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ABSTRACT

This paper assesses empirically the relationship between the development of the banking system and the stock market and economic performance for the case of Greece over the period 1986-1999. Greece is a medium sized EU country where the financial liberalization process started back in the early eighties. The empirical results, using VAR models, suggest that there exists a bi-directional causality between finance and growth in the long run. The findings, using error-correction models, show that both bank and stock market financing can promote economic growth, in the long run, although their effect is small. Furthermore, the contribution of stock market finance to economic growth appears to be substantially smaller compared to bank finance.

Key words: Financial Development; Economic Growth; VAR
JEL classification: E44; C32

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1. Introduction

Considerable attention has been drawn in recent years to the relationship between financial intermediation and economic growth. Ever since the appearance of the influential works of Goldsmith (1969), McKinnon (1973) and Shaw (1973), a debate has been ongoing about the role of financial intermediaries in promoting long-run growth.

A large body of the empirical research on the relationship between finance and growth focuses on banking, the traditional intermediation channel. However, over the last two decades, the new element in many countries, especially the developing ones, has been the increasing intermediation role of the stock markets, deriving from the financial liberalization measures. As a result, there has been renewed research interest in the role of the stock markets as a stimulus to economic growth. Recent advances in endogenous growth literature have determined the role of financial intermediaries by showing that these can contribute to economic growth through various aspects of productive activity.

The existence of a relationship between financial markets and economic growth is generally recognized, mainly through cross-country growth regressions. Yet, researchers have not reached an agreement with regard to this relationship. While it seems that the level of financial development is a good predictor of economic growth, the empirical findings do not settle the issue of causality nor do they provide answers on the endogeneity of the variables used in the analysis (King and Levine 1993a, 1993b; Levine and Zervos 1998). Furthermore, the results may vary considerably across countries, owing to their different institutional characteristics and market size.[1] Contrary to the cross-section studies, time-series approaches account for the specificity of the individual country and offer the opportunity to analyze the causality pattern and its evolution over time, since causality patterns may differ across countries (Rousseau and Watchel 1998).

[1] In addition, cross-section studies are criticized (Arestis and Demetriades 1997; Bell and Rousseau 2001) since their results are not always easy to interpret, they are based on a fragile statistical basis and they do not account adequately for the variation in the institutional setting across countries, although recent studies (e.g. Levine *et al.* 2000) try to resolve this deficiency by controlling for institutional, legal and political variables.

The purpose of this paper is to contribute to the empirical investigation of the finance-growth nexus, recognizing the separate roles of banking and the stock market. Utilizing time-series methods and applying vector error-correction (VEC) model estimation, we examine whether financial intermediation exerts a causal influence on economic growth in the case of Greece, over the period 1986-99. We also test the dynamic interactions among financial variables and economic growth and look into the extent to which the financial sector contributes to the country's economic development process. Greece is a medium size EU country with a less mature financial market compared to other advanced economies. Over the last two decades, its financial market has undergone a process of liberalization at an accelerating pace and expanded considerably, while the fairly remarkable growth rates achieved by the Greek economy after the early nineties have enabled the country to enter the Euro zone. We believe that the conclusions drawn could be instructive to other medium-sized economies in the region, such as the new EU member countries.

The paper focuses on two aspects of financial intermediation. The first concerns the linkage between real economic activity and total private financial intermediation, whether through banks or the stock market. The second aspect refers to the relationship between industrial sector's financing and economic performance, with the aim of investigating the specific role of industry in the economic development process. To this end, two models are estimated. In the first model (Model 1) the linkages among real output, total stock market capitalization and total bank credit to the private sector are examined, while in the second model (Model 2) the relationship among real output, the market capitalization of industrial stocks and bank credit to industry is considered.

The paper proceeds as follows. Section 2 broadly reviews the literature on financial development and economic growth. Section 3 briefly presents the developments in the Greek financial system. Section 4 deals with methodological issues and the data used in the empirical analysis. Section 5 presents the empirical results, while Section 6 summarizes the results of the analysis and concludes the issue.

2. Theoretical Underpinnings and Empirical Evidence

The development of endogenous growth theory in recent years has offered the opportunity to define and explain the link between financial development and economic growth. Financial development can affect the rate of economic growth by altering productivity growth and the efficiency of capital. It also affects the accumulation of capital through its impact on the saving rate or by altering the proportion of saving (Pagano 1993; Levine 1997).

The theoretical issues are not yet settled. Furthermore, the existing empirical evidence is not conclusive, while a strong empirical causal relationship among the banking system, stock market development and economic performance is difficult to establish.

Financial development is considered to be related to economic growth through various channels. An important role of financial intermediaries is to provide liquidity to individual investors (Diamond and Dybvig 1983). Financial intermediaries encourage the funding of less established but likely highly productive firms by reducing informational asymmetries and costs (Diamond 1996). Thus, they promote the efficient allocation of resources and accelerate technological innovation and economic growth (King and Levine 1993b). At the same time, the ability of financial intermediaries to offer profitable investments enhances savers' confidence and attracts additional savings. The efficient operation of financial intermediaries leads to output growth and generates additional demand for deposits and financial services (Greenwood and Jovanovic 1990).

Enhanced stock market liquidity reduces the disincentives for investing in long-duration and higher-return projects, since investors can easily sell their stake in the project before it matures, and is expected to boost productivity growth (Levine 1991; Bencivenga *et al*. 1995). Portfolio diversification, through the stock market, may have an additional growth effect by encouraging specialization of production (Saint-Paul 1992). In addition, in the case of production externalities (Romer 1986), further specialization is expected to improve productivity and hence economic growth. Similarly, a portfolio shift from safe, low return to high return investment is induced by internationally integrated stock markets, thereby accelerating productivity growth (Devereux and Smith 1994; Obstfeld 1994). On the other hand, highly liquid

markets may reduce the shareholders' incentive to monitor managers, thus impeding effective resource allocation and productivity growth (Shleifer and Vishny 1986; Bhide 1993).

Empirical efforts have adopted broader quantitative measures of the financial sector, mainly by employing bank-based measures of financial development, such as the ratio of liquid liability of financial intermediaries to GDP and domestic credit to the private sector over GDP. King and Levine (1993a, 1993b) relate the overall depth of the banking sector to economic growth using a sample of over eighty countries. Arestis and Demetriades (1997) and also Demetriades and Hussein (1996) use indicators of financial development and report mixed causal findings, especially for developing countries. Bell and Rousseau (2001) evaluate the relationship between individual macroeconomic indicators and measures of financial development in India and find that the financial sector has been instrumental in promoting economic performance.

Recent empirical research allows for a separate role for the stock market in the financial system. Levine and Zervos (1996, 1998) examine the specific role of stock markets, since banks provide different services from those of the stock markets, and show that various measures of equity market activity are positively correlated to measures of real economic activity. Demirguc-Kunt and Levine (1996a, 1996b) conclude that countries with well-developed stock markets have well-developed financial intermediaries and vice versa, implying that there is no distinction between bank-based and market-based financial systems. Atje and Jovanovic (1993) analyze a set of forty countries over the 1980s and show that the value of stock market trading relative to GDP has a strong influence on growth, while bank credit does not. Harris (1997) utilizes instrumental variables to a similar specification and finds a weak relationship between stock markets and economic growth in a sample of developed and non-developed countries; in a sample of less-developed countries the stock market variable does not seem to affect economic growth.

Singh (1997) relates the rapid growth of stock markets in the liberalization process in developing countries over the 1980s and 1990s and argues that financial liberalization, by making the financial system more fragile, is not likely to enhance

long-term growth. By contrast, Levine (1997)[2] supports the view that stock markets may affect growth through liquidity, by making investment less risky, and concludes that stock market development explains future economic growth.

Also Rousseau and Wachtel (2000), using a set of forty-seven countries, reveal a leading role of stock market liquidity and suggest that stock exchanges can promote economic performance. Levine *et al.* (2000) find that the exogenous components of financial intermediary development is positively associated with economic growth, while Arestis *et al.* (2001) support the view that although both banks and stock markets may be able to promote economic growth, the impact of banking is more powerful.

3. Developments in the Greek Financial System

Until the early 1980s the financial system in Greece was characterized by institutional specialization required by law rather than dictated by market forces. The regulation and control of the banking system was carried out through a complex system of credit rules in an environment of administrative fixed interest rates.[3] The banking system, being the main channel through which the economy was financed, was an instrument of fiscal policy, either by means of public spending or investment. In addition, the capital market was very thin.

The first step towards the liberalization of the financial system came about in 1982, when the role of the Bank of Greece in conducting monetary policy was enhanced and a ceiling was set on the financing of the central government by the central bank. Towards the late 1980s, there had been a process of gradual and extensive liberalization of the market, motivated by international developments and the need for participation in the single European market for financial services. At the beginning of the 1990s the process of deregulation of the financial system was carried out at an accelerating pace, along with the implementation of EC Council Directives.

Specifically in 1992 the Basic Banking Law concerning establishment, operation and supervising of credit institutions, incorporated the provision of the

[2] Based on the empirical work of Levine and Zervos (1996).

Second Banking Directive. Various measures were also taken towards the modernization of the capital market. Thus, in 1990 the operation of the Parallel Stock Exchange (for smaller firms) started. In 1991, the Central Securities Depository Company was established; the supervisory role of the Capital Market Committee was upgraded and the operating framework of undertakings collective investment in securities was improved. In addition, in 1992 important technological upgrading of the operation of the Athens Stock Exchange took place, through the installation of a computerized trading system that enabled remote market access.

A particular characteristic of the Greek financial system is the relatively high weight of banking, although the depth of the capital and money markets has increased considerably in recent years. For example, in the decade 1985-94, the number of credit institutions increased from 41 to 50, while the number of listed companies in the Athens Stock Exchange (ASE) also rose substantially. Additionally, over the ten-year period, there was a spectacular increase in collective investment institutions: the number of mutual funds increased from 2 to 98, the number of brokerage firms increased from 28 to 62, the number of investment firms increased from 6 to 16, while ten leasing companies were in operation by the mid-nineties.

Currently, the Greek financial system is faced with increased competition and internationalization, while banking disintermediation has been in evidence. At present, interest rates are freely determined and banks are allowed to extend credit on their own terms and provide new financial products and services. In addition, owing to the abolition of all-direct controls and interventions, the public sector meets its borrowing requirements exclusively through the money and capital markets. The liberalization of the financial system may have increased the potency of the channels through which economic activity is financed. However, the expansion of the stock market may have reduced the degree to which firms rely on bank credit.

[3] For a detailed discussion on the developments in the regulatory and institutional framework of the Greek financial system, see, Christopoulos *et al.* (2002), Hondroyiannis *et al.* (1999), Central Banking (1995/6) and the references cited therein.

4. Methodological Issues and Data

In the empirical analysis, for the case of Greece over the period 1986-99, we test for the existence of a relationship between the development of the banking system, stock market development and economic performance.

A standard measure of the importance of intermediaries in financing real activity is the ratio of an indicator of intermediary liabilities (e.g. assets) to annual output. Researchers, traditionally employ some measure of the stock of money (whether narrower or broader) over GDP as a proxy for the overall size of the "financial depth" (Goldsmith 1969; McKinnon 1973). However, this type of indicator does not inform us as to whether the liabilities are those of the central bank, commercial banks or other financial intermediaries. Furthermore, this type of indicator is mainly applicable to the study of countries, which are in the first stages of development, since the financing of the economy is to a great extent carried out by the public sector. It would be probably applicable to the case of Greece in the first stages of its economic development in the 1950s and 1960s, but it does not provide useful insight for the recent period after the liberalization of the financial system.

Following Levine and Zervos (1998), we use the value of commercial bank credit to the private sector divided by GDP, as a measure of the ability of the banking system to provide finance-led growth. Besides banking, stock market development is included in the model specification for the assessment of its independent link with growth. For the stock market development indicator, we use total market capitalization divided by GDP, as a measure of the size of the stock market. In the case of time-series analysis, this measure is preferable to other market liquidity measures used mainly in cross-section studies, since it is a stock variable and the comparison with the bank-based indicator is more meaningful (Arestis *et al*. 2001).

The endogeneity of the variables is investigated empirically via VEC models. The extent to which economic growth is associated with the developments in the financial sector is also examined. Two empirical models are analyzed. In the first model concerning the whole of the economy (Model 1) three variables are included: total real output, total stock market capitalization and total bank credit to the private sector. The second model (Model 2) assesses the relationship between industrial sector's financing and total economic activity and the three variables used are: total

real output, stock market capitalization of the industrial sector and bank credit to industry.

The existence of a statistical relationship among the variables is carried out in three steps. Initially the order of integration of the variables is investigated using standard tests for the presence of unit roots.[4] The second step involves testing for cointegration using the Johansen maximum likelihood approach (Johansen 1988; Johansen and Juselius 1990, 1992). The Johansen-Juselius estimation method is based on the error-correction representation of the VAR model with Gaussian errors. Although cointegration implies the presence of Granger-causality it does not necessarily identify the direction of causality. This temporal Granger-causality can be captured through the VEC model derived from the long-run cointegrating vectors (Granger 1986, 1988).[5]

Finally, the third step involves the utilization of the vector error-correction modelling and testing for exogeneity of variables. Engle and Granger (1987) show that in the presence of cointegration, there always exists a corresponding error-correction representation. This implies that changes in the dependent variable are a function of the level of disequilibrium in the cointegrating relationship, captured by the error-correction term (ECT), as well as by changes in other explanatory variables.

The Wald-test applied to the joint significance of the sum of the lags of each explanatory variable and the t-test of the lagged error-correction term will imply statistically the Granger-exogeneity or endogeneity of the dependent variable. The non-significance of the ECT is referred to as long-run non-causality, which is equivalent to saying that the variable is weakly exogenous with respect to the long-run parameters. The absence of short-run causality (Granger-causality in the strict sense) is established from the non-significance of the sums of the lags of each explanatory variable. Finally, the non-significance of all explanatory variables including the ECT term in the VECM indicates the econometric strong-exogeneity of the dependent

[4] Dickey and Fuller (1979, 1981), (ADF); Perron (1988), Phillips (1987), Phillips and Perron (1988), (PP); Kwiatkowski *et al.* (1992), (KPSS); Zivot and Andrews (1992), (ZA) tests are applied. The Zivot and Andrews unit root test is a transformation of Perron's unit-root test treating endogenously the presence of any possible break in the series. In the estimation we allow both the break points and the lag length to vary endogenously. The null hypothesis is that the series follow a random walk process without structural changes; while the alternative is that the series are trend stationary with one-time break with the precise timing unknown.

[5] For other applications of this technique in different topics see Masih and Masih (1996) and Hondroyiannis and Papapetrou (2000).

variable, that is the absence of Granger-causality.[6] Pesaran and Shin (1996) have proposed the estimation of a persistence profile to estimate the speed with which the effect of system-wide shocks on cointegrating relationship disappears.[7]

The empirical analysis is carried out using monthly data for Greece during the period 1986-Jan to 1999-Dec. Output is measured by real GDP (RGDP) and is obtained from the Economic Research Department of the Bank of Greece. The stock market development indicator is the total market capitalization variable (TCAP), defined as the value of listed domestic shares on domestic exchanges as percentage of GDP. The stock market indicator for the industrial sector is the industrial stocks capitalization variable (ICAP), measured by the value of listed domestic industrial shares on domestic exchanges as percentage of GDP. Stock market data is obtained from various issues of the *Athens Stock Exchange Monthly Statistical Bulletin*. The banking system development indicator is the total bank credit variable (TBC), defined as the total commercial bank credit to the private sector as percentage of GDP, while the bank credit to industry variable (IBC) is defined by the commercial bank credit to industry as percentage of GDP. Bank credit data is obtained from several issues of the *Monthly Statistical Bulletin* of the Bank of Greece. In the empirical analysis, all variables are expressed in logarithms and are not seasonally adjusted (LRGDP, LTCAP, LICAP, LTBC, LIBC).

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[6] As discussed by Granger (1988), causality in mean is the one that has empirical relevance because of its forecasting content, that is "if Y_t causes X_t , then X_{t+1} is a better forecast if the information in Y_t is used than if it is not used, where better means a smaller variance of forecast error or the matrix equivalence of variance. The simple Granger-causality tests can be formulated using I(1) variables. According to the Granger representation theorem, the error-correction model in the case of two variables X_t, and Y_t , derived from the long-run cointegrating relationship among the variables is of the following form

$$\Delta LX_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta LX_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta LY_{t-i} + \delta ECT_{t-1} + u_t \quad \text{(i)}$$

$$\Delta LY_t = a_0 + \sum_{i=1}^{q} b_i \Delta LY_{t-i} + \sum_{i=1}^{r} c_i \Delta LX_{t-i} + d ECT_{t-1} + e_t \quad \text{(ii)}$$

where ECT is the error-correction term derived from the long-run relationship, ?LX_t and ?LY_t are the first differences of the variables LX_t and LY_t and u_t and e_t are the error terms. Granger causality implies testing the significance of the joint hypothesis H_o:?=0, d=0 and H_o: c=0, d=0 using equations (i) and (ii) respectively, with the appropriate number of lags to eliminate autocorrelation in the estimated regression equations. A variable is defined as strongly exogenous when it is weakly exogneous and is not affected by any of the endogenous variables in the system, (Mosconi and Giannini 1992; Maddala 2001, p.378).

[7] The persistence profile at n periods after a shock can be viewed as the variance of the difference between the forecast for n periods if a shock had occurred and the forecast for n periods if no shock had occurred. However, the above tests do not provide an indicator of the dynamic properties of the system and do not measure the relative strength of the Granger-causal chain or the degree of exogeneity among the variables beyond the sample period.

5. Empirical Results

The combined results from all unit-root tests performed (ADF, PP, KPSS and ZA) suggest that all series under consideration (real output, total market capitalization, total private bank credit, industrial stocks capitalization and bank credit to the industrial sector) appear to be I(1) processes.[8]

Having verified that the variables are integrated of the same order, we test for a relationship between the variables for each one of the two Models. Table 1 summarizes the results of cointegration analysis, using the Johansen maximum likelihood approach, employing both the maximum eigenvalue and the trace statistic. The determination of the lag length of the VAR is carried through an extensive diagnostic testing of the OLS residuals, which is employed for various lag lengths.

[INSERT Table 1]

The equations of the VAR models pass a series of diagnostic tests, including serial correlation based on the inspection of the autocorrelation functions of the residuals as well as the reported Lagrange multiplier. It was also tested whether the estimated regression equations were stable throughout the sample, using the CUSUM and CUSUMSQ tests on structural stability of the estimated relations. Given the monthly frequency of the data, an initial version of the VAR with twelve lags was estimated. In both Models, the results indicate an optimum length of four lags, while the estimated statistics for the VAR=4 indicate not only the absence of serial correlation but also the structural stability of the estimated regressions. Specifications of the VAR with smaller number of lags reveal serial correlation in the estimated regressions. Thus, a VAR=4 is employed in the estimation procedure of cointegration to avoid over-parameterization of the estimated models. Log-likelihood ratio tests are also used to test the deletion of the eleven seasonal dummies from the VAR models. The high value of log-likelihood ratio test (LR=392.24 in Model 1 and LR=388.10 in Model 2) rejects the null hypothesis of the deletion of the eleven seasonal dummies. The estimation procedure assumes unrestricted intercepts and unrestricted trends in the VAR estimation for both Models. The two test statistics give similar results, thus

[8] The results for the unit root tests are available from the authors upon request.

providing evidence to reject the null of zero cointegrating vectors in favour of one cointegrating vector at 5% level.[9]

On the basis of our results, the long-run relationship among real output, market capitalization and private bank credit receives statistical support in the case of Greece over the period under examination (Model 1). Similar results are derived from the model for the industrial sector (Model 2).

Subsequently, we investigate the statistical significance of all variables in the cointegrating vector. Table 2 reports the likelihood ratio tests as described in Johansen and Juselius (1992). The results suggest that all variables, for both Models, enter the cointegrating vector in a statistically significant way. Table 2 also reports the statistics testing for the stationarity hypothesis of all variables. In particular, we investigate whether all variables except one, which takes the value of one, are equal to zero. The tests, which follow a chi-square distribution with two degrees of freedom, reject the stationarity hypothesis for all variables at 1% level of significance. These findings are in accordance with the rejection of the unit root hypothesis, from the ADF, PP, KPSS and ZA tests, implying that all variables employed in the analysis are not stationary.

[INSERT Table 2]

The estimated cointegration relationships are presented in Table 1. For Model 1, this equation can be rewritten as:

$$LRGDP = 0.029\ LTCAP + 0.09\ LTBC + Z_1 \qquad (1)$$

The estimated equation shows that an upward shock in the stock market due to a rise in market capitalization is associated with an increase in total output in Greece. Additionally, an increase in private bank credit boosts real economic activity. The estimated cointegrating vector among the three variables suggests that real economic activity is affected by changes in market capitalization and private bank credit in the long run.

The equation for Model 2 can be rewritten as:

$$LRGDP = 0.031\ LICAP + 0.21\ LIBC + Z_2 \qquad (2)$$

[9] It is known that the Johansen cointegration procedure is biased towards the rejection of the null hypothesis in a small sample (Cheung and Lai 1993). Therefore, in the estimation procedure we used the critical values obtained from Johansen and Juselius (1990) and the critical values adjusted for small

Again, an increase in industrial stocks capitalization raises total output of the Greek economy, while an increase in bank credit to industry adds to real economic activity. Thus, the estimated cointegrating vector among the three variables implies that, in the long run, real economic activity is affected by changes in industrial stocks capitalization and bank credit to industry.

However, the size of the estimated coefficients in both Models is quite small indicating that stock market capitalization and bank credit only partially determine the magnitude of real economic activity in Greece.[10] In addition, the contribution of the stock market financing to the growth process is substantially smaller than that of banks, a finding that is in line with the Greek institutional setting.

The long-run relationships are also estimated and their stability is tested using the recursive estimation of the break point Chow test and the forecast Chow test at 5% level of significance. In both Models, the results indicate that none of the break point Chow statistics is significant at their one-off 1% level. In addition, the recursive estimates reveal the stability of the estimated coefficients over the estimated period. These results suggest that the long-run relationship remained unchanged during the estimation period.[11]

Having verified that the variables are cointegrated, vector error-correction techniques are applied. The lagged residuals from the cointegrating regression with the appropriate number of lags are included in the Granger-causality test structure. The lag length structure depends on the restricted error-correction models. For both Models, the restricted error-correction specifications pass a series of diagnostic tests, including serial correlation based on the inspection of the autocorrelation functions of the residuals as well as the reported Lagrange multiplier. In addition, the estimated

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sample (see note in Table 1). Both values reject the null of zero cointegrating vectors in favour of one cointegrating vector at 5% and 10% level of significance.

[10] Other variables, such as measures of physical and human capital could play a significant role in the VECM specification. However, the addition of these variables would conceivably increase the size of the VECM causing serious estimation problems. These problems are mainly due to the fact that the number of unknown coefficients can quickly approach the available sample size as more variables are added. For more details see Johnston and Dinardo (1997).

[11] The results for the Chow test are obtained using PcFiml 9.0 (Doornik and Hendry 1997). The Figures of recursive Chow tests are available from the authors upon request. Furthermore, the persistence profile for the long-run relationship Z is estimated. The relationship has the tendency to converge relatively fast (ten periods = ten months after the shock) to equilibria. This suggests that the cointegrating relationship tends to respond quickly to changes in the real output, capitalization and bank credit. The Figures of the persistence profile are available from the authors upon request. For more details on the persistence profile see Pesaran and Shin (1996).

statistics (CUSUM and CUSUMSQ) support the structural stability of the estimated regressions.

Table 3 reports the findings for the endogeneity of all variables, based on the error-correction equations. In Model 1, estimates of the parameters show that the error-correction term measuring the long-run disequilibrium is significant in all equations. [12] This implies that all variables have a tendency to restore equilibrium and take the burden of any shock to the system. The t-tests for the error-correction terms, at the 1% level of significance, indicate that real output, total capitalization and bank credit are not weakly exogenous variables. The results for Model 2 are similar. The statistics in Table 3 confirm the above results employing the Wald test.

[INSERT Table 3]

Regarding the short-run dynamics (Granger-causality in the strict sense) of Model 1, the Wald-tests suggest that real output is affected by changes in total capitalization; and total bank credit is determined by real output and total capitalization. The short-run dynamics of Model 2 indicate that only a unidirectional relationship exists from real output to bank credit to industry, while there exists no short-run causality between the other variables. It seems that financial performance in the short-run is determined not just by markets and private property relations, but also by a wide range of non-financial factors such as social and political influences and institutions (Levine 1997).

Finally, the significance levels associated with the Wald-tests of joint significance of the sum of the lags of the explanatory variable and the error-correction term, provide more information on the impact of stock market capitalization and bank credit on real output. The results imply the Granger-endogeneity of the variables for both Models.[13]

From the empirical analysis several conclusions can be drawn. The results support the endogeneity of real economic activity in the long run. The results, for both

[12] The error-correction term measures the proportion by which the long-term imbalance in the dependent variable is corrected in each short-run period. The size and the statistical significance of the error-correction term measures the extent to which each dependent variable has the tendency to return to its long-run equilibrium.

[13] In addition, the generalized impulse response functions are estimated, showing how the three variables in each Model respond over a twenty-four month horizon to each one-standard deviation shock. The figures are available from the authors upon request.

Models, show that stock market capitalization and bank credit to the private sector primarily influence real economic activity in the long-run, as a component of the lagged error-correction term. However, the results show that the magnitude of this response is rather small, suggesting that stock market capitalization and bank credit to the private sector only partially determine the size of economic activity. Furthermore, the contribution of the stock market to the growth process is substantially smaller than that of the banks. Finally, in the empirical results, no structural breaks were detected in the long-run relationships, indicating that the accelerated liberalization and deregulation of the Greek financial system over the 1990s has no effect on the long-run relationship among the financial markets and economic growth.

These results are not surprising given the close relationship of the banking sector with industry in Greece and the relatively minor role played by the stock market in financing economic activity. Our findings are broadly consistent with the view that bank-based financial systems are more likely to promote long-run economic growth. Similar findings are reported by Luintel and Khan (1999), Arestis and Demitriades (1997), Arestis *et al.* (2001) and Hondroyiannis and Papapetrou (2001).

6. Conclusions

Theory and empirical evidence recognize the existence of the finance-growth nexus, although the debate on the role of financial intermediaries in promoting economic growth is still open. Following the financial liberalization measures introduced in many countries over the last two decades, the increasing intermediation role of the stock markets has received renewed research interest.

The paper provides empirical evidence on two aspects of financial intermediation for the case of Greece, employing monthly data for the period 1986-1999. The first concerns the linkage between real economic activity and total private financial intermediation, whether through banks or the stock market. The second aspect refers to the relationship between industrial sector's financing and economic performance to investigate the specific role of industry in the development process. To this end, two models are analyzed. In the first model the linkages among real output, total stock market capitalization and total bank credit to the private sector are

examined, while in the second model the relationship among real output, industrial stocks capitalization and bank credit to industry is considered.

The relationship between financial intermediation and economic growth is explained in a temporal Granger-causal framework. This is accomplished by examining the dynamic relationships among the three variables in a multivariate system. The empirical results indicate the existence of a long-run relationship among the three variables in both Models. The employed tests show that there exists Granger causality in at least one direction.

In the long run real economic activity in Greece should be considered endogenous, affected by changes in stock market capitalization and bank credit. Thus, the results suggest that a bi-directional causality exists between real economic activity and stock market capitalization and also between real economic activity and bank credit. In addition, structural breaks were not detected in the long-run relationships. These findings hold true for the model concerning the whole economy and also for the model referring to the Greek industrial sector.

However, the estimated coefficients are small in magnitude, suggesting that the interrelation of financing (stock market and bank) and overall economic activity is limited. Thus, in the long run, economic performance is only partially related to financing through intermediation. Besides, the contribution of the stock market financing to the growth process is substantially smaller compared to bank financing. The limited contribution of the stock market to growth is not surprising, given its minor role traditionally played in Greece. However, the limited role of bank financing, shown in our results, is noticeable and needs further investigation, considering the contribution that it is usually thought to have to economic development.

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Table 1

Johansen and Juselius Cointegration Test

Model 1: Real output, total capitalization, total bank credit

VAR=4, Variables: LRGDP, LTCAP, LTBC

Maximum Eigenvalues

Null	Alternative	Eigenvalue	Critical Values	
			95%	90%
r=0	r=1	74.50**	24.35	22.26
r<=1	r=2	13.68	18.33	16.28
r<=2	r=3	0.07	11.54	9.75

Trace Statistic

Null	Alternative	Trace	Critical Values	
			95%	90%
r=0	r=>1	88.25**	39.33	55.01
r<=1	r=>2	13.75	23.83	21.23
r<=2	r=>3	0.07	11.54	9.75

Z=LRGDP-0.029LTCAP-0.09LTBC

Model 2: Real output, industrial stocks capitalization, bank credit to industry

VAR=4, Variables: LRGDP, LICAP, LIBC

Maximum Eigenvalues

Null	Alternative	Eigenvalue	Critical Values	
			95%	90%
r=0	r=1	74.92**	24.35	22.26
r<=1	r=2	8.63	18.33	16.28
r<=2	r=3	0.06	11.54	9.75

Trace Statistic

Null	Alternative	Trace	Critical Values	
			95%	90%
r=0	r=>1	83.61**	39.33	55.01
r<=1	r=>2	8.69	23.83	21.23
r<=2	r=>3	0.06	11.54	9.75

Z=LRGDP-0.03LICAP-0.21LIBC

Notes: r indicates the number of cointegrating relationships. Maximum eigenvalue and trace test statistics are compared with the critical values almost identical with those reported in Johansen and Juselius (1992, Table 2). These differences are explained in Pesaran *et. al*. (2000). When the two statistics are eignevalues and the trace statistic are adjusted for the degrees of freedom the estimated values for Model 1 are for eignevalues: 69.05*, 12.68, 0.06 and for trace statistic: 81.79**, 12.74, 0.06 and for Model 2 are for eignevalues: 69.49**, 8.00, 9.07, 0.06 and for trace statistic: 83.66**, 8.69, 0.06 (Reimers 1992). The symbols (**) and (*) indicate rejection of the null hypothesis at 95 and 90 percent critical value, respectively.

Table 2			
Long-run Hypothesis Testing			
Variables	LR Test of Restrictions that each Variable does not enter in the cointegrating vector	Weak exogeneity test	Stationarity test
LRGDP	59.76***	80.69***	26.15***
LTCAP	12.53***	13.01***	71.58***
LTBC	5.48**	70.69***	62.64***
LRGDP	63.68***	79.31***	25.57***
LICAP	17.50***	12.92***	67.80***
LIBC	14.81**	65.79***	63.83***

Notes: The reported statistics are distributed as chi-square distribution with degrees of freedom the number of cointegrating vectors for the first two tests and the number of restrictions for the third test. The symbols (***) and (**) indicate rejection of the null hypothesis at 1 and 5 percent level of significance, respectively.

Table 3

Summary of Tests for Weak and Strong Exogeneity of Variables Based on Vector Error-Correction Models

Equations	Test of Restrictions											
	Short-run Dynamics Non-Causality					Weak Exogeneity, (ECT) t-test	Tests for Granger Non-Causality, (Joint Short-run Dynamics and ECT)					Tests for Strong Exogeneity
	? LRGDP	? LTCAP	? ICAP	? LTBC	? LTBC	Z=0	? LRGDP and ECT	? LTCAP and ECT	? LICAP and ECT	? LTBC and ECT	? LIBC and ECT	
? LRGDP		14.15***		3.29		-8.98***		88.96***		83.00***		91.14***
? LTCAP	1.05			0.58		3.61***	13.49***			14.05***		19.01***
? LTBC	10.46**	12.24***				8.41***	78.10***	79.19***				89.06***
? LRGDP			6.12		5.97	-8.91***			76.09***		78.11***	79.24***
? ICAP	1.61				1.94	3.59***	14.77***				16.45***	21.12***
? LIBC	15.88***		4.84			8.11***	76.41***		69.22***			79.01***

Notes: The lagged ECT is derived by normalizing the cointegrating vector on real GDP (see Table 3 and 4). The statistics reported are distributed as chi-square distribution with degrees of freedom the number of restrictions. In the short-run dynamics asterisks indicate rejection of the H_o that there is short-run non-causal relationship between the two variables. Asterisks indicate rejection of the null hypothesis that the estimated coefficient is equal to zero (weak exogeneity). Finally, in the tests for Granger-non-causality and strong exogeneity, asterisks denote rejection of the null hypothesis of Granger-non causality and strong exogeneity respectively. The symbols (***) and (**) indicate significance at the 1 and 5 percent levels, respectively.

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