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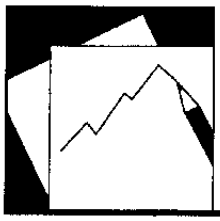

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Financial Development and Economic Growth: An Overview

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Financial Development and Economic Growth: An Overview[1]

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Abstract

In recent years there has been substantial theoretical and empirical work on the role that financial markets play in fostering economic growth and development. This paper provides a selective review of the literature, as well as new empirical evidence on the relationship between financial development and economic growth for a large cross-section sample of countries. While the results indicate that the effect of financial development on growth is positive, the size of the effect varies with different indicators of financial development, estimation method, data frequency, and the functional form of the relationship.

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I. Introduction

The fundamental question in economic growth that has preoccupied researchers is why do countries grow at different rates. The empirical growth literature has come up with numerous explanations of cross-country differences in growth, including factor accumulation, resource endowments, the degree of macroeconomic stability, educational attainment, institutional development, legal system effectiveness, international trade, and ethnic and religious diversity. The list of possible factors continues to expand, apparently without limit.

One critical factor that has begun to receive considerable attention more recently is the role of financial markets in the growth process. The positive link between financial depth, defined broadly as the level of development of financial markets, and economic growth is in one sense fairly obvious. That is, more developed countries, without exception, have more developed financial markets. Therefore, it would seem that policies to develop the financial sector would be expected to raise economic growth. Indeed, the role of financial development is considered by many to be the key to economic development and growth.

While economists have generally reached a consensus on the central role of financial markets in economic development, theoretical and empirical work supporting this concept is still very much in progress. This paper provides a selective overview of the literature on financial depth and growth, with the aim of identifying outstanding issues and offering suggestions for future research. We further provide new empirical evidence on the issue utilizing a version of the standard growth model and a new dataset of indicators of financial depth, which covers both the banking sector and securities markets. Particular attention is paid in the empirical analysis to measurement issues and the robustness of the results.

The remainder of the paper proceeds as follows. Section II contains a brief literature review with emphasis on the empirical work undertaken on the financial depth and growth question. Section III re-examines the empirical evidence using different indicators of financial depth. Finally, Section IV offers some conclusions and suggestions for future research.

II. Linkages Between Financial Development and Growth

In the theoretical Arrow-Debreu world, characterized by a complete set of state-contingent claims, with no information or transaction costs, there is no need for financial intermediation. However, this benchmark world is clearly built upon unrealistic assumptions. Intermediaries become essential once *imperfections* or *frictions* are introduced in the model. If market conditions are actually less than perfect, then economic exchange is costly, and if it is sufficiently costly, it may not occur at all. Financial intermediaries make these exchanges affordable, thus offsetting the underlying market imperfections and frictions.

Even though no general theoretical model can fully explain why financial intermediaries exist, the fundamental frictions that give rise to financial intermediaries are either of a *technological* or an *incentive* nature. The former prevents individuals from having access to economies of scale, while the latter occurs because information is costly and asymmetrically distributed across agents in world where contracts are incomplete because not all contingencies can be spelled out.

Financial intermediaries relax these frictions by: (i) facilitating the trading, hedging, diversifying, and pooling of risk; (ii) efficiently allocating resources; (iii) monitoring managers and exerting corporate control; (iv) mobilizing savings; and (v) facilitating the exchange of goods and services. In sum, the financial system facilitates the allocation of resources over space and time.

The theoretical underpinnings of the relationship between financial depth and growth can be traced back to the work of Schumpeter (1912) and, more recently, to McKinnon (1973), and Shaw (1973). The main policy implication of the McKinnon-Shaw school is that government restrictions on the banking system (such as interest rate ceilings, high reserve requirements, and directed credit programs) hinder financial development, and ultimately reduce growth. Similar conclusions are also reached by the more recent endogenous growth literature, in which services provided by financial intermediaries (such as information collection and analysis, risk sharing, liquidity provision, etc.) are explicitly modeled. These models suggest that financial intermediation has a positive effect on growth.[2]

There has been a flourishing body of empirical work aiming at testing the positive relationship between financial depth and growth. Generally, these studies find that cross-country differences in financial development explain a significant portion of the cross-country differences in average growth rates. These studies are generally based on regression analysis for large cross-sections of countries. The basic equation tested has the following form:

$$y_i = \beta_0 + \beta_1 FD_i + \beta_2 X_i + e_i \qquad (1)$$

where y_i is the rate of growth of country i, FD_i is an indicator of financial depth, X_i is a set of control variables, and e_i is the error term.

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[2] The literature is quite extensive. For an explicit link between financial development and growth, see Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), King and Levine (1993a), Roubini and Sala-i-Martin (1992), Obstfeld (1994), Bencivenga, Smith, and Starr (1995), and Greenwood and Smith (1997). A comprehensive survey is provided by Levine (1997).

Several indicators of financial depth have been proposed in the literature, and different indicators will proxy different aspects of the financial system. Initially, the indicators were based on monetary aggregates, such as M1 or M2, mainly because these aggregates are widely available. However, they may be a poor proxy for financial development, since they are more related to the ability of the financial system to provide transaction services than to the ability to channel funds from savers to borrowers. Indeed, economies with underdeveloped financial systems may have a high ratio of money to GDP, as money is used as a store of value in the absence of other more attractive alternatives. Consequently, researchers have shifted from narrower monetary measures (M1 and M2) to broader definitions, such as M3, which is generally referred to as liquid liabilities of the banking system. Although M3 overcomes some shortcomings associated with M1 and M2, it still contains M2 and therefore may be influenced by factors other than financial depth. More recently, credit to the private sector has been favored as an alternative measure of financial intermediation. The main advantage of this indicator is that, by excluding credit to the public sector, it measures more accurately the role of financial intermediaries in channeling funds to the private sector. This is also, however, only a partial indicator of financial development. It only reflects developments in the banking sector. Stock and bond markets, for example, are not taken into account. This weakness at first glance may be more relevant for industrialized than for developing countries. Indeed, industrialized countries have experienced significant non-bank financial development, while most of the financial development has occurred within the banking system in developing countries. Nevertheless, securities markets are becoming more important in a number of developing countries, and their role should not be ignored.

There has been extensive empirical work on the relationship between financial development and growth which has been largely surveyed in Levine (1997) and Levine (1999a). One of the most influential studies on the subject is King and Levine (1993b), which shows a strong positive link between financial development and growth.[3] King and Levine (1993b) also show that financial development has predictive power for future growth and interpret this finding as evidence for a causal relationship that runs from financial development to growth. The study covers a cross-section of 80 countries during the period 1960-1989,[4] and uses four measures of the level of financial development. The first is liquid liabilities of banks and nonbank institutions as a share of GDP, which measures the size of financial intermediaries. The second is the ratio of bank credit to the sum of bank and central bank credit, which measures the degree to which banks versus the central bank allocate credit. The third is the ratio of private credit to domestic credit, and the fourth is private credit as a ratio of GDP.

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[3] Related papers are Roubini and Sala-i-Martin (1992), Easterly (1993), Pagano (1993), and Gertler and Rose (1994).

[4] The main results are based on a pure cross-section where the observation for each country is given by the average over the whole period.

As mentioned earlier, the last two indicators measure the extent to which the banking system channels funds to the private sector.

Some studies have taken a more microeconomic approach. For example, Rajan and Zingales (1996) analyze the relationship between industry-level growth performance across countries and financial development. Demirgüç-Kunt and Maksimovic (1996) argue that firms with access to more developed stock markets grow faster. Jayaratne and Strahan (1996) show that when individual states in the U.S. relaxed interstate branching restrictions, bank lending quality increased significantly leading to higher growth.

Some evidence on the financial depth-growth link can also be found in country-case studies. The most influential work in this area is by McKinnon (1973), which studies the relationship between the financial system and economic development in Argentina, Brazil, Chile, Germany, Indonesia, Korea, and Taiwan in the post-World War II period. He concludes that better functioning financial systems support faster growth.[5] Gelbard and Pereira Leite (1999) examine the case of sub-Saharan Africa. They find that some progress has been achieved in terms of modernizing the financial sector since mid-1980s, but conclude that much remains to be done. They also show some empirical evidence supporting the positive relationship between financial depth and growth for sub-Saharan Africa. The positive and significant relationship between financial depth and growth has also be found in studies using pure times series.[6]

Recent empirical literature has also revisited the old debate on the relative merits of bank-based financial systems (such as in Germany and Japan) versus market-based financial systems (as in the U.K. and U.S.). Proponents of bank-based systems note that:[7] (i) in highly liquid markets, information is quickly revealed to investors at large, creating a free-rider problem; (ii) small outside investors are unable to exert corporate control due to superior information of managers and the likely collusion between managers and a few powerful members of the board; and (iii) liquid markets make it easy for concerned stockholders to simply sell their shares rather than coordinate pressure against management. The combination of all of these market failures leads to an inefficient allocation of saving. Those favoring bank-based systems argue that banks, with their long-term relationships with particular firms, mitigate these market failures. Proponents of market-based systems focus on the weaknesses of bank-based systems, arguing that:[8] (i) large banks tend to encourage firms to undertake very conservative investment projects, and extract large rents from firms,

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[5] For additional country-case studies see Cole and Park (1983), Park (1993), Patrick and Park (1994), and Fry (1995).

[6] See Rousseau and Wachtel (1998), and Neusser and Kugler (1998).

[7] See Stiglitz (1985), and Shleifer and Vishny (1986).

[8] Rajan (1992), Weinstein and Yafeh (1998), and Black and Moersch (1998).

leaving them with low profits and little incentive to engage in new and innovative products; and (ii) shareholders have little oversight over bank managers who control not only banks but also, indirectly through financing, the firms. Furthermore, the advocates of market-based systems claim that the latter provide a richer set of financial instruments that allows greater customization of risk management techniques than in a more standardized bank-based system.

Emerging evidence suggests that neither view is fully correct. La Porta, Lopez-de-Silanes, Shleifer, and Vishny, (1997), Levine (1998, 1999b), Barth, Caprio, and Levine (2000) suggest that establishing a legal environment that credibly protects the right of investors is much more important than considerations involving comparisons between bank-based or market-based systems. Levine (1997) convincingly argues that the choice is not either banks or markets. Rather, banks and markets provide complementary financial services to the economy, with both having positive implications for economic growth.

To sum up, the empirical evidence finds a strong and statistically significant relationship between financial development and growth. It can, however, be argued that the relationship reflects reverse causality.[9] That is, it is faster growth that leads to financial deepening. While this argument carries some weight, the large body of empirical evidence cannot be dismissed on the basis of this premise, since it would amount to assuming not only that growth affects financial development, which is realistic, but also that financial development has no effect on growth, which is certainly counterintuitive. Indeed, it is easy to think of many channels through which both variables affects each other, and therefore the real issue in the empirical literature is not of spurious correlations but one of *simultaneity bias*. In principle, it is possible to eliminate the simultaneity bias and some studies have attempted to tackle this problem by using instrumental variables or related econometric techniques.[10]

III. Some New Empirical Results

In this section, the results of a growth equation which incorporates a financial development indicator are presented. The dataset includes 159 countries (comprising both industrial and developing countries) and generally covers the period 1960-1999. Data for a

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[9] For a good account of this controversy over the direction of causality between financial development and growth, see the introduction in Levine (1997).

[10] King and Levine (1993b) try to control for simultaneity bias by regressing average future growth on *initial* financial development. Beck, Levine and Loayza (1999), and Levine, Loayza, and Beck (1999) use GMM methods. Using relatively long time series for 16 countries, Demetriades and Hussein (1996) conduct a formal causality test between financial development and growth and find evidence for bi-directional causation.

number of developing countries, however, have a shorter span. The growth equation has been estimated using both a pure cross-section sample (by averaging along the time dimension) and five-year-average panels (obtained by taking five-year averages of the original data). The data on financial depth indicators come from a new financial development dataset developed by Beck, Demirgüç-Kunt, and Levine (1999) and the International Financial Statistics of the International Monetary Fund. Financial depth is measured by four alternative indicators:

(i) fd_1: domestic credit to the private sector as a share of GDP;

(ii) fd_2: fd_1 plus the stock market capitalization as a share of GDP;

(iii) fd_3: fd_2 plus the private and public bond market capitalization as a share of GDP; and

(iv) *stockc*: stock market capitalization.

By definition, fd_3 is the most exhaustive indicator of financial depth but is only available for advanced countries and for a shorter time span (starting in 1975). By contrast, fd_1 is widely available but is a more limited proxy for financial depth. The set of control variables includes: investment as a share of GDP, the growth rate of population, the growth rate of terms of trade, and the log of initial income (measured by GDP per capita in 1987 PPP prices).

Table 1 presents some summary statistics for the four financial development indicators. The first panel presents the minimum (*min*), the maximum (*max*), the first, second, and third quartiles (Q_1, Q_2, and Q_3, respectively) of the various financial depth indicators. The means (that is, the second quartile) for fd_1, fd_2, fd_3, and *stockc* are 22.28, 60.47, 177.70, and 15.13 percent of GDP, respectively. The ratio of the third to the first quartile are 3.4, 3.3, 3.0, and 2.6, respectively. This implies that countries in the third quartile have financial markets that have approximately three times the size of financial markets of countries in the first quartile (when measured as a share of GDP).

The second panel presents the correlation matrix between the first three financial depth indicators. The positive and relatively high correlation coefficients imply that the three indicators tend to move in the same direction. However, some of that positive correlation may have been induced by construction since fd_1 is a subset of fd_2 which is itself a subset of fd_3. The third panel of Table 1 provides the correlation matrix for the three raw indicators used to construct fd_1, fd_2, and fd_3, namely domestic credit to the private sector (*dc_prv*), the stock market capitalization (*stockc*), and the private plus public bond market capitalization (*bond*). As expected, the raw components are much less correlated than the aggregate financial depth indicators. The bond market capitalization is only weakly correlated with domestic credit to the private sector and uncorrelated with the stock market capitalization. The relatively low correlation between the three raw indicators implies that each indicator captures only one facet of financial development. Hence, relying on only one of them may be misleading or provide an incomplete picture.

The specification of the growth equation is closely related to the one adopted in the influential paper by Mankiw, Romer, and Weil (1992) which derives the estimated equation from the neoclassical growth model relating the growth rate of real GDP to investment as a ratio of GDP and the growth rate of population.[11] We augment this equation to include a financial depth indicator, initial real per capita GDP which captures the level of development of a country and has been systematically included in growth equations to test conditional convergence, and the growth rate of terms of trade which vary substantially across countries and represent an important source of external shocks for developing countries. Thus, the estimated equation has the following form:

$$Y_i = \beta_0 + \beta_1 FD_i + \beta_2 igdp_i + \beta_3 d\log(pop_i) + \beta_4 d\log(tot_i) + \beta_5 ly0_i + e_i \qquad (2)$$

where Y_i is the growth rate of real GDP, fd_i is the indicator of financial depth, $igdp_i$ is investment as a share of GDP, $d\log(pop_i)$ is the growth rate of population, $d\log(tot_i)$ is the growth rate of terms of trade, ly_0 is log of initial per capita income, and e_i is the error term.

Table 2 provides the estimation results for the pure cross-section. The *benchmark* equation omits the financial development indicator. All variables have the right sign and are significant at the 1 percent level, except for population growth which is significant at 10 percent. The coefficient on the log of initial income, ly_0, is negative and highly significant, suggesting that conditional convergence holds, corroborating the results of a large body of empirical work on this issue.[12] The fit is reasonably good, considering the fact that the equation was quite parsimoniously specified and estimated with cross-sectional data.

The last four columns report the estimation results of the same equation with one of the three financial depth indicators as an additional explanatory variable. The coefficients of all four indicators of financial depth are positive and highly significant, suggesting a positive relationship between financial depth and growth. Furthermore, the introduction of a financial depth indicator into the growth equation significantly improves the fit. For example, the R^2 approximately doubles when fd_1 is introduced in the equation. The R^2 improves even more when fd_2 and fd_3 are introduced in the equation. However, the equations with fd_2 and fd_3 are not directly comparable to the benchmark equation because of the different sample sizes.

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[11] To be precise, the second variable is population growth plus the depreciation rate of capital plus the growth rate of total factor productivity (assumed to be exogenously growing at an exponential rate). Since the depreciation rate of capital and the growth rate of total factor productivity are assumed constant over time and identical across countries, the second variable is equivalent to the population growth rate.

[12] Conditional convergence implies that countries that are far from their steady-state equilibrium (which is typically the case for developing countries) tend to grow faster than countries that are closer to their steady states (industrialized countries). See, for example, Mankiw, Romer, and Weil (1992) for a test of the convergence hypothesis.

These results support previous empirical evidence on the positive relationship between financial development.[13] Note that the coefficient on the financial depth indicator declines as we move from fd_1 to fd_3, reflecting the increasing size of these indicators. To quantitatively illustrate these estimation results, the difference between the growth rates of two countries with financial development indicators equal to the first and third quartiles (Q_1 and Q_3 in Table 1), but identical otherwise, are computed. The result will, of course, depend on the exact financial indicator chosen. Interestingly, however, the three indicators fd_1, fd_2, and fd_3 yield relatively close results. The country in the third quartile will grow faster by 0.83, 0.73 or 0.83 percentage points, depending on whether financial development is measured by fd_1, fd_2, or fd_3. If financial depth is measured by the stock market capitalization (*stockc*), the difference in growth performance would be 0.56 percentage points.

An important issue that was ignored in Table 2 is the direction of causality between financial depth and growth. Theoretical models abound where the causality runs both ways.[14] If indeed financial development and growth are jointly determined, Ordinary Least Squares (OLS) estimation of the growth equation presented in Tables 2 may be biased. In theory, this bias can be asymptotically eliminated if appropriate instruments are used. The basic growth equation has been re-estimated using instruments for the potential endogenous variables, that is the financial development indicators (fd_i, i=1,2,3), *stockc*, and *igdp*.[15] Table 3 shows the estimation results. The Two-Stage-Least-Squares (2SLS) estimates in Table 3 and the OLS estimates in Table 2 are relatively close. In particular, the financial development indicators remain positively related to growth, even though fd_2 and *stockc* become statistically insignificant.

As mentioned earlier, the sample used in Table 2 is a pure cross-section constructed by averaging over the whole time period (1960-1999). This has been common practice in the empirical studies on financial development and growth, since the influencial paper by King and Levine (1993b), and generally is justified as necessary to smooth out short-term fluctuations in the growth rate of real GDP and focus on the "long-run" growth rate of a country.[16] However, averaging over such long periods may mask some important features of the growth path of the economy. That is why the empirical growth literature has generally

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[13] See King and Levine (1993b), and Levine (1997) and the references therein.

[14] See for example Greenwood and Jovanovic (1990), and Greenwood and Smith (1997).

[15] The list of instruments for fd_i includes the lagged fd_i, the lag of the dependent variable, the lag of ppp GDP, and a time trend. The instruments are the same for *igdp* except that the lag of fd_i is replaced by the lag of *igdp*.

[16] Note that the interpretation of long time-span averages as a proxy for long-run growth rate of an economy is erroneous as growth models predict that an economy will get closer to its steady-state growth rate as time elapses. Therefore, recent growth rates are more revealing about long-run growth than distant past ones.

adopted using panels with five-year averages, thereby allowing for the smoothing out of business cycle fluctuations in output growth without unecessarily masking all the dynamics in the data. To test whether the significant relationship between financial depth and growth is robust to data frequency, the growth equations in Table 2 were also estimated in pooled time-series cross-section form with five-year averages.[17] The results are presented in Table 4. While all four financial depth indicators remain positively related to growth, only fd_1 and *stockc* are statistically significant. Furthermore, the effect of financial depth on growth weakens significantly. These somewhat divergent results suggest that financial depth may be helpful in explaining cross-country differences in growth rates, but not the growth dynamics.

The weaker explanatory power of these financial depth indicators in panels may reflect the inadequacy of the linear specification to capture growth dynamics. Indeed, recent theoretical work shows that this relationship may well be nonlinear.[18] In Table 5, a simple form of nonlinearity is introduced by assuming that the relationship is quadratic. Estimation results are reported for both the pure cross-section and five-year-average samples. The level of financial development has a positive sign while the quadratic term has negative one, suggesting that there is an *optimium* level of financial development from a growth standpoint. However, an alternative and perhaps more plausible interpretation is that the concave relationship between financial depth and growth simply reflects conditional convergence, that is poor countries tend to grow faster than rich ones. To the extent that poor countries have less developed financial markets than rich ones, the negative sign on the square of the financial development indicator may capture the slowing growth path of advanced economies which is not completely captured by the log of initial income (ly_0).[19] The level and the quadratic term of the financial development indicators are generally statistically significant for both the pure cross-section and five-year-average growth equations.

There are, of course, more complex nonlinearities that could be considered. For example, Berthélemy and Varoudakis (1996) argue that the relationship between growth and financial depth may involve a "threshold" effect. That is, countries may need to reach a certain level of financial depth—a threshold—before there is a significant effect on growth. Indeed, the relationship may be characterized by multiple thresholds. While estimating threshold relationships is difficult, the new econometric methods that have been developed recently by Hansen (1999, 2000) and Chan and Tsay (1998) have been applied successfully

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[17] The estimation did not allow for fixed effects that take account of country differences. This was for two reasons. First, it has been found that introducing country-specific effects tends to dominate the other economic factors in the specification. Second, the initial income per capita variable in the estimated equation tends to pick up country differences, and thus estimating the model without fixed effects does not affect the results in a meaningful way.

[18] See for example Greenwood and Jovanovic (1990), and Huybens and Smith (1998).

[19] As pointed out previously, conditional convergence is generally measured by the coefficient on ly_0. However, the convergence process may be too complex to be simply captured by initial income.

by Khan and Senhadji (2000) to examine threshold effects on the growth-inflation link. But it should be noted that these new estimation methods require a large number of observations to derive inferences, and moreover, handling multiple thresholds in this framework is computationally cumbersome. Another way of getting at the same issue is to divide the sample into sub-groups of countries and estimate the relationship separately for each sub-group. The problem here is there is no obvious criterion by which to group countries. Should it be by level of economic development, financial development, or growth performance? Each one may well lead to quite a different result.

In summary, the regression analysis reveals that financial development is an important determinant in the cross-country growth differences. However, some financial depth indicators become statistically insignificant when the growth equations are estimated with panels. One might think of several sources for the reduced performance of the financial depth indicators in explaining growth dynamics. First, as discussed earlier, the relationship between financial depth and growth may be nonlinear. Second, financial depth in a particular country varies only slowly while growth is much more volatile (even when averaged over five years). And third, the three financial indicators may not be precise enough to capture the changing structure of financial markets in a particular country. While the level of financial development may explain the level of growth, it is precisely changes in the financial structure that are related to changes in growth for a given country. If the indicators do not adequately capture these changes, they will not explain a large portion of the time variation in growth.

IV. Conclusions

In this paper we re-examine the empirical evidence on the relationship between financial development and economic growth with a view to identifying some outstanding issues. We also present some new empirical evidence based on a recent dataset that includes both banking and security market indicators of financial depth.

A number of recent studies have used endogenous growth theory to show a close relationship between the level of financial development and growth. The general idea consists of assuming that financial development improves the efficiency of capital allocation, which in the context of an endogenous growth model, implies higher long-term growth. These theoretical predictions are confirmed by a large body of empirical evidence.

There are still three ongoing debates. The first one is related to the issue of measurement of financial depth. The second pertains to the direction of causality between financial depth and growth. And the third centers around the question of whether a banking-based financial system is superior to a market-based one. With respect to the first debate, the results clearly depend on the measure of financial depth that is used in the relationship. With regards to causality, it is easy to identify channels through which financial depth affects growth and vice-versa. Therefore, the regression evidence cannot be dismissed on the basis that it merely reflects correlations. However, simultaneity bias issues remain if not properly taken into account. With respect to the question of the appropriate structure of the financial

sector, the debate is perhaps misplaced. The question is not whether or not the banking system is more important than security markets, but how to promote both.

The paper also took another look at the empirical relationship between financial depth and growth by estimating a standard growth equation with financial development indicators drawn from a recent extensive database covering both the banking sector and market securities. The focus of the empirical exercise is to test robustness of previous results with respect to: (i) alternative financial depth indicators; (ii) estimation method; (iii) data frequency; and (iv) nonlinearities in the relationship.

The results in this paper confirm the strong positive and statistically significant relationship between financial depth and growth in the cross-section analysis.[20] This result is robust to four different financial depth indicators covering the banking system, and the stock and bond markets. Consistent with previous studies, the effect in each case is quite powerful, although it should be noted that the size of the effect varies with the particular indicator under consideration. Correcting for simultaneity bias changes the results marginally. Thus, we can be reasonably confident that financial depth is an important determinant of cross-country differences in growth. An important question is whether the time variation in the financial depth indicators can explain growth variation across time. This question was explored by estimating the growth equations with non-overlapping five-year-average panel data (where each observation for a given country is a five-year average of the original panel data with annual observations).[21] Interestingly, the results are generally weaker when a time dimension is introduced in the model. One possible explanation may be that a linear model is appropriate for capturing the effect of financial depth on cross-country differences in long-term growth but not for explaining growth dynamics of individual countries. Indeed, recent theoretical models suggests a nonlinear relationship between financial depth and growth. Consequently, we experimented with the simplest form of nonlinearity by assuming that the relationship between financial depth and growth is quadratic. The results are suggestive but may be quite sensitive to the specific quadratic form chosen. Furthermore, the concave relationship between financial depth and growth uncovered here may simply reflect conditional convergence, that is poor countries tend to grow faster than rich ones. To the extent that poor countries have less developed financial markets than rich ones, the negative sign on the square of the financial development indicator may capture the slowing growth path of advanced economies which is not completely captured by the log of initial income included in the growth equations. Other factors behind the mixed performance of financial development indicators in explaining growth dynamics may be the inability of these indicators to sufficiently capture the structure of financial markets, and the fact that financial markets tend to develop too slowly to explain medium-term variations in growth.

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[20] The cross-section are constructed by averaging over the whole time period, typically three decades.

[21] Averaging over five years eliminates, or at least reduces, the effects of business cycle fluctuations.

This overview of the relationship between financial depth and economic growth points to a number of areas for future research. These include, for example, the following:

- The collection of better-quality and more extensive indicators of financial depth. Currently stock and bond market indicators of financial depth are available only for industrial and a few advanced developing countries for a short time span. It is essential to obtain the relevant data for more countries so as to make the necessary cross-country comparisons. Furthermore, the data for the banking sector for most developing countries comes from the monetary survey. To properly judge the development of the banking sector, data are needed on the market structure (e.g., bank concentration, entry of foreign banks, etc.), interest rate spreads, market capitalization and liquidity, legal and regulatory frameworks, accounting practices, and payments systems.

- The relationship between financial depth and growth needs to be refined and appropriate estimation methods employed. Theoretical models suggest that the relationship may be nonlinear, with possible threshold effects, and the preliminary evidence in this paper points in that direction. However, the precise nature of the nonlinearity and its empirical counterpart have not yet been fully analyzed.

- There is as yet only limited knowledge on policies to support the development of growth-promoting financial systems. Some recent and promising work shows that legal and regulatory reforms that strengthen creditor rights, contract enforcement, and accounting practices will boost banking and securities markets development. However, much work remains to be done on how, and in what sequence, these reforms should be undertaken.

- The analysis on financial depth and growth needs to be extended to incorporate the important interlinkages between domestic and international financial markets. So far most of the analysis has been implicitly conducted in a closed economy context. In the era of globalization, it is clear that the role of foreign financial systems and institutions cannot be ignored for the development of domestic financial systems. [22]

- In conclusion, while it is clear that a strong empirical link exists between financial depth and economic growth, going from that to determining how to develop financial markets and how precisely their development will benefit growth is still relatively uncharted territory. A start in this direction has been made, but much remains to be done. Further cross-country studies, supplemented by individual country analysis, should prove extremely fruitful in addressing the open questions.

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[22] See Knight (1998) for a discussion of the impact of globalization of financial markets on developing and transition countries.

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Table 1. Descriptive Statistics for the Financial Depth Indicators

Summary Statistics for Financial Depth Indicators

	Min	*Max*	Q_1	Q_2	Q_3
fd_1	.01	203.74	12.75	22.28	42.70
fd_2	.31	492.71	32.05	60.47	106.27
fd_3	12.24	446.56	89.38	177.70	265.09
stockc	.03	386.47	5.44	15.13	38.97

Note: Q_1, Q_2, and Q_3 give the first, second, and third quartiles, respectively.

Correlation Coefficients Between Financial Depth Indicators

	fd_1	fd_2	fd_3
fd_1	1.00		
fd_2	0.85	1.00	
fd_3	0.82	0.91	1.00

Correlation Coefficients Between Financial Depth Indicators

	dc_prv	*stockc*	*bond*
dc_prv	1.00		
stockc	0.53	1.00	
bond	0.21	0.03	1.00

Table 2. Growth Regressions With Pure Cross-Section

Independent Variables	*Benchmark*	fd_1	fd_2	fd_3	*stockc*
fd_i		0.02763 (5.31)a	0.00984 (3.88)a	0.00474 (2.90)a	0.01666 (3.08)a
igdp	0.04713 (3.05)a	0.04008 (2.80)a	0.09875 (3.53)a	0.13664 (3.54)a	0.10243 (3.53)a
dlog(pop)	0.30223 (3.04)a	0.42716 (4.52)a	0.39809 (2.80)a	0.67980 (2.81)a	0.34724 (2.30)a
dlog(tot)	0.10908 (1.67)c	0.11096 (1.84)c	0.15601 (1.55)	0.37686 (1.89)c	0.14568 (1.40)
ly_0	-0.31952 (-2.70)a	-0.63930 (-5.13)a	-0.86728 (-4.83)a	-1.2390 (-5.04)a	-0.7897 (-4.34)a
N	159	159	87	34	87
R^2	0.154	0.286	0.467	0.801	0.434

Note: The pure cross-section used here is constructed as the average over the time dimension of a panel which covers the period 1960-1999 for 159 countries. The dependent variable is the growth rate of real GDP, *y*; The independent variables are: an indicator of financial depth, fd_i, *i=1,2,3 or* the stock market capitalization as a share of GDP, *stockc*, (the top of each column gives the indicator used); investment over GDP (*igdp*); the growth rate of population, *dlog(pop)*; the growth rate of terms of trade, *dlog(tot)*; and the log of initial income, ly_0. The *t-statistics*, given between parentheses. The letters "a", "b", "c", indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 3. Growth Regressions With Pure Cross-Section (2SLS)

Independent Variables	*Benchmark*	fd_1	fd_2	fd_3	*stockc*
fd_i		0.02273	0.00382	0.00348	0.00829
		(4.10)a	(1.42)	(2.26)a	(1.60)
igdp	0.05883	0.05645	0.19761	0.19080	0.19479
	(3.77)a	(3.56)a	(5.35)a	(4.69)a	(5.32)a
dlog(pop)	0.31172	0.39090	0.27238	0.55098	0.22483
	(3.17)a	(3.60)a	(1.48)	(1.94)c	(1.19)
dlog(tot)	0.09997	0.09440	-0.16309	0.52968	-0.15317
	(1.54)c	(1.45)	(-1.42)	(2.48)a	(-1.34)
ly_0	-0.31566	-0.59672	-0.80199	-0.96398	-0.79293
	(-2.71)a	(-4.40)a	(-3.80)a	(-2.35)a	(-3.89)a
N	158	141	52	21	52
R^2	0.180	0.274	0.621	0.916	0.625

Note: The pure cross-section used here is constructed as the average over the time dimension of a panel which covers the period 1960-1999 for 159 countries. The dependent variable is the growth rate of real GDP, *y*; The independent variables are: an indicator of financial depth, fd_i, $i=1,2,3$ or the stock market capitalization, *stockc* (the top of each column gives the indicator used); investment over GDP (*igdp*); the growth rate of population, *dlog(pop)*; the growth rate of terms of trade, *dlog(tot)*; and the log of initial income, ly_0. Instrumental variables were used for the fd_i*'s and igdp*. The *t-statistics*, given between parentheses. The letters "a", "b", "c", indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 4. Growth Regressions With Five-Year-Average Panel

Independent Variables	*Benchmark*	fd_1	fd_2	fd_3	*stockc*
fd_i		0.0070	0.0019	0.0016	0.0121
		(2.23)b	(1.20)	(0.80)	(4.59)a
igdp	0.1251	0.1357	0.1165	0.0851	0.1157
	(8.87)a	(13.26)a	(7.29)a	(3.33)a	(7.48)a
dlog(pop)	0.0444	0.0360	0.0494	0.0242	0.0526
	(2.96)a	(2.95)a	(12.07)a	(4.78)a	(7.12)a
dlog(tot)	0.0193	0.0181	0.5115	0.0325	0.0040
	(3.75)a	(4.21)a	(0.96)a	(1.29)	(0.78)
ly_0	-0.6200	-0.6084	-0.6358	-0.5400	-0.7443
	(-6.17)a	(-7.19)a	(-6.90)a	(-1.53)	(-11.10)a
N	890	767	285	62	289
R^2	0.139	0.159	0.182	0.281	0.198

Note: The panel covers the period 1960-1999 for 159 countries (N). The dependent variable is the growth rate of real GDP, *y*; The independent variables are: an indicator of financial depth; fd_i, $i=1,2,3$ or the stock market capitalization, *stockc* (the top of each column gives the indicator used); investment over GDP (*igdp*); the growth rate of population, *dlog(pop)*; the growth rate of terms of trade, *dlog(tot)*; and the log of initial income, ly_0. The *t-statistics*, given between parentheses. The letters "a", "b", "c", indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 5. Quadratic Model

Independent Variables	*Pure Cross-Section*				*Five-Year-Average Panel*			
	fd_1	fd_2	fd_3	*stockc*	fd_1	fd_2	fd_3	*stockc*
fd_i	0.05130	0.02031	0.00324	0.04561	0.02991	0.00961	0.03978	0.03539
	(4.19)a	(3.15)a	(0.99)	(2.83)a	(5.26)a	(2.35)a	(8.52)a	(6.91)a
fd_i^2	-0.00020	-3.86E-5	0.00253	-2.52E-4	-0.00015	-2.19E-5	-8.64E-5	-1.39E-4
	(-2.13)b	(-1.76)c	(0.53)	(-1.91)c	(-5.56)a	(-1.76)c	(-8.75)a	(-4.54)a
igdp	0.03864	0.09954	0.12979	0.10795	0.13538	0.11777	0.11985	0.13196
	(2.73)a	(3.60)a	(3.15)a	(3.76)a	(13.28)a	(6.58)a	(8.08)a	(7.95)a
dlog(pop)	0.44140	0.38862	0.65095	0.31909	0.04531	0.06237	0.25625	0.04554
	(4.71)a	(2.76)a	(2.59)a	(2.14)b	(3.69)a	(4.41)a	(6.43)a	(4.15)a
dlog(tot)	0.10142	0.18014	0.36768	0.18496	0.02093	0.00669	0.05056	0.00330
	(1.70)c	(1.79)c	(1.81)c	(1.77)c	(5.15)a	(1.23)	(2.77)a	(0.66)
ly_0	-0.71284	-0.96912	-1.23370	-0.93562	-0.71438	-0.69320	-1.38442	-0.89321
	(-5.57)a	(-5.20)a	(-4.95)a	(-4.80)a	(-8.63)a	(-5.93)a	(-5.31)a	(-11.35)a
N	159	87	34	87	767	285	62	289
R^2	0.306	0.487	0.803	0.459	0.169	0.191	0.419	0.220

Note: The pure cross-section is constructed as the average over the time dimension of a panel which covers the period 1960-1999 for 159 countries. The five-year-average panel is constructed as the five-year average of the original panel. The dependent variable is the growth rate of real GDP, *y*; The independent variables are: an indicator of financial depth; fd_i, $i=1,2,3$ or the stock market capitalization, *stockc* (the top of each column gives the indicator used); investment over GDP (*igdp*); the growth rate of population, *dlog(pop)*; the growth rate of terms of trade, *dlog(tot)*; and the log of initial income, ly_0. The *t-statistics* are given between parentheses. The letters "a", "b", "c", indicate statistical significance at 1, 5, and 10 percent, respectively.