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Financial Development and Economic Growth in European Countries: Bootstrap Causality Analysis

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Abstract

In the present study, it was investigated whether there was a causality relationship between financial development and economic growth for sixteen European countries. Data from the period of 1988-2012 was analyzed using the bootstrap panel causality test, which takes cross-section dependence and heterogeneity into account. The results of the test showed that there was a strong causality relationship between financial development and economic growth in European countries. In European countries, there was a causality relationship from economic growth to financial development and from financial development to economic growth. These results support both the supply-leading and the demand-following hypotheses. Therefore, it can be said that the feedback hypothesis is valid for European countries.

Keywords: Financial development, economic growth, European countries, panel causality, bootstrap.

JEL Classification: C33, F43, O16, O52

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Introduction

Reusing the unconsumed part of the production increases that results from real manufacturing procedures depends on an efficiently working financial structure that is developed and well-organised. An efficient financial structure contains both financial expansion and financial deepening. Financial expansion is related to the spread of financial services and to the growth of financial institutions. Financial deepening, on the other hand, can be expressed as the increase in institutions and in financial services per capita and as the increase in the rate of financial assets to income. The development of the finance sector through the expansion and variation of financial markets brings about better assigning of sources. The topic, theoretical basics of which dates back to Walter Bagehot (1873) and to Joseph Schumpeter (1912), has been increasingly analysed using country and country group data.

The financial system within market economy plays an important role by completing the real and monetary dimension of financial process. In the market, while the parties holding fund surplus can earn savings income by utilizing these funds in the financial system, parties in need of fund obtain the required funds through this market and direct these funds to new investments. In this way, through this system, both fund suppliers and fund demanders gain savings income on one hand and investment income on the other. Through this way, it is expected that there will be an increase in the welfare of all financial units.

The existence of a positive relationship between financial development and economic growth is generally accepted, but there is a clash of ideas in terms of whether the process of this effect is internal or external. Those who adopted the classical view, like Schumpeter, describes financial development with the development of crediting and financial services. In this approach, it is defended that the development of financial structure accelerates economic growth. In addition to the convenience it provides in financing the international trade and investment projects, a strong financial structure also provides an opportunity for risk distribution and the distribution of savings in different periods and places (both domestic and international). On the other hand, it is indicated that it should be taken into consideration with other explanatory variables in the analysis of the effects of financial tools on real variables. In this condition, financial variables are evaluated as internal variables in economic growth model.[1] Nevertheless, they also state that economic growth provides the required tools for the development of financial structure and that financial structure supports economic growth through activity increase in investments. Since financial intermediary agencies derive a higher profit, they support economic growth. As the income level increases, the financial system becomes widespread and the economic growth gains acceleration. Thus, countries with developed financial structure own a more consistent income distribution and higher growth rate.[2] Capasso (2004) states that the relationship of financial development and economic growth is mutual.[3]

In the present study, the relationship between financial development and economic growth was investigated for sixteen European countries. The study is a causality analysis. In this study, the bootstrap panel causality test[4] developed by László Kónya. Although there are various empirical studies on the relationship between financial development and economic growth in the literature, there is limited causality studies on the European countries. This study is comprised of five sections. Following this introductory section, the related literature is presented in section two. Section three provides information regarding the data and the methods used in the study. Empirical findings and the economic interpretations of these findings are presented in section four. Finally, conclusion and policy suggestions are given in section five.

Literature Review

The relationship between financial development and economic growth in the literature has been tested for many years. The first studies on this topic were conducted by Walter Bagehot and Joseph A. Schumpeter.[5] John G. Gurley and Edward S. Shaw, Valerie R. Bencivenga and Bruce D. Smith, Maurice Obstfeld, Bencivenga *et al.* can be given as examples for theoretical studies.[6] Empirical studies conducted on this subject can be divided into four groups as findings gained. The first one, is led by Schumpeter (1911) and developed by Patrick (1966), *supply-leading hypothesis*[7] have revealed that a the financial development fairly large and positive impact on economic growth (Ahmed and Ansari, 1998; Rousseau and Watchel, 1998; Ghali, 1999; Xu, 2000; Müslümov and Aras, 2002; Bhattacharya and Sivasubramanian, 2003; Fase and Abma, 2003; Calderón and Liu, 2003; Christopoulos and Tsionas, 2004; Dritsakis and Adamopoulos, 2004; Thangalavu and Ang, 2004; Chang and Caudill, 2005; Nieuwerburgh et al., 2006; Habibullah and Eng, 2006; Aslan ve Küçükaksoy, 2006; Eita ve Jordaan, 2007; Yang and Yi, 2008; Rathinam and Raja, 2010; Bojanic, 2012; Öztürk and Acaravcı, 2013; Mercan and Peker, 2013). This hypothesis is highly supported in empirical studies. For example, in studies conducted by Arjana Brezigar Masten et al. on thirty European countries[8], by W.N.W. Azman-Saini et al. (2010) on ninety-one countries[9], by Andrey Zagorchev et al. (2011) on eight European countries[10] and by Manoel Bittencourt on four Latin American countries[11], the findings support the supply-leading hypothesis of Schumpeter, which states that financial development supports economic growth (or has a positive effect on economic growth). Here, financial intermediation contributes to growth by increasing the effectiveness of capital accumulation, savings and, accordingly, investment rates.

The second hypothesis that explains the relationship between financial development and economic growth is the *demand-following hypothesis*, which was first put forward by Joan Robinson[12] and states that financial development follows economic growth (Liang and Teng, 2006; Ang and McKibbin, 2007; Odhiambo, 2008, 2009; Nazlıoğlu et al., 2009; Öztürk et al., 2011). This studies state that the demand for financial services will increase as the real part of the economies of countries develops. In studies conducted by C.T. Gürsoy and H. Al-Aali (2000) on Bahrain and Saudi Arabia, by J.Z. Shan et al. (2001) on Canada, Chine and Italy, by S.R.N. Colombage (2009) on Canada, by M.K. Hassan et al. (2011) on low-and middle-income countries, and by S.-J. Hsueh et al. (2013) on Malaysia, with respect to these findings they have obtained evidence to support the demand-following hypothesis of Schumpeter.

Third, the bidirectional causality hypothesis is a combination of the supply-leading and demand-following hypotheses (Demetriades and Hussein, 1996; Luintel and Khan, 1999; Al-Yousif, 2002; Hondroyiannis et al., 2005; Shan and Jainhong, 2006; Abu-Bader and Abu-Qarn, 2008; Kakilli Acaravci et al., 2009; Lee and Chang, 2009; Wolde-Rufael, 2009; Shahbaz and Lean, 2012; Shahbaz et al., 2013; Pradhan et al., 2015). It postulates that financial development and economic growth are mutually or bidirectionally causal. Financial development gradually induces economic growth and this, in turn, causes feedback and induces further financial development.

The fourth group work, while they also reached the finding which supports the hypothesis that Robert Lucas[13] argued (Atindehou et al., 2005; Guariglia and Poncet, 2008; Kar et al., 2011; Soytaş and Küçükkaya, 2011; Menyah et al., 2014). The theory is asserted which states that there is a very weak or no causality relationship between financial development and economic growth. This theory is stated as the *neutrality hypothesis*. For example, Sajid Anwar and Sizhong Sun analysed the data from Malaysia for the period of 1970–2007 and found that financial development did not have an effect on economic growth.[14] In a study conducted on data from thirty-six African countries for the period of 1980–2009, Esman M. Nyamongo *et al.* found that there was a weak relationship between financial development and economic growth.[15] In a study on data from sixty-five developing countries for the period of 1995–2011, as the result of their analysis Peresh K. Narayan, and Seema Narayan emphasized that bank loans, which is an indicator of the level of development of the financial sector, had a negative effect on economic growth. In their regional analysis, however, they found that the level of development of the financial sector had a very small contribution to economic growth in all regions (Africa, Middle East, Europe and Central/South America), except for Asian countries.[16]

Data and Methodology

Following the existing empirical literature on the Granger causality between financial development and economic growth, the model is as follows:

$$GDP = f\,(FD) \qquad \textbf{(1)}$$

where *GDP* denotes the economic growth in terms of real GDP, and *FD* denotes the variables of financial development. It is crucial that the variables selected to analyse the relationship between economic growth and financial development actually represent economic growth and financial development. In the literature, the variable generally used to represent economic growth is real GDP.[17] GDP was chosen as a proxy of economic growth. Various indicators have been used in the literature to represent financial development. The proxies that are used to represent the developments in the financial sector can be classified in three groups: (1) monetary aggregate variables,[18] (2) domestic and private credit value and banking variables[19] and (3) stock and bond market variables.[20] Because a significant part of data regarding the monetary aggregate variables could not be obtained, monetary aggregates such as M1, M2 and M3 were not used in this study.

In the literature, due to the fact that there is no single financial indicator that can show the role of financial tools in economy, estimations made using only one financial development indicator is accepted unrealistic and therefore more than one financial tool is generally used.[21] In this study, six different (*DCB*, *DCP*, *GDS*, *TR*, *ST* and *IR*) financial indicator were used in order to study different dimensions of financial sector. This study employs six indicators for financial development: (i) DCB: domestic credit provided by banking sector, (ii) DCP: domestic credit to private sector, (iii) GDS: gross domestic savings, (iv) TR: trade, (v) ST: total value of stock trade, (vi) IR: real interest rate (%). Table 1 presents these data variables and the sources used in the study.

Table 1. Data Set

Data	Explanation	Sources
GDP	Economic growth, (constant 2005,$)	WB
DCB	Domestic credit to private sector by banks (% of GDP)	WB
DCP	Domestic credit to private sector (% of GDP)	WB
GDS	Gross domestic savings (% of GDP)	WB
TR	Trade, (imports and exports of goods and services, % of GDP)	WB
ST	Stocks traded, total value (% of GDP)	WB
IR	Real interest rate (%)	IMF

WB: World Bank, IMF: International Monetary Fund.

The data were compiled from the World Development Indicator (WDI), online database and the IMF's International Financial Statistics online database. The panel consists of sixteen European countries (Austria, Belgium, Denmark, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and UK) and covers annual data for the period 1988–2012. Natural logarithms of all the variables are used in the econometric analysis.

Cross-Section Dependence

Before considering panel causality, it is best to investigate the characteristics of cross-sectional dependency among countries. Cross-section on dependency can be explained in terms of economics, is a situation which a shock happen in units forming panels, then the other units of the panel are also affected by this shock. In terms of econometrics, as units forming panels are related to error terms in the panel data model, which is given in equation (2).

$$y_{it} = \alpha_i + \beta_i x_{it} + \varepsilon_{it} \qquad \textbf{(2)}$$

$$Cov(\varepsilon_{it}, \varepsilon_{ij}) \neq 0$$

There are various tests in order to analyze cross-section dependency in panel data. In this study, tests that are developed by Trevor S. Breusch and Adrian R. Pagan (Breusch-Pagan) CD_{LM1}, M. Hashem Pesaran CD_{LM2}, M. Hashem Pesaran CD_{LM} and Pesaran *et al.* CD_{LMadj} are used.[22]

The CD_{LM1} test developed by Breusch-Pagan is calculated as:

$$CD_{LM1} = T\sum_{i=1}^{N-1}\sum_{j=i-1}^{N}\hat{\rho}_{ij}^2 \qquad \textbf{(3)}$$

This test is based on the sum of correlation coefficient squares among cross-section residuals that are obtained from OLS. This test, which has N (N-1)/2 degree of freedom, is used when N is constant and $T \rightarrow \infty$. Null hypothesis and alternate hypothesis are mentioned below.

H_0: No relations between cross sections.

H_1: Relations exist between cross sections.

The CD_{LM2} test is another test to examine cross-section dependency and is calculated as:

$$CD_{LM2} = \sqrt{\frac{1}{N(N-1)}}\left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{\rho}_{ij}^2 - 1\right)\right] \qquad \textbf{(4)}$$

In this equation, $\hat{p}_{ij}^2$ shows the estimation of the sum of cross-section residuals. The test that is used when N and T are great ($T \rightarrow \infty$ and $N \rightarrow \infty$) is an asymptotically normal distribution.

The CD_{LM} test is another test to examine cross-section dependency and is calculated with this formula:

$$CD_{LM} = \sqrt{\frac{2T}{N(N-1)}} \left[\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right] \quad (5)$$

This test is based on the sum of correlation coefficient squares among cross-section residuals. It is an asymptotically standard normal distribution and used when T > N and N > T. The null and alternative hypothesis of this test is similar with CD_{LM1} and CD_{LM2} tests.

The CD_{LM1} adjusted test is a modified version of the CD_{LM1} test developed by Pesaran *et al.*[23] This test is formulated as:

$$CD_{LM1adj} = \sqrt{\frac{2}{p(2N-p-1)}} \sum_{s=1}^{p} \sum_{i=1}^{N=s} \frac{(T-k)\rho_{i,i+s}^2 - \mu_{Ti,i+s}}{\upsilon_{Ti,i+s}} \quad (6)$$

Slope Homogeneity Test

Studies on homogeneity started with P.A.V.B. Swamy.[24] The homogeneity test in panel data analysis is another test that has to be conducted following the cross-section dependence test. The homogeneity test is conducted to check the heterogeneity of the coefficient estimates for each unit constituting the panel. Homogeneity shows that each unit forming the panel has the same characteristic properties. Heterogeneity means that each unit constituting the panel is affected by its own characteristic property. In causality analyses, homogeneity indicates whether there is causality in all units forming the panel, whereas heterogeneity shows that there is causality in certain units and there is no causality in others. Slope coefficient is evaluated in order to test the homogeneity in a model. That is,

$$Y_{it} = \alpha + \beta_i X_{it} + \varepsilon_{it} \quad (7)$$

In equation (7), whether slope coefficients are different among cross-sections is analysed through β_i. In the slope homogeneity test, while the zero hypothesis states that slope coefficients are homogeneous (H_0: $\beta i=\beta$), the alternative hypothesis states that slope coefficients are heterogeneous (H_1: $\beta_i \neq \beta$). M. H. Pesaran and T. Yamagata developed two different test statistics in order to test these hypotheses.[25] The first of these test statistics is presented in equation (8):

$$\tilde{\Delta} = \sqrt{N}\left(\frac{N^{-1}\hat{S}-k}{\sqrt{2k}}\right) \quad (8)$$

Here, slope coefficient is calculated as $\hat{S} = \sum_{i=1}^{N}\left(\hat{\beta}_i - \hat{\beta}_{WFE}\right)' \frac{X_i \mu_\tau X_i}{\hat{\sigma}_t^2}\left(\hat{\beta}_i - \hat{\beta}_{WFE}\right)$, $\hat{\sigma}_t^2 = \frac{\varepsilon_{it}' \mu_\tau \varepsilon_{it}}{T-k-1}$. In the equation, $\hat{\beta}_i$ represents the OLS estimator and $\hat{\beta}_{WFE}$ represents the weighted fixed effect. The second test statistics is presented in equation (9):

$$\tilde{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - E(\tilde{z}_{\text{it}})}{\sqrt{\text{var}(\tilde{z}_{\text{it}})}}\right) \tag{9}$$

Where $E(\tilde{z}_{\text{it}})$ = *k*, var $(\tilde{z}_{\text{it}})$ = 2*k*(*T*-*k*-*1*)/(*T*+*1*). These test statistics have standard normal distribution, and the test statistics given in equation (8) are used for big samples, whereas the one given in equation (9) is used for small samples.

Panel Causality Test

Three approaches have been employed to examine the direction of causality in a panel data.[26] The first approach is based on a GMM estimator. However, this approach is not able to take into account cross-sectional dependence.[27] The second approach was developed by C. Hurlin for examining the causality relation in a panel data.[28] However, this approach is not able to account for cross-sectional dependence. The third approach proposed by L. Kónya accounts for cross-sectional dependence. Moreover, this approach is able to take into account heterogeneity.[29] If cross-sectional dependency exists, it will be more efficient to use the seemingly unrelated regressions (SUR) approach instead of OLS when estimating panel data causality.[30] This approach, developed by L. Kónya, is more appropriate than other approaches defined previously for analysing the causality in a heterogeneous panel.[31]

This approach is based on SUR estimation of the set of equations and Wald tests with country specific bootstrap critical values in detecting causal relationships. Besides, the variables in the system are not supposed to be stationary, implying that the variables are used in level form irrespective of their unit root and cointegration properties, because country specific bootstrap critical values are used.[32]

The panel causality approach of L. Kónya can be formulated as follows:[33]

$$\begin{aligned}
y_{1,t} &= \alpha_{11} + \sum_{l=1}^{ly_1} \beta_{1,1,l} y_{1,t-l} + \sum_{l=1}^{lx_1} \delta_{1,1,l} x_{1,t-l} + \varepsilon_{1,1,t} \\
y_{2,t} &= \alpha_{2,1} + \sum_{l=1}^{ly_1} \beta_{1,2,l} y_{2,t-l} + \sum_{l=1}^{lx_1} \delta_{1,2,l} x_{2,t-l} + \varepsilon_{1,2,t} \\
&\vdots \\
y_{N,t} &= \alpha_{1,N} + \sum_{l=1}^{ly_1} \beta_{1,N,l} y_{N,t-l} + \sum_{l=1}^{lx_1} \delta_{1,N,l} x_{N,t-l} + \varepsilon_{1,N,t}
\end{aligned} \tag{10}$$

and

$$\begin{aligned}
x_{1,t} &= \alpha_{2,1} + \sum_{l=1}^{ly_2} \beta_{2,1,l} y_{1,t-l} + \sum_{l=1}^{lx_2} \delta_{2,1,l} x_{1,t-l} + \varepsilon_{2,1,t} \\
x_{2,t} &= \alpha_{2,2} + \sum_{l=1}^{ly_2} \beta_{2,2,l} y_{2,t-l} + \sum_{l=1}^{lx_2} \delta_{2,2,l} x_{2,t-l} + \varepsilon_{2,2,t} \\
&\vdots \\
x_{N,t} &= \alpha_{2,N} + \sum_{l=1}^{ly_2} \beta_{2,N,l} y_{N,t-l} + \sum_{l=1}^{lx_2} \delta_{2,N,l} x_{N,t-l} + \varepsilon_{2,N,t}
\end{aligned} \tag{11}$$

Where t refers to the time period (t=1,...,T) and N is the number of countries (j=1,....N) l to the lag.

In this system, each equation is the SUR system has different predetermined variables. To test for Granger causality, there are alternative causal relations to be found for a country in which (1) there is one-way Granger causality from X to Y if not all $\delta_{1,j,l}s$ are zero, but all $\beta_{2,j,l}s$ are zero; (2) there is one-way Granger causality from Y to X if all $\delta_{1,j,l}s$ are zero, but not all $\beta_{2,j,l}s$ are zero; (3) there is two-way Granger causality between X and Y if neither $\delta_{1,j,l}s$ nor $\beta_{2,j,l}s$ are zero; (4) there is no Granger causality between X and Y if all $\delta_{1,j,l}s$ and $\beta_{2,j,l}s$ are zero.

Empirical Findings

Before conducting the causality test developed by L. Kónya, it is necessary to test cross-section dependence and heterogeneity. The results of the cross-section dependence and homogeneity tests for sixteen European countries are presented in Table 2.

Table 2. Cross-section Dependence and Homogeneity Tests

Test	Statistic	p-value
CD_{LM1} (Breusch and Pagan, 1980)	579.956***	0.000
CD_{LM2} (Pesaran, 2004)	29.690***	0.000
CD (Pesaran, 2004)	3.457*	0.073
CD_{adj} (Pesaran et al., 2008)	8.059***	0.000
$\tilde{\Delta}$	5.480***	0.000
$\tilde{\Delta}_{adj}$	6.043***	0.000

*** and * indicate significance at the 1 and 10 %, respectively.

According to the results given in Table 2, it was concluded that there was cross-section dependence and heterogeneity in all three groups included in the study. Therefore, it would be possible to conduct the panel causality test of L. Kónya.

The first variable used as proxy for the financial sector is DCB. The results of the causality test between GDP and DCB for sixteen European countries are summarized in Table 3.

The null hypothesis that there is no causality from GDP to DCB is rejected for Portugal and Spain at 1 percent, for France, the Netherlands and UK at 5 percent, for Austria, Italy and Norway at 10 percent significance levels. The null hypothesis cannot be rejected for the remaining eight countries. On the one hand, the null hypothesis that there is no causality from DCP to GDP is rejected in Spain, Norway and UK at 1 percent, in Denmark and Greece at 5 percent and in France and Ireland at 10 percent significance levels. The null hypothesis is not rejected in the other countries (Table 3). Therefore, it can be said that there is a bidirectional causality relationship between GDP and DCB in France, Norway, Spain and UK, but there is no causality between the two variables in Belgium, Germany, Luxembourg, Sweden and Switzerland. In addition, it can be stated that there is unidirectional causality from GDP to DCP in Austria, Italy, the Netherlands, and Portugal and from DCB to GDP in Denmark, Greece, and Ireland.

The results of the causality analysis between DCP, which is another variable used to represent the financial sector, and GDP are presented in Table 4.

Table 3. The Results of Panel Causality Test for GDP and DCB

Countries	H_0: GDP does not cause DCB				H_0: DCB does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	12.70*	31.84	16.01	10.63	18.90	76.26	38.95	26.70
Belgium	0.287	22.52	11.66	7.83	0.680	60.65	30.98	20.42
Denmark	7.195	77.41	39.35	27.48	32.25**	53.84	30.13	21.16
France	12.7**	15.48	7.99	5.38	3.33*	14.66	7.24	3.05
Germany	0.89	14.36	7.35	5.13	0.80	15.44	8.30	5.65
Greece	7.95	44.42	21.07	13.88	31.03**	60.31	30.53	20.38
Ireland	28.11	71.77	38.77	37.69	23.55*	65.12	33.14	22.48
Italy	7.95*	14.49	7.99	5.55	2.70	13.12	7.08	4.77
Luxembourg	7.51	54.06	28.24	19.46	1.15	36.64	19.08	12.62
Netherlands	57.7**	70.67	38.44	26.55	0.002	53.38	28.01	18.28
Norway	38.77*	82.62	48.52	36.16	57.8***	57.52	29.40	19.60
Portugal	66.0***	62.96	35.25	25.43	4.60	43.47	22.73	15.57
Spain	53.6***	36.24	17.88	11.94	122.3***	55.76	31.34	21.93
Sweden	0.941	16.06	8.53	5.96	0.315	154.67	59.87	31.60
Switzerland	7.56	36.03	17.17	11.20	2.78	61.54	32.07	22.24
UK	11.32**	13.10	6.91	4.73	20.86***	16.57	8.57	5.77

***, ** and * indicate significance at the 1, 5 and 10 %, respectively.

Table 4. The Results of Panel Causality Test for GDP and DCP

Countries	H_0: GDP does not cause DCP				H_0: DCP does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	44.08***	43.09	21.24	13.93	0.08	62.09	32.22	21.62
Belgium	4.16	32.68	15.08	9.87	2.41	65.90	33.17	21.97
Denmark	14.54	95.18	38.45	22.81	27.90*	57.65	31.30	21.71
France	5.16*	14.25	7.32	4.94	9.38**	13.90	7.60	5.32
Germany	0.23	16.73	8.69	5.90	2.36	14.36	7.39	5.18
Greece	17.03	54.31	25.90	19.16	21.10**	36.37	19.65	13.46
Ireland	36.50*	79.41	43.31	29.90	6.84	63.32	31.01	21.71
Italy	3.87	17.28	8.65	5.43	0.15	14.96	7.93	5.58
Luxembourg	17.62	59.49	29.11	19.76	0.35	38.29	21.13	13.62
Netherlands	86.45***	60.65	34.72	24.53	0.02	49.52	26.93	18.26
Norway	30.05*	72.24	39.74	27.04	41.9**	45.26	23.27	15.20
Portugal	35.71**	55.80	29.17	20.46	0.13	44.66	24.52	16.68
Spain	55.96**	72.68	41.90	30.62	112.3***	56.53	30.71	22.04
Sweden	3.20	15.62	8.21	5.90	0.001	146.8	55.72	29.25
Switzerland	4.31	22.37	11.86	7.99	12.09	65.33	33.20	22.21
UK	23.6***	15.78	7.54	5.20	17.73***	12.31	7.11	4.90

***, ** and * indicate significance at the 1, 5 and 10 %, respectively.

The null hypothesis that there is no causality from GDP to DCP is rejected for Austria, the Netherlands and UK at 1 percent, for Portugal and Spain at 5 percent and for France, Ireland and Norway at 10 percent significance levels. The null hypothesis cannot be rejected in the other eight countries. Alternatively, the null hypothesis that there is no causality from DCP to GDP is rejected in Spain and UK at 1 percent, in France, Greece and Norway at 5 percent and in Denmark at 10 percent significance levels. The hypothesis is not rejected in the remaining ten countries (Table 4). According to these results, there is bidirectional causality between GDP and DCP for France, Spain, Norway and UK. It was found that there was unidirectional causality from GDP to DCP for Austria, Ireland, Netherlands and Portugal, and from DCP to GDP for Greece and Denmark. However, no causality was found between these two variables in Belgium, Germany, Italy, Luxembourg, Sweden and Switzerland.

The results of the causality test between GDP and GDS for sixteen European countries are summarized in Table 5.

Table 5. The Results of Panel Causality Test for GDP and GDS

Countries	H_0: GDP does not cause GDS				H_0: GDS does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	2.05	68.05	36.43	26.13	0.06	57.86	32.38	21.80
Belgium	1.23	29.47	15.27	10.31	0.27	57.36	30.50	20.88
Denmark	0.09	29.58	15.11	10.40	6.76	61.58	32.91	23.42
France	1.51	26.95	15.28	11.01	0.01	16.04	8.58	5.62
Germany	0.01	15.78	8.420	5.78	7.30*	17.26	9.12	6.16
Greece	2.34	25.02	13.68	9.17	36.68**	58.54	30.04	20.15
Ireland	2.20	54.01	27.67	18.36	109.0***	57.02	28.83	19.54
Italy	4.61	23.01	11.75	8.28	0.49	14.14	7.78	5.09
Luxembourg	25.6*	59.91	32.13	21.90	18.25*	48.64	24.85	16.66
Netherlands	0.07	19.37	10.66	7.19	0.42	69.85	35.83	24.98
Norway	17.01*	34.02	17.91	12.01	17.12*	52.47	25.49	16.78
Portugal	6.33	51.65	27.93	27.93	18.84	49.33	27.23	19.06
Spain	0.01	57.90	30.52	20.82	63.46**	73.43	40.73	28.23
Sweden	6.22	39.42	19.46	13.50	34.02**	56.01	29.18	19.96
Switzerland	3.98	57.74	30.79	21.15	3.83	42.38	21.88	14.60
UK	7.71*	18.01	10.01	6.78	5.84*	15.98	8.56	5.68

***, ** and * indicate significance at the 1, 5 and 10 %, respectively.

In Table 5, the null hypothesis that there is no causality from GDP to GDS is rejected for Luxembourg, Norway and UK at 10 percent significance levels, whereas it cannot be rejected in the other thirteen European countries. Besides, the null hypothesis that there is no causality from GDS to GDP is rejected in Ireland at 1 percent, in Greece, Spain and Sweden at 5 percent and in Germany, Luxembourg, Norway and UK at 10 percent significance levels. The hypothesis cannot be rejected in the remaining eight European countries. When the results presented in Table 5 are evaluated in general, it can be said that there is bidirectional causality between GDP and GDS in Luxembourg, Norway and UK, whereas there is unidirectional causality from GDS to GDP in Germany, Greece, Ireland, Spain and Sweden. No causality was found for the remaining European countries.

The results of the causality test between GDP and TR for sixteen European countries are presented in Table 6.

The null hypothesis stating that there is no causality from GDP to TR is rejected for Belgium, Denmark, Italy, Luxembourg, Netherlands and Norway at a 10 percent significance level. The null hypothesis cannot be rejected for the remaining ten European countries. Alternatively, the null hypothesis that there is no causality from TR to GDP is rejected for Denmark, Germany, Ireland and Spain at 1 percent, for Greece and Switzerland at 5 percent and for Austria, Belgium, France, Luxembourg, Portugal and Sweden at 10 percent significance levels (Table 6). Therefore, it can be said that there is bidirectional causality between GDP and TR for Belgium, Denmark and Luxembourg. In addition, it can be stated that there is unidirectional causality from GDP to TR for the Italy, Netherlands and Norway and from TR to GDP for Austria, Germany, Greece, Ireland, Portugal, Spain and Switzerland.

Table 6. The Results of Panel Causality Test for GDP and TR

Countries	H_0: GDP does not cause TR				H_0: TR does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	6.30	95.87	56.17	40.91	18.56*	48.25	25.56	17.81
Belgium	28.20*	69.58	37.73	26.08	18.18*	44.09	23.93	16.32
Denmark	36.73*	81.91	46.99	26.08	76.4***	51.74	26.73	18.36
France	0.25	13.81	7.52	5.08	6.39*	16.83	8.76	5.76
Germany	0.25	20.57	11.20	7.59	14.5***	13.80	7.30	4.95
Greece	0.55	43.78	22.48	33.03	25.35**	42.46	21.74	15.10
Italy	8.58*	20.94	11.78	8.18	0.17	15.55	8.42	5.73
Ireland	0.26	61.66	31.70	21.30	86.36***	81.22	38.36	26.36
Luxembourg	44.45*	86.62	51.02	37.80	14.19*	35.98	17.69	11.68
Netherlands	34.67*	83.85	46.65	33.03	0.14	61.75	32.21	22.22
Norway	9.20*	22.22	11.68	7.26	2.58	61.60	30.74	20.66
Portugal	0.25	42.53	21.86	14.66	14.56*	38.77	19.82	13.45
Spain	1.45	49.15	25.44	17.26	187.1***	80.28	40.04	28.22
Sweden	2.33	52.07	26.87	17.97	26.24*	67.32	33.92	22.50
Switzerland	0.74	52.41	28.60	20.23	22.45**	42.32	21.99	14.63
UK	2.31	16.79	9.24	6.38	1.81	15.96	8.42	5.73

***, ** and * indicate significance at the 1, 5 and 10 %, respectively.

The results of the causality test between GDP and ST for sixteen European countries are presented in Table 7.

Table 7. The Results of Panel Causality Test for GDP and ST

Countries	H_0: GDP does not cause ST				H_0: ST does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	0.11	23.24	12.83	8.55	2.031	67.41	36.08	24.14
Belgium	23.85*	57.05	31.67	22.70	103.6***	64.23	31.74	21.59
Denmark	43.91***	40.86	22.43	15.01	26.13*	70.23	37.47	25.80
France	1.64	21.78	12.51	8.96	8.93**	15.85	8.66	5.92
Germany	0.45	18.51	11.02	7.91	0.004	15.00	8.03	5.38
Greece	0.73	37.02	20.12	13.65	20.49*	59.83	29.42	19.48
Italy	2.36	19.86	12.14	8.65	33.86***	17.17	8.45	5.99
Ireland	0.39	31.51	16.12	11.21	65.09***	58.70	30.43	21.53
Luxembourg	3.75	27.78	13.90	9.39	4.019	51.01	24.37	16.14
Netherlands	0.28	41.03	22.16	14.93	29.83*	69.39	32.58	22.71
Norway	16.31*	40.36	21.75	14.39	21.67*	57.86	30.82	20.72
Portugal	0.65	46.12	25.73	17.64	22.63*	52.57	27.91	18.61
Spain	0.20	53.75	28.85	20.45	89.67***	78.01	42.59	29.67
Sweden	4.72	62.13	34.34	23.76	48.53***	43.38	22.68	15.91
Switzerland	0.26	43.25	23.44	15.85	0.14	46.21	23.95	16.30
UK	27.8***	26.65	15.07	11.06	13.30**	12.82	6.93	4.76

***, ** and * indicate significance at the 1, 5 and 10 %, respectively.

The null hypothesis that there is no causality from GDP to ST is rejected for Denmark and UK at 1 percent and for Belgium and Norway at 10 percent significance levels. The null hypothesis is not rejected for the other twelve European countries. Alternatively, the null hypothesis that there is no causality from ST to GDP is rejected for Belgium, Italy, Ireland, Spain and Sweden at 1 percent, for France and UK at 5 percent and for Denmark, Greece, Netherlands, Norway and Portugal at 10 percent significance levels (see Table 7). Therefore, it can be said that there is bidirectional causality between GDP and ST for Belgium, Denmark, Norway and UK and unidirectional causality from ST to GDP in France, Greece, Italy, Ireland, Netherlands, Portugal, Spain and Sweden. However, no causality was determined regarding these two variables for Austria, Germany, Luxembourg and Switzerland.

Last, the results of the causality test between IR and GDP for sixteen European countries are given in Table 8.

Table 8. The Results of Panel Causality Test for GDP and IR

Countries	H_0: GDP does not cause IR				H_0: IR does not cause GDP			
	Wald stat.	Bootstrap Critical Values			Wald stat.	Bootstrap Critical Values		
		1 %	5%	10%		1 %	5%	10%
Austria	45.49**	75.67	40.12	28.88	20.62	67.41	36.08	24.14
Belgium	26.91*	65.83	32.29	22.25	10.19	64.23	31.74	21.59
Denmark	5.252	69.45	30.32	19.88	10.55	70.23	37.47	25.80
France	1.64	21.78	12.51	8.96	8.93**	15.85	8.66	5.92
Germany	0.45	18.51	11.02	7.91	0.004	15.00	8.03	5.38
Greece	37.59**	54.12	28.52	20.55	32.91**	59.83	29.42	19.48
Italy	2.36	19.86	12.14	8.65	33.86***	17.17	8.45	5.99
Ireland	47.24**	60.57	32.16	21.83	3.71	58.70	30.43	21.53
Luxembourg	1.237	60.72	33.40	23.59	18.55*	51.01	24.37	16.14
Netherlands	0.414	73.76	38.84	27.95	37.11**	69.39	32.58	22.71
Norway	18.56*	45.25	24.74	17.44	32.77**	57.86	30.82	20.72
Portugal	32.21**	51.25	28.75	20.57	24.58*	52.57	27.91	18.61
Spain	81.68***	75.70	37.95	26.03	0.35	78.01	42.59	29.67
Sweden	0.169	61.26	32.19	12.95	28.81**	43.38	22.68	15.91
Switzerland	52.91***	37.56	19.00	13.77	10.15	46.21	23.95	16.30
UK	27.8***	26.65	15.07	11.06	0.008	14.73	8.05	5.38

***, ** and * indicate rejection of the null hypothesis at the 1, 5 and 10 %, respectively.

As it can be seen in Table 8, the null hypothesis that there is no causality from GDP to IR is rejected for Spain, Switzerland and UK at 1 percent, for Austria, Greece, Ireland and Portugal at 5 percent and for Norway at 10 percent significance levels. The null hypothesis is not rejected in the other seven countries. On the other hand, the null hypothesis that there is no causality from IR to GDP is rejected for Italy at 1 percent, for France, Greece, Netherlands, Norway and Sweden at 5 percent and for Luxembourg and Portugal at 10 percent significance levels. The null hypothesis cannot be rejected in the other eight European countries. Therefore, it can be said that there is bidirectional causality between GDP and IR for Greece, Norway and Portugal. In addition, it can be stated that there is unidirectional causality from GDP to IR for Austria, Belgium, Ireland, Spain, Switzerland and UK and from IR to GDP for France, Italy, Luxembourg, Netherlands and Sweden. However, no causality was found for Denmark and Germany.

The directions of the causality relationships between economic growth and financial development for all country groups are summarized in Table 9.

Table 9. Summary for the direction of causality

	DCB	DCP	GDS	TR	ST	IR		DCB	DCP	GDS	TR	ST	IR
Countries	Panel A: from FD to economic growth						Countries	Panel B: from economic growth to FD					
Austria	no	no	no	→	no	no	Austria	→	→	no	no	no	→
Belgium	no	no	no	→	→	no	Belgium	no	no	no	→	→	→
Denmark	→	→	no	→	→	no	Denmark	no	no	no	→	→	no
France	→	→	no	→	→	→	France	→	→	no	no	no	→
Germany	no	no	→	→	no	→	Germany	no	no	no	no	no	→
Greece	→	→	→	→	→	→	Greece	no	no	no	no	no	→
Italy	no	no	no	no	→	→	Italy	→	no	no	→	no	→
Ireland	→	no	→	→	→	no	Ireland	no	→	no	no	no	→
Luxembourg	no	no	→	→	no	→	Luxembourg	no	no	→	→	no	no
Netherlands	no	no	no	no	→	→	Netherlands	→	→	no	→	no	no
Norway	→	→	→	no	→	→	Norway	→	→	→	→	→	→
Portugal	no	no	no	→	→	→	Portugal	→	→	no	no	no	→
Spain	→	→	→	→	→	no	Spain	→	→	no	no	no	→
Sweden	no	no	→	→	→	→	Sweden	no	no	no	no	no	no
Switzerland	no	no	no	→	no	no	Switzerland	no	no	no	no	no	→
UK	→	→	→	no	→	no	UK	→	→	→	no	→	no

Either unidirectional or bidirectional causality was determined regarding the relationship between financial development and economic growth for all European countries, except for Switzerland. For example, bidirectional causality was determined for five European countries (France, Norway, Portugal, Spain and UK). As for Denmark, Greece, Ireland, and Sweden, findings clearly support the supply-leading hypothesis, showing that in this country financial development can directly enhance economic growth. As for Germany, and Luxembourg, same financial development variables lead to economic growth. Specifically, GDS, TR or IR can result in economic growth in Germany and Luxembourg. On the other hand, findings that support the demand-following hypothesis were obtained for some European countries, such as Austria, Belgium, Italy and the Netherlands.

The empirical findings implies that financial sector and real sector are interrelated to each other. These results are different from those in papers of Khan and Senhadji (2003), Atindehou et al. (2005), Kemal et al. (2007), Guariglia and Poncet (2008), Kar et al. (2011) and Menyah et al. (2014), which suggested that there is no significant correlation between the financial development and economic growth. However, these results are the same or similar to those in Jung (1986), King and Levine (1993b), Demetriades and Hussein (1996), Luintel and Khan (1999), Al-Yousif (2002), Kakilli Acaravci et al. (2009), Lee and Chang (2009) and Pradhan et al. (2015).

When the causality test results are evaluated in general, In EU countries, there was a causality relationship from economic growth to financial development and from financial development to economic growth. These results support both the supply-leading and the demand-following hypotheses. Therefore, it can be stated that the relationship between the financial sector and the real sector has a feedback effect in sixteen European countries. The main reason for this is that the financial sector and the real sector are much more cointegrated in European countries. A development experienced either in the financial sector or in the real sector also easily affects another sector due to the fact that European countries have good market networks. For this reason, a development in the financial and the real sector affects one another at a considerably fast pace.

Conclusion

The relationship between financial development and economic growth has long remained an important issue of debate in the literature. With the emergence of endogenous growth theories which implicitly assume a causal relation from financial development to economic growth, the direction of causality is still an empirical issue. In this study, the direction of causality among the variables in question is investigated for the period 1988–2012 for sixteen European countries. In order to see the impact of various aspects of financial development, six alternative financial development indicators are used. The method applied here is the bootstrap panel causality test which was developed by L. Kónya and takes into account cross-sectional dependence across the countries.

The empirical results showed that there was a strong causality relationship between financial development and economic growth in European countries. There was bidirectional causality between economic growth and financial development in European countries. Therefore, it can be said that the feedback hypothesis is valid for European countries. This findings show that both supply-leading and demand-following hypotheses are valid in European countries. Therefore, economic policies focus only on the development of the financial sector may not result in economic development where the financial sector follows economic growth in European countries. However, the financial sector should provide sufficient resources by creating new instruments, institutions and organizations for the demand of real sector with the progress of economic development where the economic growth leads development of the financial sector.

The financial market is highly developed in sixteen European countries. Furthermore, these financial markets have a considerably wide and extensive structure. The share of financial markets in GDP is considerably large and the obtained income has an important place within GDP. Most of the companies in the real sector are listed on the stock exchange and have close relationships with the financial sector. For this reason, there is a strong coordination between the financial markets and the real sector in Eurepean countries. This leads to a strong interaction between financial development and economic growth.

Notes

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