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Financial structure and capital investment

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This article studies the effects of financial structure on the growth of physical capital accumulation. Several theoretical works have proposed that banks are better than stock markets in funding capital investment. We test these theories with panel data for 62 industrial and developing countries using Generalized Method of Moments dynamic panel techniques. Results show that bank based financial systems are indeed associated with faster capital growth. This effect is especially strong in countries where banks can have close links to nonfinancial firms.

Keywords: financial development; financial structure; capital accumulation

JEL Classification: G10; O11

I. Introduction

This article investigates whether financial structure, defined as the relative importance of stock markets to banks in the financial system, affects physical capital investment. A number of theoretical papers have argued that financial structure might influence investment. In particular, the theoretical literature suggests that banks are especially important for physical capital accumulation. An early example of this argument is Gershenkron (1962) who argues that powerful banks are better at financing the expansion of the industrial sector, especially in developing countries, by exploiting economies of scale and exerting pressure on firms to service their debts. Stulz (2001) argues that banks can commit funds to projects that require financing in successive stages and can, therefore, fund long-term projects. Bhide (1993) shows that banks can monitor firm managers more effectively than stock markets: shareholders have little incentive to monitor managers as they can dispose of shares if the firm's performance starts to decline.

Similarly, Fulghieri and Rovelli (1998) build a version of the Diamond–Dybvig (1983) model with overlapping generations and compare two financial systems: one purely stock market-based and the other purely bank-based. Under the market-based system, members of a new generation invest part of their endowments in shares of existing firms reducing investment in new physical capital. Therefore, they find that bank-based systems promote investment more effectively. Finally, Chakraborty and Ray (2006) find that a bank-based system outperforms a market-based system using an endogenous growth model. In their framework, some firms with low initial wealth are not able to obtain financing in a market-based system. In contrast, all firms can borrow from a bank regardless of initial wealth. Banks provide an efficient monitoring role and reduce agency problems, and hence firms can borrow more for future investment. Therefore, investment is greater in a bank-based system.

In summary, although both banks and stock markets are an important source of capital financing,

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the literature suggests that banks might be particularly well suited to fund investment. Our objective is to test this hypothesis: specifically, whether physical capital accumulation is faster in countries with more bank-based financial systems. Previously, Beck and Levine (2004) studied the effect of financial structure on *overall economic growth*. Our contribution is in analysing the effect of financial structure on physical capital accumulation. The question is important as the growth of the physical capital stock is an integral component of economic growth (Acemoglu *et al.*, 2006; Abdi, 2008). In addition, the question of whether banks or stock markets are better for real activity continues to receive attention (e.g. Tang, 2006). The chief economist of the World Bank, Justin Lin, also raises this question in an article in the *The Economist* (July 9, 2009) and a recent academic paper, Lin *et al.* (2009). We contribute to that debate by investigating the role of financial structure for physical capital growth.

We use a broad sample with 62 countries during the period 1976 to 2000 and utilize Generalized Method of Moments (GMM) dynamic panel techniques to confront the potential econometric issues such as endogeneity and reverse causality.[1] Our estimations show that financial structure does matter for capital investment. Specifically, countries with more bank-based financial systems have faster rates of capital accumulation. This finding has important implications for countries at the early stages of development where capital accumulation is the main source of economic growth. It suggests that, in these countries, policies that promote banking system development might have a greater economic impact than efforts to develop equity markets.

We test several additional hypotheses. First, Boyd and Smith (1998) propose that the financial system shifts from bank-based to a more market-based structure as economies develop and get closer to the technological frontier where innovation is important. Based on this, we test if the effect of bank-based financial systems on investment declines as income increases. Second, Rajan and Zingales (1998) argue that banks are especially important in countries with underdeveloped legal systems where they can enforce payments more effectively compared to markets. Our analysis differentiates between countries with different institutions and at different levels of development. We find that the advantages of bank-based financial systems in terms of promoting investment are similar across countries with different legal systems and different levels of economic development.

Furthermore, Hoshi *et al.* (1991), Fohlin (1998) and Kong (1998) highlight the benefits of a close relationship between banks and nonfinancial firms for reducing the liquidity constraints faced by firms. A close relationship with a bank mitigates information asymmetries and reduces the reliance on retained earnings for capital investments. This argument has found empirical support in data from individual countries including Japan and Korea but has not been investigated in broader samples.[2] We provide additional supporting evidence from a broad sample of countries.

The remainder of this article is structured as follows. In Section II, we discuss our measures for financial structure and capital growth. Section III presents the hypotheses and empirical methodology. Section IV presents the results and Section V concludes this article.

II. Measures of Financial Variables and Capital Growth

The data set consists of a panel of observations for 62 countries for which we have stock market data for the period 1976 to 2000. We use the 'Financial Structure and Development Data Base' available from the World Bank (2005). In addition, we use data from Beck and Levine (2004) for the set of control variables which is described in detail later in this article. In order to focus on the long-run determinants of capital growth, we attempt to reduce business cycle fluctuations by averaging the data over five-year intervals: 1976 to 1980, 1981 to 1985, 1986 to 1990, 1991 to 1995 and 1996 to 2000. Hence, there are five observations per country when available. Using such five-year averages is a common approach in the empirical growth literature.

Our measures for financial activity and financial structure are based on three variables that have been extensively used in the literature to study the effect of financial development on economic growth. *PRIVATE CREDIT* is the credit issued by all

[1] Recent work by Luintel *et al.* (2008) adopts an alternative approach. The paper points out that pooling data from a wide range of countries masks significant heterogeneity across the sample countries. Financial structure could be important depending on countries' economic and institutional structure. The analysis uses time series methods with data from 14 countries to show that financial structure can explain economic growth.

[2] For example, Hoshi *et al.* (1991) study the Japanese *Keiretsu* where industrial groups have an affiliated bank financing investments. Similarly, Kong (1998) studies the financing of Korean *Jaebol* versus non-*Jaebol* firms. He finds that the share of funds raised by borrowing for *Jaebol* firms is more than twice that of non-*Jaebol* firms.

financial intermediaries (excluding central banks) to the private sector as percent of Gross Domestic Product (GDP). *VALUE TRADED* is the total value of domestic shares traded on the domestic stock market as percent of GDP. *MARKET CAPITALIZATION* is the total value of listed shares divided by GDP.

We combine these three variables in different ways to try to obtain a measure of financial structure and a measure of financial activity. We choose to follow this approach because we want to capture different facets of stock markets and banks within one variable. For example, our financial structure variable will both reflect the relative size and the relative activity of stock markets versus banks. Hence, we use first principal components aggregation in the construction of measures for the size and structure of financial markets following Beck and Levine (2002).[3]

The *FINANCIAL STRUCTURE* variable is constructed in the following way: it is a first principal component of two variables that measure the relative size and activity of markets and banks. The first variable equals the log of the ratio of *VALUE TRADED* to *PRIVATE CREDIT*. The second variable equals the log of the ratio of *MARKET CAPITALIZATION* to *PRIVATE CREDIT*. Thus, a higher value of the first principal component (*FINANCIAL STRUCTURE*) indicates a financial system that is more market-based as opposed to bank-based. It should be noted that Stulz (2001) points out that financial structure can take on many different characteristics. In addition to using the measure used in our article, Beck and Levine (2002) use two alternative measures for financial structure – a measure of regulatory restrictions on banks and the share of state ownership of the banking system of a country. They find that the various measures for financial structure produce different rankings of countries, but the overall results using various measures are very similar.

We measure the overall level of financial development, which we call *FINANCIAL ACTIVITY*, in a similar way by combining two variables in a first principal component. As in Beck and Levine (2002), the first variable equals the log of the product of *PRIVATE CREDIT* and *VALUE TRADED*. This variable is a measure of the overall activity of financial intermediaries and stock markets. The second variable is the log of the sum of *PRIVATE CREDIT* plus *MARKET CAPITALIZATION* and is a direct measure of the overall size of the financial sector. In summary, we create two index variables: *FINANCIAL ACTIVITY* and *FINANCIAL STRUCTURE*.

To calculate physical capital growth, we follow the perpetual inventory method which is the standard method that has been used in the economic growth literature (e.g. Baffes and Shah, 1998; Easterly and Levine, 2001) and the finance and growth literature (e.g. Beck *et al*., 2000). We start with an estimate of the initial level of capital stock for each country in 1950, assuming that the capital-output ratio was in steady state. Capital stock in later years is then computed using the chain-weighted real investment series from the Penn World Tables (2005). Following the papers cited above, an annual depreciation rate of 7% is used in the calculations. Ideally, we would use a country-specific depreciation rate; however, country level data are not available.[4] Our capital growth variable is denoted *CAPITAL*. The Appendix (Table A1) lists all the countries used in the analysis along with the 1990s' average for the key variables of interest. Table 1 presents descriptive statistics for all the variables used in the empirical analysis. The average growth rate of capital in our sample is 2% per year.

It is also useful to get an idea of the variables that make up the *FINANCIAL STRUCTURE* first principal component. Ranking countries from the most bank-based to most stock market based in the 1990s, we observe the following. The most bank-based one-third of countries had *PRIVATE CREDIT* = 0.43, *VALUE TRADED* = 0.02 and *MARKET CAPITALIZATION* = 0.15. Hence, this group had fairly developed banking sectors and small stock markets with low activity. The middle-third group had *PRIVATE CREDIT* = 0.63, *VALUE TRADED* = 0.20 and *MARKET CAPITALIZATION* = 0.34. Finally, the most market-based one-third of the countries had *PRIVATE CREDIT* = 0.74, *VALUE TRADED* = 0.51 and *MARKET CAPITALIZATION* = 0.84. Clearly, stock markets are a major part of the financial system in this latter group. The reasons for the different financial structure in countries have been explored in Allen and Gale (2000).

[3] A principal component is a linear combination of variables that captures as much of the variation in those variables as it is possible to capture via a linear combination of those variables (Kennedy, 1992).

[4] According to Baffes and Shah (1998), the depreciation rate is derived from the expected lifetime of overall capital being about 15 years. This is an average as machines and equipment have a shorter lifetime and buildings and infrastructure have a longer lifetime.

Table 1. Descriptive statistics

Variable	Capital growth	Financial activity	Financial structure	Initial income	Schooling	Government size	Openness	Inflation	Black market premium	Institutions
Mean	0.02	0.00	0.00	10 719.09	6.41	15.45	68.12	0.16	19.51	0.00
SD	0.03	0.91	0.88	7234.78	2.57	5.96	50.35	0.30	146.52	0.93
Minimum	−0.05	−2.79	−3.61	1095.38	1.03	3.12	13.71	0.00	−3.68	−2.29
Maximum	0.12	2.09	1.43	29 193.91	12.18	37.92	374.07	2.22	2233.39	1.16
Capital growth	1.00									
Financial activity	0.18*	1.00								
Financial structure	0.02	0.63*	1.00							
Initial income	−0.02	0.68*	0.29*	1.00						
Schooling	−0.07	0.60*	0.33*	0.83*	1.00					
Government size	−0.14*	0.27*	0.10	0.39*	0.37*	1.00				
Openness	0.21*	0.33*	0.21*	0.14*	0.04	0.10	1.00			
Inflation	−0.24*	−0.34*	−0.05	−0.24*	−0.20*	−0.13	−0.21*	1.00		
Black market price	−0.09	−0.11	−0.04	−0.11	−0.13	−0.06	−0.05	0.09	1.00	
Institutions	0.02	0.65*	0.33*	0.82*	0.72*	0.35*	0.19*	−0.31*	−0.07	1.00

Note: *Indicates statistical significance at the 5% level.

III. Hypotheses and Empirical Methodology

In order to summarize our hypothesis, first, define y_{it} as the growth rate of capital stock per capita in country i at time t. Also, define FD_{it} as financial development in the country; FS_{it} as the financial structure where a greater value for FS implies a more market-based financial system; and X_{it}^{C} as the set of conditioning variables. We estimate the following panel regression equations:

$$y_{i,t} = \beta^{1'} X_{i,t}^{C} + \gamma_1 FD_{i,t} + \eta_i^1 + \varepsilon_{i,t}^1 \quad (1)$$

$$y_{i,t} = \beta^{2'} X_{i,t}^{C} + \gamma_2 FS_{i,t} + \gamma_3 FD_{i,t} + \eta_i^2 + \varepsilon_{i,t}^2 \quad (2)$$

In the above equations, the η_i terms capture unobserved country-specific effects and the ε_{it} are error terms. As it is well known in the literature (Levine, 2005), financial development is expected to have a positive effect on economic growth, i.e. $\gamma_1 > 0$ and $\gamma_3 > 0$. Our main hypothesis concerning financial structure would imply that $\gamma_2 > 0$. That is, the more bank-based a country is (the lower FS is), the higher the capital growth rate should be.

We also test the additional hypothesis based on Boyd and Smith (1998) that banks are more important at low levels of development. Then as the country becomes more developed, market-based finance becomes more important. This can be estimated using the following equation:

$$y_{i,t} = \beta^{3'} X_{i,t}^{C} + \gamma_4 FS_{i,t} + \gamma_5 FS_{i,t} * GDP_{i,t} + \gamma_6 FD_{i,t} + \eta_i^3 + \varepsilon_{i,t}^3 \quad (3)$$

The resulting hypothesis is then: $\gamma_4 < 0$, $\gamma_5 > 0$ and $\gamma_6 > 0$.

An additional hypothesis is based on Rajan and Zingales (1998) who propose that banks are better for growth in countries that have poor legal systems and markets are better once legal systems improve. This can be tested as follows:

$$y_{i,t} = \beta^{4'} X_{i,t}^{C} + \gamma_7 FS_{i,t} + \gamma_8 FS_{i,t} * L_{i,t} + \gamma_9 FD_{i,t} + \eta_i^4 + \varepsilon_{i,t}^4 \quad (4)$$

In Equation 4, L is a measure of legal institutions. As a measure of institutions, we use a first principal component of the corruption, rule of law and risk of expropriation indexes published in the International Country Risk Guide by the Political Risk Group, indexes that have been widely used in the literature (Levine *et al.*, 2000). The resulting predictions are that $\gamma_7 < 0$, $\gamma_8 > 0$ and $\gamma_9 > 0$.

The final hypothesis tested is that in countries where banks can own nonfinancial firms, the information asymmetry problem is reduced, reducing liquidity constraints on firms. This can be tested with the following regression equation:

$$y_{i,t} = \beta^{5'} X_{i,t}^{C} + \gamma_{10} FS_{i,t} + \gamma_{11} FS_{i,t} * OWN_i + \gamma_{12} FD_{i,t} + \eta_i^5 + \varepsilon_{i,t}^5 \quad (5)$$

where the dummy variable OWN indicates whether banks are allowed to own equity in nonfinancial firms. Under this view, the hypotheses are $\gamma_{10} + \gamma_{11} < 0$, and $\gamma_{12} > 0$.

Methodology

Given the well-known potential problems of reverse causation, endogeneity and measurement errors, the literature has tried various approaches to confront these problems. Within the dynamic panel framework approach, GMM techniques have been typically used as in Levine *et al*. (2000) and Beck *et al*. (2000). This method was developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). Taking Equation (1) as the basic regression for illustrative purposes, we first-difference the equation as in Arellano and Bond (1991) as follows:

$$y_{i,t} - y_{i,t-1} = \beta^{1'}\left(X_{i,t}^{C} - X_{i,t-1}^{C}\right) + \gamma_1\left(FD_{i,t} - FD_{i,t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right) \quad (6)$$

Given the potential endogeneity problem of FD and of the control variables X^c, instruments must be used. The GMM *difference* estimator uses the lagged levels of the explanatory variables as instruments under the conditions that the error term is not serially correlated and that the lagged levels of the explanatory variables are weakly exogenous (i.e. they are uncorrelated with future error terms). Then, the following moment conditions are used to calculate the difference estimator:

$$E\left[X_{i,t-s}^{C}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \quad \text{for } s \geq 2;\ t = 3, \ldots, T \quad (7)$$

$$E\left[FD_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \quad \text{for } s \geq 2;\ t = 3, \ldots, T \quad (8)$$

There are some drawbacks to the *difference* estimator. First, the country-specific dimension of the data is lost. Second, persistence in the explanatory variables may adversely affect the small-sample and asymptotic properties of the difference estimator (Blundell and Bond, 1998). To address these issues, the *difference* estimator is further combined with an estimator in levels to produce a *system* estimator.

Including equations in levels implies that country-specific effects must be controlled for using instruments. Hence, the equation in levels uses the *lagged differences* of the explanatory variables as instruments under two conditions. First, the error term is not serially correlated. Second, although there may be correlation between the levels of the explanatory variables and the country-specific error term, this correlation does not change over time. Consequently, there is no correlation between the difference in the explanatory variables and the error term. This yields the following stationarity properties:

$$E\Big[X^C_{i,t+p}\eta_i\Big] = E\Big[X^C_{i,t+q}\eta_i\Big] \quad \text{and}$$
$$E\big[FD_{i,t+p}\eta_i\big] = E\big[FD_{i,t+q}\eta_i\big] \quad \text{for all } p \text{ and } q \qquad (9)$$

With this assumption, lagged differences are valid instruments for the levels equations. Then the additional moment conditions for the regression in levels are

$$E\Big[\Big(X^C_{i,t-s} - X^C_{i,t-s-1}\Big)\big(\eta_i + \varepsilon_{i,t}\big)\Big] = 0 \quad \text{for } s = 1; \; t = 3, \ldots, T \qquad (10)$$

$$E\big[\big(FD_{i,t-s} - FD_{i,t-s-1}\big)\big(\eta_i + \varepsilon_{i,t}\big)\big] = 0 \quad \text{for } s = 1; \; t = 3, \ldots, T \qquad (11)$$

In summary, the GMM *system* estimator is obtained using the moment conditions in Equations 8–11. Furthermore, a two-step estimation procedure is used. The error terms are assumed to be independent and homoscedastic over time and across countries in the first-step estimation. In the second step, a consistent estimate of the variance–covariance matrix is constructed from the residuals in the first step. The second-step estimates then relax the assumptions of independence and homoscedasticity. Following Blundell and Bond (1998), we use two specification tests: the Hansen *J*-test which tests the validity of the instruments and an Autoregression AR(2) test which tests that the error term of the difference equation is not serially correlated.

While the methodology above describes the simplest regression equation that only includes financial development, the methodology extends to adding financial structure. That is, the methodology is applied to regressions (1) through (5) testing all the hypotheses posed. Following the literature of the determinants of capital growth (Beck *et al*., 2000), we first use a simple conditioning set composed of initial income per capita and secondary schooling. The initial level of real per capita GDP controls for the convergence effect implied in the standard Solow–Swan growth model of capital accumulation, while average years of secondary schooling is a measure of educational attainment which controls for the level of human capital in the country. We augment the simple conditioning set with various policy variables that are typically used in cross-country empirical studies of capital growth. These include the inflation rate measured as the rate of change of the Consumer Price Index (CPI); the black market premium which is the difference between the market dollar exchange rate and the official dollar exchange rate; government size measured as the ratio of government spending to GDP; and openness to trade measured as the ratio of imports plus exports to GDP.[5] Large government sectors, high inflation and high black market premiums for the reserve currency are presumed to affect capital accumulation adversely, while more openness to trade is presumed to affect capital accumulation positively. Further, we also include measures of institutions in our sensitivity analysis to account for the possibility that the financial structure reflects strong institutions in a country. Specifically, Modigliani *et al*. (2000) argue that financial systems become more market based as institutions improve.

IV. Results

The results of estimations of the effects of the financial variables on capital growth are presented in Table 2. Regression (1) shows the estimated coefficients when only considering *FINANCIAL ACTIVITY* and the simple control set. Clearly *FINANCIAL ACTIVITY* has a positive and statistically significant effect on economic growth, which is consistent with the extensive literature on finance and growth. All nine regressions presented in Table 2 show that capital accumulation is positively affected by *FINANCIAL ACTIVITY*. Throughout our tables of results, we present two *p*-values for robustness. The first number in brackets is the *p*-value for the one-step GMM system estimator, indicating the statistical significance of the estimated coefficients using robust variance; the second number in brackets is the *p*-value for the two-step GMM system estimator which is obtained using Windmeijer's (2005)

[5] These data are compiled from the World Development Indicators published by the World Bank and the data set made available by Beck and Levine (2004).

Table 2. The effects of financial activity and structure on capital accumulation growth

Variable	(1) Simple set	(2) Simple set	(3) Simple set + government size	(4) Simple set + openness	(5) Simple set + inflation	(6) Simple set + BMP	(7) Interaction income	(8) Interaction legal	(9) Institutions
Financial activity	0.031	0.042	0.035	0.042	0.030	0.034	0.041	0.042	0.038
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
	[0.004]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.020]	[0.002]
Financial structure		−0.014	−0.012	−0.013	−0.012	−0.014	−0.028	−0.016	−0.015
		[0.004]	[0.005]	[0.015]	[0.029]	[0.002]	[0.255]	[0.005]	[0.004]
		[0.068]	[0.112]	[0.115]	[0.129]	[0.049]	[0.494]	[0.057]	[0.096]
Financial structure × income							0.002		
							[0.410]		
							[0.731]		
Financial structure × legal								−0.002	
								[0.504]	
								[0.839]	
Institutions									0.013
									[0.185]
									[0.095]
No. of obs.	239	239	234	235	238	234	239	233	233
Hansen *J*-test (*p*-value)[a]	0.29	0.65	0.54	0.40	0.39	0.55	0.72	0.72	0.57
AR(2) test (*p*-value)[b]	0.65	0.54	0.94	0.69	0.52	0.78	0.44	0.60	0.86

Notes: The numbers given in brackets are the *p*-values for the one-step and two-step estimators using Windmeijer's (2005) adjustment. The simple set includes initial income and level of schooling.
[a]The null hypothesis is that the instruments used are not correlated with the residuals.
[b]The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

adjustment to the SEs for potential small sample bias.[6] Inferences for statistical significance based on these two statistics are more reliable in small samples compared to inferences based on the two-step SEs without adjustment. Before discussing the results, we note that we cannot reject the null hypotheses (specified in footnotes a and b in each table of results) for both our specification tests which are reported for each estimation. That is, the Hansen *J*-test supports the validity of the instruments. Similarly, the AR(2) test indicates that serial correlation is not present in any of the estimated models.

FINANCIAL STRUCTURE is added starting in regression (2). The estimated coefficient is negative as hypothesized and statistically significant at the 1% level (one-step estimator) and 10% level (two-step estimator). In fact, the coefficient for *FINANCIAL STRUCTURE* is negative in all the regressions presented in Table 2. This provides support for the main hypothesis that more bank-based systems encourage faster capital accumulation. Regressions (2) through (6) add policy control variables one at a time.

We can further interpret the economic significance of the coefficients on *FINANCIAL STRUCTURE* as follows. Consider the country of Mauritius which was at the 33 percentile of *FINANCIAL STRUCTURE* (= 0.34) in the period 1995 to 2000. Compare Mauritius to Canada, a country at the 66 percentile of *FINANCIAL STRUCTURE* (=1.04) during the same period. The estimated coefficient of −0.014 in regression (2) implies that capital growth rate should be about 1% faster in the more bank-based country, Mauritius.[7] According to the data in this period, capital actually grew at 3.8% per year in Mauritius and 2.5% per year in Canada, a difference of 1.3%. Hence, our coefficient estimate would account for over three-fourth of the difference in capital growth rates of the two countries.

The interactions of *FINANCIAL STRUCTURE* with income and with the legal system are included in regressions (7) and (8). However, neither of the interaction terms in regressions (7) and (8) are statistically significant. Hence, we find no support for these hypotheses. Regression (9) on Table 2 serves as an additional robustness check by including institutions. We find that *FINANCIAL STRUCTURE* is negative and statistically significant as in the other regressions. Hence, even after accounting for institutions, we find support for our main hypothesis; so, it is not simply that structure proxies for institutions (Modigliani *et al*., 2000).

We finally test the hypothesis that the positive effect of banks on investment would be particularly strong in countries where banks can hold an equity stake in nonfinancial firms. We use country data on banking sector characteristics from the World Bank's (2003) 'Bank Regulation and Supervision Data set' to test this hypothesis. The data set provides coded information on regulations regarding equity holdings by banks: '1' indicates that ownership is permitted within the legal entity of the bank; '2' is permitted within the holding company structures; '3' is restricted; and '4' is prohibited. Using this information, we created a dummy variable *OWN* with a value of 1 if banks or their holding companies were allowed to own nonfinancial firms to some degree (codes '1', '2' and '3' above) and zero if such ownership was prohibited (code '4'). Twenty one countries out of 62 have $OWN = 1$; these countries are identified in the Appendix (Table A1).[8] We interacted the variable *OWN* with *FINANCIAL STRUCTURE* to investigate whether financial structure has a different effect in the two groups.[9] Table 3 shows that the interaction term is negative and generally statistically significant. In addition, we tested the sum of the coefficients on *FINANCIAL STRUCTURE* and the interaction term. In all cases, the coefficient was significant at the 5% level. This would indicate that close ties between banks and nonfinancial firms do reduce the liquidity constraints on firms and lead to greater capital accumulation.

V. Conclusions

According to the literature survey of Levine (2005) on the effects of banks versus stock markets, both these

[6] Note that the estimated coefficient that is reported is always the two-step GMM system coefficient. The one-step coefficient is not reported for conciseness since it is typically almost identical to its two-step counterpart.
[7] The exact calculation is: coefficient × change in *FINANCIAL STRUCTURE*: $-0.014 \times (0.34 - 1.04) = 0.98\%$.
[8] We also tried alternatively to define $OWN = 1$ for codes '1' and '2' and $OWN = 0$ for codes '3' and '4'. The results were very similar since this change only affected a couple of countries.
[9] Levine (2002) constructs a variable called Structure-Regulation that combines the information on whether banks can own equity with information on whether banks can engage in securities, real estate and insurance activities. He uses the Structure-Regulation variable as a measure of regulatory restrictions on banks to examine its influence on economic growth and its sources. Similar to the other measures of financial structure, Levine (2002) does not find statistically significant results on this variable. Here, we test a different hypothesis. We investigate whether the possibility for commercial banks to own equity in nonfinancial firms influences the effect of financial structure on capital investment. This hypothesis is based on work discussed earlier including Hoshi *et al*. (1991).

Table 3. The effects of financial activity and structure on capital accumulation growth in countries where banks can own nonfinancial firms

Variable	(1) Simple set	(2) Simple set + government size	(3) Simple set + openness	(4) Simple set + inflation	(5) Simple set + BMP
Financial activity	0.038	0.034	0.041	0.029	0.032
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]
Financial structure	−0.005	−0.004	−0.004	−0.001	−0.002
	[0.183]	[0.359]	[0.486]	[0.700]	[0.545]
	[0.579]	[0.743]	[0.783]	[0.893]	[0.839]
Financial structure × OWN	−0.021	−0.018	−0.025	−0.027	−0.028
	[0.040]	[0.024]	[0.027]	[0.006]	[0.006]
	[0.063]	[0.205]	[0.086]	[0.049]	[0.031]
No. of obs.	239	234	235	238	234
Hansen J-test (p-value)[a]	0.74	0.50	0.30	0.41	0.67
AR(2) test (p-value)[b]	0.91	0.78	0.83	0.75	0.58

Notes: The numbers given in brackets are the p-values for the one-step and two-step estimators using Windmeijer's (2005) adjustment. The simple set includes initial income and level of schooling.
[a]The null hypothesis is that the instruments used are not correlated with the residuals.
[b]The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

foster economic growth and the relative mix does not make much difference (e.g. Levine, 2002; Beck and Levine, 2004). The majority of these studies, however, have concentrated on the effects of overall economic growth. We study the effects of financial structure on capital accumulation testing several theories. Our results agree with the literature in that both banks and stock markets boost capital accumulation. However, our results show that more bank-based systems are better for capital accumulation. And, in particular, that this result arises when banks have close relationships to nonfinancial firms which help reduce their liquidity constraints.

Policy makers in international organizations and domestic governments that have pushed for expansion in financial markets in the last 15 years have sometimes focused on stock market development. Our findings imply that if such efforts are also focused on the expansion and efficiency improvements in the banking sectors, the positive effects on capital accumulation in these countries may be even larger.

Several questions arise from this article for future research. One of them is to study the 'ownership hypothesis' at a micro level by using firm-level data to study investment patterns of particular firms that have close relationships with banks. While this has been done for a few countries, notably Japan and Germany, we are not aware of a systematic study using a large number of countries of different income levels. While it is beyond the scope of this article to pursue this idea, our finding that financial structure does matter, at least for capital investment, gives motivation for further research.

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Appendix

Table A1. Country list and variables of interest, 1990s average

Country	Capital growth	Financial activity	Financial structure	Private credit	Value traded	Market capitalization
Argentina	0.008	−0.642	0.484	0.191	0.046	0.145
Australia[a]	0.019	0.868	0.748	0.726	0.331	0.658
Austria[a]	0.024	0.449	−0.709	0.949	0.063	0.131
Bangladesh	0.023	−1.250	−0.719	0.183	0.009	0.030
Barbados	−0.042	−0.293	−0.369	0.488	0.005	0.394
Belgium[a]	0.024	0.549	0.304	0.703	0.107	0.480
Bolivia	0.010	−1.389	−2.798	0.466	0.000	0.022
Botswana	0.031	−1.363	0.014	0.127	0.007	0.084
Brazil[a]	0.002	−0.048	0.609	0.315	0.145	0.213
Canada[a]	0.021	0.974	0.748	0.805	0.403	0.691

(*continued*)

Table A1. Continued

Country	Capital growth	Financial activity	Financial structure	Private credit	Value traded	Market capitalization
Chile	0.066	0.599	0.627	0.605	0.087	0.823
Colombia	0.023	−0.644	−0.325	0.307	0.013	0.119
Costa Rica	0.018	−1.457	−0.250	0.135	0.005	0.068
Cyprus	0.022	1.002	0.006	1.247	0.200	0.450
Denmark	0.018	0.355	0.869	0.402	0.246	0.394
Ecuador	−0.008	−0.792	−0.440	0.278	0.011	0.089
Egypt	0.001	−0.208	0.024	0.377	0.051	0.155
Finland[a]	0.003	0.888	0.884	0.677	0.394	0.705
France[a]	0.014	0.866	0.405	0.876	0.303	0.461
Ghana	−0.012	−1.736	0.795	0.050	0.004	0.133
Greece[a]	0.009	0.304	1.011	0.347	0.318	0.362
Hong Kong	0.052	1.893	1.195	1.483	1.335	2.278
Iceland	0.014	0.035	−0.189	0.544	0.043	0.197
India	0.041	−0.093	1.029	0.231	0.185	0.270
Indonesia	0.058	0.022	0.141	0.437	0.091	0.179
Iran	0.004	−0.684	−0.019	0.253	0.016	0.148
Ireland	0.053	0.681	0.412	0.732	0.224	0.419
Israel	0.033	0.556	0.426	0.643	0.192	0.384
Italy[a]	0.015	0.451	0.330	0.595	0.213	0.264
Jamaica	0.017	−0.377	0.484	0.253	0.028	0.301
Japan	0.029	1.296	0.147	1.568	0.291	0.692
Jordan	0.016	0.624	0.469	0.690	0.107	0.651
Kenya	−0.014	−0.760	−0.448	0.309	0.006	0.152
Republic of Korea	0.070	1.160	0.384	1.113	0.783	0.375
Malaysia	0.064	1.657	1.233	1.138	1.030	1.884
Mauritius	0.036	−0.192	−0.100	0.442	0.017	0.287
Mexico	0.020	−0.190	0.935	0.224	0.121	0.270
Nepal	0.044	−1.321	−0.718	0.196	0.003	0.058
Netherlands[a]	0.019	1.462	0.640	1.383	0.751	0.911
New Zealand[a]	0.012	0.763	0.140	0.936	0.148	0.447
Norway[a]	0.016	0.659	0.122	0.816	0.203	0.290
Pakistan	0.019	−0.278	0.688	0.236	0.157	0.153
Panama	0.045	−0.263	−1.020	0.661	0.005	0.159
Paraguay	0.014	−1.420	−1.493	0.229	0.002	0.022
Peru[a]	0.002	−0.691	0.613	0.169	0.046	0.154
Philippines[a]	0.008	0.366	0.925	0.391	0.170	0.525
Portugal	0.049	0.568	0.095	0.756	0.178	0.263
Singapore	0.049	1.468	1.107	1.034	0.795	1.452
South Africa[a]	−0.023	1.023	1.237	0.585	0.261	1.455
Spain[a]	0.025	0.907	0.586	0.800	0.586	0.398
Sri Lanka	0.033	−0.790	0.222	0.196	0.021	0.140
Sweden[a]	0.007	1.307	0.620	1.201	0.600	0.795
Switzerland[a]	0.009	1.816	0.922	1.657	1.351	1.542
Thailand	0.059	1.009	0.404	1.007	0.365	0.515
Trinidad & Tobago[a]	0.008	−0.204	−0.087	0.433	0.017	0.286
Tunisia	0.012	−0.152	−0.811	0.609	0.015	0.118
Turkey[a]	0.048	−0.504	0.927	0.158	0.294	0.094
United Kingdom[a]	0.024	1.441	0.934	1.136	0.705	1.265
United States	0.032	1.431	0.986	1.081	1.132	0.994
Uruguay	0.016	−1.577	−2.437	0.285	0.000	0.011
Venezuela	−0.016	−1.059	0.220	0.147	0.025	0.079
Zimbabwe	−0.018	−0.422	0.255	0.280	0.027	0.223

Note: [a]Denotes countries where $OWN = 1$.