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STOCK MARKET DEVELOPMENT AND ECONOMIC GROWTH: EVIDENCE FROM THE EUROPEAN UNION

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Abstract

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The paper examines the causal relation between the stock markets development and economic growth in the EU countries. In particular, the nature and causality direction is investigated. Panel data techniques including cointegration tests, vector error correction models and Granger causality tests were applied to indicate the nature and direction of causality. Long-run effects of the economic growth upon stock market development was detected in the sample of the Euro area member countries. In addition, the short-run mutual relations between growth and stock markets were indicated in that country-sample. In the non-Euro area countries, only short-run impact of the stock market development upon economic growth was found. The empirical findings bring up implications for macroeconomic stabilization and development policies. The indicated relations also play a role in predicting economic growth and stock markets' development.

Keywords: economic growth, European Union, panel causality, panel cointegration, stock market development

INTRODUCTION

The relation among financial system development and economic growth belongs among extensively examined issue in economic literature. Nowadays, the financial system development is considered as a crucial factor of economic growth and development among economists. However, as pointed out by Calderón and Liu (2003) the nature of this causal relationship remains unclear. The direction of causality and other related characteristics have significant implications for development policy and macroeconomic policy in general.

There is no widely accepted consensus about the direction, extent and nature of the causal relation between the financial system and economic growth. For instance, Schumpeter (1911), King and Levine (1993), Arestis *et al.* (2001), Christopoulos and Tsionas (2004), Levine (2005) hold the view that the financial development leads to economic growth. On the contrary, Robinson (1952), Kindleberger (1978) or Demetriades and Hussein (1996) consider the economic growth to influence crucially the financial system. A number of studies including Patrick (1966), Luintel and Khan (1999) or Calderón and Liu (2003) come to a conclusion that the relationship between financial development and economic growth is mutually causal. Patrick (1966) assumes that the direction of causality depends on the economic growth level.

The financial system and economic growth causal relations have been examined intensively in recent literature. The global economic crisis and its aftermath, economic integration and convergence in Europe revived the interest and put this topic in the center of economic debate nowadays. Especially, current integration efforts comprising establishing of fiscal and banking unions as well as expected enlargement of the Euro area with the Central and Eastern European countries (CEEC) revive this issue as a subject of examination in literature. A limited number of studies focusing on the European Union,

Euro area or CEECs also increases motivation of this research. In addition to that, a large complexity of financial system allows for examining of the relation between its main components and the economic growth separately. Especially, the bond market, stock market, banking system or development are investigated in the literature.

In our study, we aim at examining the causal relation between the stock markets development and economic growth in the EU countries. In particular, the nature and causality direction is investigated in the analysis. Regarding the nature of the relation we ask: Is there a long-run or short-run causal relation between the stock market development and economic growth in the EU countries? Does the Euro area membership matter? Is the nature of relation different in the Euro area (EA) comparing to non-Euro area (non-EA) countries? Considering the causality direction, we ask: Does the stock market development lead to economic growth or opposite? Can this relation be significantly identified as mutual?

The nature and direction of causality between stock market development and economic growth is important for the investors' strategies, but also can bring important policy implications. The nature of indicated association is important for predicting economic growth. It might also shed some light on the question of how deeply the stock market development is linked to economic growth, which is a subject of interest especially for CEE countries with relatively less developed stock markets. Regarding relatively high level of trade integration of the CEE countries such as Czech Republic, Hungary, Poland and Slovakia, the influence of external factors might be considered as significant. The counter argument is, however, that a high share of companies traded at the CEEC' stock exchange markets act on the domestic markets and thus contribute to the economic growth of their countries.

In literature, the market capitalization as a proportion of GDP, number of listed companies, value of shares traded as a percentage of GDP, value of shares trades as a percentage of market capitalization are used as proxy variables of stock market development. Also monetary aggregates are used as a possible proxy of financial development, e. g. see Kapounek (2011) or Kar *et al.* (2011). J. Similarly to Harvey (1989), Liu and Sinclair (2008), Humpe and Macmillan (2009), the main composite stock indices of each national stock exchange markets were applied as proxies of stock market development in our study.

The paper is structured as follows. The next section reviews the literature dealing with the relation between stock markets development and economic growth. Then the data and descriptive statistics are presented. In the next section, the methodology is explained. The discussion of results follows the final section concludes the paper.

Literature review

The literature on financial development and economic growth is very extensive, a well-arranged summary of main literature can be found e.g. in Demirgüc-Kunt and Levine (1996), Levine (1997), Cavenaile *et al.* (2014) or Havranek *et al.* (2014). In this paper, we focus on studies that are devoted particularly to the stock market development and economic growth.

There are many studies dealing with the relationship between economic growth and stock market development on the sample of heterogeneous countries from the entire world. Atje and Janovic (1993) examined the relationship between stock market development and growth in 40 countries during the period 1980–1988. They found that stock market measured in the relative size to the country's economy enhances economic growth. Harris (1997) studied the relationship in 49 countries during the period 1980–1991. He found that in developed countries the level of stock market activity has an impact on growth and that the evidence in less developed countries is very weak. Levine and Zervos (1998) examined the link between stock markets and economic growth on the sample of 47 countries and they found that stock market development has an important role in predicting economic growth. Cavenaile *et al.* (2014) focused on five developing countries and found a single cointegration vector between financial development and economic growth and causality going from stock market development to economic growth. Prahdan *et al.* (2014) studied the causal nexus between economic growth, banking sector development, stock market development and other macroeconomic variables in ASEAN countries from 1961 to 2012. Concerning stock market development, their results showed that stock market development Granger causes economic growth. Gazdar and Cherif (2015) focused on MENA countries in their research. They came to the conclusion that institutional quality mitigates the negative effect of financial development on economic growth and that financial development can promote economic growth only in countries with sound institutional environment. Pradhan *et al.* (2015) investigated the causal relationship between economic growth, oil prices, stock market depth and other macroeconomic variables in the G20 countries from 1961 to 2012. Their results support the supply-leading hypothesis meaning that financial development support economic growth in the long-run, but in the short-run opposite relation was found.

Also one can find studies that are focused on one country, e. g. Abu-Bader and Abu-Qarn (2008) who investigated the relationship between growth and financial development in Egypt with use of Granger causality, cointeration and error correction models. They found that the relationship between financial development and economic growth is

mutually causal. Liu and Sinclair (2008) studied the linkage between stock market performance and economic growth in Greater China also with use of causality within the VECM (vector error correction model) framework. They found that economic growth is the main determinant of movements in stock prices in the long-run and that stock markets act as a leading economic indicator of future economic growth in the short-run. Marques *et al.* (2013) tested the relationship between stock market and economic growth in Portugal in the period 1993-2011. The evidence of Granger bi-directional causality was found.

Focusing on the EU, only limited literature is available which deals with the relationship in a comprehensive way. Panopoulou (2009) studied the predictive ability of financial variables for EA growth with the use of Granger causality tests. She suggests that stock market developments for the EA as a whole seem to provide limited information on future growth. She also argues that it is not surprising because some EA countries did not have a developed stock market until recently. Yildirim *et al.* (2013) investigated the relation between financial development and economic growth in the new EU member states, acceding countries and potential candidates for the EU membership with use of other indicators of financial sector development. Their results are mixed and differ from country to country. A study by Narayan and Narayan (2013) focused on the relationship between financial system and economic growth in 65 developing countries for the period 1995 to 2011. They also examined the relationship between regional panels including the European panel as well. The results are ambiguous, since they differ from indicator to indicator. A paper by Deltuvaite and Sineviciene (2014) investigated the relationship between financial development and economic growth in different clusters of EU countries. Their results are mixed leading to the conclusion that there is no clear consensus on the relation between variables. A recent study by Caporale *et al.* (2015) focused on 10 new EU member countries and comes to a conclusion that the contribution of the relatively underdeveloped credit and stock markets to growth has been rather limited. Even though it belongs among the latest studies, the observed period ends in 2007. Georgantopoulos *et al.* (2015) studied the financial system-growth relationship for the EU countries separating them in the Euro area panel and the non-Euro countries for the period 1999-2012, however they did not take into account the opposite relationship. Their results indicate that stock market development is a significant growth factor in the Euro area panel, however the results for the non-Euro panel are insignificant.

Data

The dataset (GDP and share prices) is sourced from the OECD database on quarterly basis from 1999 (Euro area beginning) to 2015 (third quarter). Stock market development is approximated with composite stock market indices comprising share prices development at each particular national stock market. Appendix A includes information on used stock market indices. GDP (% change of GDP) was used to estimate the economic growth of each country in the sample.

Our panel includes 22 EU countries. Two panels were created – panel with the EA members and panel with non-EA countries. Since countries join the EU or EA continuously, the number of countries changes over the whole sample within the panels. Information on the EU and EA membership can also be found in Appendix A. Bulgaria, Croatia, Cyprus, Lithuania, Malta and Romania are excluded from the sample due to data unavailability. The United Kingdom and Denmark with opt-out clause and Sweden, where the referendum on introduction of the euro failed, were also added to the EA panel since their financial systems have longer history and are much more developed then the systems of countries in the non-EA panel.

All data were converted into natural logarithmic forms to gain more constant variance. The descriptive statistics of used variables is reported in Tab. I. The probabilities of Jarque-Bera test statistics are equal to zero, hence the normality is rejected in all cases.

METHODS

Panel data techniques are employed to observe the nature of relationship between the variables separately for each panel. However, data should be firstly tested for the presence of a unit root. When data is stationary, the panel cointegration approach is used to find if the long-run relationship

I: *Descriptive statistics (natural logs)*

	GDP	Share prices
Mean	12.66877	4.55857
Median	12.56375	4.59107
Std. deviation	1.35282	0.44186
Skewness	–0.06568	–0.52140
Kurtosis	2.25829	3.91593
Jarque-Bera stat.	34.75223	117.98888
Probability	0.00000	0.00000

exists between economic growth and stock market development. In this paper, we use two types of tests – Pedroni (Engle-Granger based) test and Fisher-type test using Johansen's test methodology (Maddala and Wu, 1999) to detect the stationarity of used variables.

Following Pedroni (2004), a general formula for panel cointegration is specified as follows:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + ... + \beta_{Mi} x_{Mi,t} + e_{it} \quad (1)$$

where y_{it} and x_{it} are time series panels of observables and are assumed to be integrated of $I(1)$ and where $i = 1, \ldots, N$, $m = 1, \ldots, M$, $t = 1, \ldots, T$. We consider y_{it} to be economic growth and x_{it} to be stock market development. The parameters α_i and δ_i allow for the possibility of unit specific effects and deterministic trends.

It is assumed that under the null hypothesis of no co-integration, the residuals e_{it} will also be of $I(1)$. To find out if the residuals are of $I(1)$, the subsequent regression is employed:

$$e_{it} = \rho_i e_{it-1} + u_{it} \quad (2)$$

Pedroni provides various statistics for testing the null hypothesis of no co-integration: $\rho_i = 1$. But there are two alternative hypotheses – the heterogeneous alternative: $\rho_i < 1$ for all i (between-dimension statistics tests – panel v-Statistic, panel rho-Statistic, panel PP-Statistic and panel ADF-Statistic); or the homogeneous alternative: $(\rho_i = \rho) < 1$ for all i (within dimension statistics test – group rho-Statistic, group PP-statistic and group ADF-Statistic).

Also a Johansen cointegration test is conducted using the methodology developed in Johansen (1991, 1995). A VAR of order p is considered:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B x_t + \varepsilon_t \quad (3)$$

where is a k-vector of non-stationary $I(1)$ variables, x_t is a d-vector of deterministic variables, and ε_t is a vector of innovations. This VAR can be rewritten as follows:

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-p} + B x_t + \varepsilon_t \quad (4)$$

where:

$$\Pi = \sum_{i=1}^{p} A_i - I \quad (5)$$

and:

$$\Gamma_i = -\sum_{j=i+1}^{p} A_j \quad (6)$$

The null hypothesis of no co-integration is rejected, if the rank of the coefficient matrix is at least 1. Johansen and Juselius (1990) developed two test statistics to determine the number of co-integrating vectors (the rank of the matrix) namely the trace statistic and the maximum eigenvalue statistic, which are computed for the null hypothesis as:

$$y_t = LR_{tr}(r|k) = -T \sum_{i=r+1} log(1-\lambda_1) \quad (7)$$

$$\begin{aligned} y_t &= LR_{max}(r|r+1) = -Tlog(1-\lambda_1) \\ &= LR_{tr}(r|k) - LR_{tr}(r+1|k) \end{aligned} \quad (8)$$

Trace statistic tests the null hypothesis of r co integrating relations against the alternative of n co-integrating relations, where n is the number of variables in the system for $r = 0, 1, 2 \ldots n - 1$. The maximum eigenvalue statistics tests the null hypothesis of r co-integrating relations against the alternative of $r+1$ co-integrating relations for $r = 0, 1, 2 \ldots n - 1$.

If cointegration exists between variables, a causal relations in at least one direction must exist (see Granger, 1988), therefore panel vector error correction model can be employed for identification of the direction of the relationship.

$$\begin{aligned} \Delta y_{it} &= \theta_{1j} + \lambda_{1i} \varepsilon_{it-1} + \sum_k \theta_{11il} \Delta y_{it-l} + \\ &+ \sum_k \theta_{12il} \Delta x_{it-l} + u_{1it} \end{aligned} \quad (9)$$

$$\begin{aligned} \Delta x_{it} &= \theta_{2j} + \lambda_{2i} \varepsilon_{it-1} + \sum_k \theta_{21ik} \Delta y_{it-k} + \\ &+ \sum_k \theta_{22ik} \Delta x_{it-k} + u_{2it} \end{aligned} \quad (10)$$

where Δ denotes first differencing, λ is the coefficient of the error correction term and l represents lag length that we specified according to the Schwartz information criterion.

The next step is that we try to identify the causality between the variables by testing for the significance of the coefficients of dependent variables in formulas (9) and (10). The significance of the coefficient λ indicates long-run relationship from the explanatory variable to the dependent variable and shows how quickly variable(s) re-converge to the long-run relationship after a deviation. Therefore H_0: $\lambda_{1i} = 0$ for all i and $\lambda_{2i} = 0$ for all are tested. Also short-run causal effects are studied by using a Wald test (Chi-square test statistic: χ^2) for the significance of the lagged explanatory variables.

In case no cointegration relation between variables is found, panel Granger causality tests are then applied. These tests do not allow us to confirm the existence of a causal relationship; however, they can provide information wheter the past values of one variable can help to predict the values of the second one. The formulas can be specified as following vector autoregressive models:

II: *Panel unit root tests results*

EA countries				
Test	**GDP (level)**	**GDP (1st difference)**	**Share prices (level)**	**Share prices (1st difference)**
Levin, Lin and Chu test	5.49470	–11.99860*	–0.39388	–18.50556*
ADF – Fisher Chi-square	3.73982	266.89634*	17.3840	380.65179*
PP – Fisher Chi-square	2.66516	455.24410*	16.8002	362.57072*
Non-EA countries				
Test	**GDP (level)**	**GDP (1st difference)**	**Share prices (level)**	**Share prices (1st difference)**
Levin, Lin and Chu test	8.37837	–7.82403*	2.20819	–15.74858*
ADF – Fisher Chi-square	0.31090	127.38594*	5.40917	252.98447*
PP – Fisher Chi-square	0.17385	178.40617*	2.97306	242.08530*

* denotes statistical significance at 1 % level.

$$y_{it} = \alpha_{0i} + \alpha_{1i} y_{it-1} + \ldots + \alpha_{li} y_{it-1} + \\ + \beta_{1i} x_{it-1} + \ldots + \beta_{li} x_{it-1} + \varepsilon_{it} \quad (11)$$

$$x_{it} = \alpha_{0i} + \alpha_{1i} x_{it-1} + \ldots + \alpha_{li} x_{it-1} + \\ + \beta_{1i} y_{it-1} + \ldots + \beta_{li} x_{it-1} + \varepsilon_{it} \quad (12)$$

Software Eviews is used to employ all test and models described in this chapter.

RESULTS

Panel unit root test

Since the used variables should be integrated of order one *I*(1), the panel unit tests are performed to investigate the order of integration. The tests were employed separately for the panels including EA and non-EA countries. The results of three types of panel tests – Levin, Lin and Chu, ADF (augmented Dickey-Fuller) – Fisher Chi-square and PP (Phillips-Perron) – Fisher Chi-square are provided in Tab. II. The results show that data are not stationary at levels; however they are stationary at first differences, which is required for the analysis.

Panel cointegration

Since stationarity was confirmed for the variables, the presence of cointegration can be tested. At first, the Pedroni residual cointegration tests are employed. The results of all test statistics are presented in Tab. III. The value of probability lower than 0.05 indicates that the variables are cointegrated. The results differ between the panels. The majority of statistics results is statistically significant within the panel that includes EA countries except of panel v-statistics, panel weighted v-statistics and group

III: *Pedroni residual co-integration test results*

EA countries				
	Statistic	**Prob.**	**Weighted stat.**	**Prob.**
Panel v-Stat.	–3.014307	0.9987	–3.018647	0.9987
Panel rho-Stat.	–2.424169	0.0077	–2.949133	0.0016
Panel PP-Stat.	–2.126225	0.0167	–2.564592	0.0052
Panel ADF-Stat.	–3.354889	0.0004	–3.909831	0.0000
Group rho-Stat.	0.225731	0.5893	–	–
Group PP-Stat.	–2.084029	0.0186	–	–
Group ADF-Stat.	–4.192738	0.0000	–	–
Non-EA countries				
	Statistic	**Prob.**	**Weighted stat.**	**Prob.**
Panel v-Stat.	–2.500992	0.9938	–2.505122	0.9939
Panel rho-Stat.	–0.840369	0.2004	–0.752136	0.2260
Panel PP-Stat.	–1.426784	0.0768	–0.966287	0.1670
Panel ADF-Stat.	–1.968130	0.0245	–1.812888	0.0349
Group rho-Stat.	1.559686	0.9406	–	–
Group PP-Stat.	–0.792928	0.2139	–	–
Group ADF-Stat.	–2.804260	0.0025	–	–

IV: *Results of Johansen Fisher panel cointegration tests*

EA countries				
Hypothesized no. of CE(s)	Fisher stat. (trace test)	Prob.	Fisher stat. (max-eigen test)	Prob.
None	52.49204	0.0067	50.66490	0.0106
At most 1	21.89068	0.8580	21.89068	0.8580
Non-EA countries				
Hypothesized no. of CE(s)	Fisher stat. (trace test)	Prob.	Fisher stat. (max-eigen test)	Prob.
None	30.95860	0.0557	25.82912	0.1715
At most 1	18.76661	0.5370	18.76661	0.5370

rho-statistics, hence a cointegrated relationship between the studied variables exists. The results for the panel including non-EA countries indicate that there is no cointegrating relationship between variables in almost all statistics except panel ADF statistics, panel weighted ADF statistics and group ADF statistics. It shows that there is no equilibrium relationship in the long-run between economic growth and stock market development.

We also employ Johansen Fisher panel cointegration tests to confirm the results of previously applied statistics. The results are reported in Tab. IV. The results for EA countries show that there is at most one cointegration vector. The null hypothesis of no cointegration can be rejected in case if the value of trace test statistics and max-eigen value statistics is statistically significant. We can reject this hypothesis since the probability is lower than 5%. Then the null hypothesis that there is at most one cointegration vector is tested. This hypothesis cannot be rejected; therefore one cointegration vector exists between variables, meaning that there is an equilibrium relationship in the long-run between the studied variables and that the VECM can be applied for the further study of this relation.

The results for the panel of non-EA countries confirm the outcomes of previously employed statistics. We cannot reject the null hypothesis of no cointegration which means that there is no cointegration vector since the probability is higher than 5% significance level. Therefore we cannot employ the consequent panel VECM for panel of non-EA countries, but the Granger causality test is applied to find out the direction of the relationship between variables. These results are in compliance with study by Caporale *et al.* (2015) who confirmed that the underdevelopment of stock and credit markets, with the consequent lack of financial depth, remains one of the main features of 10 new EU member countries.

Panel vector error correction model

Since the cointegration was found between economic growth and stock market indices within the panel including EA countries, the panel VECMs are employed for the further study of this relationship. The results are presented in Tab. V. The results of the first VECM show that the error correction term λ_1 is negative and statistically significant (the probability is lower than 1 %), it means that there is a long-run causality between independent variable and dependent variable. In

V: *Panel VECM results – EA countries*

VECM 1		**VECM 2**	
λ_1	–0.058536	λ_2	–2.29E–06
t–stat.	–5.866627	t–stat.	–0.035249
Prob.	0.00000	Prob.	0.97189
χ^2_1	14.92026	χ^2_2	53.37579
Prob.	0.00058	Prob.	0.00000

VI: *Granger causality tests results – non-EA countries*

Null hypothesis	**F-statistics**	**Prob.**
Stock market development does not Granger cause economic growth	20.60519	8.37499e-16
Economic growth does not Granger cause stock market development	0.88475	0.47274

our case, the long-run influence of economic growth upon stock market development is indicated.

The short-run causal effects are investigated with the use of Wald test for the significance of the lagged explanatory variables. The lag was chosen according to the Schwarz information criterion. The value of Chi-square statistic χ^2_1 is statistically significant at 1% level which shows that there is also a short-run causality denoting the short-run impact of economic growth upon stock market development. The results of the second VECM indicate that there is no long-run relationship between stock market development and economic growth, because the error correction term λ_2 is not statistically significant, meaning that stock market development does not lead to economic development in the panel of EA countries. However a short-run causality was found since the Chi-square statistic χ^2_2 is statistically significant, which points to the fact that stock market development contributes to economic growth in the short-run.

Panel Granger causality

Panel Granger causality tests are employed in this section for non-EA countries because the existence of cointegration was not confirmed. The results are shown in Tab. 6. At first, we test the null hypothesis that stock market development does not Granger cause economic growth. If the value of F-statistics is statistically significant, then the null hypothesis can be rejected meaning that stock market development does Granger cause economic growth. Analogously the second null hypothesis is tested.

The result of Granger causality test shows that the first null hypothesis can be rejected, therefore stock market development in non-EA countries does Granger cause economic growth, in other words, the past development of stock markets can help to explain the values of economic growth. The second null hypothesis cannot be rejected, hence economic growth does not Granger cause stock market development in non-EA member countries.

DISCUSSION

The long-run relationship between stock market development and economic growth was found within the panel including EA-countries. In consequent VECM analysis, we found a long-run causality running from economic growth to stock market development. Also the short-run bi-directional causality was discovered between variables. The results on the long-run relationship are in accordance with Patrick (1966) who suggests that at the later stages of economic growth the demand following hypothesis may become prominent, meaning that the economic growth leads to financial development. The results are also consistent with Liang and Teng (2006) who found a unidirectional causality from economic growth to financial development, or with Zang and Kim (2007) who came to the conclusion that economic growth precedes later financial development. Our results on short-run causality are consistent e. g. with the results of Liu and Sinclair (2008) who found the bi-directional relationship between economic growth and stock market development.

Focusing on non-EA countries, we did not find any long-run relationship between stock market development and economic growth. We believe that it can be caused primarily by the underdeveloped stock markets of these economies and that the adoption of the common currency can have a positive impact on financial development and economic growth of non-EA countries which is in the accordance with Caporale et al. (2015). The Granger causality test results on the short-run causality showed that economic growth can be explained by past stock market development. This is in accordance with Patrick (1966) and his supply leading hypothesis and the majority of studies for developing countries.

CONCLUSION

The paper examined the nature and direction of causal relationship between stock markets development and economic growth in 22 EU countries. The long-run impact of economic growth upon stock markets development was indicated for the EA member countries. This is important finding for the investors who do not aim at speculative transactions. Indicated long-run causality can play important role for predicting the long-run trends in share prices in respective stock markets. In the short-run the mutual causal relation was found. This interconnection provides implications for macroeconomic and development policy. Similarly to Pradhan *et al.* (2015), our finding brings up recommendations to promote the economic growth of countries by stabilizing macroeconomic environment and supporting of the stock market developments. Regarding the stock market development policy, our recommendations aim at prudential monetary policy, taxation policy having great influence on investors' participation in stock market and the policy regulating the institutional investor's activities.

No causality relation between the economic growth and stock market development in the long-run was found in case of non-EA countries. In the short-run, the study provided evidence that the stock

market development leads to economic growth in the non-EA countries. This also supports arguments for stabilizing macroeconomic environment, which is a crucial factor of positive stock market development. Although, only short-run effects were indicated, the role of stock market development when predicting the growth should be taken into account in the non-EA countries.

Regarding future research incentives few improvements can be considered at this stage. Since the analysis was employed with the use of panel estimation techniques, it would be constructive to investigate the relationship between economic growth and stock market development separately for individual countries. In addition, a larger variety of stock market development indicators can be used to shed more light on the examined relation.

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Appendix A. A list of countries

Country	EU member since	EA member since	Stock index
Austria	1995	1999	Wiener Borse Index
Belgium	1957	1999	Belgian All Shares Index
Czech Republic	2004	-	PX Index
Denmark	1973	opt-out	KAX Index
Estonia	2004	2011	OMX Tallinn
Finland	1995	1999	HEX Index
France	1957	1999	SBF250 Index
Germany	1957	1999	DAX Index
Greece	1981	2001	ASE Composite Index
Hungary	2004	-	BUX Index
Ireland	1973	1999	ISEQ Index
Italy	1957	1999	MIB Index
Latvia	2004	2014	OMX Riga
Luxembourg	1957	1999	LUX General Index
Netherlands	1957	1999	AEX All Shares Index
Poland	2004	-	WIG All Shares Index
Portugal	1986	1999	BVL Share Price Index
Slovak Republic	2004	2009	SAX Index
Slovenia	2004	2007	LJSEX Index
Spain	1986	1999	IGBM Index
Sweden	1995	refused in referendum	AFGX Index
United Kingdom	1973	opt-out	FTSE-100

Source: OECD.stat database and European Central Bank