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Full Length Research Paper

Banks, stock markets and economic growth in high-income OECD: An empirical investigation

Bilge Oney* and Hakan Halilsoy

Department of Banking and Finance, Faculty of Business and Economics, Eastern Mediterranean University, Gazi Magosa, Mersin 10, Turkey.

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This study examines the 21 high income OECD countries to explore the effect of financial development on economic growth in the highest stage of financial and economic development. In this paper, it was unable to find strong evidence that banking and stock market development increase the GDP per capita growth or sources of economic growth which are per capita capital stock growth and productivity growth in the high income countries. The existing literature also provides some findings about irrelevance of the financial development on economic growth in high income OECD countries by using different methodologies. The findings of this paper also show that banking development indicator is statistically significantly related to capital stock growth instead of productivity growth which is considered as the primary source of growth in the existing literature.

Key words: Banks, stock markets, economic growth, OECD countries.

INTRODUCTION

The past two decades have witnessed a dramatic increase in the number of studies about the relationship between financial development and economic growth. This is the inevitable outcome of the increasing significance of financial systems within many countries. Financial systems consist of financial markets and financial intermediaries. The existing literature is very rich in this field in terms of both theoretical and empirical studies. Nevertheless, there is not an exact consensus on the relevance of the financial development on the economic growth among studies. In early empirical studies, researchers generally suggest a positive effect of financial development on economic growth but recent findings indicate that this relationship has been more fragile and ambiguous. Some studies even reach the conclusion that the effects of financial systems on economic growth change with stages of economic and financial development within the countries. This study investigates 21 high-income OECD countries from 1980 to 2001. These countries have the most advance financial systems and economies. Therefore, this study not only contributes to existing literature about the effects of financial develop-ment on economic growth but also describes how the relationship between financial development and econo-mic growth occurs in the most advanced economies and financial systems.

Studies suggest that financial development increases the economic growth through productivity growth rather than capital accumulation and this is particularly apparent in high income countries. Less is known about how financial development influences the source of growth in the high income countries because cross-country studies generally focus on larger samples of countries. In addition to GDP growth, physical capital stock growth and productivity growth indicators are also used as the sources of growth in this study to explore the channels in which financial development is linked to economic growth. Different financial development indicators are used separately in this study in order to detect the effect of bank and stock market development on economic growth. There is an inconsistency in the choice of measurement for financial development in this field. The financial development indicators are reliable in this study

*Corresponding author. E-mail: bilge.oney@emu.edu.tr. Tel: (90) 392 630 2117. Fax: (90) 392 630 2825.

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because each indicator is obtained by comprehensively investigating the existing literature. There is also empirical evidence to support that these financial indicators successfully link empirical study and theories concerning the effects of financial development on economic growth. This paper is organized as follows. The empirical and theoretical findings are first reviewed, followed by the functions of the financial system which facilitate the growth.

The functions of financial system are the fundamental part of both empirical and theoretical studies. The empirical studies which use different methodologies are then explored. This paper uses the cross-country OLS regression technique which is similar to existing cross country studies (King and Levine, 1993a; Levine and Zervos, 1998). Nevertheless, this literature is very rich in terms of methodologies and each methodology reveals a different significant aspect of the finance-growth relationship. Therefore, it is essential to discuss the findings which cannot be detected by the methodology of this paper. Next, economic growth models which incorporate finance into economic growth modelling are illustrated to establish a link between the empirical studies and the different economic growth theories. The methodology is then presented, followed by a discussion of findings and finally, conclusion of the paper.

THE FUNCTIONS OF THE FINANCIAL SYSTEM IN THE FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH RELATIONSHIP

The functions of the financial system are the fundamental part of all the empirical and theoretical studies. Therefore, a discussion of these functions is vital to establish the accurate links between financial development and economic growth. Levine (1997) indicated that financial institutions, instruments and markets have emerged to ameliorate the constraints of asymmetric information and transactions costs. These market frictions can cause loss and misallocation of the savings in countries. The effects of these problems can be reduced with financial development. Consequently, financial system can trigger the economic growth. Financial systems can easily cope with the market frictions because financial systems can exploit the economics of scale and economies of scope due to their structures (Ang, 2008). Levine (2005) summarises the functions of the financial system in his remarkable survey article. He summarises the five main functions of financial systems as follows: pooling and mobilising savings; producing information about investments; managing risks; monitoring investments after funding and facilitating the exchange of goods and services. All of these functions are essential to promote higher economic growth because each function theoretically eliminates one aspect of market frictions which can impede economic growth. The positive effects of all of these functions could not be strongly supported by the empirical evidence.

Financial systems can effectively pool savings within countries and financial systems can mobilise the pooled savings to large projects, which is crucial to overcome the investment indivisibilities problem (Levine, 2005). As a result of this, capital accumulation can increase. Nevertheless, some studies have pointed out that financial systems ensure the efficient allocation of savings which raises the productivity growth and this is a more important channel to economic growth (King and Levine, 1993a; Beck et al., 2000). In the light of these findings, one question that needs to be asked is whether the only pooling and mobilisation of savings to investment projects are sufficient to ensure economic growth. It is considered that the ratio of investment to GDP has a strong link with the growth rate in countries. However, there are considerable variations in growth rates among the countries which have a similar investment to GDP ratio (Wachtel, 2003). This finding supports the crucial role of the efficient allocation in stimulating long run economic growth. Efficient allocation of resources primarily depends on the availability of information to distinguish the most promising investment and monitoring firms to pursue the promising investments (Wurgler, 2000). Providing information and monitoring are two of the functions which were stated by Levine (2005).

The significance of these two requirements for efficient allocation has been supported by several studies. Boyd and Prescott (1986) highlighted the reinforcing role of financial intermediaries for the efficient allocation of resources through the allocation of private information in a general equilibrium analysis. Greenwood and Jovanevic (1990) also modelled that the financial intermediaries collect and analyses the information about the most promising projects, thus investors can funnel their funds to these projects. Financial markets especially stock markets also provide information which reinforces the efficient allocation (Holmstrom and Tirole, 1993). Stock prices can be drastically influenced by hidden information. Therefore, investors always seek further information about the activity of firms in order to exploit this information for more gain. Regulators of financial markets have incentives to make the information more accessible in order to facilitate more transactions. Monitoring is also an essential component of the efficient allocation but it is a very costly process. Financial intermediaries can benefit from economies of scale to deal with the high cost. De La Fuente and Marin (1996) used the financial efficiency and product innovation to examine the role of financial development on economic growth in an endogenous growth model. De La Fuente and Marin (1996: 270) pointed out that “innovation is risky and the probability of success depends on entrepreneurs action which can be monitored by outsiders and at a cost”.

This study just focuses on the liquidity and portfolio aspects of risk management to establish a channel to economic growth although financial risk management is a broad topic. Liquidity is required to deal with unanticipated

circumstances. Hence, investors have a tendency to hold liquid assets in their portfolios. Bencivenga and Smith (1991) demonstrated that economies without financial intermediaries often fail to form illiquid but productive investments because the individual must hold liquid assets to be prepared against unpredicted events. Self-financing constraints impede longer-run and higher return projects which are vital for triggering productivity growth. Financial intermediaries also reduce the unnecessary and inappropriate capital liquidation of longer-run projects (Bencivenga and Smith, 1991). This increases the chance of successful innovations because innovation projects are longer-run projects with massive capital requirements. Financial markets especially stock markets ensure liquidity for firms. Stock markets also enable investors to form and alter their portfolios to diversify the risks over the projects (Arestis et al., 2001). Stock markets can reduce the risks for both investors and firms. As a result of risk management, higher economic growth can be facilitated by the financial system. On the other hand, very liquid stock markets especially with a high volume of transactions have been criticised in the literature. High trading can cause noise in the stock market and shareholders can give up the monitoring of firms because they can easily sell their shares in liquid markets. A decrease in monitoring activity can deteriorate the productivity of the firms (Bhide, 1993; Shen and Lee, 2006). Domestic risk diversification is not sufficient to diversify all domestic risks. International integration is needed to achieve more diversification of risk. Levine and Zervos (1998) stated that a more developed financial system encourages international integration. However, they failed to detect a statistically strong link between financial market integrations and output growth or sources of economic growth.

Edison et al. (2002) advocated this result but they identified that high stages of financial development can damage the relationship between economic growth and international integration. Bekaert et al. (2005) claims that easing the restrictions on equity markets for foreign investors and increasing international integration can spur the economic growth within countries. There are other functions of financial development at international level. Beck (2003) also claimed that that financial development provides comparative advantages for trade. Moreover, Alfero et al. (2004) found out that improve-ments in the financial market can enable host countries to benefit more efficiently from the positive effects of FDI inflows such as adopting of new technology or other spillovers.

REVIEW OF EMPIRICAL LITERATURE ON FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

Empirical studies use different methodologies, financial indicators and channels where economic growth and finance are linked. This section aims to explain which aspect of the relationship between financial development and economic growth has been clarified by using new analysis techniques. Shaw (1973) and McKinnon (1973) formed the fundamental building blocks of the finance and economic growth relationship. These studies support a positive relationship between finance and economic growth. On the other hand, Lucas (1988: 6) argued, “The importance of the financial matters is very broadly over stressed” in economic growth studies. King and Levine (1993a) undertook the first comprehensive cross-country empirical study across 80 countries over 1960-1989. They extended the framework of Barro (1991) cross country economic growth investigation by adding financial variables in order to prove the theoretical arguments of Schumpeter (1911) about the link of finance-economic growth. Levine and King (1993a) indicated robust positive correlations between financial development indicators and economic growth indicators.

Atje and Jovanevic (1993) found out the positive and large influence of the stock markets on the economic growth in their cross country studies of 40 developed and developing countries, whereas they failed to show the positive effect of bank lending. Levine and Zervos (1998) found that both development in banking and stock market liquidity are significantly linked to long run GDP per capita growth, productivity growth by investigating 46 countries between 1976-1993. However, it is stated that stock market and banking development is not strongly related to capital accumulation. Gregorio and Guidotti (1995) pointed out that there is a negative relationship between private credit to GDP and economic development in high income and Latin American countries. Ram (1999) reported that there was a negligible and weakly negative covariance between financial development and growth when the countries are individually taken into considera-tion or divided into sample subgroups according to their level of growth. Meaning (2003) showed that introducing regional dummies such as Asian Tigers invalidated the findings of Levine and Zervos (1998) study. Meaning (2003) also stated that Asian Tigers were driving the positive between financial and economic development in Levine and Zervos (1998) study.

Odedokun (1994) also carried out a time series analysis for 71 developing and less developed countries. Even though financial development exerts a positive influence in 85% of the countries in the sample, it only exerts a positive effect on capital formation in 49% of countries. Moreover, Granger causality from financial development to output growth, capital accumulation and productivity growth in developing countries is stronger than causality in developed countries (Calderon and Liu, 2003). Generalized Method of Moments (GMM) analyses are also used in the existing literature. GMM can control the endogeneity of financial development proxies and unobserved country specific effects, and this method can detect specific relationship over time series dimension.

Beck et al. (2000) used both a GMM dynamic panel analysis and pure cross country instrumental variables analysis in their study.

Rioja and Valev (2004b) identified the relationship between financial development and sources of growth in both developed and less developed countries with a GMM model. Rioja and Valev (2004b) revealed that financial development spurs economic growth through capital accumulation rather than through productivity growth in less developed countries. Acemoglu et al. (2006) stated that less developed countries behind the world technological frontier pursue a capital accumulation growth strategy. On the other hand advanced economies which are closer to the world technology frontier focus on innovation based growth. Furthermore, Aghion et al. (2005) investigated the role of financial development in the growth convergence with the same dataset. Aghion et al. (2005) indicated that all countries above a certain financial development converge in the long run. However, it is also highlighted that the financial development has a diminishing effect on convergence above a certain threshold level.

Benhabib and Spiegel (2000) indicated that financial development also increases the investment in human capital by ameliorating market imperfections and borrowing constraints. Allen et al. (2005) argued that the Chinese legal and regulatory system can be categorized as an under developed system but China has been growing fast in the recent years. Furthermore, there are other developing countries that experience high growth rate and their legal systems and regulation cannot be classified as high quality systems as well. Rioja and Valev (2004a) revealed a non-linear effect of financial development in economic growth by using the GMM technique in 74 countries from 1960 to 1995. Deidda and Fattouh (2008) also confirmed that the effect of bank development on economic growth can be reduced by the higher level of financial market development.

Beck (2008) discussed the econometrics of finance and growth for all existing empirical literature. Beck (2008) concluded that improvements in micro-level studies about effect of the financial system on household welfare and firm growth are more important than improvements in econometric techniques. Demirguc-Kunt and Maksimovic (1998) showed that developed financial and legal systems encourage the firms to use long-term debt and equity financing in 30 countries, thus they can exploit the most promising investment opportunities. Rajan and Zingales (1998) showed that industries which needed external finance, such as the drug and pharmaceutical industry, grew faster in the 1980s in the existence of developed financial systems that include both developed equity and banking financing. They stated that if there are successful innovators studies, Schumpeter`s creative destruction can be initiated. These studies reflect the facts in the modern economies. Micro-level studies provide strong evidence about the significant role of financial development in efficient allocation. Wurgler (2000) successfully established a positive relationship between efficiency measurement and financial development across 28 industries in 65 countries.

Brown et al. (2009) comprehensively analysed 1347 high tech firms from 1990 to 2007 in the USA and they found evidence that external finance development led to the R&D boom in the 1990s. Brown et al. (2009) indicated that external finance facilitates the R&D especially in young rather than mature firms. Most of these firm-level and industry level studies include OECD countries as well because it is easy to access micro-level data in OECD. In some of the similar recent studies, such as Sawhney et al. (2006), Jalil et al. (2009), Feridun et al. (2009a, 2009b), the role of financial development in economic growth has also be verified for a range of countries.

Cross country studies that use both OLS and GMM methods generally support the positive effect of financial development on economic growth at the aggregate level such as GDP per capita growth. However, several studies state that the relationship between financial development and economic growth is ambiguous at the high stage of economic and financial development. An empirical examination of 21 high income OECD countries will test this assumption for the high financial and economic development level. Time series analyses will support our discussion because they investigate the both the supply leading and demand following approaches. The empirical analysis of this paper is merely restricted to investigate the supply leading approach, although some studies which are reviewed in this section suggest the validity of the demand following approach in OECD countries. It is essential to review and discuss the firm and industry level findings because these will enable this paper to provide a comparison between aggregate and micro-level findings. The firm and industry level studies usually support relevance of financial development on economic growth and these studies usually state the productivity growth in OECD countries as a main source of growth in financial development. These findings raise the expectation to find a positive relationship between financial development and productivity growth in this study because these micro-level studies are very comprehensive studies compared to cross-country studies.

ECONOMIC GROWTH MODELS AND FINANCIAL DEVELOPMENT

This section presents some growth models which were modified to explore the relationship between financial development and economic growth in the existing literature. Endogenous growth models are considered as more adequate models to investigate the finance-growth link because neoclassical models have some shortcomings which fail to detect some aspects of the relationship (Theil, 2001). The neoclassical growth models assume that steady-state or long- term growth depends on constant

exogenous technological change. Nevertheless, empirical studies indicate strong evidence about the role of entrepreneurship and innovation in finance-growth nexus that require an endogenous approach to technological change. Financial development can also exert positive effect on savings but increases in saving have temporary influence in the neoclassical models (Ang, 2008).

Cooray (2009) incorporated financial capital on Mankiw-Romer-Weil (1992) augmented Solow-Swan model. The MRW (1992) model is an enhanced version of the textbook Solow-Swan model by introducing human capital into the production function. Atje and Jovanevic (1993) had used the same production function but they used a different definition for the financial capital. Cooray (2009) only took into consideration the bank-related financial capital whereas, Atje and Jovanevic (1993) only took into consideration the stock market-related financial capital. Equations are illustrated from Cooray (2009) because both studies used a similar production function.

$$Y(t)= K(t)^{\alpha} H(t)^{\beta} F(t)^{\gamma} (A(t)L(t))^{1-\gamma-\beta-\alpha} \quad (1)$$

Y represents output, K, H and F represent physical capital, human capital and financial capital respectively. A is the level of technology, α, β and γ are the elasticity of output with respect to physical, human and financial capitals. It is also assumed that the labour force and level of technology grows exogenous (n) and (g) rates respectively. δ represents the constant depreciation rate. Share of physical capital (s_k), share of human capital (s_h) and share of financial capital to (s_f) GDP are also defined. Cooray (2009) defined the steady state level of per capita output (y*) by using equation 2. Cooray (2009) model just added the share of financial capital to GDP to the MRW (1992) model as it can be seen in Equation 2.

$$\ln\frac{Y(t)}{L(t)} = \ln A(0)+gt + \frac{\alpha}{1-\alpha-\beta-\gamma}\ln s_k + \frac{\beta}{1-\alpha-\beta-\gamma}\ln s_h + \frac{\gamma}{1-\alpha-\beta-\gamma}\ln s_f - \frac{\alpha+\beta+\gamma}{1-\alpha-\beta-\gamma}\ln(n+g+\delta) \quad (2)$$

where lnA (0)= a_0+μ where a_0 is a constant μ is country specific effect. Cooray (2009) followed the exactly same steps as MRW (1992) and obtained an estimation equation for the growth rate of the output per capita:

$$\ln y(t) \ln y(0) = a_0+a_1\ln s_k+a_2\ln s_h+a_3\ln s_f+a_4 \ln(n+g+\delta)+ a_5\ln y(0)+\mu \quad (3)$$

This estimation equation states that the growth of output per capita depend on population, physical capital, human capital and financial capital growth, respectively. Cooray (2009) improved the study one further step. Efficiency of the financial sector (σ) is also incorporated into the equation to investigate the role of financial system efficiency in economic growth which is supported by some empirical studies.

$$\ln y(t)-\ln y(0) = a_0 + a_1\ln s_k+ a_2\ln s_h + a_3\ln s_f + a_4\ln(n+g+\delta)+ a_5\ln y(0) + a_6 \ln\sigma+\mu \quad (4)$$

Cooray (2009) confirmed that the size, activity and efficiency are crucial for the economic growth in 35 countries. Atje and Jovanevic (1993) also verified the validity of their model in 40 countries. Nevertheless, both studies fail to detect the real share of financial capital. An adequate proxy for financial sector capital share can only be obtained by adding both bank-related and financial market-related proxies because financial capital in financial markets is very significant in developed countries, while bank-related capital is more significant than financial market-related capital in developing and less developed countries.

Pagano (1993) developed an AK model to explore the relevance of finance in economic development. Pagano (1993) successfully showed the positive effect of financial systems on economic growth in an endogenous growth framework. The important difference between the AK model and neoclassical models is the absence of diminishing returns. “Learning by doing” and knowledge spillovers are considered as two main factors that eliminate the diminishing returns (Barro and Sala-i Martin, 2004).

The simple AK model is used as a production function and it is assumed that economy produce, consume and invest only one type of good. Gross investment (I_t) is decided in equation 6 with fixed depreciate rate (δ). The gross investment equals gross savings (St) in this closed economy, but a proportion of saving (1-σ) is lost in the financial system. The steady-state growth rate is given in Equation 8.

$$Y_t= AK_t \quad (5)$$

$$I_t=K_t+1 – (1-\delta)K_t \quad (6)$$

$$\sigma S_t=I_t \quad (7)$$

$$g=\frac{Kt+1-Kt}{Kt} = \frac{It+ (1-\delta)Kt - Kt}{Kt} = \frac{\sigma St}{Kt} – \delta=A\sigma s_t – \delta \quad (8)$$

Financial development exerts a positive effect on the long run output growth in different ways according to this model. The financial development can help to funnel more proportion of savings to investment through reducing losses in the system (1-σ). Pagano (1993) indicated that financial development can overcome risk sharing, information and liquidity problems. As a consequence of these, financial development can increase the productivity (A_t) which promotes the steady state growth rate according to Equation 8. Increase in saving rate can also raise the steady state growth rate that is not possible with exogenous growth models. Pagano (1993) model can successfully explain the most of functions of financial system which were reviewed initially under the endogenous growth framework.

Nevertheless, Ang (2008) highlighted two limitations of

this model. This is a closed economy model and this model fails to take into consideration the financial markets because this model is merely based on the role of financial intermediaries.

Aghion and Howitt (2009) used a multi-sector Schumpeterian growth model to illustrate the effect of the financial constraints on innovation, which is the main engine of growth in the Schumpeterian growth model. Recently, the firm and industrial level empirical studies put emphasis on the role of external finance on the economic growth (Rajan and Zingales, 1998; Demirguc-Kunt and Maksimovic, 1998). Furthermore, some empirical studies empirically test Schumpeter`s creative destruction in the presence of financial development (Wrugler, 2000). Therefore, it is crucial to illustrate a Schumpeter model to connect theoretical framework and empirical studies, particularly firm and industry level empirical studies.

$$Y_t = L^{1-\alpha} \int A_{it}^{1-\alpha} x_{it}^{\alpha} d_i \quad (9)$$

The production function was defined in Equation 9 by Aghion and Howitt (2009). Productivity (A_{it}) , flow of latest version of intermediate good (x_{it}) and number of individuals (L) form their multi sector model production function where the $0<\alpha<1$. One final good is produced in this economy. This is used for consumption, input to R&D and input to produce the intermediate goods. It also assumed there are two generation which are old and young. An old person is capable of innovation. The initial parameter of technology is given by an average across all industries: $A_{t-1}=\int_0^1 Ai, t-1$ and productivity become $A_{it} = \gamma A_t$ where $\gamma>1$. If the μ is the probability of successful innovation, the value of parameter and growth rate of productivity from t to t+1 can be shown by Equations 10 and 11 respectively.

$$A_t = \mu\gamma A_{t-1} + (1-\mu)A_{t-1} \quad (10)$$

$$g = \frac{At - At-1}{At-1} = \mu(\gamma-1) \quad (11)$$

Aghion and Howitt (2009) stated that every innovation attempt is not successful within an economy, thus banks must screen all credit demands but this increases the cost of external finance for the entrepreneurs who are capable of attempting an innovation. Aghion and Howitt (2009) modelled that high cost of external finance reduces the frequency and probability of innovation (μ) without efficient financial intermediaries. As can be seen in Equation 11, this situation reduces the productivity growth (g) in the economy. This model is better than Pagano (1993) model because this model illustrates the impact of interaction between entrepreneurship and the financial system on economic growth explicitly. This model also only focuses on the effects of banks but this model can be easily modified to enable entrepreneurs to benefit from equity financing for innovation attempt as well.

METHODOLOGY AND DATA

The effects of financial development on economic development are investigated with a cross country regression analysis from 1980 to 2001 in 21 OECD countries. This study is similar to Levine and King (1993b) and Levine and Zervos (1998) work in terms of the methodology and analysis. However, this study improves the existing literature by assigning more recent data and focusing on high income OECD countries. Ordinary least square technique is used to obtain estimators for the regression. The following standard cross country regression is estimated by using PcGive 13.0 econometrics software:

$$G_i = \alpha + \beta F_i + \delta CONTROL + \varepsilon$$

G_i represents the dependent variables which are related to the economic growth. The real per capita GDP and two sources of growth that are real per capita physical capital stock and productivity growth are used as the dependent variables. These dependent variables are called GDP GROWTH, CAPITAL STOCK GROWTH and PRODUCTIVITY GROWTH respectively in the rest of this paper. In order to measure financial development, different indicators are used which are based on existing empirical studies. F_i represents these financial development indicators in regression. The ratio of private credit by deposit money banks and other financial institutions to GDP is used as a banking development proxy (Levine and King, 1993; Levine et al. 2000) and this is called PRIVATE CREDIT. Two stock market development indicators are used in this paper to explore effects of the stock market development in addition to the effects of bank development. MARKET CAPITALISATION is the proxy of stock market size and this is the value of listed domestic shares divided by GDP. TURNOVER RATIO is the value of traded stock market divided by stock market size and this is a proxy of market liquidity. These are widely used stock market development indicators and they are often separately used to decide either market size or market liquidity is significant for the economic growth (Levine and Zervos, 1998). CONTROL represents the set of control variables in the regression. This includes log of initial GDP per capita, log of secondary school enrolment and trade as a percentage of the GDP to control sensitivity of relationship. The robust relationship between these variables and economic growth is proven in the existing literature (Barro and Sala-i Martin, 1995, 2004) and these three variables are frequently used in the literature of growth-finance nexus (Levine and King, 1993; Levine and Zervos, 1998; Beck et al., 2000).

GDP per capita data series are from the World Development Indicators (World Bank) and GDP per capita dataset is set. Growth accounting has several limitations for the measurement of capital and productivity growth because there are not certain data series for the capital stock and productivity stock in the existing databases. Distinct estimates are used for the capital stock and productivity stock. Most of the remarkable studies in the economic growth and financial development field base their studies on the estimates of the other studies. This is because capital stock estimates also require a comprehensive study and their main aim is to find out the financial development and economic growth relationship. Therefore, this study also uses other studies for capital stock estimates. The capital estimates are taken from study of Kamps (2004) study. Kamps (2004) provides physical capital stock data which includes both the private and public physical capital stock data. Kamps (2004) follows the perpetual inventory method which is based on the following equation:

Table 1. Summary statistics of financial indicators for 21 OECD countries over 1980-2001.

Statistic	Private credit	Market capitalisation	Turnover ratio
Mean	0.81	0.50	0.50
Maximum	1.58	1.19	1.79
Minimum	0.36	0.09	0.16
Standard deviation	0.32	0.28	0.33

Table 2. Summary statistics of initial financial indicators in 1980.

Statistic	Initial private credit	Initial market capitalisation	Initial turnover ratio
Mean	0.53	0.18	0.24
Maximum	1.17	0.45	1.92
Minimum	0.20	0.0044	0.010
Standard deviation	0.25	0.15	0.40

$K_{t+1} = K_t + I_t - \delta K_t$

I_t represents the investment at time t and the investment series is taken from the OECD Analytical Database. The depreciation rate δ is constant over time. These physical capital stock estimates are used to establish both physical capital growth rate and productivity growth estimates.

The Cobb Douglas production function is used to estimate the productivity growth residual. It is assumed that the production function is common across the countries This productivity is called "total factor productivity". This is a standard technique which is estimated widely in the finance-growth literature (Levine and King, 1993b; Levine and Zervos, 1998; Bect et al., 2000).

$Y_i = A_i \ K_i^{\alpha} \ L_i^{1-\alpha}$

$y=A\ k^{\alpha}$

$\log A_{t+1} - \log A_t = (\log y_{t+1} - \log y_t) - \alpha (\log k_{t+1} - \log k_t)$

Per capita approach is followed in this calculation process. Initially, the variables are divided by labour force which is obtained from the World Development Indicators (World Bank) to get per capita values, and then log transformation is carried out. Subtraction from the first time difference provides the growth rates. Capital share (α) is considered as 0.3 as it is considered in the existing literature. Capital utilization is stable over the time period.

The dependent variable is GDP Growth, Capital Stock Growth or Productivity Growth. Private Credit enters regressions with either Market Capitalization or the Turnover Ratio to detect the effects of market size and liquidity separately. In Tables 4 and 5, averages of both economic growth proxies and financial development proxies over 1980-2001 are used in the regression. This was used by King and Levine (1993a) but they only used bank-related development indicators and they did not take into consideration the stock market indicators. Therefore, this study improves upon King and Levine (1993a) study. In Tables 6 and 7, the regression results of the effects of financial development indicators in 1980 on subsequent long term growth from 1980 to 2001 are illustrated. This type of analysis was carried by both King and Levine (1993a) and Levine and Zervos (1998).

FINDINGS AND DISCUSSION

Summary statistics of financial and growth indicators for 21 high incomes OECD countries are illustrated in Tables 1, 2 and 3. Table 1 illustrates the summary of the financial development indicators over all country averages over the period 1980-2001. The mean values of the Private Credit to GDP, Market Capitalization and Turnover Ratio are 0.81, 0.50 and 0.50 respectively over 1980-2001 for the sample of 21 OECD countries. These countries have very high financial indicator values. This is an inevitable outcome of their advanced and sophisticated financial systems. Therefore, the results of this paper must be interpreted with caution. Although, this can be considered as a limitation, this study can contribute to the existing literature about the ambiguous effect of financial development on economic growth in the higher stages of financial and economic development. Table 2 shows that initial values of financial indicators were substantially lower than the average values between 1980-2001. Finally, Table 3 illustrates a summary of the statistics of the economic growth indicators for 21 countries over the period 1980-2001. There are some notable results of the descriptive statistics that must be highlighted. Ireland experienced the highest average level of per capita growth (4.5). Ireland also experienced high capital stock (1.8) and productivity growth (2.8) over 1980-2001 whereas, Ireland had a lower private credit, market capitalization and turnover ratio than the averages of 21 high income countries over the same period. On the other hand, Switzerland had very high financial development indicators but very low economic growth indicators over the 1980-2001. This situation in this country sample can explain the negative results of the stock market development indicators on the source of economic growth.

Regression analysis only includes 21 high income OECD countries due to the constraints in capital stock estimates. In order to make a comparison between high-income and middle-income OECD countries, a middle-income OECD group including Mexico, Turkey, Poland

Table 3. Summary statistics of growth indicators for 21 OECD countries over 1980-2001.

Statistic	GDP per capita growth	Capital stock growth	Productivity growth
Mean	1.94	1.32	0.93
Maximum	4.53	2.97	2.84
Minimum	0.82	0.31	0.08
Standard deviation	0.71	0.59	0.06

Table 4. Cross country regression results.

Independent variable	Dependent variable		
	GDP growth	Capital stock growth	Productivity growth
Constant	0.0245 (0.338)	0.036 (0.677)	0.0127 (0.202)
Private credit	0.0032 (0.504)	0.01061* (1.95)	0.0004 (0.0723)
Market capitalisation	0.004 (0.612)	-0.0019 (-0.337)	-0.206 (-0.313)
log (secondary school)	0.0354 (1.05)	0.0132 (0.468)	0.0207816 0.617
log (GDP per capita 1908)	-0.026** (-2.81)	-0.0133* (-1.71)	-0.0173* (-1.88)
Trade (% of GDP)	0.001 (1.45)	-0.0054 (-0.938)	0.0121 (1.78)
R^2	0.39	0.39	0.33
Observation	21	21	

Dependent Variables: The Average GDP growth, Average Capital Stock Growth and Productivity Growth over 1980-2001. Financial Development indicators: Average Private Credit over 1980-2001, Market Capitalisation over 1980-2001. * and ** denote statistically significant at 10 and 5% level respectively. T-statistics are illustrated in the parenthesis.

and Chile is constructed. Contemporaneous associations between financial development and economic growth indicators are illustrated in Tables 4 and 5. The average values of both financial development and economic growth indicators are used in these regressions over the period 1980-2001. The Private Credit variable has positive coefficients for all growth indicators when it enters the regression either Market Capitalization or Turnover Ratio variables. However, estimated coefficients are only statistically significant while Capital Stock Growth is the dependent variable. For instance, Table 5 indicates that one standard deviation increase in private credit (0.32, Table 1) would increase capital stock growth by 0.4 per annually [(0.32*0.0125)*100]. This is a similar interpretation to King and Levine (1993a) but their bank development indicator was different, thus direct comparison cannot be carried out. There are unexpected negative but statistically insignificant coefficients of Market Capitalization and Turnover Ratio on capital stock and productivity growth in the regression. Hence, the findings do not support that stock market development promotes economic growth through productivity growth or capital accumulation Tables 6 and 7 show that whether or not financial development is strongly linked to future long run (1980-2001) economic growth. Although the estimated coefficients of initial private credit are positive for all growth indicators, initial Private Credit is only statistically significant at 5% when it enters the regression with Capital Stock Growth. For instance, one standard deviation increase in private credit (0.25, Table 2) would increase the capital stock growth by 0.3% annual [(0.25*0.0134)*100] when it enters the regression with

Table 5. Cross Country regression results.

Independent variable	Dependent variable		
	GDP growth	Capital stock growth	Productivity growth
Constant	0.0193) (0.308)	0.0482 (0.958)	0.0114 (0.185)
Private credit	0.0067 (1.07)	0.0125** (2.47)	0.0018 (0.288)
Turnover ratio	-0.0024 (-0.386)	-0.0055 (-1.13)	-0.0021 (-0.353)
log (secondary school)	0.0339 (0.958)	0.0026 (0.093)	0.0184 (0.527)
log (GDP per capita 1908)	-0.0238** (-2.47)	-0.011 (-1.42)	-0.0157* (-1.65)
Trade (% of GDP)	0.0102 (1.47)	0.0046 (0.825)	0.0012 (1.81)
R^2	0.38	0.33	0.33
Observation	21	21	21

Dependent variables: The Average GDP growth, Average Capital Stock Growth and Productivity Growth over 1980 -2001. Financial Development Indicators: Average Private Credit over 1980-2001, Turnover Ratio over 1980-2001. * and ** denote statistically significant at 10% and 5% level respectively. T-statistics are illustrated in the parenthesis.

Table 6. Cross country regression results.

Independent variable	Dependent variable		
	GDP growth	Capital stock growth	Productivity growth
Constant	0.0132 (0.203)	-0.0026 (-0.0494)	0.0274 (0.402)
Initial Private credit (1980)	0.0022 (0.358)	0.0134** (2.66)	0.0028 (0.438)
Initial Market Capitalisation (1980)	0.016 (1.71)	0.0063 (0.842)	-0.00023 (-0.0238)
log (secondary school)	0.0373 (1.14)	0.0223 (0.844)	0.013 (0.384)
log (GDP per capita 1908)	-0.024** (-3.01)	-0.0075 (-1.17)	-0.0163* (-1.96)
Trade (% of GDP)	0.0103 (1.6)	0.0066 (1.26)	0.01184 (1.75)
R^2	0.45	0.48	0.34
Observation	21	21	21

Dependence variables: The Average GDP growth, Average Capital Stock Growth and Productivity Growth over 1980-2001. Financial Development Indicators: Private Credit in 1980, Market Capitalisation in 1980. * and ** denote statistically significant at 10 and 5% level respectively. T-statistics are illustrated in the parenthesis.

Table 7. Cross country regression results.

Independent variable	Dependent variable		
	GDP growth	Capital stock growth	Productivity growth
Constant	0.0228 (0.324)	0.0024 (0.0466)	0.0301 (0.449)
Initial Private credit (1980)	0.0058 (0.749)	0.0161** (2.75)	0.0001 (0.0193)
Initial Turnover ratio (1980)	0.0033 (0.668)	-0.003 (-0.775)	-0.0034 (-0.72)
log (secondary school)	0.0224 (0.606)	0.013 (0.047)	0.0047 (0.135)
log (GDP per capita 1908)	-0.0175* (-1.81)	-0.0034 (-0.47)	-0.013 (-1.41)
Trade (% of GDP)	0.0094 (1.35)	0.0065 (1.25)	0.0127* (1.9)
R^2	0.36	0.36	0.36
Observation	21	21	21

Dependent variables: The Average GDP growth, Average Capital Stock Growth and Productivity Growth over 1980-2001. Financial Development Indicators: Private Credit in 1980, Turnover Ratio in 1980. * and ** denote statistically significant at 10 and 5% level respectively. T-statistics are illustrated in the parenthesis.

initial Market Capitalisation. Levine and Zervos (1998) found that it would increase 0.4% annual and results can be compared with Levine and Zervos (1998) paper because they used the same stock and bank indicators with a larger sample and control group. Initial Market Capitalisation and Turnover Ratio have negative coefficients on productivity growth again but these coefficients are not statistically significant.

The findings of this paper do not support the existing empirical studies which suggest the primary source of growth is the productivity growth in high income countries. The significant role of productivity growth in high income countries was supported by cross-country studies with GMM (Rioja and Valev, 2004a) and industry level studies (Carling amd Mayer, 2003). It must be noted that these studies use more advanced techniques and they have several advantages against the technique used in this paper. However, a cross-country analysis with OLS technique for high income technique is crucial to make comparison with the earlier studies which assigned the OLS techniques with a large sample of countries (King and Levine, 1993b; Levine and Zervos, 1998).

None of the estimated coefficients of stock market development indicators is statistically significant in the regressions and even stock market development indicators have negative coefficients on the capital stock and productivity growth in some regressions. Private credit is strongly linked to capital accumulation instead of productivity growth. Several possible explanations of these results are discussed here and in the limitations aforementioned. Summary statistics and graphical analyses also suggest that some countries such as Ireland and Portugal which have high capital and productivity growth whereas, have lower level of stock market indicators. Therefore, there can be a negative effect of stock indicators in the sample of high income OECD countries. There are also drawbacks of using OLS methodology. Methodological limitations have previously been comprehensively discussed. It can be seen apparently that the results deteriorate when the productivity enters the regression as the dependent variable. Although the productivity residual calculation method is taken exactly from study of Levine and Zervos (1998), the inputs of this estimation, such as capital stock estimates, are different. Capital Stock Growth is based on the estimation of Kamps` (2004) study and this is fragile as well.

Conclusion

The findings in this study only support a statistically significant effect of Private Credit on Capital Stock Growth. This is valid for both average value of Private Credit between 1980 and 2001 and initial value in 1980.

Therefore, this study fails to confirm that banking development influences the economic growth primarily through productivity growth in the 21 high-income OECD countries. There are negative coefficients for both market capitalisation and turnover ratio, but the estimated coefficients are not statistically significant. Several explanations are provided for these results. Descriptive statistics of the country sample, graphical analyses and some existing empirical evidence also suggest the irrelevance of financial development on economic growth in the high income OECD countries. Therefore, it is hard to reach a conclusion that statistically insignificant estimated coefficients of the financial development variables are the only result of the methodological approach of this study.

The findings from the time series studies indicate a two-way causality between financial development and economic growth in high income countries. This statement verifies that it might be tenuous to form hypotheses that only test the supply leading approach in this field. The influence of economic growth on financial development should be taken into consideration as well. Contrary to the cross country studies, firm and industry level studies strongly advocate the positive effect of financial development on economic growth. Investigations of micro-level studies are based on more sophisticated relationships such as relationship between investments in R&D and development in external finance. Researchers should more pay attention to this type of analyses because micro-level studies enable research exploit more specific interactions. Endogenous growth models have several advantages over the exogenous growth models in modelling the finance and economic growth relationship and a better explanation of the relationship in micro-level studies is one of them.

The findings of this study and empirical findings in the literature suggest that pooling the countries which are at different stages of economic and financial development misleads the researcher towards confirming a positive relationship between financial development and economic development. The regression results of the high-income OECD countries are not consistent with the cross-country studies that use larger samples of countries, including countries at different stages of financial and economic development. Future studies should separately investigate countries which are at different levels of financial and economic development. Policy makers also should take into consideration the country specific effects in order to facilitate higher economic growth with financial development.

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