PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU
RESEARCH PAPERS OF WROCŁAW UNIVERSITY OF ECONOMICS nr 482 • 2017

Wrocław Conference in Finance: Contemporary Trends and Challenges ISSN 1899-3192
e-ISSN 2392-0041

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DEVELOPMENT OF FINANCIAL SYSTEMS IN 1995-2014 – A FACTOR ANALYSIS*

ROZWÓJ SYSTEMÓW FINANSOWYCH W LATACH 1995-2014 – ANALIZA CZYNNIKOWA

DOI: 10.15611/pn.2017.482.05
JEL Classification: O11, O16, F36, G00

Summary: The aim of the research was to analyse financial system development patterns for both 19 post-communist European economies and 21 non-post-communist (advanced) countries over the 1995-2014 period. The use of a factor analysis allowed for identifying two unobservable factors which account for most of the variance of the 9 observed variables characteristic of the economic and financial development, the banking sector's standing and the structure of the financial sector. Identified factors represent the financial system development and growth of the banking sector, but their roles differ among the analysed groups of countries. The banking sector is a significant driving force of development in both cases. Yet, in advanced economies, a certain role is also played by the stock market, which is not the case for post-communist countries. The results show that there is higher homogeneity in the financial system development patterns in post-communist countries, while the roles of both factors are more heterogeneous among advanced economies. Lastly, the results provide evidence that the global financial crisis did not cause a permanent structural change in these two processes.

Keywords: post-communist countries, financial system, factor analysis.

* This article is based on the results of statutory research titled *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?* funded by the Collegium of Management and Finance (No. KZIF/S/12/15) at Warsaw School of Economics (SGH) carried out in 2015. The opinions expressed herein are those of the authors and do not reflect those of the associated institutions. The statistical annex to the report from the statutory research was prepared by: Bazy 3000, Marek Karwański (NIP 113-080-13-83, Regon 010162551). We are grateful to dr Marek Karwański for helpful discussions and valuable comments to the earlier version of the paper. All remaining errors are our own. The earlier version of the paper was published as [Iwanicz-Drozdowska, Smaga 2017].

Streszczenie: Celem badania była analiza rozwoju systemów finansowych 19 europejskich krajów postkomunistycznych i 21 krajów wysokorozwiniętych w okresie 1995-2014. Zastosowanie analizy czynnikowej pozwoliło na zidentyfikowanie dwóch nieobserwowalnych czynników, które odpowiadają za większość wariancji 9 zmiennych charakterystycznych dla rozwoju gospodarki, systemu finansowego oraz kondycji sektora bankowego i struktury systemu finansowego. Pierwszy czynnik obejmuje ogólny rozwój systemu finansowego, a drugi rolę sektora bankowego. Rola poszczególnych czynników jest zróżnicowana w badanych grupach krajów. O ile sektor bankowy jest znaczącą siłą napędową rozwoju w obu grupach, to w krajach wysokorozwiniętych istotną rolę odgrywa także rozwój rynku giełdowego, co z kolei nie jest obserwowalne w krajach postkomunistycznych. Wyniki wskazują na istnienie większej jednorodności w kierunkach rozwoju systemów finansowych wśród krajów postkomunistycznych, natomiast rola wspomnianych czynników jest bardziej zróżnicowana w gospodarkach wysokorozwiniętych. Analiza czynnikowa prowadzi także do wniosku, że globalny kryzys finansowy nie spowodował trwałych zmian strukturalnych w obu procesach.

Słowa kluczowe: kraje postkomunistyczne, system finansowy, analiza czynnikowa.

1. Introduction

The beginning of the 1990s marked a breakthrough for many formerly centrally planned economies in Europe, as it was the start of political and economic transformations. At the beginning, the differences in the level of economic and financial development between post-communist economies and advanced economies were significant. However, as the convergence and financial integration processes started to speed up, the financial systems in post-communist economies grew in size and became more diverse in terms of structure. There is empirical evidence that post-communist countries exhibit strong beta (β) and sigma (σ) convergence in the case of the banking sector and stock market development with advanced countries [Iwanicz-Drozdowska et al. 2016] which took place over the transition period.

Therefore, the aim of the research is to analyse the driving forces behind the financial systems' development in post-communist economies during approximately 20 years of the transformation process and use non-post-communist economies as a kind of a benchmark. The analysis covers the period from 1995 to 2014 and 19 post-communist European countries and 21 advanced countries[1].

The factor analysis is applied to identify structural similarities in the financial system development within both groups of countries. The purpose is to explore whether there are any common factors driving the financial system development in those groups of countries.

[1] The data for 19 post-communist countries include: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, Czech Republic, Estonia, Latvia, Lithuania, Republic of Macedonia, Moldova, Poland, Russia, Romania, Serbia, Slovakia, Slovenia, Ukraine and Hungary. The data for 21 advanced countries include: Austria, Belgium, Cyprus, Denmark, Finland, France, Greece, Spain, Netherlands, Ireland, Luxembourg, Malta, Germany, Norway, Portugal, Sweden, Switzerland, United Kingdom, Italy, USA and Japan.

The contribution of the paper to the literature is twofold. First, the results show that the financial crisis has not permanently changed the financial system and the banking sector development patterns. Second, there still is a relatively high homogeneity in the development patterns of the financial systems (including the banking sectors) among post-communist countries, as opposed to high heterogeneity in the case of advanced economies.

The paper is structured as follows. Section 2 contains a brief review of relevant literature. Section 3 presents the research methodology and data. Section 4 focuses on the empirical results. The conclusions are presented in the last section.

2. Review of literature

There are still major differences in the size and structure of the financial systems in post-communist and non-post-communist countries. On average, the banking systems are significantly larger (higher ratio of bank assets to GDP), yet less profitable (lower ROE), less capitalized (lower CAR) and slightly less concentrated in advanced economies, as compared to post-communist countries. Also, the size of the insurance sector and the capitalization of the stock market is higher in advanced economies, while the structure of the post-communist financial systems is significantly dominated by their banking sectors. The financial systems in advanced countries have, on average, experienced financial crises relatively more often over the period of 1995-2014. At the same time, the quality and "the institutional strength" of financial safety nets [Iwanicz-Drozdowska 2016] are on comparably high levels in both groups of countries.

There are few empirical studies on the growth and finance nexus in transition economies like the CEE[2] – with younger and relatively less developed financial systems – in which this link is significantly weaker. The financial sectors in former EU accession countries were similar and with a relatively low financial deepening level, underdeveloped stock market, the dominant role of banks and a high degree of foreign presence [Caviglia et al. 2002]. It was still confirmed 10 years later by Firescu [2012]. In such an environment, there was a relatively weak contribution of the financial sector to economic growth in South-Eastern Europe over 1993-2001 [Mehl, Winkler 2003]. Koivu [2002] using panel data from 25 transition countries over the 1993-2000 period supported the conclusion that bank credit to the private sector does not contribute to economic growth, also due to soft budget constraints (a concept introduced by Kornai [1979]) and banking crises in those economies. The lack of a positive and significant relationship between financial development and economic growth in 13 CEE countries for 1994-1999 was proven likewise by Dawson [2003]. Additionally, Fink et al. [2008] found in 9 EU accession countries

[2] 'CEE' is used for Central and Eastern Europe and 'CESEE' – for Central, Eastern and South-Eastern Europe.

over 1996-2000 an overall weak relationship and no impact of stock market development on growth. Similarly, Petkovski and Kjosevski [2014], for panel data in 16 CESEE countries, over the period of 1991-2011, confirmed the weaknesses of the link, which is mainly due to the high level of NPLs and banking crisis experiences (mostly in mid 90s). Using longer panel data for 27 transition economies over the period of 1989-2004 Akimov et al. [2009] found contrasting evidence – there was a strong and positive link between financial development and economic growth. Thus, proper financial development may have just started in those economies. On the other hand, Yu et al. [2012] found a strong link (over the 1980-2009 period) between financial development, stock market development and economic growth in high-income countries, but not in emerging market countries, including Eastern Europe. However, after the outbreak of the global financial crisis, this link might have changed in high-income countries.

As opposed to many developed countries, the CESEE countries are still in the 'middle of the road' and due to their underdeveloped stock markets, the banking sector seems to be the only viable engine of financial development.

3. Methodology and data

The aim of the factor analysis (FA) is to identify common and idiosyncratic factors. Based on the correlations between observed variables, small numbers of the latent factors are extracted. The factors span the observation space in low dimensions. It is convenient for interpretation purposes to identify latent factors which are uncorrelated linear combinations of weighted observed variables that explain the maximal amount of variance in the data [Suhr 2005]. The factors correlate highly with a given group of the observed variables (jointly representing an underlying variable which is to be identified), but poorly with other observed variables.

The factor analysis was chosen as the extension of principal components analysis (PCA). PCA has been applied to analyse financial development by e.g. Saci and Holden [2008]. FA and PCA have been used, for instance, by Klomp and de Haan [2012] to analyse the bank risk and regulations. Due to the fact that the objective of the analysis is to find similarities in the financial system development of post-communist and non-post-communist countries in this paper, it was decided to apply FA.

The data used consist of 9 variables divided into three groups[3], demonstrating the financial system development in both groups of countries. The sources of both sectoral and country-level data include the ECB Statistical Data Warehouse, World

[3] The paper analyzes three groups of variables which are characteristic of the economic and financial development (*GDP_pc* – GDP p.c. in EUR, *bank_assets* – deposit money bank assets to GDP), banking sector standing (*dep_cred* – deposits to credits ratio, *ROE* – return on equity, *CAR* – capital adequacy ratio) and the structure of the financial sector (*credit* – domestic credit to private sector to GDP, *insurance* – life and non-life insurance premiums to GDP, *stock_market* – stock market capitalization to GDP, *C5* – concentration ratio of 5 banks in the assets of the banking sector).

Bank and Helgi Library databases, as well as databases and data from reports of respective national central banks. The missing values were imputed with the use of IVEware (Imputation and Variance Estimation Software) algorithm[4].

The choice of analysed variables is determined by the theoretical framework arising from the reviewed literature. Basing on the theoretical analysis, Matysek-Jędrych [2007a], Kasprzak-Czelej [2010] and Pietrucha [2013] argue that the financial system performs important functions that contribute to the economic growth through, *inter alia*, pooling of savings and their effective allocation, risk mitigation, capital formation and liquidity provision. Yet, the review by Sobol [2015] shows that the direction of this two-way relationship, although positive, remains unclear. Thus, the paper tries to verify one direction of finance and growth nexus i.e. whether the development of the financial system depends on the economic growth (*GDP_pc*).

There are two basic financial system models – continental and Anglo-Saxon [Matysek-Jędrych 2007b]. In post-communist countries, the dominant one is the continental model; thus, the paper employs the growth of bank loans (*credit*), which fosters the consumption of private households and financial investment. The key role of the banking sector in this model is reflected by its major share in the financial systems in those countries (*bank_assets*). At the same time, the banking sector condition is determined mainly by profitability (*ROE*), solvency (*CAR*) and liquidity (*dep_cred*). The research of Bojnec and Oliynyk [2014] empirically proves that the financial system effectively fulfils the abovementioned functions, mainly through the bank lending channel in Slovenia and Ukraine. In turn, in advanced countries, where the Anglo-Saxon model takes prominence, the growth of both the insurance sector (*insurance*) and the stock market (*stock_market*) support the economic growth through intertemporal allocation of savings (allocating capital more efficiently) and by performing an intermediation role in the economy. However, the financial systems of both groups of countries underwent significant changes over the analysed period, including liberalization, deregulation, improvement of the institutional framework and globalization [Matysek-Jędrych 2008]. Thus, there is a need to verify the finance-growth nexus in the analysed groups of countries, as it might have been altered by these trends.

The total variance of the observed variables can be accounted for by means of factors, as the error variance exists. The exploratory factor analysis is used, as there is no predefined hypothesis of the structure or the number of dimensions in the analysed set of variables. As the size of the data sample might be deemed appropriate[5], the next steps of the factor analysis are as follows: an analysis of the correlation matrix,

[4] This methodology was developed by the Researchers at the Survey Methodology Program, Survey Research Center, Institute for Social Research, University of Michigan.

[5] In total, the sample consists of 420 observations for advanced economies and 380 – for post-communist countries. Additionally, Kaiser-Meyer Measure of Sampling Adequacy shows that all the observed variables, apart from the deposits to credits ratio, meet the minimum criteria for variable adequacy.

specifying the number of factors to be retained, followed by the factor rotation – and finally, interpretation of the results.

Table 1. Correlation matrix (full sample)

	GDP_pc	bank_assets	dep_cred	ROE	CAR	credit	insurance	stock_ market	C5
GDP_pc	1								
bank_ assets	**0.59011**	1							
dep_cred	0.06164	–0.03223	1						
ROE	0.0208	–0.13909	0.12767	1					
CAR	–0.25454	–0.32808	0.08157	0.06309	1				
credit	**0.5564**	**0.93497**	–0.14567	–0.13011	–0.349	1			
insurance	**0.64261**	**0.6223**	–0.12186	–0.02128	–0.26746	**0.63709**	1		
stock_ market	**0.63347**	**0.47235**	0.10311	0.09943	–0.18218	**0.49709**	**0.6049**	1	–
C5	–0.11638	–0.19326	–0.06364	0.00665	0.04497	–0.15564	–0.22896	–0.07199	1

Note: based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

Source: own study.

The correlation matrix (see: Table 1) for the whole sample provides the first insights into the possible structure of latent factors. It indicates which observed variables might be correlated closely enough to create factors[6]. To no surprise, the GDP p.c. is highly positively correlated with the size of the banking system, domestic credit to private sector, insurance premiums and stock market capitalization (all measured as % of GDP). Thus, economic growth and financial system development reinforce each other [Levine 2005]. This also translates into a relatively high correlation of bank assets to credit activity, the size of the insurance sector and the stock market. Moreover, credit to the private sector exhibits also a noticeable positive correlation to the size of the insurance sector and the stock market, hence suggesting interdependencies in the joint growth of particular financial sectors. On the contrary, the deposits to credits ratio, ROE, CAR and C5 do not seem to be significantly correlated with other variables.

The next step is to determine the number of factors to be retained out of the initial 9 observed variables, calculated as a result of the factor analysis. There are several criteria for factor extraction, but they are just empirical guidelines rather than exact quantitative solutions. That is why multiple most common factor extraction criteria have been used simultaneously [cf. Kootstra 2004]:

[6] Only correlation coefficients with absolute values over 0.30 are inspected.

1. Retaining only the factors with an eigenvalue larger than 1 (Guttman-Kaiser rule) assumes that a factor must have a variance at least as large as that of a single standardized observed variable.

2. Keeping these consecutive factors which, in total, account for about (at least) 80% of the common variance.

3. Making a scree-plot (scree test) and keeping all the factors before the breaking point or 'elbow' of the plot.

Table 2. Eigenvalues of the reduced correlation matrix (full sample)

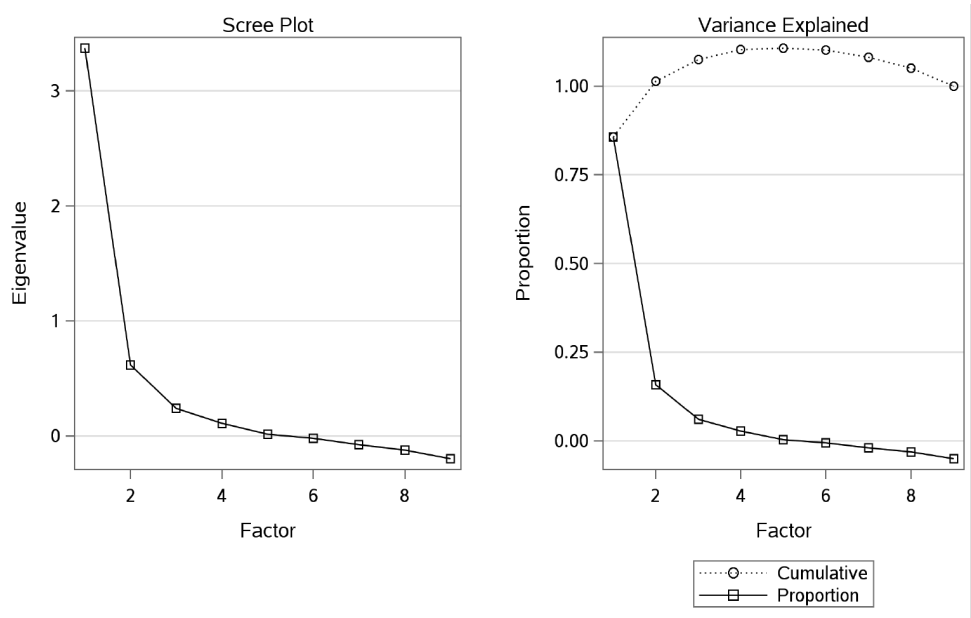
	Eigenvalue	Difference	Proportion of variance	Cumulative percentage of variance
1	**3.3713**	2.7523	**0.8569**	**0.8569**
2	**0.619**	0.3791	**0.1573**	**1.0142**
3	0.2399	0.1284	0.061	1.0752
4	0.1115	0.0983	0.0283	1.1035
5	0.0131	0.0347	0.0033	1.1069
6	–0.0216	0.0552	–0.0055	1.1014
7	–0.0768	0.0466	–0.0195	1.0819
8	–0.1234	0.0754	–0.0314	1.0505
9	–0.1988	0	–0.0505	1

Note: based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

Source: own study.

Using the criteria above (see: Table 2 and Figure 1), two factors were chosen to be extracted. Although it seems that the first factor on its own explains the significantly larger proportion of the variance (and the structure of the correlations) than the second factor, it was decided to analyse the two consecutive factors, as one factor model would not allow for a reasonable interpretation.

As the next stage, there is a need to compute the factor rotation, as it alters the pattern of factor loadings and – by the means of non-singular linear transformation of the unrotated factor pattern matrix – improves the interpretation. The standard type of orthomax rotation was employed. Application of this method results in a rotated component matrix, presenting the loadings of the observed variables on the extracted two factors. The higher the factor loading of the given variable, the higher the correlations between that variable and the respective factor. As a rule of thumb, it is possible to interpret only the factor loadings with values close to 0.5.



Note: based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

Fig. 1. Scree plot (full sample)

Source: own study.

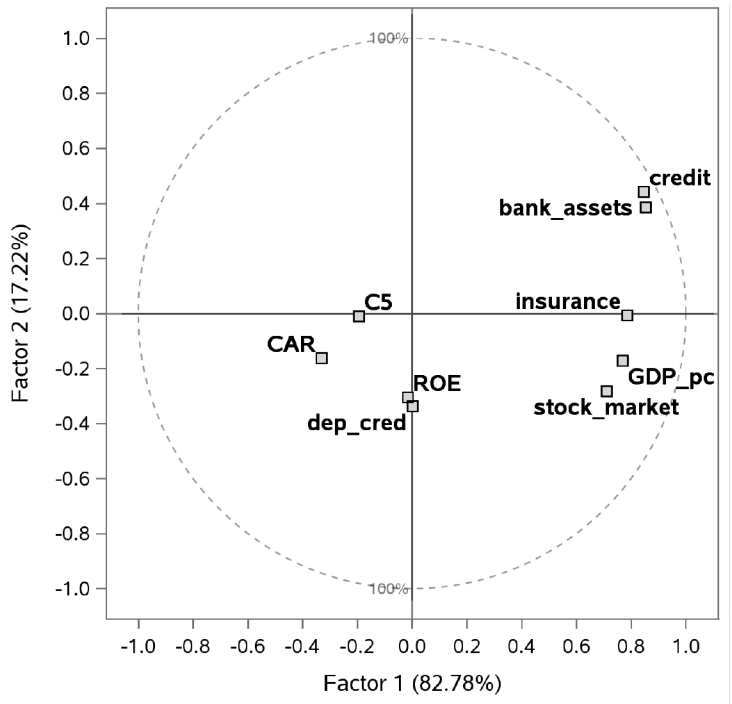
4. Analysis of the empirical results

Two latent factors were identified in the full sample of countries (see: Table 3 and Figure 2):

- the first factor is associated with the variables signifying the growth of the whole financial system (*bank_assets*, *credit*, *insurance*, *GDP_pc*, *stock_market*), hence it is called the "financial system development" factor;
- the second factor is associated with the variables characteristic for the "role of the banking sector" (*bank_assets, credit*).

After identification of two factors, the analysis of relative importance of the variables most correlated with the factors was conducted, including changes over time and cross-country comparisons. The changes of factor patterns over time (1995--2014) reveal the following conclusions concerning the variables associated with the factors:

- The relative importance of GDP p.c. has been (apart from the crisis) shifting from the second to the first factor. This means that as economies developed, the economic growth was more conductive towards the growth of all the financial sectors, not only to the growth of the banking sector itself.



Note: The elements of the factor pattern reflect the unique variance each factor contributes to the variance of the observed variable. The numbers in parentheses indicate which part of the variance is explained by a factor. Based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

Fig. 2. Rotated factor pattern – chart (full sample)

Source: own study.

- The domestic credit to private sector (*credit*) and (or) the size of the banking sector (*bank_assets*) have been the leading factors for the financial system development prior and after the crisis.
- Throughout the whole period (except for 2005) the proxy for the insurance sector has, on average, to a similar degree been correlated with both factors.
- The role of the *stock_market* has contributed to the financial system development between 1999-2007 and 2011-2014. During the crisis, the relative weight of the stock market was balanced between both factors.

As a result, a conclusion might be drawn that the global financial crisis (2008--2010) has significantly altered the impact of the analysed variables for the financial system and the banking sector's growth. Yet, this was not a permanent structural change, as past 2011 the variables became associated with the same factors as prior to the crisis.

Table 3. Rotated factor pattern (full sample)

	Factor 1	Factor 2
bank_assets	0.85235	0.38615
credit	0.84652	0.44208
insurance	**0.78594**	–0.0066
GDP_pc	**0.7685**	–0.17102
stock_market	**0.70993**	–0.28184
C5	–0.19494	–0.01047
CAR	–0.33122	–0.16226
ROE	–0.01564	–0.30518
dep_cred	0.00054	–0.33782

Note: based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

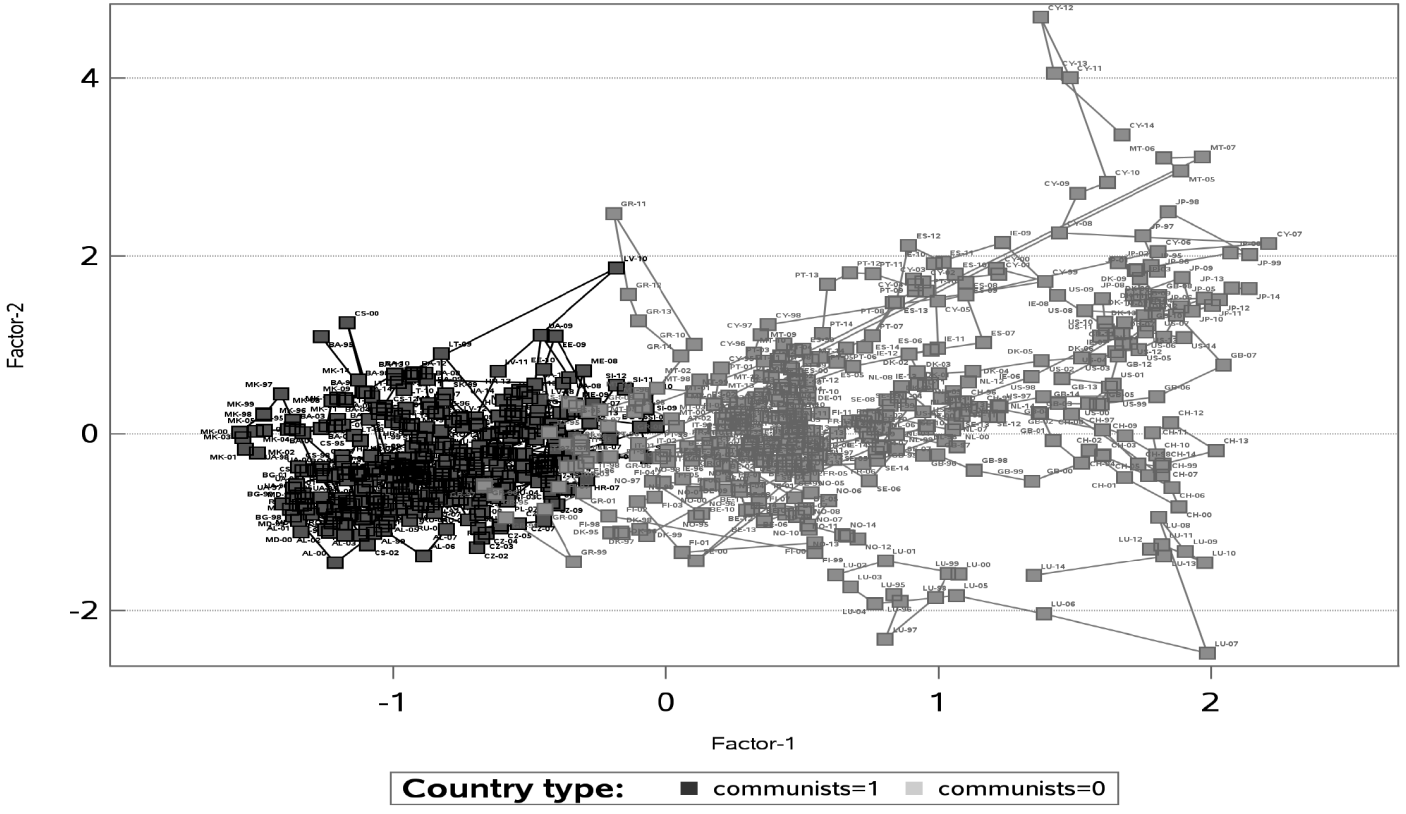
Source: own study.

As regards the cross-country analysis, the following conclusions might be reached. First, there are strong differences in the structure of the financial systems in post-communist and advanced economies, but the role of the banking systems remains similar. Second, the role of both latent factors is on a comparable level for all post--communist countries and does not change significantly over the 1995--2014 period, while its significance is more varied among advanced economies. The relative importance of the financial system development factor has been steadily rising among advanced economies over 1995-2014, which is not characteristic of post--communist countries. This might imply higher homogeneity in the growth of the financial system, including the banking sector in post-communist countries and higher heterogeneity among advanced countries.

The dynamics of trajectories of each country in the factor space throughout the analysed period reveal numerous differences, yet, no clear common trends in trajectories of particular countries can be observed[7]. However, the comparison of trajectories' dynamics for both groups of countries (see: Figure 3) demonstrates that post-communist and advanced economies constitute two distinctive groups. The factor trajectories are far more widespread and less consistent in advanced economies, as opposed to more similar and concentrated patterns among post-communist ones.

The factors were also analysed separately for each group of countries. Estimations of factors differ significantly among both groups (see: Table 4). For advanced countries, two factors can clearly be distinguished, i.e. the role of the banking sector (very high factor loadings for *credit* and *bank_assets*) and the stock market development (high factor loadings for *stock_market* and *GDP_pc*). However, for post-communist, countries only the first factor has meaningful factor loadings for *bank_assets, credit* and *GDP_pc*, i.e. the role of the banking sector. This confirms that the economic development is strongly driven by the banking sector in both groups of countries, but in advanced economies somehow also by the stock market, which is, in turn, rather a missing pillar in post-communist countries. Such conclusions

[7] In Poland, from 2002-2007 the balance was shifting from the banking system development to the financial system development, but from 2007 onwards, the role of the banking sector has been rising back to the level observed at the beginning of the 20th century.



Note: based on the statistical annex to report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path*?

Fig. 3. Comparison of factor trajectories dynamics for all countries (full sample)

Table 4. Rotated factor pattern (both groups separately)

Advanced			Post-communist		
	Factor 1	Factor 2		Factor 1	Factor 2
credit	**0.915**	–0.0795	bank_assets	0.8269	–0.2869
bank_assets	**0.9001**	–0.0399	credit	**0.7881**	–0.4876
C5	–0.1181	–0.0903	GDP_pc	**0.7139**	0.1344
ROE	–0.233	0.2291	insurance	0.3869	–0.128
stock_market	0.1737	**0.6427**	CAR	–0.4512	–0.0234
GDP_pc	0.0314	**0.5906**	dep_cred	–0.0932	0.4803
CAR	–0.0676	0.4597	ROE	0.0123	0.4106
dep_cred	–0.0365	0.3887	C5	0.0049	–0.0805
insurance	0.3461	0.3612	stock_market	0.162	–0.2108

Note: based on the statistical annex to the report *Size and structure of financial sectors in selected Central and Eastern European countries and developed countries. Convergence or own path?*

Source: own study.

partly confirm the results of Wasilewski et al. [2015], who showed that the level of financial system development is an important factor for economic growth in Poland and Ukraine (post-communist countries), which was not the case for Germany and the US (advanced countries). This positive relationship works only up to a certain point in financial system development, determination of which is, however, uncertain [Sobol 2015]. Yet, as Bongni et al. [2017] present for CESEE economies during the period 1995-2014, the positive contribution of banking credit to the private sector and stock market development to the GDP cannot be undoubtedly confirmed.

5. Conclusions

With the use of the factor analysis of the 1995-2014 period, the paper provides evidence that there are two processes driving the development of both groups of countries, i.e. the financial system development (for non-post-communist countries) and the growth of the banking sector (for post-communist ones). However, the role of those factors varies among the analysed groups of countries. The economic development is strongly driven by the banking sector in both cases, while in advanced economies a certain role is also played by the stock market. The results indicate that there is higher homogeneity in the development patterns of the financial system, including the banking sector in post-communist countries, while the role of both factors is more heterogeneous among advanced economies. Moreover, the global financial crisis (2008-2010) did not cause a permanent structural change, but only temporarily altered the impact of the analysed variables on the two processes.

The following policy implications might be drawn from the analysis. First, as there are significant differences in the paths of the financial development in both groups of countries, regulatory frameworks and financial stability policies cannot be used in a harmonized manner and must focus on the banking sector risks in post--communist countries and in advanced economies, and additionally, on the stock market risks. Second, as the financial systems in post-communist economies are bank-based, the development of the stock market should be fostered particularly in order to create another driving force for the economic development ('a spare wheel'), as it is the case in advanced economies. This underscores the relative importance of such incentives as the Capital Market Union, especially for post-communist countries in the EU.

Further research should widen the scope of the observed variables and cover, in more detail, the financial system structure. Moreover, a similar factor analysis might be applied to other emerging markets, e.g. in Asia and Africa, to account for differences and similarities in the growth paths of their financial systems.

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