FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH. A GRANGER CAUSALITY ANALYSIS FOR 13 CEE COUNTRIES

Abstract

The paper aims at investigating the direction of causality between financial development and economic growth for a group of 13 CEE countries, members of the European Union. We use the Granger causality tests and a multivariate panel model (GDP per capita, domestic credit to private sector, market capitalization). The results are consistent with the supply-leading hypothesis that supports the uni-directional causality from financial development to economic growth.

Keywords: financial development, economic growth, CEE countries, Granger causality

JEL classification: G10, O10

1. INTRODUCTION

The connection between financial development and economic growth has been largely debated in both theoretical and empirical literature, beginning with the seminal paper of Schumpeter (1912) that argument the role of functional financial intermediaries for innovation and development and further investigated in the studies of Patrick (1966), Goldsmith (1969), Mckinnon (1973) and Shaw (1973).

From that point, different perspectives were followed in the literature. There is a large body of literature that supports the positive effect of financial development on economic growth, considering the "supply-leading" hypothesis which emphasizes on the channels of transmission between the two, such as capital accumulation, efficient allocation of capital, increased liquidity, reduced cost of capital for firms or reduction of transaction costs (Pagano (1993); King and Levine (1993); De Gregorio and Guidotti (1995); Levine (1997); Levine et al. (2000); Müslümov and Aras (2002); Fink et al. (2009), Corduneanu and Iovu, 2009).

The "demand-following" hypothesis assumes the reverse connection, from economic growth to financial development, argued by the increased demand for financial services and products that occur when the economy develops (Demetriades and Hussein (1996)).

The third hypothesis is considering the bi-directional causality between the two variables (Greenwood and Jovanovic (1990); Apergis et al. (2007)).

The fourth hypothesis, of a no causal relationship between financial development and economic growth, was investigated empirically by Lucas (1988) which states that there is no statistically relevant relationship between the two.

The importance of the subject is given by its potential implications on the macroeconomic level, for the policy-makers, regarding the steps needed for future development of the financial system, which can trigger positive consequences for the economic development. The findings can be useful especially for transition economies, where the financial system was underdeveloped for a long time and where there are still many reforms to be made in order to provide a sound and efficient financial system. If we look at the CEE financial system, we can easily depict the traditional role of banks as financial intermediaries in the economy (with size of domestic credit to private sector that ranges between 35 - 60 %, while the market capitalization hardly reaches 30 % of GDP, for the majority of the considered countries (with the exception of Cyprus, Malta and Croatia) (Figure no.1). While we can agree that all the countries have a bank-oriented financial system, that still needs improvements in what concerns the prudential regulation, significant positive dynamics have been registered in almost all the CEE countries in what concerns the stock markets and their role in financing the economy. On the other hand, not all the CEE countries have experienced a similar pace of economic growth.

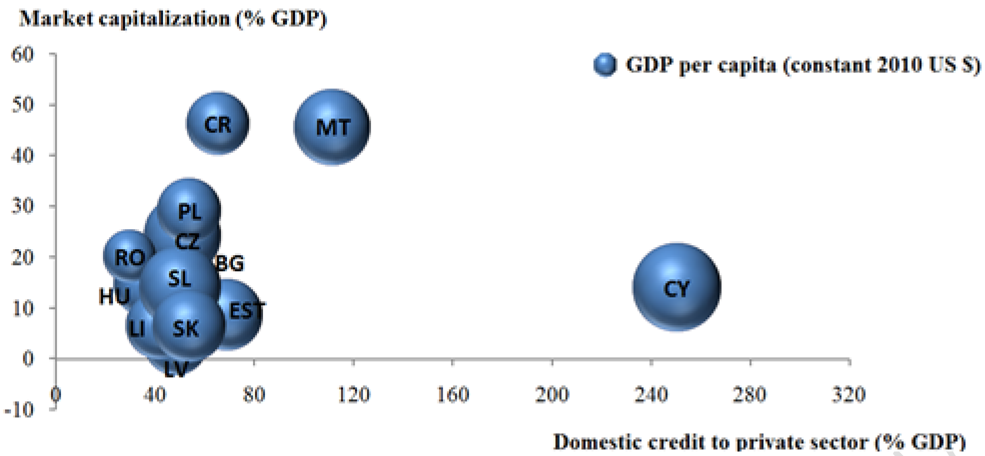

Figure no. 1 - Size of banking system, respectively of the stock exchange in the CEE financial system (2015)

Source: realized by authors, data provided by the World Bank, national stock markets

Since we found mixed results in the literature in what concerns the connection between the financial system and growth, and the case of CEE countries was not enough investigated, the paper aims at bringing a new insight on this subject, posing the following research question: does the financial development enhances economic growth or reversely? Is there an unidirectional or bidirectional relationship between financial development and economic growth in the 13 CEE countries?

The remainder of the paper is structured as follows: section 2 reviews the existing literature, section 3 present the data and used methodology, section 4 presents the obtained results, section 5 draws the conclusions and highlights some future research ideas.

2. THEORETICAL BACKGROUND

Granger causality tests and GMM estimator are used in a large number of papers to prove the relationship between financial development and economic growth. From these, only several empirical papers focused on European Union countries and even less in the case of Central and Eastern Europe (Table no.1):

Table no.1 - Review of the main empirical literature

Authors	Sample	Period	Methodology	Results
Caporale et al. (2009)	EU-10	1994-2007	GMM Granger Causality	No causal relationship between private credit or financial depth and economic growth; causality runs instead from bank efficiency and stock market capitalization to economic growth and not reversely.
Cojocaru et al. (2012)	10 CIS and 15 CEE countries	1990-2008	GMM estimator	Financial system efficiency and competitiveness are more important than the amount of private sector credit provided by the banking system.
Creel et al. (2015)	EU countries	1998-2011	GMM estimator	The hypothesis that financial depth positively influences economic performance is not confirmed; financial instability, however, has a negative effect on economic growth.
Deltuvaitė and Sinevičienė (2014)	EU-27	2000-2011	Spearman's correlation coefficient	Evidence of a positive relationship between financial and economic development; no clear consensus when considering different clusters of countries (according to their GDP per capita).
Fink et al. (2009)	9 EU countries	1996-2000	Panel analysis	Financial development influences positively the economic growth in the short run, rather than on the long-run.
Hagmayr et al. (2007)	4 SEE countries	1995-2005	Panel analysis	Positive effect of stock market development (both stock and bond markets) on growth
Kenourgios and Samitas (2007)	Poland	1994-2004	Cointegration analysis	Credit influence economic growth on the long-run
Koivu (2002)	25 CEE and CIS countries	1993-2000	Fixed effect panel model	Private credit is influencing negatively the economic growth
Mehl and Winkler (2003)	8 SEE countries	1993-2003	Panel analysis	Financial deepening has no significant effects on the economic growth
Pirtea et al. (2009)	16 EU countries	2004-2007	TSLS regression	Positive connection, although not so stable, between a lower cost of borrowed resources and the economic growth
Vazakidis and Adamopoulos (2011)	UK	1965-2007	VECM	Bi-directional causal relationship between stock market development and economic growth while only a unidirectional relationship between credit market development and economic growth

Source: realized by authors

3. DATABASE AND METHODOLOGY

Our database includes 13 CEE countries, members of the European Union - Romania, Bulgaria, Hungary, Poland, Czech Republic, Slovakia, Slovenia, Estonia, Lithuania, Latvia, Malta, Cyprus, Croatia. The data is annual and it is provided by the World Development Indicators, Beck et al. (2016) and complementary, by the national stock markets reports, when necessary. The database covers the 1995-2015 period.

Table no. 2 - Description of variables

Variables	Proxied by:	Source:
Economic Growth	Real GDP per capita (constant 2010 US $)	World Development Indicators
Stock market development	Market capitalization (% of GDP)	World Development Indicators, World Bank - Financial Development and Structure Dataset, national stock markets
Banking system development	Domestic credit to private sector (% of GDP)	World Development Indicators

Source: realized by authors

The most frequently used methods for testing the financial development - economic growth connection are panel data techniques and Granger causality tests. Granger causality cannot be used when the variables are not stationary. Consequently, the first step is to test the stationarity of the variables. We have tested the stationarity of the variables using several unit root tests: Levin, Lin and Chu; Im, Pesaran and Shin; ADF - Fischer; PP-Fischer; Hadri (an example is provided in Appendix 1).

All tests are suggesting that GDPC, DC and MK become stationary after first-differencing. Taken into consideration that all the variables are non-stationary in their levels, but become stationary after first-differencing (integrated of same order, I(1)), we will further run a Panel Cointegration Model (Johansen Cointegration Model) in order to see whether the variables are cointegrated. We have performed two cointegration tests: Pedroni (Engle-Granger based) and Kao (Engle-Granger based) (see Appendix 2). Both tests are indicating the fact that the variables included in the model are not cointegrated. Therefore, we can choose a VAR methodology, instead of VECM to do our estimations. With no co-integration and variables that require first difference to be stationary (they are I(1)), the VAR in changes must be employed.

In general, Granger causality is computed by running bivariate regressions. The bivariate regression in a panel data context take the form:

$$y_{i,t} = \alpha_{0,i} + \alpha_{1,i} y_{i,t-1} + \dots + \alpha_{l,i} y_{i,t-l} + \beta_{1,i} x_{i,t-1} + \cdots + \beta_{l,i} x_{i,t-l} + \epsilon_{i,t} \quad (1.1)$$

$$x_{i,t} = \alpha_{0,i} + \alpha_{1,i} x_{i,t-1} + \dots + \alpha_{l,i} x_{i,t-l} + \beta_{1,i} y_{i,t-1} + \cdots + \beta_{l,i} y_{i,t-l} + \epsilon_{i,t} \quad (1.2)$$

where t denotes the time period dimension of the panel, i denotes the cross-sectional dimension, l the maximum number of lags.

But first, we will have to determine the optimal lag selection. We used several tests to select the optimum lag for the model (See Appendix 3). LR, AIC, HQ results indicated there should be used a number of 4 lags. Finally, we proceeded to a VAR regression and to the Granger causality tests to measure cause and effect relationships.

4. RESULTS

The results outlined the existence of an unilateral Granger causal relationship between financial development and economic growth, as it appears in Table no. 3. Both banking system development, as well as stock market development Granger cause economic growth in the EU-13 countries, for the analyzed period.

Table no. 3 - VAR Granger causality tests for CEE countries

VAR Granger Causality/Block Exogeneity Wald Tests		
Sample: 1995-2015		
Lags: 4		
Included observations: 188		
Null hypothesis:	**Chi-sq**	**Prob.**
DC does not Granger Cause GDPC	31.89437	0.0000
MK does not Granger Cause GDPC	19.79261	0.0005
GDPC does not Granger Cause DC	6.078449	0.1934
MK does not Granger Cause DC	1.225311	0.8739
GDPC does not Granger Cause MK	2.189259	0.7010
DC does not Granger Cause MK	6.063001	0.1945
Results/direction of causality		
MK → GDPC DC → GDPC		
No Granger causality between:		
MK and DC		

Source: realized by the authors

5. CONCLUSIONS AND FURTHER RESEARCH

To sum up, the results are consistent with the previous empirical studies that have proven the causality running from financial system development to economic growth (the studies that support *the supply-leading hypothesis*), but we could not find evidence for a reverse causality between economic growth and financial system development (the studies with empirical evidence on *the demand-following hypothesis*). Consequently, the finance precedes economic development in CEE countries. However, the relatively reduced explanatory power of the model (See value of R^2 in VAR estimations in Appendix 4), gives us reason to believe there are more independent variables that must be taken into account when considering the level of development of the financial system (in terms of depth and efficiency), as well as control variables that could be introduced in a further analysis. Moreover, the sample of countries can include also the most developed countries of European Union, in order the broaden up the image regarding the causal relationship between the development of the financial system and the economic growth in the whole European Union.

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Appendix 1 - Panel unit root testing - in level and after first-differencing (GDPC)

Panel unit root test: Summary

Series: GDPC

Sample: 1995 2015

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.09180	0.1375	13	245
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.89142	0.9707	13	245
ADF - Fisher Chi-square	13.5993	0.9779	13	245
PP - Fisher Chi-square	12.3393	0.9891	13	258

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Stationarity

Series: GDPC

Exogenous variables: Individual effects

Newey-West automatic bandwidth selection and Bartlett kernel

Total number of observations: 271

Cross-sections included: 13

Method	Statistic	Prob.**
Hadri Z-stat	9.98041	0.0000
Heteroscedastic Consistent Z-stat	9.88403	0.0000

* Note: High autocorrelation leads to severe size distortion in Hadri test, leading to over-rejection of the null.

** Probabilities are computed assuming asympotic normality

Panel unit root test: Summary

Series: D(RGDPC)

Sample: 1995 2015

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				

Levin, Lin & Chu t*	-7.60179	0.0000	13	232

Null: Unit root (assumes individual unit root process)

Im, Pesaran and Shin W-stat	-5.07344	0.0000	13	232
ADF - Fisher Chi-square	72.4369	0.0000	13	232
PP - Fisher Chi-square	77.8011	0.0000	13	245

** Probabilities for Fisher tests are computed using an asymptotic Chi

Null Hypothesis: Stationarity

Series: D(GDPC)

Exogenous variables: Individual effects

Newey-West automatic bandwidth selection and Bartlett kernel

Total number of observations: 258

Cross-sections included: 13

Method	Statistic	Prob.**
Hadri Z-stat	1.42313	0.0773
Heteroscedastic Consistent Z-stat	0.20241	0.4198

* Note: High autocorrelation leads to severe size distortion in Hadri test, leading to over-rejection of the null.

** Probabilities are computed assuming asympotic normality

Heteroscedastic Consistent Z-stat	3.96016	0.0000

Appendix 2 - Panel Cointegration Tests - Pedroni (Engle-Granger based) and Kao (Engle-Granger based)

Pedroni Residual Cointegration Test
Series: DC MK GDPC
Sample: 1995 2015
Included observations: 273
Cross-sections included: 13
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.493957	0.6893	0.960711	0.1683
Panel rho-Statistic	0.290977	0.6145	0.463434	0.6785
Panel PP-Statistic	-0.291490	0.3853	-0.019245	0.4923
Panel ADF-Statistic	-1.092030	0.1374	-0.127400	0.4493

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.954260	0.9747
Group PP-Statistic	1.028947	0.8482
Group ADF-Statistic	1.582767	0.9433

Pedroni Residual Cointegration Test
Series: DC MK GDPC
Sample: 1995 2015
Included observations: 273
Cross-sections included: 13
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.353300	0.9120	-0.447745	0.6728
Panel rho-Statistic	2.270539	0.9884	1.869784	0.9692
Panel PP-Statistic	1.235431	0.8917	0.494531	0.6895
Panel ADF-Statistic	1.228433	0.8904	1.043183	0.8516

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.064639	0.9989
Group PP-Statistic	-0.112629	0.4552
Group ADF-Statistic	1.219151	0.8886

Pedroni Residual Cointegration Test
Series: DC MK GDPC
Sample: 1995 2015
Included observations: 273
Cross-sections included: 13
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or trend

User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	0.443551	0.3287	0.488903	0.3125
Panel rho-Statistic	-0.303022	0.3809	0.320895	0.6259
Panel PP-Statistic	-1.082155	0.1396	-0.432039	0.3329
Panel ADF-Statistic	-1.361963	0.0866	-0.450809	0.3261

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.936058	0.9736
Group PP-Statistic	0.392565	0.6527
Group ADF-Statistic	0.456681	0.6760

Kao Residual Cointegration Test
Series: DC MK GDPC
Sample: 1995 2015
Included observations: 273
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	0.243810	0.4037
Residual variance	103.8386	
HAC variance	124.1800	

Appendix 3 - Optimum lag selection

VAR Lag Order Selection Criteria
Endogenous variables: D(RGDPC) D(DC) D(MK)
Exogenous variables: C
Included observations: 134

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2147.686	NA	1.75e+10	32.09979	32.16466	32.12615
1	-2123.786	46.37190	1.40e+10	31.87741	32.13692*	31.98287
2	-2113.467	19.56046	1.38e+10	31.85772	32.31186	32.04227
3	-2097.238	30.03573	1.24e+10	31.74982	32.39859	32.01346
4	-2078.600	33.66057*	1.07e+10*	31.60597*	32.44937	31.94870*
5	-2075.820	4.894947	1.18e+10	31.69881	32.73684	32.12063
6	-2071.156	8.005094	1.26e+10	31.76353	32.99619	32.26444
7	-2066.452	7.864003	1.35e+10	31.82764	33.25494	32.40765
8	-2060.988	8.889884	1.43e+10	31.88041	33.50234	32.53951

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix 4 - VAR with 4 lags

Vector Autoregression Estimates
Sample (adjusted): 2000 2015
Included observations: 188 after adjustments

	D(RGDPC)	D(DC)	D(MK)
D(RGDPC(-1))	0.392665	0.001432	-0.000781
	(0.07197)	(0.00149)	(0.00239)
	[5.45577]	[0.96222]	[-0.32737]
D(RGDPC(-2))	-0.195842	0.001664	0.001444
	(0.07831)	(0.00162)	(0.00260)
	[-2.50086]	[1.02751]	[0.55625]
D(RGDPC(-3))	0.087327	0.000683	-0.002512
	(0.07941)	(0.00164)	(0.00263)
	[1.09972]	[0.41628]	[-0.95455]
D(RGDPC(-4))	0.049333	0.001293	-0.001642
	(0.07260)	(0.00150)	(0.00241)
	[0.67949]	[0.86159]	[-0.68249]
D(DC(-1))	5.350610	0.067019	0.134391
	(3.56922)	(0.07380)	(0.11831)
	[1.49910]	[0.90814]	[1.13596]
D(DC(-2))	-4.405873	0.122176	-0.019986
	(3.53941)	(0.07318)	(0.11732)
	[-1.24481]	[1.66949]	[-0.17036]
D(DC(-3))	-10.77364	0.126312	-0.248187
	(3.28730)	(0.06797)	(0.10896)
	[-3.27735]	[1.85838]	[-2.27773]
D(DC(-4))	-14.39820	-0.200778	-0.014638
	(3.39251)	(0.07014)	(0.11245)
	[-4.24411]	[-2.86236]	[-0.13017]
D(MK(-1))	8.620411	-0.032940	-0.143224
	(2.17718)	(0.04502)	(0.07217)
	[3.95944]	[-0.73174]	[-1.98465]
D(MK(-2))	-0.833444	-0.035560	-0.183964
	(2.27639)	(0.04707)	(0.07545)
	[-0.36612]	[-0.75551]	[-2.43808]
D(MK(-3))	5.276862	0.012884	-0.046055
	(2.26951)	(0.04692)	(0.07523)
	[2.32511]	[0.27457]	[-0.61222]
D(MK(-4))	-0.466951	0.000427	-0.080971
	(2.28208)	(0.04718)	(0.07564)
	[-0.20462]	[0.00904]	[-1.07044]
C	294.6205	0.060133	1.874599
	(52.7979)	(1.09166)	(1.75006)
	[5.58015]	[0.05508]	[1.07116]
R-squared	0.371394	0.137012	0.102562
Adj. R-squared	0.328290	0.077835	0.041023
Sum sq. resids	42239981	18057.85	46408.54
S.E. equation	491.2956	10.15813	16.28471
F-statistic	8.616151	2.315312	1.666622
Log likelihood	-1425.069	-695.8604	-784.5873
Akaike AIC	15.29861	7.541069	8.484972
Schwarz SC	15.52241	7.764865	8.708768
Mean dependent	365.5021	2.159742	-0.139641
S.D. dependent	599.4484	10.57815	16.62937
Akaike information criterion		31.32366	
Schwarz criterion		31.99505	