practical conclusions consists in imperfections of the so called human capital in developing countries, which make benefits from capital invested in them lower than expected. Lucas's arguments are not convincing. Occupying powers (colonial countries) transfer their own economic models to countries they occupy (colonies) only to the extent indispensible for the occupied country to operate and meet its needs. Hence, it does not mean full implementation of laws and adoption of organisational patterns of the colonial power. On top of that, colonies may be unable to fully embrace these models due to the advancement of their social and economic development, they may also be uninterested in their adoption because of their origin.

Studies conducted by R. Lucas in 1990 inspired many economists who wanted to answer the question what, if not differences in marginal product of capital, determines international capital flows. Here are some examples.

M. Clemens (2002) pointed out that not only rich countries export capital to other rich countries but also capital borrowers from poor countries have relatively difficult access to domestic capital since capital lenders from poor countries prefer investing abroad rather than at home. This derives from market failures in developing countries. Importantly, however, capital borrowers from developing

countries are treated like capital lenders from rich and poor countries, meaning they do not get enough incentives to invest in developing countries.

C.M. Reinhart and K.S. Rogoff (2004) highlight another reason for Lucas paradox. According to them, the main problem is the frequent inability of poor countries to meet their financial obligations connected with servicing and repaying their foreign debts. That is the reason why investors do not perceive them as safe investment targets. Thus, not so much modest investments of rich countries in poor countries but the fact that these investments (especially credits) are made, especially in countries, which have already failed to pay their debts on time is a paradox.

L. Alfaro, S. Kalemla-Ozcan and V. Volosovych claim that broadly understood institutional quality of social, economic and political environment and economic policy pursued by a given country (Alfaro, Kalemli-Ozcan, Volosovych, 2005), are among major determinants of capital inflow. It means they have adopted the hypothesis which R. Lucas challenged about investment risk in developing countries at levels above those that would justify making an investment.

Vast majority of analyses focused on Lucas paradox assume that marginal product of capital in developing countries is higher than in developed countries. The foregoing is contradicted, however, by results obtained by F. Caselli and J. Feyrera (2006), in accordance with which the product is very similar in all countries. These authors analysed not only domestic labour and capital resources, usually considered on similar occasions, but also land and natural resources.

A plethora of studies on Lucas paradox is available.. Relatively short paper by R. Lucas Jr is quoted practically in all publications on international flows of capital. This paper, however, does not attempt to explain what is the principal determinant of global capital flows but discusses the validity of conclusions drawn by R. Lucas based on his study. Before coming to the point, I would like to indicate that the term „Lucas paradox" can be interpreted in two ways:

1) in classical approach, i.e., in accordance with conclusions drawn by R. Lucas: capital flows among countries in quantities smaller than suggested by differences in marginal product of capital in individual countries and the flows do not eliminate the differences;
2) in contemporary approach: directions of capital flows in global economy do not concur with those identified by neoclassical model; capital flows from poor (developing) countries to rich (developed) countries.

Analysis of conditions of Lucas paradox suggests, however, that the paradox can hardly be perceived in classical Lucas's approach and in its expanded version concerning directions of capital flows in global economy.

4. Lucas paradox – classical approach

To start with, I would like to address classical approach to Lucas paradox, in accordance with which neoclassical model „does not work" in contemporary global economy because marginal products of capital do not fully equalise among countries. First and foremost, we need to stress that R. Lucas does not negate the usefulness of neoclassical theory from the point of view of directions of capital flows and only stresses that too little capital is flowing among countries to arrive at equal marginal products of capital in all countries covered by the study.

The key issue, to my surprise left aside by R. Lucas and other economists invoking the „paradox", is the fact that examining how neoclassical theory works in modern global economy on the example of United States and India was unjustified. Precondition for a complete convergence of marginal products of capital in these countries is full liberalisation of capital flows between them. If such liberalisation does not exist, expecting that capital flows will continue until rates of return in the two countries are equal cannot be justified even on theoretical grounds. Restrictions imposed upon free movement of capital isolate domestic market from international markets and limit relative freedom of the country in question to exercise monetary policy, including establishing the interest rate (when stabilising the exchange rate of domestic currency - it is consistent with the so called macroeconomic trilemma).

Under such circumstances, to validate a theory we should select countries which abolished restrictions in capital flows. Only then could we reasonably expect that marginal products of capital become equal, the process is theoretically reflected in neoclassical model of general equilibrium[5] (Fig. 4). The model is based on short-term analysis of production function. Producer decides how much capital is needed, depending on the revenue he/she receives from using an additional unit of capital, thus the analysis is based on marginal product of capital[6]. Optimum amount of engaged capital depends on marginal product of capital and on its price. As you cannot justify the employment of additional capital when its price exceeds profit obtained by the producer, optimum amount of engaged capital is reached when the price of capital equals its marginal product.

Country A has got relatively less capital than country B, meaning in country A at the price of capital r_A used capital is represented by 0_AC_1 area, while in

[5] Also in this cased we used simplified assumptions: the study covers only two countries, perfect competition, full employment of other factors of production and constant production curve, there are barriers to the flow of goods, no external environment and two extreme options are researched – full closure and full opening (0-1 system).

[6] Marginal product of capital is a relation of anticipated (not current) net income from an additional unit of a factor to its price.

country B at the price r_B – 0_BC_1, at the total value of capital 0_A0_B. When restrictions are imposed on capital flows, country A manufactures global production represented by area 0_AIHC_1, and capital owners receive $0_Ar_AHC_1$, and owners of other factors of production – HIr_A. Situation is identical in country B – global production is 0_BDFC_1, out of which $0_Br_BFC_1$ is taken over by owners of capital leaving r_BDF to the rest. When barriers to flow are eliminated, situation changes in both countries. Country A, which had less capital starts receiving it, as a result of which prices of capital decrease. A reverse situation takes place in country B, from which capital outflows leading to price increases. After some time, prices of capital equal r in both countries. Country A receives capital, profitability rate drops from r_A to r, but the value of global production increases from 0_AIHC_1 to 0_AIEC_2 (some manufacturing C_1C_2EG is taken over by foreign investors). At the same time, income of capital lenders in the country decreases – from $0_Ar_AHC_1$ to 0_ArGC_1, and incomes of owners of other factors of production increase from r_AIH to rIE. Capital is leaving country B, production volume in this country is 0_BDEC_2, and capital, which left the country generates production in country A the value of C_1C_2EG. Since some capital moved abroad, National Product in country B increases reaching 0_BDEGC_1 and is higher than the previous one by EGF. Income of capital lenders in country B increases and amounts to 0_BrGC_1, while income of owners of other factors of production decreases to rED. Increase in net welfare in the area where capital flows have been liberalised is illustrated by the triangle EFH (EGH+EGF). Convergence of prices of capital will positively impact countries, which decide to eliminate barriers to capital flows and will improve overall performance of global economy.

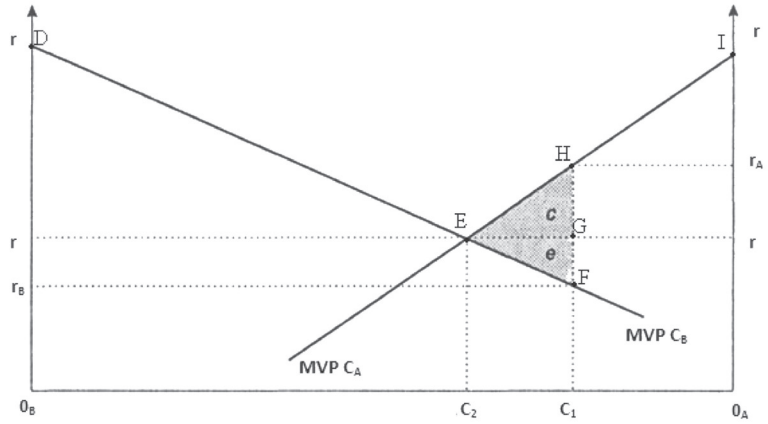

Figure 4. Neoclassical model of general equilibrium – production and income effects under free flows o capital

Source: A. Czarczyńska, K. Śledziewska (2003), p. 72.

Referring to R. Lucas's choice of countries, while the U.S. can be considered open, meaning the key assumption of neoclassical model is met, India has never been an open economy. It means, waiting for rates of return on capital in India and in the U.S. to become equal (even leaving profit/risk indicator aside) was and is simply ungrounded. As demonstrated by I. Patnaik and A. Shah (2012) restrictions of crossborder flows were imposed in India by the British back in 1942. Then, the system of restrictions on transactions from current and financial accounts was expanded and first changes were introduced as late as in 1991! [7] Full liberalisation of transactions included in the current account and gradual liberalisation of capital flows took place in 2000. The authorities were very much preoccupied with the stability of the exchange rate as until 1990 India had a fixed exchange rate. Step-by-step approach was followed to switch to market-determined exchange rate and for Indian authorities it was difficult to approve fluctuating rupiah's exchange rate. That explains why restrictions in free movement of capital were either maintained or restored so that they could actively impact the volume of capital movements, when, and if, necessary from the point of view of exchange rate policy (Patnaik, Shah, 2012). Lucas's survey was conducted in 1988 when Indian economy was practically closed for free movements of capital and Indian currency was not convertible. I must admit, it is really ununderstandable to me how, under such circumstances, can one expect equal rate of return on capital invested in the United States and in India. The choice of India for the study is also difficult to understand since the country did not meet the major assumption of neoclassical model, i.e., absence of restrictions in financial flows.

Conclusions draw by Lucas still today provide a reference point for economists who analyse the possibility to apply the neoclassical model to modern global economy. If we consider initial conditions, i.e., restrictions in the Indian economy, the fact that rates of return on capital did not equalise is not surprising. It would be surprising if under such circumstances returns were equalised. Hence, it is hard to acknowledge that R. Lucas considerations prove that neoclassical model does not work in modern global economy. Neither does it seem justified to question marginal product of capital as a leading determinant of international capital flows. Preconditions for drawing such a conclusion were not met.

5. Lucas paradox – contemporary approach

As we have already mentioned, original conclusions of R. Lucas have been distorted and currently Lucas paradox is interpreted as a situation when, contrary to neoclassical theory, global capital flows from developing to developed countries.

[7] As a result of reforms consulted with the IMF.

At this point a question emerges: is this direction of capital flows really inconsistent with neoclassical theory? Neoclassical theory teaches us that capital flows from surplus to deficit countries, and this direction is maintained in contemporary economy. Interpretational problems with the theory arise somewhere else. In the age of gold standard, when neoclassical model emerged, surplus, rich countries were developed countries while poor, deficit countries were developing ones. Capital actually flew from developed and rich countries to countries which were developing and poor. Countries did not pursue any active monetary policy, did not accumulate meaningful currency reserves, did not interfere with foreign exchange markets and in international markets private not public funds were invested.

Nowadays, the above circumstances have changed. Developing countries pursue active monetary and exchange rate policies, accumulate currency reserves, restrict free movements of capital. For all these reasons, even with relatively low GDP per capita, they have become surplus countries – they not only run surpluses on current account but also have huge currency reserves. Under such circumstances, capital flows in accordance with neoclassical model from surplus (developing) countries to deficit (developed) countries, which develop at their cost. Neoclassical model does not explore the source of capital (public-private) but is interested in financial resources of countries. This is, of course, atypical as flows of resources from currency reserves are not classical investment flows. Currency reserves are invested mainly with safety and liquidity criteria in mind with profit playing less prominent role. Since flows of public funds are not predominantly guided by profit, they do not equalise marginal rate of return between countries. Moreover, restrictions in capital flows are not abolished – e.g. China invest their currency reserves in various countries worldwide, mainly in the U.S. and maintain restrictions on capital flows.

One aspect remains obvious, capital flows from countries which have it in abundance to those suffering due to its scarcity. Neoclassical theory does not distinguish between poor and rich countries. China invest significant financial resources in the U.S. market. According to data, GDP per capita at the end of 2014 in China was USD 3 ,886 and in the United States 46, 405 (GDP per capita PPP – USD 12, 609 and USD 52, 118, respectively); China currency reserves, ca. USD 3.85 trillion, while the U.S. currency reserves ca. USD 120 bn. China run current account surplus (2.0% GDP) , while United States a deficit (2.4% GDP)[8]. No doubt, China are still a developing country while United States a developed economy. But the answer to the question which country is more wealthy is not an easy one. The structure of a contemporary international currency system is very

[8] Data for individual countries after: www.tradingeconomics.com

much different from that of the gold standard, just as much as economic policy presently exercised by countries of global economy, where the key role is played by managing the domestic market (taking care of economic growth and active combating unemployment – Keynesian ideas, alien to neoclassical theory) differs from economic policy of countries in the age of gold standard. Thus, simply saying that at present capital flows against the direction specified by neoclassical theory, i.e., from poor to rich countries, seems a too far-reaching simplification. The situation can hardly be referred to as „paradox" as neoclassical model makes references to capital resources only, not to their sources. Beyond any doubt, the rates of return on invested capital do not equalise, which is due to the specificity of operating conditions in contemporary economy. However, if we replaced India with China we would still have problems with employing the neoclassical model: China maintain restrictions on free movement of capital.

Conclusion

Lucas paradox has been discussed in specialist literature for years and I do not expect that to change. My paper strives to demonstrate that drawing „hard" conclusions based on quoted studies seems to be ungrounded. In my opinion, the biggest paradox is the fact that R. Lucas drew a correct conclusion that in contemporary global economy marginal products of capital have ceased to be the leading determinant of capital flows but he did not develop the justification to his conclusion to identify how neoclassical model can be related to the reality of global economy, with particular attention paid to involved economies. For we may say that a theory does not work but saying that it does not reflect the reality and it simply does not make sense to apply it, is a different matter.

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PULSE OF ECONOMY. IDENTIFICATION, DIAGNOSIS, DIRECTIONS OF DEVELOPMENT

Abstract

Samuelson and Nordhaus (2012: 436) claim that „There is no pattern in the type formulas, the trajectory of the planets or swing of the pendulum, which would be used to predict the duration and timing of business cycles. Rather, they resemble a change in the weather".

Nogalski and Klimek showed that in the years 1995-2010, the Polish GDP was forming in a way that made it possible to describe it using a mathematical formula (2015: 302-305). Having done further research, the authors are trying to establish whether Samuelson and Nordhaus are right. In their search for the answer, they conducted research on the „rhythm" of the world economy, European economy and that of several European states, including Poland, basing on the World Bank (WB) data for the years 1983-2013. The paper presents the results of these studies and the results of the analysis of the development of the Polish GDP based on the Central Statistical Office (CSO) data for the years 1995-2014.

JEL Classification Code: **E17**.

Keywords: GDP model, growth, cycles, forecast.

Research method

Mathematical models were sought from which conclusions could be drawn about the pace of economic growth and fluctuations in the economic situation of the examined entities. It was assumed that such conditions may fulfill the following functions: polynomial-trigonometric (1) and exponential-trigonometric[3] (2).

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[3] The exponential-trigonometric function has the feature that contains an element fulfilling the condition of constant growth rate s $P_{t+1} = (1+s) \cdot P_t$, where s = const.

$$GDP\,mod\_po = a_0 + a_1 \cdot N + a_2 \cdot N^2 + a_3 \cdot sin\left(2\pi \cdot \frac{N}{T-\alpha}\right) + \varepsilon \quad (1)$$

$$GDP\,mod\_ex = b_0 + b_1 \cdot (1+b_2)^{N-1} + b_3 \cdot sin\left(2\pi \cdot \frac{N}{T-\alpha}\right) + \varepsilon \quad (2)$$

where:
N – year number from 1 for 1983,
Searched parameters:
a_0, b_0 – fixed,
a_1, a_2, b_1, b_2 – growth rates,
a_3, b_3 – fluctuation amplitude,
T – length of the cycle,
α – phase period,
while maximizing the factor R^2 used as a measure of fitting the model to the actual data.
GDPmod_po – model (1) polynomial-trigonometric
GDPmod_ex – model (2) exponential-trigonometric

Parameters of the models developed on the basis of the World Bank data

The models were constructed on the basis of the data of the World Bank [WB] for the years 1983-2013[4] for the World (WLD)[5], the European Union (EUU), Germany (DEU), France (FRA), Great Britain (GBR), Greece (GRC) and Poland[6] (POL).

Table 1 shows the calculated parameters of functions (1) and (2) and the level of adjustment of the models to the data for the mentioned entities.

Table 1. Summary of the model parameters (1) and (2) for the examined entities

	T=15, α=π										
	Model (1)						Model (2)				
	a_0	a_1	a_2	a_3	R^2		b_0	b_1	b_2	b_3	**R^2**
WLD	16.72089	-0.08227	0.06327	3.47116	98.88%		6.76827	8.662	7.25%	3.26079	**99.30%**
EUU	4.19383	0.23139	0.00779	1.54775	97.33%		-6.01252	10.2446	3.00%	1.52071	97.27%
DEU	0.99628	0.07474	0.000334	0.378875	96.93%		-7.24098	8.31827	0.90%	0.37938	96.94%
FRA	0.771798	0.030799	0.001223	0.261578	97.36%		-0.39911	1.181632	3.50%	0.258304	97.37%
GBR	0.406961	0.065198	0.000439	0.105443	94.08%		-2.40911	2.93081	2.00%	0.1106	93.89%
GRC	4.19383	0.23139	0.00779	1.54775	91.40%		-6.01252	10.2446	3.00%	1.52071	91.15%
POL	-0.03082	0.005185	0.000434	0.043256	97.20%		-0.31632	0.267125	4.00%	0.044071	97.18%

Source: Own elaboration based on the World Bank data [WB].

[4] The World Bank provides data about the GDP for 249 entities (states and groups of states).

[5] The symbols come from the table of the World Bank [WB].

[6] The data for Poland cover the period 1990-2013.

It turned out that for all the analyzed entities the best adjustment is reached for the 15-year- cycle, wherein all test agents are in the same phase of the cycle.

The size of GDP can be represented as the sum of three components:

$$GDP = G\_GDP + CGDP + R\_GDP$$

where:
G_GDP – describes the growth rate,
C_GDP – describes the amplitude and phase of the cycle,
R_GDP – describes the short-term fluctuations[7].

The World GDP

Models (1) and (2)for the global GDP are shaped as follows:

$$GDP\ mod\_ex = 6.76827 + 8.662 \cdot (1+0{,}0725)^{N-1} + 3.26079 \cdot sin\left(2\pi \cdot \frac{N}{15-\pi}\right)$$

$$GDP\ mod\_po = 16.72089 - 0.08227 \cdot N + 0.06327 \cdot N^2 - 3.47116 \cdot sin\left(2\pi \cdot \frac{N}{15}\right)$$

The real data (provided by the World Bank[8]) and the data calculated on the basis of these models are given in the table and the graph (Figure 1). The high level of adjustment (99%) allows one to state that the world economy during the period 1983-2013 „passed" through two 15-year cycles.

The analysis of the differences between the real GDP and the data obtained from the models indicates the existence of fairly regular shorter cycles overlapping 15-year-cycles. These differences are shown in Figure 2 in which two nine-year cycles (1985-1993, 1994-2002) and two four-year cycles (2003-2006 , 2007-2010) can be observed.

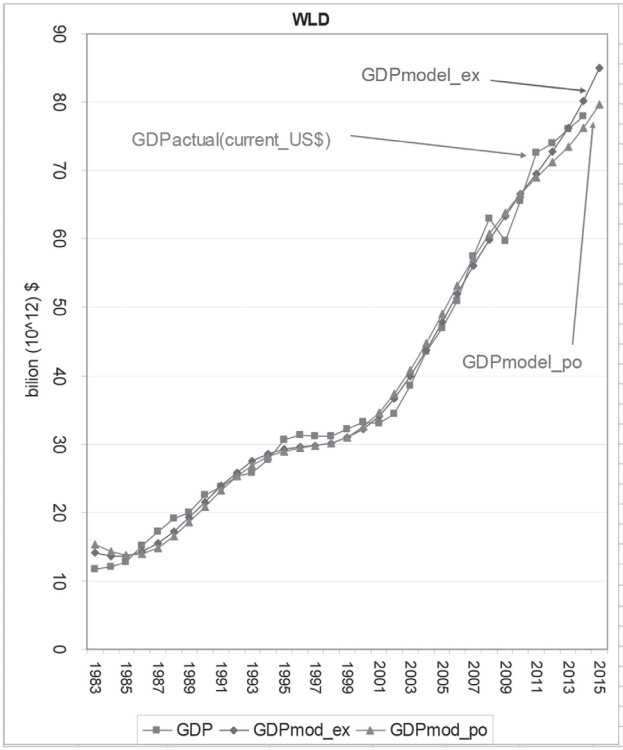
For the global GDP (WLD) model (2) thus it can be written

$$GDP = G\_GDP\ mod\_ex + CGDP\ mod\_ex + R\_GDP\ mod\_ex$$

$$GDP\ mod\_ex = \left[6.76827 + 8.662 \cdot (1+0{,}0725)^{N-1}\right] + \left[3.26079 \cdot sin\left(2\pi \cdot \frac{N}{15-\pi}\right)\right] + (-3.758864 + 3.030148) \quad (3)$$

[7] See further: the World GDP and the GDP of the Union and selected European states

[8] The models were developed on the basis of the World Bank data for the period before January 1, 2015. On July 1 the data were updated. GDP was introduced for 2014 and the „older" figures were updated. Changes to the „older" data were a fraction of a percent (with the exception of GBR for the period 1987 to 1993, during which the average changes amounted to 2.2%). The adjustment of the models developed on the basis of the data for the period 1983-2013 to the data for the period 1983-2014, with the exception of Germany, has slightly increased.



Year	GDP	GDPmod_ex	GDPmod_po
1983	11,680	14,104	15,290
1984	12,126	13,635	14,230
1985	12,749	13,631	13,742
1986	15,084	14,211	13,952
1987	17,180	15,405	14,885
1988	19,080	17,143	16,465
1989	20,046	19,273	18,524
1990	22,547	21,585	20,834
1991	23,670	23,848	23,146
1992	25,341	25,855	25,231
1993	25,775	27,453	26,924
1994	27,679	28,576	28,146
1995	30,631	29,254	28,924
1996	31,289	29,612	29,382
1997	31,198	29,845	29,723
1998	31,080	30,192	30,190
1999	32,233	30,890	31,028
2000	33,276	32,136	32,438
2001	33,079	34,058	34,546
2002	34,359	36,691	37,377
2003	38,586	39,972	40,855
2004	43,465	43,757	44,812
2005	47,034	47,844	49,020
2006	50,971	52,012	53,230
2007	57,452	56,060	57,214
2008	62,983	59,848	60,805
2009	59,705	63,320	63,925
2010	65,489	66,517	66,601
2011	72,572	69,576	68,957
2012	74,042	72,707	71,196
2013	76,124	76,161	73,561
2014	77,869	80,191	76,297
R-squared		99,34%	98,99%

Figure 1. The real GDP and models (1) and (2) [current US $ (billion=1012)] for the world (WLD)

Source: own elaboration based on the World Bank data [WB].

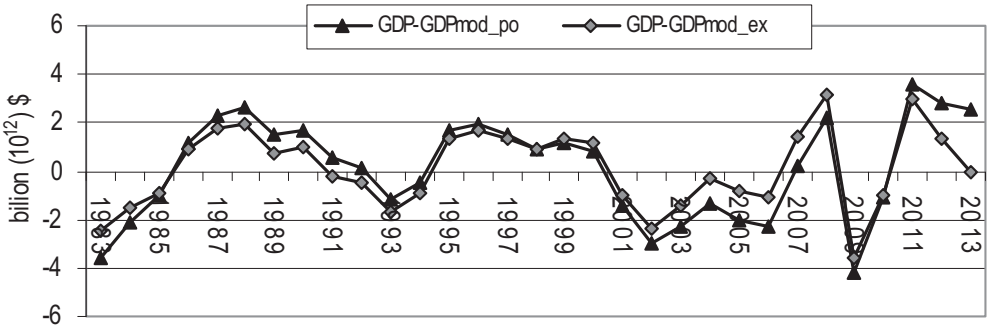


Figure 2. A list of the differences between the real GDP and the models (= R_GDP)

Source: own elaboration.

The GDP of the European Union and selected European states

A similar study was carried out for the European Union, Germany, France, Great Britain, Greece and Poland. Considering the compatibility of the cycle and the phases of these entities with the cycle and phase for the world GDP (see Table 1), an analysis of the differences between the real GDP and the results of model (2) was made:

$$R\_GDP = GDP - GDP\,mod\_ex$$

As a measure of accuracy of synchronizing the individual states' economies, a correlation R_GDP of the examined entities was adopted. The correlation coefficients are included in Table 2.

Table 2. Matrix of correlation differences (R_GDP)

	WLD	EUU	DEU	FRA	GBR	GRC	POL*
WLD	1.00	0.60	0.76	0.66	0.32	0.09	0.75
EUU	0.60	1.00	0.60	0.96	0.79	0.73	0.60
DEU	0.76	0.60	1.00	0.75	0.18	0.04	0.47
FRA	0.66	0.96	0.75	1.00	0.63	0.61	0.59
GBR	0.32	0.79	0.18	0.63	1.00	0.67	0.31
GRC	0.09	0.73	0.04	0.61	0.67	1.00	0.37
POL*	0.75	0.60	0.47	0.59	0.31	0.37	1.00

* – the WB provides the data for Poland for the period 1990-2013.
Source: own elaboration.

Almost all correlation coefficients indicate the existence of fairly significant co-dependences. It is confirmed by the value of the determinant of this matrix which is close to zero.

It is also worth looking at the summary of charts R_GDP (Figure 3). It can be observed that R_GDP are similar for all the examined entities.

Because the presented differences are applicable to all models of the same cycle of years (T = 15 years) and the same phase ($\alpha = \pi$), it seems reasonable to state that in the period from 1983 to 2013, two 15-year cycles are a fact. Synchronised shorter cycles (sub-cycles), to a large extent, overlapped these cycles. Thus, the economy operated in the „rhythm" which is defined with a relatively high accuracy.

It can also be noted that the economies of the European Union, Germany and France are working in the „rhythm of the World". The economies of Great Britain, Greece and Poland reveal less similarity.

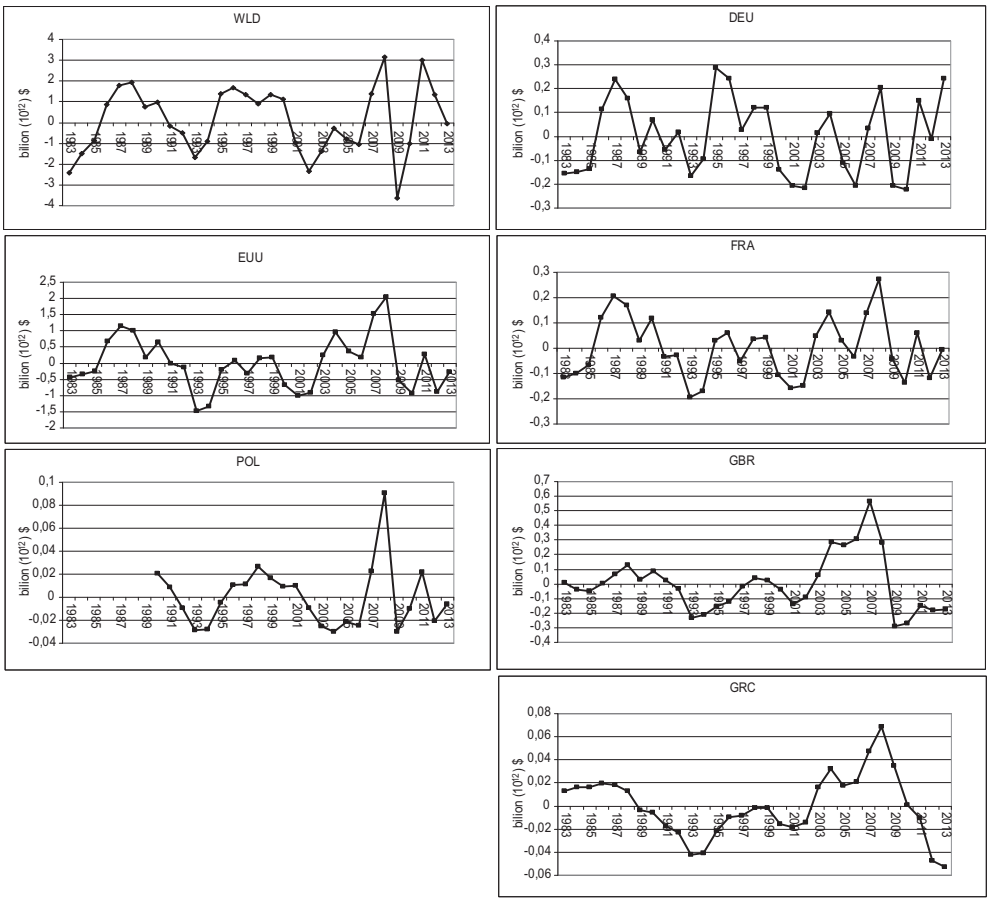


Figure 3. Deviations from the model for the examined entities R_GDP = GDP - GDPmod_ex
Source: own elaboration.

Observations of the Polish GDP 1995-2014

Continuing research on the Polish GDP as presented in Nogalski and Klimek (2015), the CSO data were used, calculated in the system of national accounts ESA 2010[9] [GDP GUS] and the period up to and including 2014 was taken into consideration. In addition, the CSO data were analyzed for the formation of the investment [INV GUS]. The CSO data are presented in the table in Figure 4.

[9] In the cited study, the data of the Central Statistical Office were used, collected in the system of the National Accounts ESA 1995 (the analysis results for both sets of data differ only slightly).

GDP at current prices

On the basis of the available research studies, a mathematical model was searched to describe the forming of the GDP in the period 1995-2010 in the form of a polynomial-trigonometric function (1). Table 3 shows the parameters found for this period at a very high coefficient of adjustment of 99.94% (left part of the table).

The data for the period 2011 - 2014 deviated significantly from the developed model. It was then decided to find a way to revise the model in order to maintain the level of adjustment throughout the period 1995-2014 which is not lower than for the models developed on the basis of the data for the years 1995-2010.

In Table 3 (right part) revised parameters are presented. The changes made to the model are indicated in bold – they consisted in adding a fixed amount to the coefficient a_0 at the amount of 84 billion PLN. The revision introduced in 2011 made it possible to reach the adjustment at the level of 99.97%[10].

Table 3. Parameters of the model (1) for the „nominal GDP" before the change and after the change

	1995-2010				1995-2010		2011-				1995-2014
Model (1)	T=10			α=5/10·π			T=10			α=5/10·π	
	a_0	a_1	a_2	a_3	R^2		$a_{0+84000}$	a_1	a_2	a_3	R^2
	327 636	5 8179,9	505,7	49 869,9	99,94%		411 636	58 179,9	505,7	49 869,9	99,97%

Source: own elaboration.

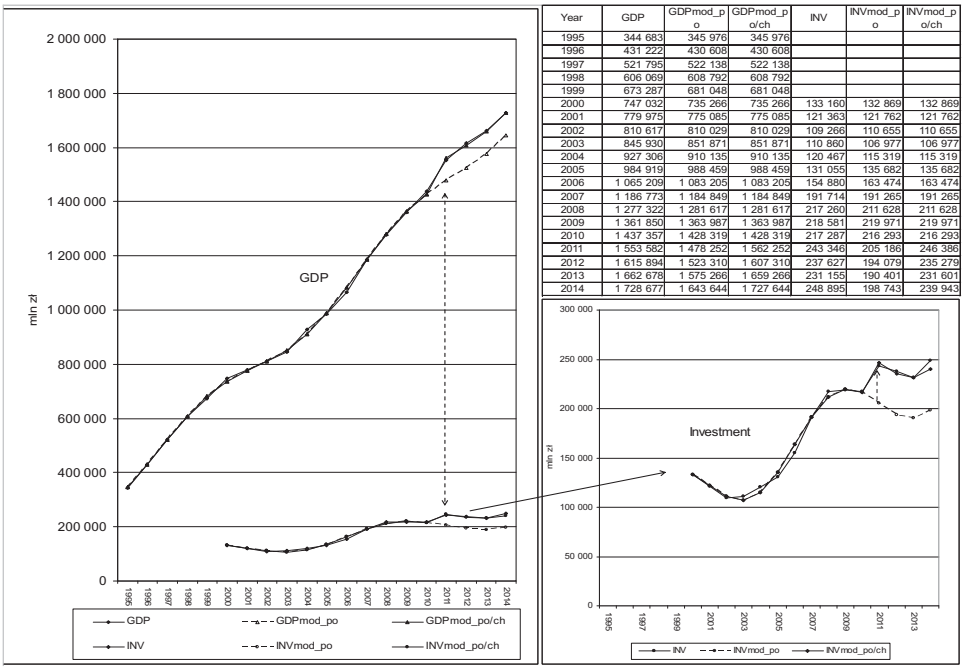
Seeking an explanation for the introduced revision, it was decided to analyze the amount of investment in the individual years. The analysis was carried out for the CSO data for the period 2000-2014. The analysis was conducted in the same way as for the GDP – the model parameters were found for the data up to 2010 (with the adjustment of 99.15%), and having concluded that the further data significantly differed from the developed model, the model was revised, reaching the adjustment level of 99.37% (Table 4). The revision consisted in adding a fixed amount equaling 41.2 billion PLN to the coefficient a_0 in 2011.

[10] The business cycle for the CSO data is different from for the WB data.

Table 4. The model parameters (1) for the „Investments nominal" before the change and after the change

	2000-2010				2000-2010		2011-				2000-2014
Model (1)	T=10			α=4/10·π			T=10			α=4/10·π	
	a_0	a_1	a_2	a_3	R^2		$a_{0+41200}$	a_1	a_2	a_3	R^2
	63364,82	8342,4	0	33089,37	99,15%		104564,8	8342,4	0	33089,37	99,37%

Figure 4 shows graphs reflecting the actual data and the data from the models.



Year	GDP	GDPmod_po	GDPmod_po/ch	INV	INVmod_po	INVmod_po/ch
1995	344 683	345 976	345 976			
1996	431 222	430 608	430 608			
1997	521 795	522 138	522 138			
1998	606 069	608 792	608 792			
1999	673 287	681 048	681 048			
2000	747 032	735 266	735 266	133 160	132 869	132 869
2001	779 975	775 085	775 085	121 363	121 762	121 762
2002	810 617	810 029	810 029	109 266	110 655	110 655
2003	845 930	851 871	851 871	110 860	106 977	106 977
2004	927 306	910 135	910 135	120 467	115 319	115 319
2005	984 919	988 459	988 459	131 055	135 682	135 682
2006	1 065 209	1 083 205	1 083 205	154 880	163 474	163 474
2007	1 186 773	1 184 849	1 184 849	191 714	191 265	191 265
2008	1 277 322	1 281 617	1 281 617	217 260	211 628	211 628
2009	1 361 850	1 363 987	1 363 987	218 581	219 971	219 971
2010	1 437 357	1 428 319	1 428 319	217 287	216 293	216 293
2011	1 553 582	1 478 252	1 562 252	243 346	205 186	246 386
2012	1 615 894	1 523 310	1 607 310	237 627	194 079	235 279
2013	1 662 678	1 575 266	1 659 266	231 155	190 401	231 601
2014	1 728 677	1 643 644	1 727 644	248 895	198 743	239 943

Figure 4. GDP and INV (current prices in million PLN) and the models

Source: own calculations based on the CSO data [GDP GUS, INV GUS].

The graphs in Figure 4 reflecting the data obtained from the uncorrected models are marked using a dotted line.

Having eliminated the C_GDP factor reflecting the volatility of the economic conditions and the residue of R_GDP from the GDP model and the INV model, it was decided to look for the relations between the increases for these models. In 2011, the relation was clearly disturbed (Figure 5).

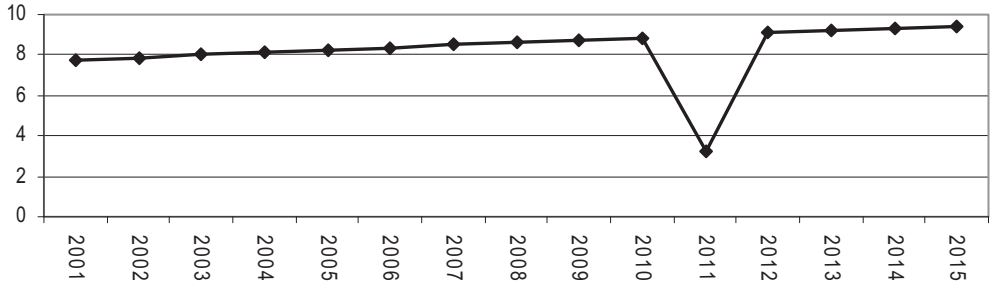


Figure 5. ΔG_GDP / ΔG_INV

Source: own elaboration.

Real GDP

The research was also continued for the real GDP. The prices of 1995 were adopted as basic (after the denomination). The real GDP was calculated by dividing the nominal GDP by the cumulative consumer price index [WCEN GUS]. The real GDP was estimated for the model parameters (1) and (2).

As was the case with the nominal GDP, models were developed on the basis of the data for the period 1995-2010. Table 5 shows the parameters found for this period, reaching a very high coefficient of 99.78% of the adjustment level for model (1) and 99.56% for model (2) (left part of the table).

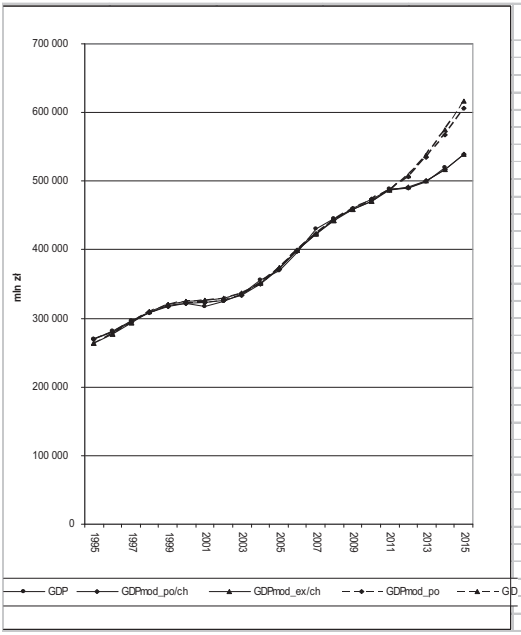
Unlike for the nominal GDP, the data deviated significantly from the developed models only since 2012. In the attempt to find a way to revise them in order to maintain the level of adjustment, it was concluded that the revision of the models must be deeper than for the nominal GDP.

Table 5. Model parameters (1) and (2) „real GDP" before the change and after the change

	1995-2011				1995-2011		2012-				1995-2014
Model (1)	T=9		N^2	α=5/9·π			T=9		$N^{2-0,185}$	α=5/9·π+2/9·π	
	a_0	a_1	a_2	a_3	R^2		$a_{0+65000}$	a_1	a_2	a_3	R^2
	278945	1882,5	640,2	13708,5	99,82%		343945	1882,5	640,2	13708,5	**99,88%**
Model (2)	T=9		N^2	α=5/9·π			T=9		N^2	α=5/9·π+2/9·π	
	b_0	b_1	b_2	b_3	R^2		$b_{0+85000}$	b_1	$b_{2-0,0245}$	b_3	R^2
	192885,9	81915,2	8,5%	13450	99,64%		277885,9	81915,2	6,05%	13450	**99,77%**

Source: own elaboration.

Figure 6 shows the graphs which reflect the real data and the data from the models.



Year	GDP	GDPmod_ po/ch	GDPmod_ ex/ch	GDPmod_ po	GDPmod_ ex
1995	269 705	269 596	263 153	269 596	263 153
1996	281 417	280 582	277 164	280 582	277 164
1997	296 367	295 043	293 919	295 043	293 919
1998	307 900	308 590	309 163	308 590	309 163
1999	318 778	317 863	319 654	317 863	319 654
2000	321 248	322 099	324 704	322 099	324 704
2001	317 928	323 492	326 528	323 492	326 528
2002	324 258	326 166	329 242	326 166	329 242
2003	335 698	334 243	336 967	334 243	336 967
2004	355 547	349 918	351 937	349 918	351 937
2005	369 869	372 428	373 495	372 428	373 495
2006	396 060	398 412	398 438	398 412	398 438
2007	430 497	423 483	422 567	423 483	422 567
2008	444 667	444 279	442 697	444 279	442 697
2009	458 061	460 039	458 205	460 039	458 205
2010	471 207	472 956	471 377	472 956	471 377
2011	488 312	487 154	486 403	487 154	486 403
2012	489 775	490 535	491 595	506 755	507 486
2013	499 460	500 258	500 447	533 953	536 951
2014	519 286	516 848	516 311	567 986	574 234
2015		539 536	538 488	605 494	616 240

Figure 6. The real GDP and the models (million PLN)

Source: Own calculations based on the CSO data [GDP GUS, WCEN GUS]

The graphs in Figure 6 reflecting the data derived from the unrevised models are marked using a dotted line.

In model (1) an amount of 65 billion PLN was added to factor a_0, and also the growth rate was reduced by changing the exponent of 2 to 1,815 and the phase of the cycle was revised by 2/9 π (extending the cycle), reaching the level of adjustment 99.88%. In model (2), the amount of 85 billion PLN was added to the coefficient b_0 and also the growth rate was reduced by reducing the coefficient b_2 by 2.45%. The cycle phase was revised in the same way as for model (1).

In Table 5 (the right part) the revised parameters are presented. The obtained adjustment was 99.77%.

The prospect of 2050 - the world and Poland

In order to evaluate the development of the world economy in 2050, the following assumptions were made (see (3)):

1. G_GDP - growth parameters (A0, B0, a1, b1, a2, b2) do not change - the growth rate for model (1) decreases and model (2) tends to b2.
2. C_GDP – economy 'fluctuates" in 15-year cycles (a3, b3, T, α do not change - the amplitude and phase of the cycle remain unchanged).
3. R_GDP - sub-cycles occurring in the last 15 years to be repeated[11] in the next 15-year - periods.

Indicators GDP_{2050} / GDP_{2014} and average annual growth rates $((GDP_{2050} / GDP_{2014})^{(1/36)} - 1)$ were calculated on the basis of the models.

The results obtained on the basis of the developed models were compared with the results published by PricewaterhouseCoopers [PWC][12] (Table 6).

Table 6. GDP growth forecast for 2050 in relation to 2014

	GDP (current US$) 2050/2014			Average annual grow th rates		
	Model (1)	Model (2)	Pw C	Model (1)	Model (2)	Pw C
WLD	4.0	11.8	3.0	3.9%	7.1%	3.1%
EUU	3.1	3.7	nd	3.1%	3.7%	nd
DEU	2.2	2.3	1.7	2.3%	2.4%	1.5%
FRA	3.0	4.0	2.0	3.1%	4.0%	1.9%
GBR	2.4	3.0	2.3	2.5%	3.1%	2.4%
GRC	3.2	3.2	nd	3.2%	3.3%	nd
POL*	4.3	6.1	2.5	4.1%	5.2%	2.6%

* – an indicator for the Polish Central Statistical Office stated in Table 7.
Source: own elaboration.

The course of the annual forecast growth rates for WLD is shown in Figure 7.

The bold line indicates the growth rate calculated on the basis of the real data in the period 1983-2013, and in the subsequent years it shows the growth rate for model (2) (top) and (1) (bottom) resulting from the forecast, assuming the following are fulfilled: 1-3 (G_GDP + C_GDP + R_GDP). Solid lines (regular) reflect rates of growth respectively for models (2) and (1) assuming that the fol-

[11] The assumption was adopted to show a sample diversity of a future growth rate.

[12] The forecasted average growth rates of real increase in GDP (in % on an annualized basis, in the years 2015-2050). PwC analysis was conducted on the basis of the UN projections on population size.

lowing are fulfilled 1-2 (G_GDP + C_GDP), and the dotted lines assuming that the following is fulfilled 1 (G_GDP).

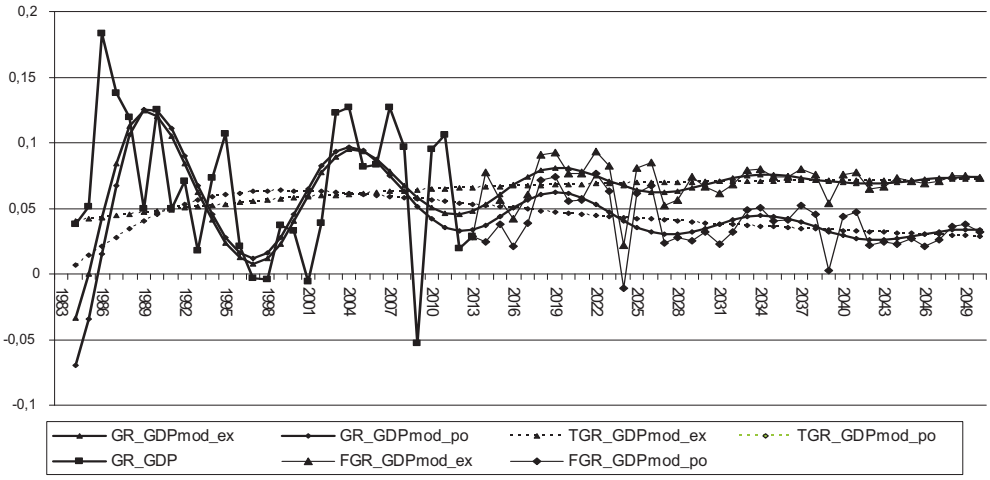


Figure 7. Forecasted growth rate for the WLD

Source: own elaboration.

The upper graph in Figure 8 shows the course of cycles: resulting from the World Bank and resulting from the data from the Polish Central Statistical Office for the Polish GDP (it seems from the graph that, according to the CSO data , Poland is now entering a phase of recovery, which will last until 2018/2019 and then it will enter a recession phase; the global economy should be in the recovery phase at the moment). In the lower diagram, Poland's cycles according to the CSO were referred to the sub-cycles resulting from the World Bank for the world.

The forecast for Poland for 2050 was also prepared on the basis of the CSO data. The result is shown in Table 7. The table also gives the forecast of PricewaterhouseCoopers [PwC].

Table 7. Polish GDP growth forecast for the period 2014-2050 (based on the CSO data)

	PwC	GDPC mod_po	GDPR mod_po	GDPR mod_ex
GDPx 2050/2014	2,5	3,1	2,7	4,5
Average annual growth rates	2,6%	3,2%	2,8%	4,3%

Source: own elaboration.

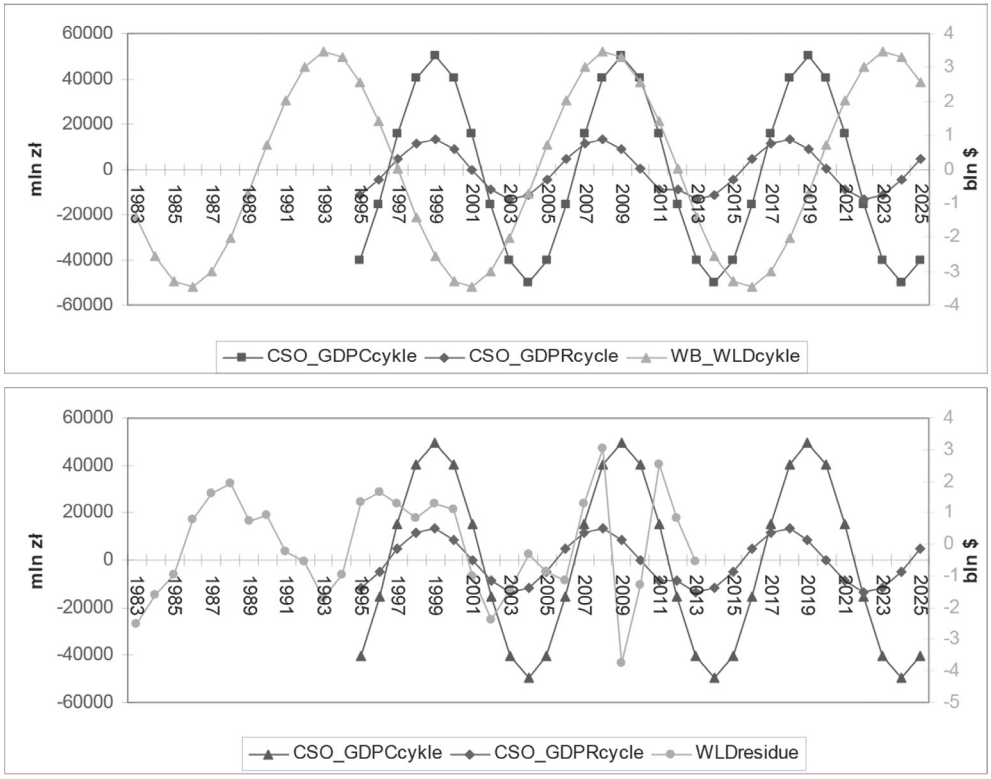


Figure 8. Cycles according to the data from the WB and CSO (for Poland)
Source: own elaboration.

On the basis of the developed models, attempts were made to compare the forecasts outlined in the Medium-Term National Development Strategy 2020 [MNDS] with the forecast resulting from the revised models[13] (Table 8).

Table 8. Polish GDP growth forecast for the period 2010-2020

	MNDS	GDPC mod_po	GDPR mod_po	GDPR mod_ex
GDPx 2020/2010	140%-144%	161,5%	133,2%	134,4%

Source: own elaboration.

[13] While maintaining the „old" parameters, indicators calculated as based on the models would be the following: GDPCmod_po - 155,6%, GDPRmod_po - 159,0%, GDPRmod_ex - 172,7%.

The weakened growth rate of the GDP „captured" by the models looks consolidated. Its acceleration requires implementing systemic and institutional changes.

The authors consider public administration, whose activities largely contribute to the prolongation of the investment process, as one of the brakes of economic growth. They believe that one of the key factors leading to the way in which administration functions is, among others, lack of an institution responsible for maintaining the legal order of the land[14].

Conclusions

Answering the question whether Samuelson and Nordhaus were right in saying that „There is no pattern in the type formulas, the trajectory of the planets or swing of the pendulum, which would be used to predict the duration and timing of business cycles. They resemble rather the change of weather", the authors conclude that precise description of the future size of the GDP is impossible, however, it can be possible to mathematically describe domestic product not only of states but also of groups of states, including the duration and time of cycles when using the same functions which are needed to calculate a deviation of a pendulum, with accuracy that is significant at a macroeconomic level.

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INTEGRATION PROCESSES AND MARGINAL VERTICAL β-CONVERGENCE IN THE EUROPEAN UNION MEMBER STATES

Abstract

The aim of the paper is to examine the connection between the intensity of integration processes and the real convergence process in the group of 28 member states of the European Union, with special regard to individual countries' impact on it. A study of β-convergence process in „new" UE member states' pre-accession period (1993-2004) and the period after enlargement of the EU (2004-2014) was conducted. To investigate the individual contribution of the related countries to the „catching-up" process in the EU, the concept of marginal vertical β-convergence was used.

In the light of the conducted empirical studies, there is a positive connection between the level of member states' engagement in the economic and institutional integration and convergence rate in the European Union. The stronger interconnections between member states are, the higher speed of the β-convergence process is. The respective member states' impact on β-convergence process is diversified. The degree of that diversity is decreasing while institutional and economic links between „old" and „new" member states of the EU are deepening.

JEL Classification Code: **F15, F43, C51**.

Keywords: marginal vertical convergence, integration, catching-up process, the European Union.

Introduction

The phenomenon of real convergence, which is the process of gradually reducing the development gap between countries, measured by GDP per capita, has long been the subject of theoretical and empirical discussion. It is empirically proved that it is impossible at the global level (Baumol, 1986; Dowrick, Nguyen,

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1989; de Long, 1988). It is more likely to occur in the group of countries whose economies operate in a similar manner, i.e. have a similar level of economic and technological development, complementarity of economic structures, close geographic locations and institutional connections, ensuring the convergence of income to a common steady state. Thus, the so-called conditional convergence (or club convergence) exists in more homogenous groups of countries, for example in integration groups like the European Union. Furthermore, one can assume that gradual integration processes may accelerate catching-up process between member states (Bukowski, 2011).

The results of theoretical and empirical studies on the positive impact of integration processes on economic growth (and convergence) are ambiguous. According to R. Solow's neoclassical model, open economies should converge as long as the savings ratios are similar and technology is exogenous. Since fixed capital is subject to diminishing marginal returns, each economy will converge on a unique, long-run stable growth path (determined by the growth of the labour and technology). Poorer countries having capital (labour) ratios below their long-run optimum level are characterized by a higher rate of return on fixed investment than richer countries (Solow, 1956). Therefore, poorer countries should grow faster than rich ones and catch up with them. Fallowing this line of reasoning Matrin et.al (2001) claim that opening up the country in a way that it happens in the framework of an integration process, should trigger a convergence process, as capital should flow to capital scarce countries to take advantage of higher returns. The above statements are also in accordance with J. Viner's (1950) trade and integration theory confirming that economic integration (static effects- trade creation and division) leads to the real convergence process between countries. Later theories of economic integration considering dynamic effects of integration process like economies of scale (Corden, 1972), technological change (Balassa, 1965), investment creation and diversion (Dunning, Robson, 1988), development of the private sector (Lawrence 1996), foreign direct investment (Inotai 1991; Ethier 1998) confirm their positive impact on market structure, competition and productivity growth of integrated countries.

However, the existence of the convergence process between integrating countries in the new growth theory models is not confirmed. After considering the assumption that the returns to capital do not have to be diminishing and that technology is endogenous and a subject to decision-making processes at individual firms, the impact of economic integration on convergence is not as clear as in the neo-classical models (Romer, 1990). Increasing returns on human capital (Lucas, 1988) and individual R&D efforts as the main engine of economic growth deny the phenomenon of member states' fallowing the same long-term growth path and reducing income disparities in integration groups. Furthermore, the new trade theory pioneered by Krugman (1991) and developed by Ottaviano

and Puga (1998), delivers several reasons why economic integration may lead to increasing income inequality, rather than convergence.

Economic convergence has been one of the main goals of European integration process, repeated in all the EU treaties. Article 174 of the Treaty of Lisbon states that „The Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions…" (EU Treaty of Lisbon, 2007). In early nineties of the 20th century a vast group of less developed Central and Eastern Europe countries started their integration process with relatively richer Western Europe countries. In recent decades, after signing their association agreements with the European Community, these „poorer" candidates and then- the full EU members- were taking gradual steps toward the liberalization of trade, capital and labour markets, harmonization of economic policy and the foundation of the European Economic and Monetary Union. There are good reasons to expect increased per capita real income convergence (β- convergence), especially in the period after joining the EU in 2004 (Estonia, Czech Republic, Hungary, Latvia, Lithuania, Malta, Cyprus, Poland, Slovakia, Slovenia), in 2007 (Bulgaria, Romania) and in 2013 (Croatia), when their degree of engagement in economic and institutional integration was much higher than in the pre-accession period.

Generally, the majority of empirical studies of convergence process in the European Union (regardless of the method employed) confirms its existence (e.g.Growiec (2005); Schadler, Mody, Abiad, Leigh (2006); Michałek, Siwiński, Socha (2007); Soszyńska (2008); Liberda (2009); Rapacki (2009); Siwiński (2009); Wolszczak-Derlacz (2009); Batóg (2010); Halmai i Vásáry (2010); Adamczyk i Łojewska (2011); Tatomir i Alexe (2011); Stańisić (2012); Stawicka (2012); Walczak (2012); Grzelak i Kujaczyńska (2013); Rapacki, Próchniak (2014)). The results of new empirical studies suggest, however, that negative demographic trends in the European Union may lead to inversion of the current convergence tendencies and may cause divergence process between „new" and „old" EU countries (Matkowski, Próchniak, Rapacki, 2013, 2014). Thus, the discussion on the connection between integration and convergence has not been finished yet.

However, the most significant disadvantage of the mentioned surveys (confirming convergence in the EU or not) is that they are focused only on investigating the existence and rate of general convergence process in the analysed group of countries. They do not identify the individual impact of the particular countries on catching-up process in the European Union. The solution of that problem may be a specific approach consisting in testing the vertical marginal β-convergence.

The aim of the paper is, first of all, to examine the existence and rate of the real β- convergence process in the group of 28 member states of the European Union in the period from 1993 to 2014. The analysis is conducted also in two sub-periods. The first one is the pre-accession period for „new" UE member

states (1993-2004) and the second (2004-2014) is the period after enlargement of the EU, when almost all of the analysed countries were full members of the EU or at the final stage of joining it (Romania, Bulgaria and Croatia). The second goal of the paper is to exhibit the individual contribution of the related countries to the β-convergence process in the UE. The new concept of the marginal vertical β-convergence is used for that purpose. The differentiation of the countries in terms of their impact on catching-up process in the EU is investigated in the pre- and after- accession period.

1. General and marginal vertical β – convergence concept

The easiest way to verify the hypothesis of β convergence is estimating the structural parameters of the following equation 1.

$$\frac{1}{T} ln \frac{Y_{Ti}}{Y_{0i}} = \alpha_0 + \alpha_1 ln\, Y_{0i} + \varepsilon_{ti} \quad (1)$$

where:

$\frac{1}{T} ln \frac{Y_{Ti}}{Y_{0i}}$ – the average growth rate of GDP per capita of country *i* between the period *T* and the base period 0

LnY_{0i} – the logarithm of the initial level of per capita income of country *i*

The left side of the equation represents the average growth rate of GDP per capita of country *i* between the period *T* and the base period 0. The explanatory variable is the logarithm of the initial level of per capita income of country *i*. The negative value of the parameter α_1 means the occurrence of convergence.

The rate of convergence is reflected by β coefficient defined by the following formula 2.

$$\beta = -\frac{1}{T} ln(\, 1 + \alpha_1 T\,) \quad (2)$$

where: T – the number of years.

The higher the coefficient β value (between 0 and 1), the higher the convergence rate.

The additional coefficient used very often in convergence analysis is the half-life of convergence coefficient, defined by the following formula 3.

$$T_{1/2} = \frac{ln 2}{\beta} \quad (3)$$

It indicates the amount of time it will take to cover half the distance separating the current starting point of the countries from their long- term equilibrium point. In other words, it indicates the amount of time it will take to reduce income disparities between the analysed countries by 50%.

The idea of the marginal, vertical convergence is to estimate the individual contribution of a country to general convergence process in the analysed group of countries. The method comes from microecomic methods of investment risk calculations. Risk can be calculated as the difference between the level of risk calculated for the full portfolio and for the portfolio with N-1 elements (Hozer, 2004).

Fallowing this line of reasoning, to calculate the value of marginal, vertical convergence for country i the following equation (4) can be used.

$$\beta_i = \beta - \beta_i^{N-1} \tag{4}$$

where:
β_i – vertical marginal convergence β for country i
β – β coefficent (convergence rate) for the group of N countries
β_i^{N-1} – β coefficent (convergence rate) for the group of N-1 countries (without county i).

To obtain the value of vertical marginal β- convergence for country i it is essential to estimate the structural parameters of equation (1) for the entire group of countries and its modification with corrected data. The mentioned modification consists in eliminating from the full dataset observations for investigated country i (Batóg, 2010). Individual β_i coefficient is the difference between β and β_i^{N-1} (calculated with the use of estimated structural parameters of model (1) and its modification and formula 2). The positive value of β_i coefficient indicates a positive impact of country i on general convergence process.

In a similar way it is possible to calculate individual country's contribution to half-life of convergence (see formula 5).

$$T_{1/2i,i} = T_{1/2} - T_{1/2,i}^{N-1} \tag{5}$$

where:
$T_{1/2i,\,i}$ – half- life of convergence for country i
$T_{1/2}$ – half- life of convergence for the group of N countries
$T_{1/2,\,i}^{N-1}$ – half-life of convergence for the group of N-1 countries (without county i)

The negative sign of half-life of convergence coefficient for country i means that the investigated country has a positive impact on half-life of convergence and shortens the time needed to reduce income disparities in examined group of countries. The obtained indicator $T_{1/2,i}$ is measured in number of years.

2. Results

The above mentioned formulas were used to conduct a study of β- convergence in a group of 28 European Union Member States. Data on GDP per capita based on purchasing-power-parity (PPP) in current international dollars (Geary-

Khamis dollar) in the period of 1993 - 2014 was obtained from the International Monetary Fund World Economic Outlook Database.

As the aim of the research was to exhibit the positive connection between the degree of countries' involvement in economic (and institutional) integration and β- convergence process, in addition, the analysis was divided into two (mentioned above) sub-periods: 1993-2004 and 2004-2014. For the majority of „new" EU countries the first sub-period was initiated by signing association agreements and completed by full membership in the EU structures or- as in the case of Bulgaria and Romania - finishing the negotiation process. The exception was Croatia that started its accession process later, at the beginning of 2000. However, including Croatia in the survey is justified because its degree of involvement in the integration processes in the UE in the period 1993-2004 was, just as the rest of examined „new" countries, lower than in the next period 2004-2014.
In table 1 the estimation of structural parameters of equation (1) using the data for the period from 1993 to 2014 are included.

Table 1. Equation 1: Classical least squares method estimation, used observations 1-28
Dependent variable (Y): PPPlnYtyoT19932014

variable	coefficient	stand. error	student's t	p value	significance
const	0.210653	0.0288268	7.3075	<0.00001	***
l_PPPY1993	-0.0181416	0.00304576	-5.9564	<0.00001	***

Source: own calculations using GRETL.

The results indicate the presence of β convergence in the EU-28. The negative value of the structural parameter α_1 of the equation 1 indicates a negative correlation between the initial level of income per capita in 1993 and economic growth rate in the period of 1993-2014. The value of the coefficient β calculated according to formula (2) amounted to 2.3%. This means that in the analysed period, the countries with lower GDP per capita „approached" the level of prosperity of the former EU-15 at a rate of approximately 2.3% per year. The value of half-life of convergence coefficient calculated according to formula (3) amounted to approximately 30 years.

The results of estimation of structural parameters of equation (1) using the data for the period from 1993 to 2004 indicates the presence of β convergence in the EU-28 (table 2).

The negative value of the structural parameter α_1 of the equation was obtained. The value of the coefficient β amounted to 1.7% and it was lower than its value for the entire period 1993-2014. This means that in the analysed period, the countries with lower GDP per capita „approached" the level of prosperity of richer

countries at a rate of 1.7% per year. According to the obtained results, it will take about 40 years to reduce income disparities in the EU by 50% (the value of half-life of convergence coefficient- 40.641).

Table 2. Equation 1: Classical least squares method estimation, used observations 1-28 Dependent variable (Y): PPPlnYtyoT19932003

variable	coefficient	stand. error	student's t	p value	significance
const	0.192246	0.0454165	4.2329	0.00025	***
l_PPPY1993	-0.0155511	0.00479857	-3.2408	0.00326	***

Source: own calculations using GRETL.

In table 3 the estimation of structural parameters of equation (1) using the data for „after- accession" period (2004-2014) are included.

Table 3. Equation 1: Classical least squares method estimation, used observations 1-28 Dependent variable (Y): PPPlnYtyoT20042014

variable	coefficient	stand. error	student's t	p value	significance
const	0.247328	0.0455154	5.4339	0.00001	***
l_PPPY2004	-0.0220473	0.00455114	-4.8444	0.00005	***

Source: own calculations using GRETL.

The results indicate the presence of β convergence in the EU-28 (the negative value of the structural parameter α_1). The value of the coefficient β amounted to 2.5%. This means that in the analysed period the rate of β-convergence (catching-up) process was higher than in the „pre-accession" period by 0.8 percentage point. The time needed to reduce GDP per capita disparities between EU members was shorter and amounted to approximately 27 years (the value of half-life of convergence coefficient – 27.4505).

In table 4 the results of marginal vertical β-convergence of EU countries for the period 1993-2004 are presented. They were obtained through the estimation of 28 econometric models (modified equation 1, with corrected data). In the second and fourth column the speed of β-convergence process and half-life of convergence indicator for the group of 27 countries -after elimination of the examined country *i* – are included. The values of countries' β_i and half-life of convergence coefficients (calculated in accordance with equation 4 and 5) are contained respectively in the third and last column.

Table 4. Results of the marginal vertical convergence of the European Union member states in the period 1993-2004

Country	β_i^{N-1}	β_i	$T_{1/2,\,i}^{N-1}$	$T_{1/2,\,i}$
Austria	1.69	0.01	40.95	-0.31
Belgium	1.68	0.03	41.30	-0.66
Bulgaria	2.09	-0.39	33.11	7.53
Croatia	1.76	-0.05	39.43	1.21
Cyprus	1.70	0.00	40.70	-0.06
Czech Republic	1.70	0.00	40.70	-0.06
Denmark	1.68	0.02	41.18	-0.54
Estonia	1.48	0.22	46.72	-6.07
Finland	1.73	-0.02	40.08	0.56
France	1.66	0.05	41.82	-1.18
Germany	1.63	0.07	42.41	-1.77
Greece	1.70	0.00	40.66	-0.02
Hungary	1.73	-0.03	40.05	0.59
Ireland	1.79	-0.08	38.78	1.87
Italy	1.66	0.05	41.88	-1.24
Latvia	1.47	0.24	47.17	-6.53
Lithuania	1.55	0.15	44.64	-4.00
Luxembourg	2.04	-0.33	34.05	6.59
Malta	1.53	0.18	45.37	-4.73
Netherlands	1.70	0.01	40.77	-0.13
Poland	1.69	0.01	40.99	-0.34
Portugal	1.70	0.00	40.71	-0.07
Romania	2.02	-0.31	34.33	6.31
Slovak Republic	1.70	0.01	40.77	-0.12
Slovenia	1.70	0.01	40.86	-0.22
Spain	1.71	0.00	40.62	0.02
Sweden	1.72	-0.02	40.20	0.44
United Kingdom	1.73	-0.03	39.96	0.68

Source: own calculations using GRETL.

In the light of the obtained results, the contribution of respective countries to general convergence process in the EU diverged significantly in the period 1993-2004. In the group of 28 member states one can identify the group accelerating relevantly convergence in the EU, the group with a slight positive or negative impact and the group of countries slowing down that process. In the first mentioned group were „candidates" for UE membership- Estonia, Latvia, Lithuania and Malta with β_i coefficient ranging from 0.1 to 0.25 percentage point. In the group of coun-

tries with low positive, low negative or even neutral influence on catching-up process were „old" UE members like Austria, Belgium, Denmark, France, Germany, Italy and also „candidates" of that time- Slovakia, Slovenia and Poland.

Among countries definitely slowing down the catching-up process in the EU were Bulgaria and Romania- countries with the lowest level of GDP per capita in 1993 and insufficiently high rate of economic growth in the period 1993-2004. At the same time, these countries were characterised by relatively low degree of economic interconnections with other EU countries and its candidates. Moreover, Luxembourg- the richest EU country, growing at high rate of 4% in the analysed period- was another country with negative influence on general convergence process in the EU. Luxembourg, Bulgaria and Romania also contributed to extending the time needed to reduce income disparities in the EU. Including them into analysis resulted in extending the half-life of convergence by 4-6 years. In turn, including Estonia, Lithuania, Latvia and Malta made it 4-6 years shorter.

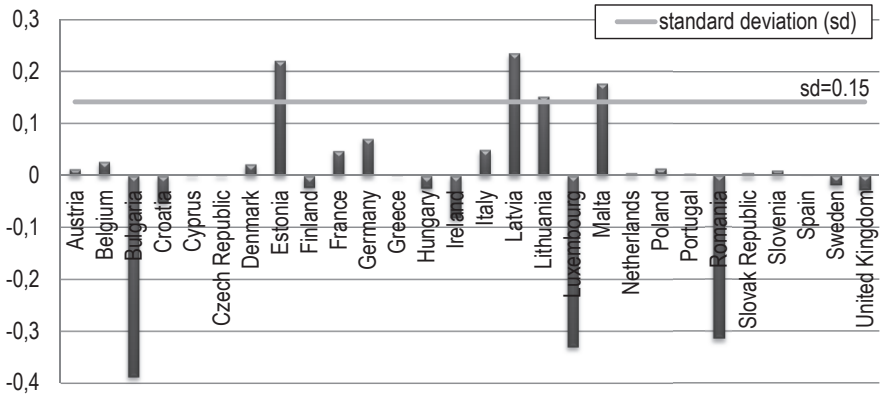

Figure 1. Individual β_i coefficients of European Union member states and standard deviation in the period 1993-2004

Source: own calculations.

Furthermore, the average value of individual β_i coefficients in the period 1993-2004 for the group examined countries amounted to -0.0071 p.p . It means, that, on average, EU countries had a very small but negative influence on the catching-up process. In order to investigate the degree of countries' differentiation in terms of their impact on general convergence rate, the value of standard deviation was also calculated. It amounted to 0.15 percentage point.

In the period 2004-2014 (when β-convergence rate in the EU was higher than in „pre- accession" period and amounted to 2.5 %) individual β_i coefficients of respective member states were, however, lower than in the period 1993-2004.

Table 5. Results of the marginal vertical convergence of the European Union member states in the period 2004-2014

Country	β_i^{N-1}	β_i	$T_{1/2,i}^{N-1}$	$T_{1/2,i}$
Austria	2.61	-0.08	26.57	0.88
Belgium	2.54	-0.01	27.34	0.12
Bulgaria	2.47	0.06	28.06	-0.61
Croatia	2.54	-0.01	27.32	0.13
Cyprus	2.49	0.04	27.85	-0.40
Czech Republic	2.52	0.01	27.55	-0.10
Denmark	2.52	0.00	27.48	-0.03
Estonia	2.48	0.04	27.94	-0.49
Finland	2.52	0.01	27.54	-0.09
France	2.52	0.00	27.49	-0.04
Germany	2.60	-0.07	26.66	0.79
Greece	2.47	0.05	28.03	-0.58
Hungary	2.59	-0.07	26.73	0.72
Ireland	2.45	0.07	28.28	-0.83
Italy	2.46	0.06	28.16	-0.71
Latvia	2.39	0.14	29.01	-1.56
Lithuania	2.28	0.25	30.41	-2.96
Luxembourg	3.03	-0.50	22.88	4.57
Malta	2.52	0.01	27.52	-0.07
Netherlands	2.58	-0.05	26.92	0.53
Poland	2.37	0.15	29.23	-1.78
Portugal	2.55	-0.03	27.16	0.29
Romania	2.65	-0.13	26.15	1.30
Slovak Republic	2.39	0.14	29.04	-1.58
Slovenia	2.52	0.00	27.45	0.00
Spain	2.49	0.03	27.81	-0.36
Sweden	2.60	-0.08	26.65	0.80
United Kingdom	2.53	-0.01	27.36	0.09

Source: own calculations using GRETL.

It means that the impact of particular countries on general β-convergence process became more unified, as they went forward to closer institutional and economic connections as full members of the EU.

In the light of the results obtained for the period 2004-2014, in the group of countries exerting the most positive impact on β-convergence rate in the EU were Lithuania, Latvia, Poland and Slovakia with β_i coefficients amounting to

about 0.15 percentage point. The group of EU member states with a slight positive influence on catching-up process extended in „after-accession" period. In this group there were mainly „new" EU countries (not mentioned above) apart from Romania and Hungary.

The majority of EU „former 15" e.g. Luxembourg, Germany, Sweden, Netherlands, Austria, Portugal, Spain and United Kingdom was in the „slowing down" group. After including Luxembourg into the survey, half-life of convergence coefficient increased by 4.5 years; in the case of including other countries mentioned above – by one year. Their negative impact on the catching-up process in the EU results from the fact that, for example, Luxembourg with the initial GDP per head at the level of twice higher than EU average, was characterised by relatively high GDP per capita growth (2% per year) in the period 2004-2014. Spain, by contrast, with the initial income level of three times lower than in Luxembourg, achieved the annual growth rate of 1.5%.

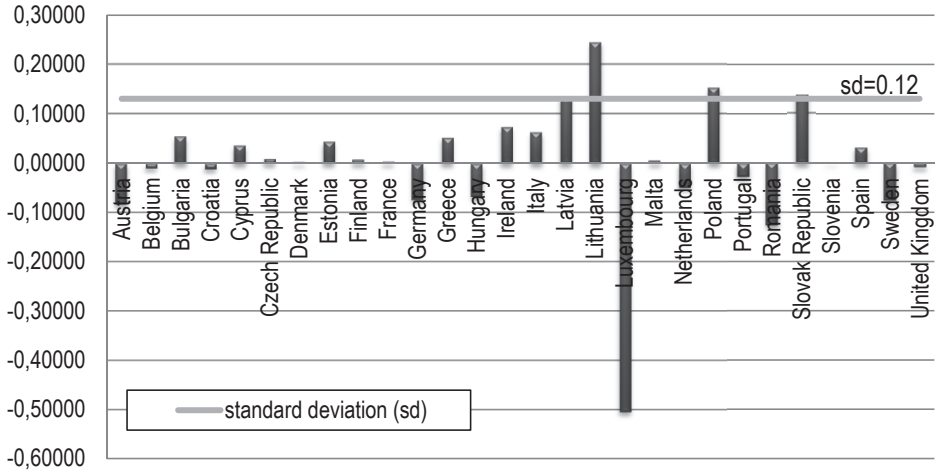

Figure 2. Individual β_i coefficients of European Union member states and standard deviation in the period 2004-2014

Source: own calculations.

The average value of individual β_i coefficients in the group of 28 EU countries in the period 2004-2014 amounted to 0.00075. It means, on average, EU member states had a very small but positive influence on the catching-up process. Standard deviation, reflecting the degree of countries' diversity in terms of their impact on general convergence rate, was lower than in the period 1993-2004 and amounted to 1.2. It confirms that the individual contribution of countries to the catching-up process in the EU was more unified than in the „pre-accession" period.

Conclusions

The presented analysis of convergence conducted for the European Union in two sub-periods 1993-20014 and 2004- 2014 furnishes evidence that the „catching-up" process in that regional group exists and –what is essential from the point of view of paper's aim - its rate is higher in the second, „after-accession" period. Thus, one can draw the conclusion that there is a positive connection between the member states' level of engagement in economical and institutional integration and the convergence rate in the European Union. The closely interconnected the countries are, the higher speed of β-convergence process is. In the period 2004-2014, when the majority of examined countries was official members of the EU and when their economical and institutional links were much stronger (compared with the period 1993-2003), the convergence rate in the EU was higher and amounted to 2.5%, even though, almost all of the European countries experienced GDP per capita slowdown as the result of financial and economic crisis after 2007. Nevertheless, the problem of the impact of economic crisis on β-convergence process in the UE seems to be a very interesting issue, worth to deepen in subsequent studies.

Although β- convergence process in the European Union exits, the respective member states' contribution to it is diversified. In both analysed sub-periods one can easily distinguish the group of countries accelerating β-convergence process and slowing it down. In the group mentioned first „new" EU members play a more and more important role, especially Lithuania, Latvia, Poland and Slovakia. However, according to the obtained results of the vertical marginal β-convergence examination, the degree of that diversity is decreasing while institutional and economic links between „old" and "new" European Union member states are deepening. Their impact on „catching-up" process is much more positive and unified.

One can assume that not only in the EU but also in other regional groups in Asia, North and South America or in Africa, gradual integration processes, consisting in implementation of the same necessary system changes „forced" by the membership and intensification of economic interconnections, may be reflected in more unified member states' impact on β-convergence process. The above mentioned hypothesis should be verified in the future with the use of the method based on average data, implemented in that paper or with the use of panel data. Methods based on panel data are regarded as more solid due to taking into account a large number of observations and various methods of estimation, so one should consider employing it to study the convergence process in the European Union too.

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BUSINESS FUNDING SOURCES DURING THE FINANCIAL CRISIS: SUPPLY-SIDE AND DEMAND-SIDE FACTORS. CASE STUDY OF GREECE

Abstract

The objective of this study is to present the evolution of the financing of Greek enterprises during the years of crisis, and in particular analyze the impact of the crisis on companies' access to external financing.

The deep economic crisis that hit Greece is reflected, inter alia, in the main macroeconomic ratios, like Gross Domestic Product and unemployment and some indicators of the banking sector, like deposits, total loans and non-performing loans. Greece is characterizes today by borrowing problems, high public debt, serious lack of competitiveness, unsustainable social security system, particularly poor public administration and a large and wasteful public sector. Economic crisis decreased firms' profitability and increased their needs for external sources of financing. In the situation when internal sources are limited external capital is the main source allowing to finance firm's investment projects. Insufficient availability of external capital can restrict future firm's growth opportunities and its competitiveness.

In this paper we analyze two main sides of the problem of business financing: the supply and demand of external capital. The extreme reluctance of banks to lend Greek companies because of the strict financing constrains due to the national debt crisis exacerbates the cycle of economic recession and seriously undermines the efforts of Greek companies to continue their activities. In new circumstances banks try to limit risk. But in the current environment they have trouble finding creditworthy borrowers. As a result the credit market is very constrained. On the other side economic crisis decreased firms' profitability and increased needs in finding ways to gain funds. The analysis shows that small and medium enterprises have been particularly affected by tighter credit conditions and financial instability. Debt financing has become more expensive and difficult to obtain.

JEL Classification Code: **G2, G32**.

Keywords: Economic crisis, Greece, business financing, sources of financing.

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Introduction

Greece is considered as the country of SMEs with 99,9% of its firms in the non-primary sector employing 100 persons or less. SMEs account for 72,1% of added value and 85,8% of employment (Table 1). These proportion are considerably larger than for the rest of the EU (58% and 67%, respectively) (EC, 2014). SMEs provide 80% of all jobs in the manufacturing sector and about 90% in the wholesale and retail trade sector. These figures are well above the EU average, especially in the manufacturing and wholesale and retail trade sector (EU, 2014). Given the above, the financial performance and viability of SMEs are very important to the Greek economy as well as to investors, bankers and their suppliers (Hyz & Gikas, 2012).

Table 1. SMEs in Greece - basic figures, 2013

	Number of enterprises		Number of employees		Value added	
	Number	Proportion	Number	Proportion	Billion Euros	Proportion
Micro	629.811	96,2%	1.130.794	55,2%	16	33,1%
Small	21.669	3,3%	398.503	19,5%	11	22,5%
Medium	2.464	0,4%	227.832	11,1%	8	16,5%
Total SMEs	653.944	99,9%	1.757.129	85,8%	34	72,1%
Large	423	0,1%	290.547	14,2%	13	27,9%
Total	654.367	100,0%	2.047.676	100,0%	48	100,0%

Source: EC (2014), SBA Fact Sheet - Greece.

The deep economic crisis that hit Greece is reflected, inter alia, in the main macroeconomic ratios, like Gross Domestic Product and unemployment and some indicators of the banking sector, like deposits, total loans and non-performing loans (NPLs). Between 2008 and 2013 the Greek Gross Domestic Product decreased more than 25%, while unemployment increased to 27% in 2013 (Table 2). Greece is characterizes today by borrowing problems, high public debt, serious lack of competitiveness, unsustainable social security system, particularly poor public administration and a large and wasteful public sector (Gikas et al., 2012; Gikas et al. 2013). With real GDP in 2013 almost 25% below its 2008, Greek SMEs have borne the brunt of the economic crisis in recent years. In that period, SME employment fell by 27% (EC, 2014). Almost one of four of the SMEs that existed in 2008 closed down, reducing the total volume of business, measured in added value, by a third of its 2008 levels, about 51,4% of SMEs have difficulties paying their employees on time, 50,5% have reduced the number of working hours or days for some of their employees (EC, 2014). Even though the EU returns to the before crisis levels increasing jobs in SMEs and SMEs value added,

reducing unemployment in SMEs etc, Greece still faces problems in policies for SMEs according to data (Table 3). Economic crisis decreased firms' profitability and increased needs in finding ways to gain funds. Bank credit, particularly through term loans, is one of the primary sources of external financing for small business in Greek economy which is characterized by bank-based financial system. Bank credit is also a key to helping small firms maintain cash flow, hire new employees, purchase new inventory or equipment, and grow their business. Unlike large firms, small businesses lack access to public institutional debt and equity capital markets and the vicissitudes of small business profits makes retained earnings a necessary less stable source of capital.

Table 2. Main indicators of Greek economy (2008-2013)

Variables	2008	2009	2010	2011	2012	2013
GDP change (2005 prices)	-0,2	-3,1	-4,9	-7,1	-6,4	-4,0
Unemployment rate (%)	7,2	8,9	11,8	16,3	23,6	27,0
Savings (billions euro)	227,2	237,3	209,5	174,1	161,4	160,2
Loans change (preceding year = 100)	15,9	0	3,2	-3,7	-8,4	-3,6
Private NPLs, (billions euro)	5,1	7,3	10,5	16,0	24,5	31,2

Source: Bank of Greece, 2014.

Table 3. Data concerning the SMEs in Greece and EU(27) average, 2010-2013

		2011	2012	2013
Number of enterprises	GREECE	745.677	727.883	531.059
	EU(27) average	770.973	753.920	763.486
Gross Value Added (million euro)	GREECE	55.000	47.000	34.000
	EU(27) average	126.186	125.755	127.036
Number of persons employed	GREECE	2.150.438	1.998.453	1.426.840
	EU(27) average	3.239.916	3.215.360	3.225.641

Source: SBA Fact Sheets for Greece 2010/2011, 2012, 2013 in: http://www.gsevee.gr/press/mme_eng.pdf

This paper is organized as follows: in the next section we briefly review the main sources of firms' capital. The situation of Greek banking sector is presented and discussed in section three. Next we analyse the changes in Greek firms' financial sources. The last section contains concluding remarks and directions for further researches.

Sources of Business' Capital - why bank credit is so important in Greece?

Access to sources of capital is determined to a large extend, by the firm's development phase, which has a major impact on evaluation of its creditworthiness[3]. During early phases of their development firms have to rely primarily on financial resources possessed by their owners and their families, sometimes on assistance funds or on venture capital. During further phases of its development the firm is financed primarily from accumulation of financial surpluses and additionally by means of external capital. Mature firms (mainly medium sized enterprises) have an easier access to external capital and, in particular, bank loans than other groups of firms from the SME sector. In the Table 4 we presented sources of finance typically available at various growth stage, along with potential financing problems that may arise at each stage.

Table. 4. The financial life cycle of the firm

Phase	Sources of finance	Main problems
Inception	Owners' resources	Undercapitalization
Growth I	As above plus: Retained profits, trade credit, bank loans and overdrafts, hire purchase, leasing	Overtrading, liquidity crises
Growth II	As above plus: Longer term finance from financial institutions	Finance gap
Growth III	As above plus: New market issue	Loss of control
Maturity	All sources available	Maintaining return on investment (ROI)
Decline	Withdrawal of finance: firm taken over, liquidation	Falling ROI

Source: Weston and Brighton (1970), p. 157; in: C. Mac an Bhaird, Resourcing Small and Medium Sized Enterprises, Contribution to Management Science, Springer- Verlag Berlin Heidelberg, 2010

External capital becomes the main source allowing to finance the firm's investment project in the situation when internal accumulation capabilities of SMEs are limited. Insufficient availability of external capital can restrict the firm's growth opportunities. The main sources of external capital for small and medium sized enterprises are bank loans (short- and long-term) and the so-called non-banking sources of financing (trade credit, lease, factoring, franchising, loans from the non-banking sector).

The Greek SME sector has also access to capital provided by different types of EU's assistance programmes and funds allocated in the framework of govern-

[3] The phase model or life cycle theory of the firm originates in economics literature and is commonly used to describe the progression of the successful firm through growth phases.

ment projects assisting small and medium sized enterprises. In most countries, commercial banks are the main source of finance for SMEs, so if the SME sector is to expand it must have access to bank credit (EOS Gallup Europe, 2005). Taking into account the fact that SMEs (due to their size) are unable to raise investment capital in the capital market, the banking system becomes the only real opportunity of raising additional financial resources. This situation is theoretically advantageous for the SMEs due to the detailed evaluation of an investment project by the bank, which implies, among other things, the feasibility analysis of a project and professional counselling provided by the bank's employees. On the other hand the position of SMEs in the bank loans market is determined by a strong influence exerted by structural characteristics of these enterprises.

State of Greek banking sector: supply-side

Financial markets in the euro area progressed steadily towards integration in the years following the introduction of the single currency. This was reflected among others in a convergence of interest rates for private sector loans. However, with the start of the crisis, the banking sector and financial markets gradually fragmented along national borders (see: Graph 1). These borders separated countries on the basis of their perceived capacity to cope with a banking crisis[4]. The level of fragmentation remains high for the lending to non-financial corporations, as reflected in the widening of interest rate differentials. Interest rates for one-year loans up to 1 million euro was 5% in Greece while small and medium enterprises in France, Belgium and Luxembourg reporting rates around 2% in 2013[5].

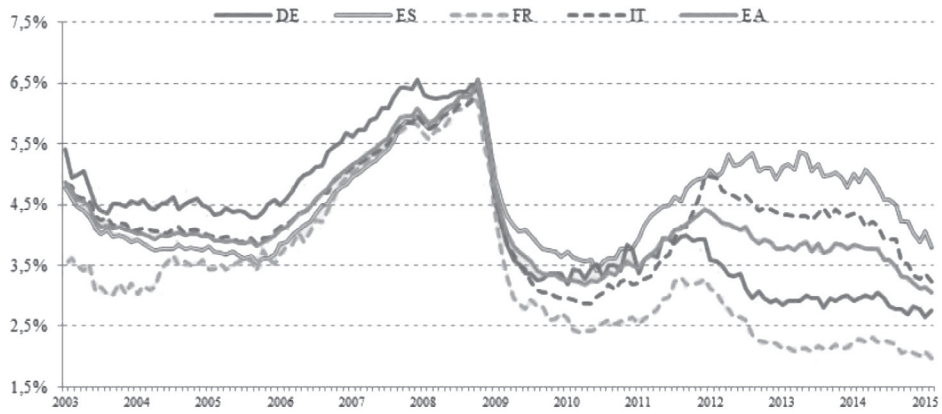
The data shows also, that financing conditions remain tighter for SMEs than for larger firms, as reflected in the higher interest rates paid by the former (Graph 2).

There is evidence that many parts of the banking sector are still reeling from the financial crisis. Many of banks are themselves in trouble, as they suffered from increased loan defaults and have insufficient capital to make loans. The situation in the Greek banking sector during the last five financial years was characterized by:

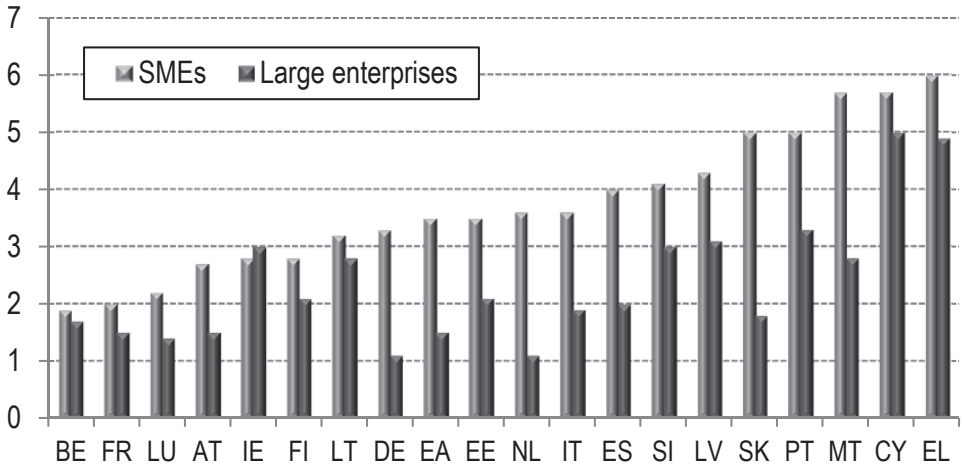
1. Consolidation process and concentration. The number of banks has been declining steadily. The top four banks acquired smaller players and increased their market share of loans from 67% in 2011 to 95% in 2013. The concentration of assets in ever-larger financial institutions is problematic especially for small business credit because large banks are less likely to make small loans. Generally, large banks use standardized quantitative criteria to assess loan

[4] http://ec.europa.eu/europe2020/pdf/themes/09_sme_access_to_finance.pdf

[5] http://intelligent-news.com/greece/newsroom/item/3889-greece-the-loan-interest-rates-decreased-in-june



Graph 1. Interest rates for one-year loans up to EUR 1 million
Source: European Central Bank/Commission



Graph 2. Interest rates for one-year loans, in % (February 2015)
Source: European Central Bank/Commission.

applications from small firms, where small banks favour qualitative criteria based on their loan offices' personal interactions with loan applicants. Similarly, large banks typically have more branches that are more geographically dispersed than do smaller banks and, because of this, large banks need very explicit rules and underwriting guidelines to avoid distortions and to keep loan officers rowing in the same direction. As a result, large banks, employ standard

criteria, often an individual borrower's score and data obtained from financial statements in the loan decision process - a "cookie-cutter approach". By contrast, small banks rely to a greater extent on information and relationship capital about the character of the borrower , a "character approach", which they use to put any numbers-based assessment of a borrowers' creditworthiness within a broader social context. This difference in approach to lending has important repercussions for small business lending, and the decline in the number of community banks has meant small businesses may be losing one of their most reliable sources of credit access.

2. The financial situation of four banks worsened. The situation of four banks according to CAMELS methodology can be described as "satisfactory" to "fair" with the tendency after 2011 to increasing share of "less-than-satisfactory" institutions (score greater than three) (Hyz & Gikas, 2015).
3. The main problem is bank's Assets Quality measure by Net Non-performing Assets Ratio. Non-Performing Loans (NPLs) on bank's loan SMEs portfolio have reached more than 35% and are still expected to increase[6], whereas numerous active loans are being restructured; in this context, banks have a risk-averse position and an important part of SMEs are excluded from access to finance.
4. During the crisis, banks were required to make a number of changes to their capital structure, including holding more Tier 1 capital and submitting to stress tests. Although Greek banks have received significant funding support they seek to strengthen their balance sheets in order to regain access to market funding.
5. Continuous decrease in deposits by domestic enterprises and households (see: Graph 3 and Table 5) and parallel increase in loan's interest rate. In 2014 in Greece, the overall weighted average interest rate on loans increased. The interest rate spread means as the difference between the overall weighted average rate on all loans and the overall weighted average rate on all deposits was 4.13 percentage points (see Table 6).The increase is mainly due to the increase of the average interest rate on corporate loans exceeding €1 million. The average interest rate on corporate loans without a defined maturity was 6.58%. The

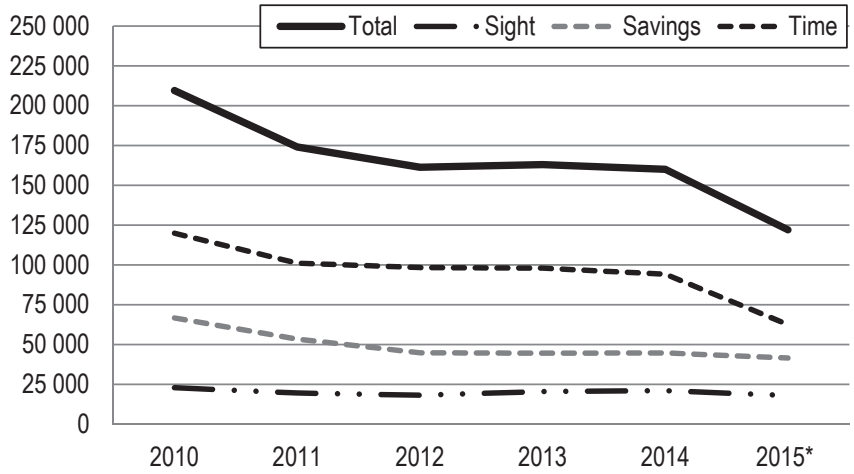
[6] The NPLs increased in 2013 to 30% of total loans. While bad loans elsewhere in Europe come to an average of 6.1 percent of all credit, in Greece they climbed to 22,8 percent at the end of 2013 in the case of Eurobank, 30 percent – National Bank of Greece, 32,7% Alpha Bank and 36 percent in the case of Piraeus Bank, which means six times more than European average. It should be noted high increase which was posted by all banks during last years. In June 2013, the ratio of loans overdue for more than 90 days to total loans increased by 7.7 percentage points compared to the same period 2012. The increase is mainly due to the portion of consumer loans outstanding, which has displayed the most rapid growth rate over the past three crisis years, hitting 43.8% by mid-2013. Overdue business loans as a percentage of total business loans increased by 9.4 pp over the span of just one year since June 2012, and have now surpassed the non-performing ratio of mortgage loans.

Table 5. Deposits by domestic enterprises and households with OMPIs (EUR millions and annual percentage changes)

End of period	Total			Sight			Savings			Time		
	Outstanding amounts	Flow during period	Annual percentage change	Outstanding amounts	Flow during period	Annual percentage change	Outstanding amounts	Flow during period	Annual percentage change	Outstanding amounts	Flow during period	Annual percentage change
2010	209.522	-29.329	-12.4	22.865	-3.364	-12,9	66.706	-9.302	-12.3	119.951	-16.663	-12.3
2011	174.137	-35.655	-17.0	19.601	-3.275	-14.3	53.439	-13.342	-10,0	101.097	-19.038	-15,9
2012	161.373	-12.749	-7.3	18.173	-1.399	-7.1	44.844	-8.559	-16.0	98.357	-2.791	-2.8
2013	163.052	2.116	1.3	20.500	2.444	13.4	44.566	-182	-0.4	97.986	-146	-0,1
2014	160.072	-3.990	-2.4	21.074	712	3.5	44.791	31	0.1	94.207	-4.733	-4.8
2015*	122.085	-16.071	-26.0	17.974	13	-13.0	41.552	-1.703	-4.4	62.558	-14.381	-38.0

* two months

Source: Bulletin of Conjunctural Indicators, 2015.



* two months.

Graph 3. Deposits by domestic enterprises and households with OMPIs (EUR millions)
Source: Bulletin of Conjunctural Indicators, 2015.

Table 6. Average interest rates on new euro-denominated loans

Loan's interest rate	2014
Corporate without a defined maturity	6,58%
To sole proprietors without a defined maturity	8,25%
Corporate with a fixed maturity at a floating rate or with an initial rate fixation period of up to 1 year: – loans up to an amount of 250.000 euro – loans above 250.000 euro and up to 1 million – loans above 1 million	 6,01% 5,30% 5,63%
Overall weighted average rate on all loans	5,36%
Interest rate spread	4,13%

Source: Bulletin of Conjunctural Indicators, 2015.

corresponding rate on loans to sole proprietors was 8.25%. The average interest rate on corporate loans with a defined maturity at a floating rate or with an initial rate fixation period of up to one year for loans up to €250,000 was 6.01%, for loans over €250,000 and up to €1 million was 5.30%, and for loans above €1 million was 5.63%.

State of the business economy: credit-less recovery?

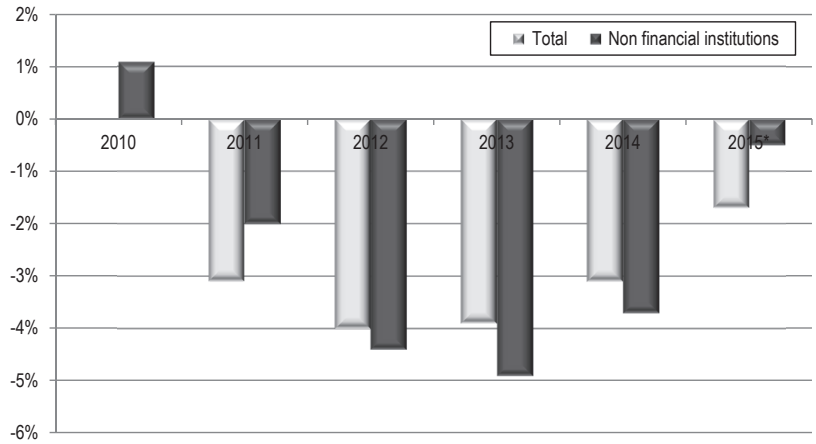
The financing model of Greek companies is based mainly on bank lending. The average share of bank lending in the overall funding in Greece is much higher than in other countries of euro area. This is mainly due to the structure of the Greek economy (see: Introduction). The majority of companies belongs to the category of small and medium enterprises that do not have easy access to other alternative sources of external financing according to the analysis presented in section 2 of this paper. The reduction of banks' credits observed in recent years (see: table 5, graph 3) is expected to have a significant impact on Greek business viability.

Table 7. Credit to domestic private sector by domestic MFIs (millions of euro and annual percentage changes

End of period	Total (non-financial corporations, insurance corporations and other financial intermediaries, sole propritors)			Non-financial corporations		
	Outstanding amounts	Flow during period	Annual per-centage change	Outstanding amounts	Flow during eriod	Annual per-centage change
2010	257.846	50	0,0	123.244	1.483	1,1
2011	248.535	-8.110	-3.1	120.126	-2.429	-2,0
2012	227.655	-9.971	-4,0	107.335	-5.228	-4,4
2013	217.920	-8.798	-3,9	103.204	-5.216	-4,9
2014	212.039	-6.723	-3,1	101.354	-3.777	-3,7
2015*	208.536	-360	-1,7	98.579	190	-0,5

* two months.

Source: Bulletin of Conjunctural Indicators, 2015.



Graph 4. Credit to domestic private sector by domestic MFIs (Annual percentage changes)

Source: Bulletin of Conjunctural Indicators, 2015.

In this study we try to analyze the situation of business economy in Greece using as a sample small and medium enterprises from Epirus region in Greece. Data was extracted from ICAP database containing income statements and annual balance sheets of Greek companies. We get a data set of 612 companies split up over 18 sectors, according to the European NACE classification scheme of economic activities. The main three sectors which represent about 87% of total sales in the region and above 58% of total number of firms are: wholesale and retail trade (26,2% in total number of firms in region and 41,2% in total sales), manufacturing (23,2% and 40,8% in total number of firms and total sales respectively) and construction (8,9% and 4,9% respectively). The criteria used for selection of the companies were two: 1/. European Commission criteria for small and medium enterprises[7], 2/. Data available for ten years continuously. We exclude all firm-year observations without data available on debt (short term and long term), total assets, shareholders equity, sales and net income. As a result we obtained a balanced panel dataset of 612 firms and a number of 6120 firms-years observations. The research covers the period of 2004-2013, which gives ten-year period of observations of financial results of selected companies: this period covers five years (2004 – 2008) before the economic crisis in Greece and the first five years of the crisis (2009 – 2013). Variables used in the analysis are presented in Table 8.

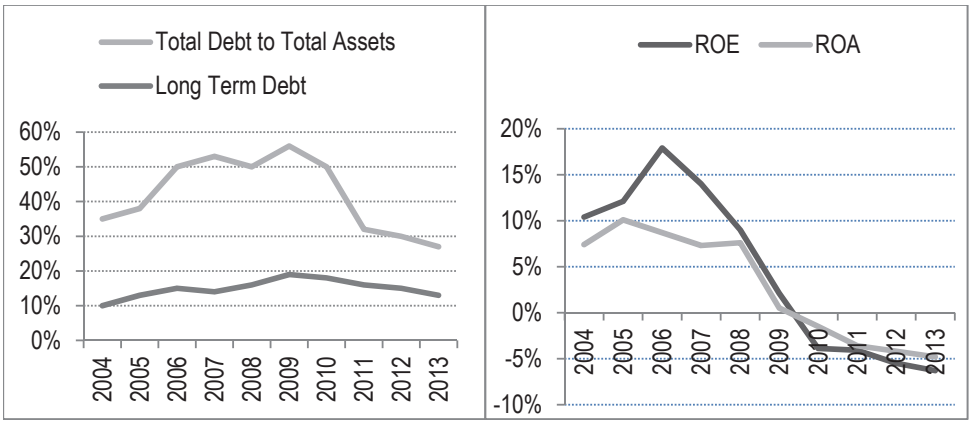
Table 8. Variables

Total Debt to Total Assets	$\frac{Short\ Term\ Debt + Long\ Term\ Debt}{Total\ Assets}$
Long Term Debt to Total Assets	$\frac{Long\ Term\ Debt}{Total\ Assets}$
Equity multiplier	$\frac{Total\ assets}{Shareholders\ Equity}$
Total Assets Turnover	$\frac{Sales}{Total\ Assets}$
Profit Margin	$\frac{Net\ Income}{Sales}$
ROE	$\frac{Net\ Income}{Shareholders\ Equity}$
ROA	$\frac{Net\ Income}{Total\ Assets}$

Source: Bulletin of Conjunctural Indicators, 2015.

[7] http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm

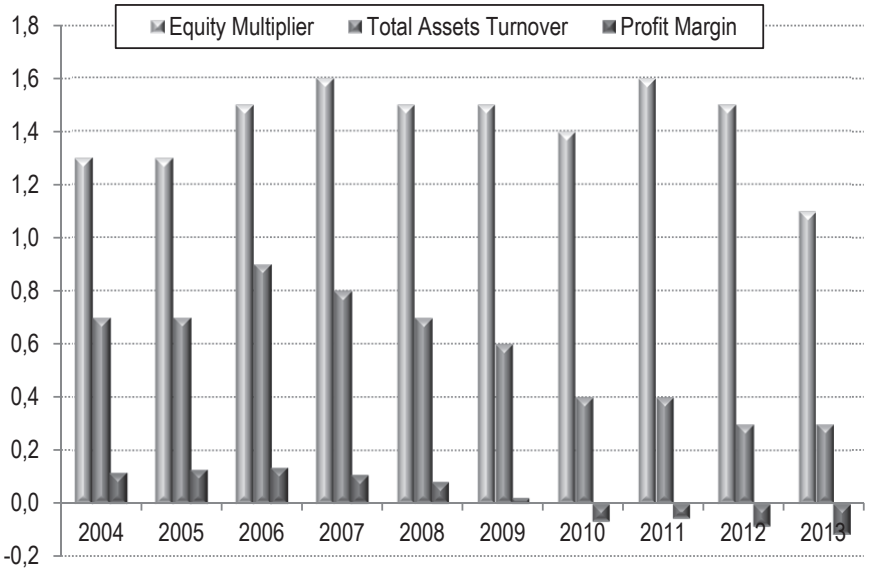
On the graph 4 we can see the evolution of profitability and business dependence on debt. From the analysis we observe that till the 2010 the profitability was on average positive with downward trend after 2006. Since 2010 the average profitability is negative. Meanwhile, the average leverage ratio for the whole sample shows an increasing trend until 2009 and then diminishing. It is worth noting that approximately 64% of enterprises participating in the research was using banking debt in financing in the period considered. Comparing the two sub-periods: before and during the crisis we may observe significant credit expansion in the period before the crisis. The increase of total debt in the pre-crisis period was mainly caused by the increase of long-term debt. The impact of the crisis on external borrowing becomes apparent since 2009 when we can noted first decrease mainly in long-term borrowing. The situation changed dramatically in 2010, where for the first time, the change in overall lending by businesses was negative with significant reduction of long-term debt and expansion of short term lending. The initial expansion of short-term lending was caused mainly by the enterprises' efforts to meet the borrowing requirements through short-term borrowing and postponement their investment plans. From 2011 the business access to credit becomes more difficult and affects also the short-term lending. The demand for business loans fell partly because most businesses experienced a decline in sales, business owners had a heightened level of uncertainty concerning future sales and they address their balance sheet problems by reorganising and scaling down their operations in a way that reduces their need for external financing. The worsening economic situation in many companies affected their credit standing and has limited their access to credit market.



Graph 5. Profitability and Use of Debt, 2003-2013

Source: Bulletin of Conjunctural Indicators, 2015.

Analyzing the downturn trend of ROE and observing its components we can conclude 1) decrease in the net profit margin and asset turnover which is negative sigh for companies and 2) increasing trend in equity multiplier till 2007 and decrease from 2008 with exception 2011. The last trend is positive since in the risky environment the increase of leverage may cause turbulences for the firm.



Graph 6. Main components of ROE

Source: Bulletin of Conjunctural Indicators, 2015.

Conclusions

Greece is in the fifth year of deep recession. In a country where 85% of private employment is concentrated in SMEs and more than 50% in micro enterprises, a prolonged recession, which is exacerbated by austerity measures has affected profoundly Greek companies. The financial crisis and the recession negatively affected credit flows to businesses for several reasons, including a tightening in the supply of credit by financial institutions, and the deterioration of financial health of potential borrowers. As outlined in the analysis above, banks' balance sheet and capital positions and borrowers' credit risk affect banks' decisions regarding credit provisions. Nonetheless, making a conceptual distinction between supply-side and demand-side factors in credit markets is difficult. Banks' perception of the risks associated with potential borrowers can lead to credit rationing. So, on the supply side, there has been a tightening of credit standards for bank

loans to non-financial firms. At the same time, borrower-specific situation, also associated with creditworthiness can influence the demand for loans. So, on the demand side, the persistently weak level of economic activity, high uncertainty, low confidence and the need to reduce the high debt levels have continued to weigh on borrowing. On the other side, general macroeconomic conditions and availability of alternative financing sources and internal financing also affecting the demand for banks debt.

The structure of Greek economy with the large share of small and medium enterprises makes it very sensitive to fluctuations in the business cycle. Small businesses are always hit harder during financial crises because they are more dependent on bank credit to fund their growth. The conditions of credit markets act as a "financial accelerator" for small firms; they feel the swings up and down more acutely due to their reliance on the flow of bank credit.

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TRANSFORMATION, INTEGRATION, GLOBALISATION AND CHANGES IN THE WORLD ECONOMY SUBSYSTEMS

Abstract

Systemic transformation, international economic integration and globalisation have been, without doubt, the most important socio-economic processes of the last decades. These processes have a huge impact on the economies of individual countries, as well as the contemporary system of the world economy. The subsystems of the world economy are also changing. The subject of discussion in this paper is to show their impact on changes and the emergence of new subsystems of the world economy. These considerations are preceded by a short presentation of the system and subsystems of the world economy, and a discussion of subsystems of the world economy in the past. At the end, conclusions drawn from the study are included.

JEL Classification Code: **F01, F02**.

Keywords: world economy, subsystems of world economy, systemic transformation, international economic integration, globalisation.

Introduction

The world economy, which emerges at a certain stage of economic development, has become a subject of research. Economists are interested in its emergence and development, change factors, the main trends and directions of change, as well as its structure. Its subsystems are also the subject of interest. For the world economy (world economic system) is not homogeneous. Within its framework, we can identify many groups of countries with similar characteristics, which are treated as downstream systems.

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In recent decades, many new developments and socio-economic processes have taken place in the world economy. The most important ones include: systemic transformation, the development of international economic integration and globalisation. These processes affect the nature of the world economy and its subsystems.

The goal of this paper is to show the influence of these socio-economic processes on the changes in the subsystems of the world economy.

1. The system and subsystems of the world economy

Different definitions of the world economy are presented in the literature. One of them is: '[...] historically shaped, varying in time, system of the production, technological, commercial, financial and institutional links among various countries of different social systems and levels of economic and social development, integrating them into the global process of production and exchange' (Sołdaczuk, 1987, p. 7). Others define the world economy in a similar way[3].

Hence, the world economy is treated as a system, and, therefore, it should be borne in mind that[4]:

- The world economy is a whole (arrangement) consisting of many elements between which occur various links, including feedback. These elements interact. They also have an impact on the whole that they create.
- The world economy is part of a large social system, where a political and cultural system can be distinguished as well. Therefore, non-economic factors also affect the world economic system.
- The world economy is dynamic. This system is in constant motion and development, as its elements (entities of the world economy) are constantly changing. Economic links occurring between them are also changing (e.g. forms of economic exchange). This system is constantly evolving.
- This category has also a historical character, namely it emerged at a certain stage of development (with the rise of the capitalist economy and the indus-

[3] The world economy is also defined as '[...] a system which binds its composite national economies of individual countries and their groups, while, as a whole, it affects the processes of the operation and growth of its components' (Kleer, 1981, p. 39) or – A. Makać writes – '[...] a community of diverse organisms and institutions functioning both at the national and at the international level, thus, for example regional, trans-regional or global (such as, among others, domestic and international/ transnational enterprises, national economies, states, integration groupings, international organisations) directly or indirectly engaged in economic activity and interrelated in a complete system through a network of international economic relations' (Oziewicz, 2006, p. 13).

[4] For more on this topic see: Swadźba (2008).

trial revolution, and so the development of the production on a mass scale on the market, for unknown recipient; at the same time then the international exchange develops on a large scale). Since then, the world economy has evolved and passed through various stages.

- The world economy is also a stochastic system, so we can only talk about the directions of development and trends that exist in the world economy. It is impossible to predict its future accurately.
- The world economy is not just a simple sum of its constituent elements (national economies). It is something more. This is a new quality. Interrelationships between components of the system cause the emergence of the new features of the system.

Within the system one can distinguish subsystems (downstream systems). This also applies to the system of the world economy. For presenting the world economy as a system, its components can be regarded as subsystems. They can be understood as '[...] separate parts of the system, subordinated to the regularities of two types: internal regularities and external regularities from the perspective of each of the subsystems, which are the general regularities of the system' (Kleer, 1981, p. 83).

If national economies are recognised as subsystems of the world economy, then their total would be of over 200. For this reason, the division of the world into groups of countries is created in the literature and – in this way – there are much fewer subsystems of the world economy (a dozen or so). Sometimes, the notion of the regional structure of the world economy (regions of the world economy are regarded as subsystems) is used instead of the term subsystems. It is believed that some countries have many common characteristics and can be included in one group. A variety of criteria are used for their disgregation. The most common are: geographic location, level of economic development of individual countries (GDP/GNP per capita or HDI are frequently used), the socio-political system in given countries (it can be the division into two main systems, namely capitalism and socialism, or the market economy and centrally planned economy), as well as many others (history, tradition, culture, religion, lifestyle etc.).

There can be many more such disgregation criteria. In recent years – due to the rapid changes taking place in the global economy – there was a need to include new criteria for the division of the world economy subsystems. This can be a criterion of: the degree of globalisation, membership in particular integration groupings, international organisations, etc. It should be emphasized that a single criterion is not often used in practice, usually two or three criteria are used simultaneously. Existing divisions were mostly based on a few of them (mainly the criteria of geographical location and the level of socio-economic development are used).

2. The world economy subsystems in the past

In the history of the world economy we had to deal with various subsystems. Other subsystems were distinguished in the traditional economy, and other in the contemporary (post-war) the world economy.

The traditional system of the world economy was built at the turn of the eighteenth /nineteenth century and continued essentially until the end of World War II. It was associated with the emergence and development of capitalism, colonialism, the industrial revolution etc. It was closely associated with the international division of labour moulded in those days. At that time – in the literature there is a consensus on this – there were usually distinguished two subsystems: 1. Highly developed, industrialised countries, specialising in the manufacture and export of highly processed industrial products and 2. countries that were at a much lower level of development, specialising in agricultural production and exploitation of raw materials, and the export of these products. These were usually colonial countries that did not have their own sovereignty. These could have been independent countries, but politically and economically dependent on the first group of countries.

Three subsystems can be distinguished in the post-war period, namely: 1. highly developed capitalist countries, 2. socialist countries and 3. the third world countries (developing countries). In this case, there is an agreement as to the division in the economic literature. As for the causes of changes in this division, these were: the victory of the Soviet Union and the creation of a new socialist system in the world, the collapse of the colonial system and the emergence of many new countries on the world map), and the specific characteristics of individual subsystems (role of the state and the market economy, democracy – dictatorship, level of development, etc.). The so-called comparative economics dealt with the analysis of these subsystems. Most commonly discussed – within the individual subsystems – were: the goals of economic activity, economy, relationships within subsystems, regularities of their development, etc. (Kleer, 1981; Sołdaczuk, 1987).

This division of the world economy into three subsystems become out of date at the turn of 80s/90s of the twentieth century. This was the result of a series of various events. The most important of these include: the collapse of the socialist system and the beginning of systemic transformation in these countries. The second reason is the development of integration processes in the world economy (regionalisation). During this period, a lot of changes also occurred as a result of increasing globalisation. It is the process which had the greatest impact on the changes in the world economy and its subsystems.

3. Systemic transformation and the subsystems of the world economy

Systemic transformation has led to the disappearance of one of three systems of the world economy – the socialist countries. The socialist countries were replaced by the countries in transition in one of the new divisions of the world economy characterising the so-called regional structure of the modern global economy. Among others, A. Makać distinguishes (Oziewicz, 2006, p. 23): economically developed countries (highly developed), developing countries (poor countries) and countries in transition. Each of these groups is treated as a separate region (subsystem) of the world economy. The countries are classified into one of these groups. This division refers to the post-war division of the world economy into three subsystems. A group of socialist countries replaced with the new term 'countries in transition', i.e. with economies in transition from a centrally planned to a market economy.

It should be stated that this division is a major simplification. The group of countries in transition is not homogeneous. The collapse of the socialist system showed that these countries were not monolithic, as it had often been shown. These countries have started the systemic transformation at about the same time, but its nature was different and its effects are different. This applies both to the countries of Central Europe (to a lesser extent), and the countries of the former Soviet Union (to a larger extent). As a result, this group has undergone significant diversification. On the one hand, we have a group of countries that have joined the EU, that is countries with a market and democratic economy (the criterion of membership), representing a relatively high level of economic development, and on the other hand, the former Asian republics of the USSR (5 new countries) – quasi-democratic countries or totalitarian regimes, often having more in common with a centrally planned economy or a feudal system, countries with completely different socio-cultural system and which are at a much lower level of economic development (GDP per capita). Among them there are the European countries of the former USSR (excluding Lithuania, Latvia and Estonia), which more or less represent the European standards of democratic market economies (hybrid economic systems)[5]. As it can be seen, within this group (subsystem) there should be distinguished at least three subgroups (downstream subsystems).

A similar division into three groups of countries is proposed in UNCTAD studies (Development ..., 2004). It is a division into: (1) developing countries, (2) Central and Eastern European countries and (3) developed countries. Up to 184 countries and territories were included in the first group (Africa – 58, America – 49 Asia – 49, Oceania – 28). The second group includes 19 European countries – the former socialist countries. These are: Albania, Belarus, Bosnia and Herzego-

[5] For more on this topic see: Swadźba (2003, 2004).

vina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Serbia and Montenegro (now it will be Serbia, Montenegro and Kosovo), Slovakia, Slovenia and Ukraine. The third group consists of 32 countries, including 26 countries and territories in Europe (other countries) and Canada, the USA, Australia, New Zealand, Japan and Israel. This division, which takes into account the level of development and geographical location seems to be better (due to previous reservations), although it can also be the subject of criticism (due to the very large differences in income levels in a group of European countries). The former socialist countries (countries in transition) have not been thrown into one bag in this division.

In turn, for practical purposes, the IMF distinguishes two groups of countries in the world economy, namely advanced countries – 37 countries and emerging markets and developing economies – other countries (152). The second group consists of 6 sub-groups: European countries (13 countries), Commonwealth of Independent States - CIS (12 countries), developing countries in Asia (29 countries), developing countries in Latin America and the Caribbean (32 countries), the Middle East and North Africa (20 countries) and Sub-Saharan Africa (45 countries). In this division, the first group of countries includes the Czech Republic, Estonia, Lithuania, Latvia, Slovakia and Slovenia. Other post-socialist countries – including Poland – are in the second group[6]. This division further takes into account the diversity of the former socialist countries.

Another classification is used by UNCTAD, which – also for practical reasons – distinguished three groups of countries: 1. developed or industrialised countries: OECD (except for Mexico, South Korea and Turkey), the new EU countries and Israel; 2. the countries in transition in South East Europe and the CIS countries; 3. developing countries (other countries). This latter group is divided into groups according to geographical criterion (Trade, 2014). It can be noticed that in this division the former socialist countries are classified in the first or second group depending on the EU membership.

At this point one might mention one more possible classification. In the past, the primary classification criterion was the existing socio-economic system (capitalism and socialism) in given countries. Currently, the dominant system is capitalism with its specific market economy. However, there is no one capitalism and one market economy. Thus, their type, kind, nature can be the basis of distinctions of various subsystems of the world economy. In the literature, Polish and foreign, there were different models of the market economy (capitalism)[7].

[6] As the first country in this group was included the Czech Republic. Other countries have been qualified later. It is worth noting that these are the countries of the euro zone (www.imf.org).

[7] Note, however, that capitalism is a broader concept than a market economy. Capitalism is not just the economy (economic system), but also the political, cultural system

Their number is quite substantial. Most often, depending on the degree of state interference in the economy and the level of social security of citizens, there are distinguished: liberal economy model, social market economy model, model of the welfare state and Asian model. One can also come across the concept of the Mediterranean model, the EU model, as well as other terms.

Assigning all countries to specific models of the market economy (capitalism) would be extremely difficult and debatable. However, the possibility of such a classification and distinction of new subsystems of the world economy should be mentioned in theoretical considerations. The post-socialist countries also vary in this respect. In Europe, some countries represent the liberal model (neoliberal), while others are moving towards a social market economy or the Mediterranean model. The Asian model (Asian Tigers) is close for China and Vietnam, but for other countries (Asian republics of the former Soviet Union) it might be the Islamic state model.

4. Economic integration and world economy subsystems

International economic integration has become one of the major socio-economic processes of the last decades. Its origins date back to the 50s of the twentieth century and were referred to Europe only. The development of European economic integration and its positive effects meant that the process has moved to other regions of the world economy. Hence, we talk about regional economic integration. Now, we have to deal with it on all continents. Integration groupings are treated as new actors of the world economy. This is not a simple sum of national economies, it is a new quality. There are new institutions which give the world economy a new character (Oziewicz, 2006). Does economic integration effect, and if so how, changes in world economy subsystems? Have the integration groups became (are they becoming) its new subsystems?

This can happen, but only when we deal with the process of its 'deepening', namely the transition to a higher and higher level (degree) of integration: from the free trade zone and customs union to a common market, and next to an economic and monetary union. Such is the case of the mainstream of the European integration. The development of European integration has led to the transfer of some powers of nation states to the EU institutions, which – leading common policy – have led to systemic convergence (assimilation of national economic systems, their differentiation is becoming smaller). Its scope gradually grew and began to cover new areas. Hence, we are dealing with the construction of a single economic model of the European Union (EU). This is identical with the formation of a new subsystem of the world economy (Swadźba, 2007).

The process of 'widening' the European economic integration should also be mentioned. The EU (formerly the European Communities) has become attrac-

tive to European countries that are not Member States. Successive enlargements have caused that its composition changed from six to nine, then to ten, twelve and fifteen countries (EU-15). After the collapse of the socialist system, the EU has grown by further countries: EU-25, EU-27 and EU-28. Additional European countries are waiting in line for the EU membership. This means that the EU is a growing area of the global economy in terms of population, area, and, above all, the economic potential (size of the generated GDP). Thus, it aspires to become a new subsystem of the world economy.

Is that also the case of other continents? Well, no, and if it does, it is experienced on a much smaller scale. This is due to the fact that integration groupings occurring there are most commonly free trade zones. Less frequently, it is a customs union or common market, not to mention the economic union. These groupings (with few exceptions) do not provide for unification or even coordination of the economic policies of their member countries. There are no developed institutions that take specific action in this direction. At this point it is worth to mention some integration groupings in which the convergence is taking place in the real economy, and to some extent in the regulatory sphere. These groupings claim to be the world economy subsystem (Swadźba, 2007).

In the first place there should be mentioned the North American Free Trade Agreement (NAFTA) which includes: the US, Canada and Mexico. From the standpoint of economic potential it is the largest integration grouping, comparable to the EU. The economies of the USA and Canada had already been integrated (informal integration). Mexico's accession to the agreement was made possible as a result of the reforms carried out there towards more democratic, market and liberal system. Mexico is moving towards the American model. In this sense, NAFTA contributes to the systemic convergence, not only in the real economy (there are still big differences in the level of development), but mainly in the regulatory sphere. Although NAFTA is only a free trade zone, it also contains elements relevant to higher forms of integration (the issues of environmental protection, movement of capital, labour, services, etc.). Thus, NAFTA is increasingly becoming a new subsystem of the world economy.

The second group in America which should be mentioned is the Southern Common Market (Mercado Common del Sur – MERCOSUR). It only consists of 4 countries of South America, including two largest (Argentina and Brazil). In addition, several other states are associated with this grouping. MERCOSUR is a customs union (with some exceptions), and in addition it also has some elements of common market and economic union. It is the most dynamic and promising grouping which can be an important subsystem of the world economy in the future. In practice, it is already treated as a separate regional group of countries.

From Asian groupings, a special attention should be paid to the Association of South-East Asian Nations (ASEAN). Although its origins were political, it is now

dominated by the economic factor. The scope of ASEAN's activity is not only the liberalisation of trade, which has become a reality. It is also cooperation in the field of industrial development, financial services, agriculture, energy, transport etc. ASEAN, to some extent, is already treated as a recognisable subsystem of the world economy. It is in fact identified with the Asian Tigers. Attention should be paid to the informal cooperation of ASEAN with Japan, South Korea and China. The term ASEAN + 3 has already been coined. It would be the largest integration grouping in the world.

Attention should also be paid to the Gulf Cooperation Commission (GCC). It consists of 6 countries of the Arabian Peninsula, which have many features in common (religion, language, hereditary governments, high level of GDP per capita, alliance with the USA, avoiding war conflicts, etc.). A customs union has already been in operation there. Moreover, these countries also cooperate in the development of the oil industry (common interest), as well as have already announced the introduction of the single currency ('Arabic euro'). These countries have already been included in the new subsystem which are oil countries, but the concept is broader. The GCC countries are its strong backbone[8].

In practice, there are already classifications of the world countries according to their membership in integration groupings (commercial). This type of classification emerged in UNCTAD[9] and the WTO[10] studies. There is no doubt that this is a new division and it is becoming increasingly important with the development of regional economic integration. Its disadvantage, however, is that it cannot take into account all countries (not all the countries are members of integration groupings), and some of them are counted more than once (in the case of belonging to two or more groupings that takes place in Africa or South America).

5. Globalisation and the world economy subsystems

Globalisation is also an important, if not the most important, socio-economic process. This is nothing else but international integration on a global scale – not regional. This is a growing integration (merging) of national economies. This is rapid acceleration of the process of internationalisation of management. It is

[8] The processes of regional integration in the world economy more broadly, among others, in: (Orłowska,& Żołądkiewicz, 2012).

[9] See also: World Investment Report. See: www.unctad.org

[10] E.g. in International Trade Statistics. See: www.wto.org

a very broad and complex process with an economic, social and political dimension. It is a process that produces positive and negative effects[11].

Globalisation understood in such a way should lead to the systemic convergence, to a 'borderless world economic order'. In such a uniform world, there would be no room for subsystems. That would be a single model of the world economy – capitalist, liberal and democratic economy. That is not so. In addition to the theoretical and practical arguments in favour of the systemic convergence, there are also arguments in favour of divergence. It has been emphasized that globalisation and its positive effects can only occur in some parts of the world. The negative effects of globalisation lead to polarisation of the world, and thus to the diversification of the world economic system (Swadźba, 2007). In such a world there is a place for its subsystems.

The ongoing process of globalisation has caused that one of the criteria for allocating countries to subsystems is their participation in the globalisation process. At first, this division appeared in the report of the consulting firm A.T. Kearney 'Globalization Ledger' which shows the degree of globalisation of 34 selected countries. These countries are divided into 6 groups depending on the level of the so-called index of globalisation (Globalization Ledger). In the following years A.T. Kearney measured the level of globalisation in a much larger number of countries – The Globalization Index[12]. The division of countries according to the degree of globalisation also appeared in the World Bank's reports. In one of them, the developing countries – depending on the relationship of foreign trade to GDP – were divided into two groups: 'more globalised' (24 countries) and 'less globalized' (49 countries) (Globalization, Growth and Poverty). Similar rankings represent other research centres[13]. Their main drawback is that – unlike in the previous divisions of UNCTAD and the World Bank – they cover a narrower group of countries in principle.

The level of globalisation is measured by a new index developed by the Swiss Economic Institute in 2002. KOF index (Ger. Konjunkturforschungsstelle) measures the economic, social and political dimensions of globalisation (scale 1-100). It takes into account changes that have occurred in the economy since 1970. In a report from 2015 (based on data from 2012). were included up to 207 countries.

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[11] Due to the purpose of the paper it does not make sense to develop the above issues. The literature on the subject is very extensive. On this subject writes, among others: Swadźba (2007). See also: Orłowska & Żołądkiewicz (2012).

[12] See: www.atkearney.com

[13] Extensive research on this topic was led by the Centre for the Study of Globalization and Regionalization in the years 1982-2004, which presented an index of globalisation, including economic, social, political globalisation (CSGR Globalization Index).

The most globalised countries are: Ireland, the Netherlands, Belgium, Austria and Singapore[14].

Globalisation has contributed to many changes in the global economy and thereby – indirectly – to the emergence of new subsystems of the world economy. It cannot be divided into 2 or 3 subsystems, and if it is done, then these divisions are highly debatable. Hence, there are listed 5 or 6 subsystems, and even then this number less accurately – than in the past – reflects the existing differences between subsystems. The rapid development of the world economy has contributed to its diversification. Currently, speaking of subsystems of the world economy, one has in mind such subsystems as newly industrialising countries (NIC), the countries of Southeast Asia (the so-called 'Asian Tigers' of I as well as II generation), newly emerging markets, the oil states (distinguished from developing countries due to their specificity – countries with very high GDP per capita), developing countries (former countries of the so-called 'Third World'), developing countries at a very low level of development (i.e. 'Fourth World') and others. Also in this context, the emergence of the BRIC group, the G-7 or the G-20 should be analysed.

The term 'emerging markets' appeared at the beginning of the 80s of the twentieth century. This term – according to its author, a World Bank economist Antoine van Agtmaela – was to replace the term 'Third World'. This term was adopted in the literature and world politics, pointing to the end of the era of dividing the world economy into the aforementioned three subsystems. The last of them diversified to such an extent that its continued use does not reflect the existing reality (Zielińska-Głębocka, 2012).

The successive waves of industrialisation led to the emergence of a group of newly industrialising countries (NIC) in the 80s of the twentieth century. The OECD included in this group: Brazil, Mexico, Hong Kong, South Korea, Singapore and Taiwan. In the 90s they were accompanied by the countries of Southeast Asia (i.e. second generation Tigers) as well as China and India. Currently, some of these countries have reached a high level of development and have become members of the OECD. Others are included in the new world economy subsystems (Zielińska-Głębocka, 2012).

Noteworthy is another term that has emerged in recent years, namely the BRIC countries. The abbreviation is derived from the names of the four most dynamically developing countries classified as emerging markets: Brazil, Russia, India and China. It was introduced by Jim O'Neill, an economist at Goldman Sachs, in 2001. With time, other countries were attempted to be entered to this group, including South Africa. Therefore, the literature shows the term of the BRICS

[14] www.globalization.kof.ethz.ch

(S – South Africa). The creator of this term proposed a new one, namely 'growth markets' and referring it to new countries (Zielińska-Głębocka, 2012).

It is not a binding division of the world economy subsystems. These are just the terms – appearing in the economic literature – of various modern subsystems distinguished according to different criteria. Some of them refer to the same countries and are used interchangeably. In case of the others, they are not synonymous. It would be difficult to qualify many countries into individual subsystems. Therefore, it seems necessary to create different subgroups or increase the number of subsystems that better reflect the existing reality.

From the foregoing considerations it follows that we have had to deal with many new divisions of the world economy into its subsystems in recent years. It should be noted that these divisions do not always use the term subsystem. They are often referred to as: the regions, groups of countries etc. These breakdowns are presented by economists dealing with the world economy. Sometimes these are the divisions created on the side of other research. Own divisions are also employed by international economic organisations.

Conclusions

The conducted research of the world economy system and its subsystems allow for drawing the following conclusions:

- Subsystems of the world economy, as the world economy system, are constantly evolving.
- These changes affect different phenomena and socio-economic processes that appear or disappear at certain times. In recent decades, these have included: systemic transformation, international economic integration and globalisation.
- The transformation has contributed to the disappearance of socialist economic system, as one of the three post-war subsystems. The post-socialist countries have gone in a different directions. Currently, they are a part of many different sub-systems or create a new hybrid system (China). In addition, it should be remembered that this system is still functioning (Cuba and North Korea) in a very truncated form.
- There has been the development of international economic integration. If it had previously been characteristic for Europe only, now it encompasses all other continents. A membership in the integration groupings is a new criterion to distinguish economic subsystems. Countries belonging to the most developed integration groupings, which share common characteristic features, undoubtedly are a new subsystem of the world economy (European Union countries).

- The impact of globalisation is also large, both direct (there are newer classifications of countries according to the degree of globalisation) and indirect (through the impact of globalisation on the development and liberalisation of international trade, the development of scientific and technological progress, economic growth, and many others – both positive and negative – effects). The latter manifests itself in the emergence of such subsystems, as newly industrialising countries (NIC), emerging markets, BRIC and others.

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INVESTIGATING THE REASONS OF GREECE'S UNDERPERFORMING IN FORFAITING

Abstract

The aim of this paper is to point out the characteristics of Forfaiting as it is applied the Greek economy and to investigate the reasons of its underperformance. The conclusions are linked with the dominant role of transactions with free shipping documents instead of time letters of credit.

JEL Classification Code: **F10, G3**.

Keywords: forfeiting, export, transaction.

Introduction

Forfaiting is consider a medium or long term form of financing that consists of discounting obligations due to mature at a future date with non-recourse to the exporter in case of non-performance.

It is considered as a flexible form of financing that can be adjusted to the varying requirements of the exporters.

Forfaiting covers the credit risk and besides the risks of fluctuation of interest rates and exchange rates. The discounting may be up to 100% of the present value of each transaction after subtracting the expenses. Forfaiting is addressed to exporters giving them flexibility in their credit policy without binding existing credit lines of the companies. It includes 100% financing without recourse. The claims are secured either by the letters of guarantee or by bills of exchange, promissory notes or even letters of credit.

The cost of forfaiting will depend on factors like the country of the importer, the nature of goods (usually capital goods), the importer's name and reputation, the

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value of the goods, the shipment date and the terms of repayment sought by the importer, the quality of the guarantee for the importer's obligation, the currency etc (Credit Suisse – First Boston, Forfaiting An Introduction, FINANZ AG ZURICH).

Pros and Cons of Forfaiting

The advantages of Forfaiting can be summarized in the following:

- Forfaiters finance the exporters without the right of recourse. Therefore the exporters transfer the business and the political risk to the Forfaiters. So, they can export to countries that could not be approached without forfaiting, due to increased risk.
- Additionally, it is the forfaiters than bear the risk of fluctuation of interest rates and the risk arising from the changes in the exchange rates.
- The exporters receive cash immediately after the delivery of their products and therefor their liquidity is improved, the bank borrowing is reduced and their own funds are freed for other activities.
- The exporters don't spend time and money for handling and collecting their claims, as they have been transferred to the forfaiter.
- The exporter is not obliged to assign the whole volume of his works to a single forfaiter as the negotiation for financing though forfaiting takes place separately for every specific transaction (spot).
- The exporter is entitled to demand secrecy over the financing and therefore the transaction can remain confidential.
- As Forfaiting , is a process without recourse, it helps the borrower to have a better looking balance sheet, because instead of having accounts receivable, the borrowing company will have cash.

The drawbacks of forfaiting can be summarized in the following:

Lack of legal framework for the protection of Forfaiter against the risks connected with international transactions.

- Due to the high risks involved in Forfaiting, the cost is very high for the exporters. (Interest rate in Greece around 6%, commission ranges from 4% to 5%, Source: Eurobank).
- Lack of secondary market for the instruments involved and consequently lack of liquidity.
- The exporter needs to find a guarantor acceptable by the forfeiter.
- It is limited to medium and long term transactions and usually to amounts exceeding 100.000,00 euros.

Reasons for Greece's underperforming

The presence of Forfaiting in Greece is too weak. This condition is connected mainly with two basic characteristics of the Greek economy. More specifically with the low performance in exporting and the limited potential of producing capital goods. (Kyrmizoglou)(Albaum G – Duerr E)

According to the World Bank the exports of Greek goods and services as a percentage of the G.D.P. are very low. In the following table we can compare the low performance of Greece with many other countries members of the European Union.

Table 1. Exports of goods & services in the countries of the European Union (% of GDP)

Country	Exports of goods & services (% of GDP 2013)
Austria	53.5
Belgium	82.8
Bulgaria	68.4
Croatia	42.9
Czech Republic	77.2
Denmark	54.3
Estonia	86.1
Finland	38.2
France	28.3
Germany	45.6
Greece	30.2
Hungary	88.8
Ireland	105.3
Italy	28.6
Luxemburg	203.3
Netherlands	82.9
Poland	46.1
Portugal	39.3
Romania	42.0
Slovak Republic	93.0
Slovenia	74.7
Spain	31.6
U.K.	29.8

Source: World Bank.

The World Bank ranks Greece in the 48th position in the Ease of Trading Across Borders. This position (regarding exports) could be much better if the average number of days needed for an export could be less. The exporter on aver-

age needs 15 days to complete an export, compared with an average of 10.5 days needed for the OECD countries. The difference is mainly due to the number of days needed to prepare the required documents (although the number of documents is the same with OECD, namely 4: Bill of lading, Commercial Invoice, Customs Export declaration and Packing List). (Doing Business 2015, World Bank)

It is important to notice that the value of consumer goods exports is (at least) 4 times higher than the value of capital goods exports. As Forfaiting focuses mainly on exports of capital goods (internationally) we realize that under these conditions there is not enough room for Forfaiting to grow in Greece (At least in the short-run).

Besides the composition of the national economic output (Services sector 80.6%, Industry 16% and Agriculture 3.4%), shows the weak position of the manufacturing sector. The fact that the vast majority of the Industrial Production in Greece consists of consumer goods, shows the low potential for Forfaiting in the near future.

Additionally the following reasons lead to difficulties in the spreading of Forfaiting in Greece:

- Forfaiting is a transaction needing specialized staff with long experience.
- Banks do not have an incentive to deal with Forfaiting, as it is a transaction that doesn't necessarily lead to a wider collaboration of exporters with the bank in other fields.
- Forfaiting is usually a form of financing with fixed interest rates and this lack of flexibility makes the Greek banks skeptic and reserved.
- There is a big obstacle for the development of Forfaiting in Greece and it is the existence of the Export Credit Insurance Organization (ECIO). This organization is non-profit seeking and it is supervised by the Ministry of Economy. It has a State Guarantee Capital amounting 1.47 billion euros. ECIO insures against commercial and political risks of non-payment, the export credits guaranteed by exporters to foreign buyers. So Forfaiting, has to face competition from a State Organization, to some extent with unequal terms.
- According to the answers received by bank officers (4 systemic banks) dealing with Forfaiting activities, the difficulties in the spread of Forfaiting are connected with problems inherent in Greece's International Transactions. More than 60% of those transactions are carried out with free shipping documents. This practice implies that exports are addressed to people (companies), they know each other. Exports like this based on the personal relation between the parties involved, do not leave much room for the development of Forfaiting. As the Greek economy is dominated by small firms, we can realize that Forfaiting can do very little for them.

Besides the interviewed officers stressed the imperative need for the banks making their customers more familiar with the concept of Forfaiting.

Perspectives of Forfaiting in Greece

The future of Forfaiting in Greece is connected with changes in Forfaiting itself. It seems that in the last few years, there is a tendency for Forfaiting to include consumer goods and services. It seems also that Forfaiting refers to even longer periods (more than ten years). (Christopoulos A. – Ntokas J.)

The current crisis creates conditions for further spread of Forfaiting as:

- The credit risk increases due to the lack of liquidity.
- Access to bank financing has become more difficult.
- The risk of countries has been increased.

Besides, reforms are expected to speed up, either due to the pressure of the European Commission, the European Central Bank and the International Monetary Fund or because it is widely acceptable in the country, that they are necessary. These reforms will create a more business friendly environment and of course the promotion of exports and less State intervention will be top priorities.

On the other hand, the Greek Banks need to undertake a more active role in informing their customers and making them more aware about the nature of Forfaiting.

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