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Resumen

Dadas las conflictivas predicciones teóricas acerca del impacto de los mercados bursátiles y de la banca en el crecimiento económico, este artículo evalúa empíricamente este debate. Los resultados enfatizan el papel reforzador del crecimiento de los mercados bursátiles y los bancos. Chile es claramente un *outlier*, tiene mercados bursátiles menos líquidos y menores niveles de desarrollo bancario que otros países de rápido crecimiento. El artículo además compara el sistema de regulación y de supervisión de la banca comercial chilena con los de otros países resaltando algunas áreas que merecerían mayor estudio.

Abstract

Given conflicting theoretical predictions about the impact of stock markets and banks on economic growth, this paper empirically evaluates this debate. The results emphasize the growth-enhancing role of stock markets and banks. Chile is clearly an outlier; it has less liquid stock markets and lower levels of banking development than other rapidly growing countries. The paper then compares Chile's commercial bank regulatory and supervisory system with other countries and highlights some areas worthy of further study.

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I. Introduction

Nobel Prize winners sharply disagree about the role of the financial sector in economic growth. In a collection of essays by the "pioneers of development economics" – including three winners of the Nobel Prize in Economics, finance is not even discussed (Meier and Seers, 1984). Similarly, Nobel Laureate Robert Lucas (1988) dismisses finance as a major determinant of economic growth. Building on prescient insights by Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), Goldsmith (1969), and McKinnon (1974), however, a new wave of research indicates that financial systems play a critical role in stimulating economic growth (Levine, 1997). Moreover, recent work suggests that both stock markets and banks independently influence growth (Levine and Zervos, 1998). Thus, unlike more dismissive views of the finance-growth nexus, Nobel Laureate Merton Miller (1998, p. 14) recently remarked, "... that financial markets contribute to economic growth is a proposition almost too obvious for serious discussion."

There are shortcomings, however, with recent empirical investigations of the impact of stock markets and banks on economic growth. Research either uses pure cross-country analyses that do not account for possible biases induced by endogeneity and omitted variables (Levine and Zervos, 1998). Or, researchers use complex, hard to interpret panel estimates without focusing on the potential influence of outliers (Rousseau and Wachtel, 2000; Beck and Levine, 2001). As we will see however, identifying and studying outliers is important, particularly in the case of Chile. Furthermore, most studies use data through the mid-1990s and therefore do not capture the financial and economic disruptions of 1998. To provide a balanced assessment of the connection

between economic growth and both stock market and bank development however, researchers should incorporate data on the recent financial crisis.

The first part of this paper addresses some of the shortcomings with existing work on stock markets, banks and economic growth while focusing on Chile. Specifically, we extend the pure cross-country analyses through 1998 to include the initial impact of the financial crisis and also examine the importance of outliers on the results. We complement these cross-country regressions with panel techniques to control for a variety of statistical biases. Furthermore, we document how Chile fits into these analyses and highlight distinguishing characteristics about Chile's finance-growth experience.

The results emphasize the growth-enhancing role of stock markets and banks and document unique aspects of Chile's experience. Subject to some qualifications, stock markets and banks each exert an independent, positive influence economic growth. Endogeneity, omitted country factors, macroeconomic policies, and outliers do not drive these findings. Furthermore, the pure cross-country regressions and the panel procedures produce consistent results. Chile is an outlier, however. Chile has remarkably large stock markets as measured by the ratio of market capitalization to Gross Domestic Product (GDP). Just as remarkably however, Chile's equity markets are surprisingly illiquid as measured by the value of transactions as a share of market capitalization (or as a share of GDP). Since the link between stock market development and growth runs through liquidity and not through size, Chile stands out as a country with an illiquid equity market that has managed to grow quickly. Similarly, though less dramatically, Chile's economic growth rate is more rapid than that predicted by its level of banking development, which is measured as bank credit to private enterprises as a share of GDP.

Chile's level of financial development – as measured by stock market liquidity and bank development – is lower than the level of financial development associated with other very rapidly growing economies, such as Taiwan, Hong Kong, Thailand, Singapore, and Malaysia. Although Chile and a few other countries are outliers the cross-country growth regression, the estimated growth-finance relationship remains strong and positive even when omitting outliers, using panel techniques that eliminate country-specific effects, and controlling for a variety of growth determinants.

Given that finance promotes growth, this paper motivates an inquiry into the legal, regulatory, and policy factors that support stock market and bank development. Specifically, part one of this paper finds that banking sector development and stock market liquidity exert a positive impact on economic growth. Part two of this paper turns to policies. We use a unique international dataset to examine the relationship between commercial bank regulations and supervisory practices and banking sector development.

The second part of this paper (a) reviews the connections between bank development and commercial bank regulation and supervision and (b) assesses how Chile compares internationally. Specifically, Barth, Caprio, and Levine (2001a) assemble a large cross-country dataset on supervisory and regulatory practices. They then examine what regulatory and supervisory practices best support bank development and stability (Barth, Caprio, and Levine, 2001b). In this paper, we take the Barth, Caprio, and Levine (2001a,b) data and findings and then identify where Chile stands in the cross-section of countries. By documenting those commercial bank regulatory and supervisory practices that have led to success in other countries and juxtaposing it with current practices in Chile, this should foster informative discussions. In conducting these analyses, we were

able to obtain information on commercial bank regulations and supervisory practices in Chile during the 1987-90 period. Thus, we document recent changes in regulations and supervision to see how the direction of change in Chile corresponds with successful international practices.

The results demonstrate the importance of bank regulatory and supervisory strategies that emphasize private sector monitoring, competitive banking markets, and sound incentives. International comparisons highlight important features of Chile's bank regulatory and supervisory system that may deserve further attention. In terms of broad measures of the extent to which the regulatory structure encourages and facilitates the ability of private sector creditors to monitor banks, Chile is slightly below average for all upper-middle income countries. This is relevant since Barth, Caprio, and Levine (2001b) show that regulatory structures that promote private sector monitoring of banks tend to boost bank development. In terms of competitiveness, Chile imposes comparatively tight restrictions on banks engaging in non-traditional activities and it has been extraordinarily reluctant to grant new banking licenses. The evidence suggests that restrictions on bank activities and entry hurt banking sector performance. Furthermore, Chile grants comparatively generous deposit insurance. The evidence suggests that overly generous deposit insurance augments bank fragility (Demirguc-Kunt and Detragiache, 2001). In terms of changes over the last decade, Chile has importantly strengthened capital regulations and official supervisory power, but it has maintained a generous deposit insurance regime, tight controls on bank activities, and it has not boosted regulations that facilitate private sector monitoring of banks. In sum, these comparisons highlight areas that might deserve further attention from policy makers in Chile.

The careful reader will ask, what about stock markets? The first part of this paper motivates an inquiry into the laws, regulations, and policies underlying both markets and banks. We only study bank regulations. We do this because we have detailed data on bank regulation and supervisory practices around the world from Barth, Caprio, and Levine (2001a,b). We do not, however, have detailed data on stock market regulation around the world. Thus, we examine bank regulations and not stock market regulations because of data limitations, not because the data suggest that banks are more important than markets (Beck and Levine, 2002; Levine, 2002).

We need to make two additional caveats before continuing. This paper's two parts are logically connected. Since stock markets and banks influence long-run growth, this helps motivate an inquiry into the regulatory determinants of well-functioning banking systems. We also show that bank regulations and supervisory practices influence bank development. However, the paper's two parts are not statistically connected. We do not estimate a structural model that traces the impact of bank regulation and supervision on bank development through to economic growth because we only have cross-country data on bank regulation and supervision in 1999.

Finally, while we use international comparisons to draw broad implications about finance and growth and to provide useful information to policymakers in Chile, there are serious limitations to our analysis. The broad, cross-country regressions – both the pure cross-sectional and panel analyses – are just that, broad cross-country comparisons. We control for many variables, but we may miss key factors shaping economic performance in individual countries. There may be important omitted variables. We may not have sufficiently detailed measures of financial development. Along these lines, for examples,

we do not have information on the use of international financial markets or the special role played by Chile's private pension system. Thus, we emphasize that Chile has comparatively illiquid markets, tight regulatory restrictions on bank activities and bank entry, generous deposit insurance, and weak rules encouraging private sector monitoring. We also emphasize that these features tend to be associated with sub-optimal performance in a broad cross-section of countries. From these observations alone, of course, one should not recommend policy reforms in Chile. These observations do, however, highlight specific regulatory and supervisory areas that might benefit from additional attention in Chile.

II. Stock Markets, Banks, and Economic Growth

This section discusses existing theoretical and empirical work and presents new evidence on the connections among stock markets, banks, and economic growth. We also examine how Chile compares internationally in terms of the relationship between stock markets, banks, and economic growth. The next section then examines commercial bank regulatory and supervisory policies and how they influence financial development.

A. Theory

Theory provides conflicting predictions about the impact of overall financial development on growth and about the separate effects of stock markets and banks. Many models emphasize that well-functioning financial intermediaries and markets ameliorate information and transactions costs and thereby foster efficient resource allocation and hence faster long-run growth [Bencivenga and Smith, 1991; Bencivenga, Smith, and Starr, 1995; King and Levine, 1993a]. Similarly, financial market development may accelerate economic growth by enhancing risk diversification and thereby encouraging

risk-averse investors to shift toward higher-return, projects. Theory, however, also shows that financial development can hurt growth. Specifically, by enhancing resource allocation and the returns to saving, financial sector development could lower saving rates through well-known income and substitution effects. Also, greater risk diversification in some models lowers precautionary savings and therefore may lower aggregate saving rates. If there are externalities associated with capital accumulation, this drop in savings could slow growth and reduce welfare. Thus, theory provides ambiguous predictions about the growth effects of financial development.

Theory also provides conflicting predictions about whether stock markets and banks are substitutes, compliments, or whether one is more conducive to growth than the other. For instance, Boyd and Prescott (1986) model the critical role that banks play in easing information frictions and therefore in improving resource allocation, while Stiglitz (1985) and Bhide (1993) stress that stock markets will not produce the same benefits as banks. On the other hand, some models emphasize that markets mitigate the inefficient monopoly power exercised by banks and stress that the competitive nature of markets encourages innovative, growth-enhancing activities as opposed to the excessively conservative approach taken by banks [Allen and Gale, 2000]. Finally, some theories stress that it is not banks or markets, it is banks and markets; these different components of the financial system ameliorate different information and transaction costs.[1]

B. New Evidence on Stock Markets, Banks, and Economic Growth

1. Methodology

Given the differing theoretical predictions about the impact of stock markets and banks on economic growth, this section evaluates the debate empirically. To assess the relationship between stock market development, bank development and economic growth in a panel, we use two econometric methods.

First, we use a standard, pure cross-country growth regression.

$$g_i = a y_{i,0} + b' X_i + e_i \qquad (1)$$

Where, g_i is real per capita GDP growth over the period 1975 to 1998 for country i, $y_{i,0}$ is the logarithm of initial real per capita GDP in 1975 for country i, X_i represents additional explanatory variables averaged over the period 1975-98 for country i (including stock market development and bank development), and ε is the error term.

There are well-known problems associated with the standard cross-country growth regression. There may be omitted country-specific factors that induce omitted variable bias. Standard regressions do not control for endogeneity so there may be simultaneity bias. Also, the cross-country regression does not exploit the time-series dimension of the data. Nevertheless, simple cross-country regressions provide a simple benchmark. Moreover, theory focuses on long-run growth, which implies using low frequency data. To correct statistical problems with standard cross-country growth regressions however, researchers typically move to higher frequency data that may not conform as closely to theory.

Second, we use panel econometric methods to confront potential biases inherent in the pure cross-sectional estimator. Consider a general panel growth regression:

$$y_{i,t} - y_{i,t-1} = a y_{i,t-1} + b' X_{i,t} + h_i + e_{i,t} \qquad (2)$$

where y is the logarithm of real per capita GDP, X represents the set of explanatory variables, other than lagged per capita GDP and including our indicators of stock market and bank development, h is an unobserved country-specific effect, ε is the error term, and the subscripts i and t represent country and time period, respectively. Time dummies are included in the regression, but omitted from the presentation.

Arellano and Bond (1991) propose differencing equation (2) to eliminate the country specific component:

$$(y_{i,t} - y_{i,t-1}) - (y_{i,t-1} - y_{i,t-2}) = a\left(y_{i,t-1} - y_{i,t-2}\right) + b'\left(X_{i,t} - X_{i,t-1}\right) + \left(e_{i,t} - e_{i,t-1}\right) \qquad (3)$$

This, however, introduces a new bias. The new error term, $e_{i,t} - e_{i,t-1}$ is correlated with the lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. Under the assumptions that (a) the error term, e, is not serially correlated, and (b) the explanatory variables, X, are uncorrelated with future realizations of the error term, Arellano and Bond (1991) propose a two-step GMM estimator. In the first step the error terms are assumed to be independent and homoskedastic across countries and time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumptions of independence and homoskedasticity. The two-step estimator is thus asymptotically more efficient relative to the first-step estimator. Rousseau and Wachtel use this *difference* estimator and annual data to study the relationship between stock markets, banks, and economic growth.

There are, however, shortcomings with this difference estimator. First, the difference estimator eliminates the cross-country relationship between financial development and growth. Second, in small samples, weak instruments can produce biased coefficients. Finally, differencing may exacerbate the bias due to measurement errors in variables (Griliches and Hausman, 1986).

To reduce these shortcomings, we use an estimator that combines in a *system* the regression in differences with the regression in levels [Arellano and Bover, 1995 and Blundell and Bond, 1998]. The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged *differences* of the corresponding variables. We employ the *system* panel estimator to generate more consistent and efficient parameter estimates than in Rousseau and Wachtel (2000).[2]

The consistency of the GMM estimator depends on the validity of the assumption that the error terms do not exhibit serial correlation and on the validity of the instruments. To address these issues we use two specification tests. The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term $e_{i,t}$ is not serially correlated. Failure to reject the null hypotheses of both tests gives support to our model.

2. Data

We analyze the link between stock markets, banks, and economic growth. In the cross-country regressions, we use up to 54 countries. For the panel, data are averaged over five 5-year periods between 1976 and 1998 data permitting.[3] In the panel analyses, we use 40 countries and 106 observations. The difference in the number of countries between the cross-country and panel investigations arises because in the cross-section analysis we require countries to have a minimum of 13 observations. For the panel, we require that countries have observations for a minimum of four out of the five panels. The theories we are evaluating focus on the long-run relationships between stock

markets, banks, and economic growth. Thus, we use five-year averages rather than annual data (Rousseau and Wachtel, 2000) to focus on longer-run relationships.

To measure stock market development we use the *Turnover Ratio* measure of market liquidity, which equals the value of the trades of shares on domestic exchanges divided by total value of listed shares. It indicates the trading volume of the stock market relative to its size. Some models predict countries with illiquid markets will create disincentives to long-run investments because it is comparatively difficult to sell one's stake in the firm. In contrast, more liquid stock markets reduce disincentives to long-run investment, since liquid markets provide a ready exit-option for investors. This can foster more efficient resource allocation and faster growth [Levine, 1991; Bencivenga, Smith, and Starr, 1995].

We also experiment with *Market Capitalization*, which equals the value of listed shares divided by GDP. Its main shortcoming is that theory does not suggest merely listing of shares will influence resource allocation and growth. Levine and Zervos (1998) show that *Market Capitalization* is not a good predictor of economic growth. Our results confirm this finding.[4]

To measure bank development, we use *Bank Credit*, which equals bank claims on the private sector by deposit money banks divided by GDP. This measure isolates loans given by deposit money banks to the private sector. It excludes loans issued to governments and public enterprises.[5]

To assess the strength of the independent link between both stock markets and growth and bank development and economic growth, we control for other growth determinants. We include the logarithm of initial real per capita GDP (*Initial Income*) to

control for convergence and the logarithm of initial average years of schooling (*Schooling*) to control for human capital accumulation. We also control for (i) the *black market premium*, (ii) the share of exports plus imports to GDP (*Trade*), (iii) the inflation rate (*Inflation*) or (iv) the ratio of government expenditures to GDP (*Government spending*).

Table 1 presents data on financial development and growth over the period 1975-98. There is a wide variation of bank and stock market development across the sample. While Taiwan had a Turnover Ratio of 232% of GDP over the 1975-98 period, Nigeria had a Turnover Ratio of only 1% of GDP. While Switzerland's banks lent 141% of GDP to the private sector over the 1975-98 period, Peru's banks lent only 9% of GDP. Similarly, while Chile and the Asian Tigers (Hong Kong, Korea, Singapore, Taiwan, and Thailand) enjoyed greater than 4% per capita growth on an average annual basis over the 1975-98 period, many countries experienced negative growth. Table 1 also indicates that Chile, like South Africa, is a country with a large stock market (as measured by Market Capitalization) but an illiquid market (as measured by the Turnover Ratio).[6]

3. Cross-Country Results

Table 2 present pure cross-country, OLS growth regressions over the 1975-98 period. The first regression includes the broad set of conditioning variables mentioned above along with Bank Credit and the Turnover ratio. The second regression is the same as the first except that it includes Market Capitalization instead of the Turnover ratio.

The Turnover ratio and Bank Credit are positively and significantly related to economic growth. The Turnover ratio enters with a p-value of less than 0.01 and Bank Credit enters with a p-value of 0.03. The control variables also enter with expected signs.

For instance, initial income, government spending, inflation, and the black market premium enter with negative coefficients, while trade and schooling enter with positive coefficients.

The coefficients on the financial indicators are also economically large. For instance, a one standard deviation increase in Turnover would increase long-run per capita growth by 0.7 percentage points per year (0.35*0.0189), which is large since average per capita growth is only 1.9 points per year in the sample. The coefficients suggest that if Chile increased its low level of Turnover from 0.07 to the level existing in Thailand (0.70), then Chile would enjoy more than a full percentage point of extra per capita growth per year (0.63*0.0189). Similarly, a one standard deviation increase in Bank Credit would increase per capita growth by 0.5 percentage points per year (0.27*0.017), which is quite large since 17 percent of the countries grew more slowly than this over the 1975-98 period. If Chile increased its level of banking development from its average level of 0.42 to the level in Thailand (0.59), Chile's growth rate would have jumped about 0.3 percentage points per year (0.17*0.017), which would have virtually eliminated the growth gap between Chile (0.042) and Thailand (0.050). While these conceptual experiments are purely illustrative and should not be viewed as exploitable elasticities, they do advertise the strong positive relationship between financial development and economic growth.

Consistent with Levine and Zervos (1998), we do not find a strong relationship between market capitalization and economic growth, as shown in regression 2 of Table 2. While stock market liquidity (Turnover ratio) is positively and robustly associated with

growth, market size is not. Banking sector development continues to enter with a positive and significant coefficient.

We focus on outliers and Chile in particular. Figure 1 provides a partial scatter plot of growth relative to Turnover, which projects the multivariate regression plane of equation (1) in Table 2 into the two dimensional space defined by growth and Turnover. As shown, some countries do not fall neatly along the regression line. In particular, Chile and Denmark have much faster growth rates than that associated with countries with low levels of stock markets liquidity (after controlling for many other growth determinants). Some countries also have much slower growth rates than that predicted by the regression line (South Africa, Jamaica, Philippines). Korea and Taiwan are also outliers.

Figure 2 shows the partial scatter plot of growth relative to Bank Credit. Again, Chile enjoys faster growth than the regression line predicts. More specifically, even after controlling for many other growth determinants, Chile has experienced unpredictably rapid economic growth relative to its level of banking sector development. More generally, Chile does not fit the growth regression very well. Its fitted values from the regression predict a growth rate of 1.9%, while its actual growth rate is 4.2%.

When we remove the outliers from the regression, we still get a strong positive relationship between growth and both Turnover and Bank Credit. This is shown in Table 2 regression 3. Thus, across countries, there is a strong, positive link between stock markets, banks, and economic growth even after controlling for other growth determinants and outliers.[7]

4. Panel Results

The dynamic panel results confirm that banking sector development and stock market liquidity exert a positive influence on economic growth (Table 3). These results are based on Beck and Levine (2001). The dynamic panel results show that even after controlling for simultaneity bias, country fixed effects, and the biases induced by including lagged GDP per capita in the regression, financial development still has a robust, positive relationship with economic growth. Due to severe data limitations, we do not simultaneously include each of the full conditioning information set in a single regression. As shown, we include the conditioning variables one at a time to demonstrate the robustness of the results.

5. Discussion

The results strongly suggest a positive relationship between financial development and economic growth. Moreover, even after controlling for outliers and including the initial years of the Asian financial crisis, we continue to find both stock market liquidity and banking sector development are positively linked to long-run growth.

Chile does not fit the regression lines very well. As noted, the predict growth rate (21.9%) is less than half of the actual growth rate experienced by Chile (4.2%). In terms of the specific relationship between growth and finance, Chile has much lower market liquidity than other rapidly growing economies. The other control variables included in the regression do not account for the disparity between low stock market liquidity and fast growth in Chile. Chile also has average bank development but has grown very rapidly. Again the other control variables included in the regression do not account the disparity between average bank development and superior growth. These results imply

that (a) the growth process in Chile is fundamentally different from other countries so Chile should not be included in the analysis and the regression line should not be used to assess growth in Chile, (b) the regression omits key variables, (c) the regression is mis-specified along a different dimension, or (d) Chile will need to improve bank development and stock market liquidity substantially to continue to enjoy exceptional growth in the future. We cannot unequivocally distinguish among these possibilities. Nevertheless, we do not know of convincing reasons for believing that Chile is fundamentally different. We do not believe omitted variables drive the results because we confirm the results using an assortment of control variables and after employing panel techniques that eliminate country-specific effects. While the estimated regression may be severely mis-specified along some important dimension, we get remarkably similar results when using cross-country regressions over long-time horizons, and when using panel techniques over five-year intervals. While recognizing that we have not proven that Chile will need to enhance financial sector performance to continue to enjoy the type of economic success it has experienced over the last few decades, we turn our attention to policy mechanism for improving banking sector performance.

III. Bank Regulation and Supervision

As noted in the introduction, we examine bank regulation and supervision and not stock market policies because Barth, Caprio, and Levine (2001a,b) have compiled a new dataset on bank regulation and supervision around the world. We do not have a comparable data set on policies toward stock markets. Thus, the choice is driven by data availability. It is not driven by an assessment that banks are more important than markets. Indeed, although Chile has a notably under-developed banking system for its

rapid growth, the disparity between stock market liquidity and growth is much more notable. Furthermore, as emphasized in the introduction, we examine bank regulation because banks are crucial to economic growth. Thus, this section's examination of bank regulation and supervision is logically connected to the last section's study of banks, markets, and economic growth. We do not, however, link the two sections statistically.

A. Data and Issues

This subsection briefly reviews the major theoretical and policy debates surrounding key issues in the regulation and supervision of commercial banks. We also describe the data. All of the data are taken from Barth, Caprio, and Levine (2001a,b). They discuss the data in detail and also provide a more complete description of the theoretical and policy debates. This paper is different from the Barth, Caprio, and Levine (2001a,b) analyses in that we focus on comparing Chile with other countries.

1. Bank Activity Regulatory Variables.

Researchers and policy makers disagree about the efficacy of imposing regulatory restrictions on the activities of banks. Many argue that restricting banks from engaging in securities, insurance and real estate activities and restricting their ability to own non-financial firms will reduce conflicts of interest, reduce the ability of banks to assume excessive risk, and keep financial intermediaries from becoming too large to supervise. On the other hand, many hold that permitting banks to engage in a wide assortment of activities allows them to exploit economies of scale and scope and thereby provide more effective financial services.

Barth, Caprio, and Levine (2001a,b) measure the degree to which the national

regulatory authorities in our sample countries allow banks to engage in the following activities. Countries receive a value between 1 and 4, where 4 means prohibited, 1 means allowed within the bank, 2 means allowed within a subsidiary, and 3 means there are regulatory restrictions on the activity.

a. **Securities Activities:** the ability of banks to engage in the business of securities underwriting, brokering, dealing, and all aspects of the mutual fund industry.

b. **Insurance Activities:** the ability of banks to engage in insurance underwriting and selling.

c. **Real Estate Activities:** the ability of banks to engage in real estate investment, development, and management.

d. **Banks Owning Nonfinancial Firms** measures restrictions on the ability of banks to own and control nonfinancial firms.

Restrictions on Bank Activities: includes restrictions on securities, insurance, and real estate activities plus restrictions on the ability of banks to own and control nonfinancial firms. This variable is constructed by adding the values of a, b, c, and d.

2. *Competition Regulatory Variables*.

Economic theory provides conflicting views on the need for and the effect of regulations on entry into the banking sector. A "Pigouvian" view holds that governments overcome information problems, screen out bad banks, and thereby reduce contagious and socially harmful bank failures. Also, banks with some monopolistic power may possess considerable franchise value that enhances prudent risk-taking behavior [Keeley (1990)]. Alternatively, while there may exist valid economic reasons for regulating entry, some authors argue that politicians and regulators use entry restrictions to reward friendly constituents, extract campaign support, and collect bribes [Shleifer and Vishny (1993) and Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2001)].

Furthermore, an open, competitive banking sector may be less likely to produce powerful institutions that unduly influence policymakers in ways that adversely affect bank performance and stability.

We use an assortment of the Barth, Caprio, and Levine (2001a,b) measures of regulatory impediments to the entry of foreign and domestic banks.

a. **Entry into Banking Requirements:** measure the specific legal requirements for obtaining a license to operate as a bank. These might be "prudent" requirements, or excessive regulatory barriers, so it remains an empirical issue as to their effects.

b. **Fraction of Entry Applications Denied**: measures the fraction of applications denied.

   (1) **Foreign Denials:** fraction of foreign applications denied.

   (2) **Domestic Denials:** fraction of domestic applications denied.

3. Capital Regulations.

Bank regulators and supervisors frequently focus on capital regulations. Capital, or net worth, serves as a buffer against losses. Also, with limited liability, greater capital reduces the incentives for bank owners to shift toward more risky activities. Moreover, with deposit insurance (implicit or explicit), higher levels of capital may help align the incentives of bank owners with those of depositors and other creditors. From a different perspective, however, researchers disagree over whether the imposition of capital requirements actually reduces risk-taking. Many doubt whether regulators and supervisors set capital standards that mimic those that would be demanded by well-informed, private-market participants. Many hold that official capital requirements frequently increase risk-taking behavior. Thus, theory provides

conflicting predictions on whether capital requirements curtail or promote bank performance and stability.

We use the Barth, Caprio, and Levine (2001b) index of overall capital stringency to measure each country's policy toward capital regulations.

Capital Regulatory Index measures the extent of regulatory requirements regarding the amount of capital that banks must have relative to specific guidelines and the extent to which the source of funds that count as regulatory capital can include assets other than cash or government securities, borrowed funds, and whether the sources of capital are verified by the regulatory or supervisory authorities. It ranges in value from 0 to 9, with a higher value indicating greater stringency.

4. Official Supervisory Action Variables.

Many view supervisory power as critically important for developing a sound regulatory and supervisory regime. The line of reasoning is as follows. Depositors frequently have neither the ability nor the incentives to monitor banks. Also, banks are prone to contagious and socially costly bank runs due to informational asymmetries. Thus, official supervisors can ameliorate these market failures and thereby improve bank performance and stability.

Others, however, emphasize the negative implications of powerful government regulators and supervisors. Powerful supervisory agencies may use this power to benefit favored constituents and extract bribes. Thus, powerful supervision and regulation may boost corruption without improving either bank performance or stability.

Official Supervisory Power measures the extent to which official supervisory agencies have the authority to take specific actions to prevent and correct problems. The measure includes information on the ability of the supervisory agency to: meet with external auditors; take legal action against auditors; force banks to change its internal organizational structure; to force banks to constitute provisions; suspend dividends, bonuses, management fees; declare a bank insolvent; remove and replace management and/or directors. It ranges in value

from 0 to 14, where higher values signify greater official supervisory power.

5. *Private Monitoring Variables*.

Many countries promote private monitoring of banks. They do this by requiring banks to obtain certified audits and/or ratings from international-rating agencies, making bank directors legally liable if information is erroneous or misleading, or by compelling banks to produce accurate, comprehensive and consolidated information on the full range of bank activities and risk-management procedures. Some analysts, however, question placing excessive trust in private-sector monitoring, especially in countries with poorly-developed capital markets, accounting standards, and legal systems. According to this perspective, countries with weak institutions may benefit more from official supervision and regulation than from increased reliance on private sector monitoring.

We use a variety of measures to gauge the degree to which regulations encourage private sector monitoring of banks.

a. **Certified Audit Required:** This variable captures whether an outside licensed audit is required of the financial statements issued by a bank. Such an audit would presumably indicate the presence or absence of an independent assessment of the accuracy of financial information released to the public.

b. **Percent of 10 Biggest Banks Rated by International Rating Agencies:** The percentage of the top 10 banks that are rated by international credit-rating agencies. The greater the percentage, the more the public may be aware of the overall condition of the banking industry as viewed by an independent third party.

c. **No Explicit Deposit Insurance Scheme:** this variable takes a value of 1 if there is an explicit deposit insurance scheme, and 0 otherwise. A lower value would indicate more private monitoring.

d. **Bank Accounting:** this variable takes a value of 1 when the income statement includes accrued or unpaid interest or principal on nonperforming loans and when banks are required to produce consolidated financial

statements.

e. **Private Monitoring Index:** includes (a), (b) [which equals 1 if the percentage is 100; 0 otherwise], (c), and (d). In addition, three other measures are included in the index based.

6. Deposit Insurance

The pros and cons of deposit insurance have been debated for a century. Countries often adopt deposit insurance schemes to provide protection for unsophisticated and small depositors. Also, deposit insurance eliminates – or at least reduces – poorly informed depositors from attempting to withdraw their funds all at once from an illiquid but solvent bank. Potential gains from a deposit insurance scheme come at a cost, however. Deposit insurance encourages excessive risk-taking since depositors have fewer incentives to monitor bank managers.

Moral Hazard Index: based on Demirgüç-Kunt and Detragiache (2001), who used principal components to capture the presence and design features of deposit insurance systems. We use their overall index of deposit insurance generosity, which is composed of seven specific components. Here, we list the specific components, summarize the Demirgüç-Kunt and Detragiache (2001) findings, and note Chile's policies according to each component:

i. They find that countries with explicit deposit insurance tend to create greater moral hazard than countries with no deposit insurance or those with implicit insurance regimes. (Chile is explicit.)

ii. They find that co-insurance – where depositors face a deductible on their deposits – limits the generosity of the deposit insurance regime and the extent of moral hazard. (Chile has some co-insurance.)

iii. They find that the extent of deposit insurance coverage – as measured by the coverage limit divided by bank deposits per capita – is positively associated with moral hazard. (Chile fully covers demand deposits.)

iv. They find that when foreign currency deposits are covered, this increases moral hazard. (Chile covers foreign currency deposits.)

v. They find that when inter-bank loans are covered, this increases moral hazard. (Chile does not cover interbank deposits.)

vi. They find that fully funded schemes are more prone to moral hazard problems than partially, or un-funded deposit insurance schemes. (Chile's system is not funded.)

vii. They find that government funding of the deposit insurance scheme creates greater moral hazard than bank funded schemes. (Chile's deposit insurance system is funded by the government.)

viii. They find that deposit protection systems managed by banks limit moral hazard to a greater extent than deposit insurance regimes managed by the government. (Chile's system is managed by the government.)

ix. They find that compulsory membership tends to reduce adverse selection, so that compulsory systems reduce moral hazard to a greater extent than voluntary systems. (Membership in the deposit insurance program is compulsory in Chile.)

B. Past Results on Regulation, Supervision, and Bank Performance

Barth, Caprio, and Levine (2001b) document the links between bank regulatory and supervisory systems and banking sector performance. Their major findings can be summarized as follows:

- Government corruption is positively associated with (a) powerful official supervisory agencies, (b) restrictions on bank activities, and (c) tight entry restrictions; but government corruption is negatively associated with regulations that promote private sector monitoring.
- Bank development is negatively associated with (a) restrictions on bank activities and (b) tight entry restrictions; but bank development is positively associated with regulations that promote private sector monitoring.
- Generous deposit insurance is positively associated with bank fragility.
- Capital regulations, restrictions on bank activities, and powerful official supervision do not mitigate the destabilizing effects of generous deposit insurance.

These results are summarized in Table 4, which presents regressions on the link between bank regulations and supervisory practices on the one hand and bank development, efficiency, and fragility on the other. The regression results are based on Barth, Caprio, and Levine (2001b), who also conduct a battery of sensitivity checks,

control for many other explanatory variables, examine the potential impact of outliers, and use instrumental variables to control for potential simultaneity bias. The first regression shows that countries with regulations and supervisory practices that (a) promote private sector monitoring of banks and (b) permit banks to engage in variety of financial activities tend to have better developed banks than countries that restrict bank activities and do not implement regulations and supervisory practices that encourage private sector monitoring of banks. The second regression examines interest margins, the differences between bank interest income and interest expense. The results indicate that barriers to entry, insufficient regulations that promote private monitoring, and regulatory restrictions on bank activities tend to be associated with higher bank interest income margins. Finally, the last regression examines the impact of regulations and supervisory practices on bank fragility. The dependent variable in regression three is a one-zero variable indicating whether the country experienced a systemic crisis or not (see Barth, Caprio, and Levine, 2001b, for details.). We run a logit regression to assess the relationship between policies and bank fragility. The results indicate that countries with more generous deposit insurance, which is reflected in a larger moral hazard index, have a higher probability of suffering a systemic banking crisis. Also, banks in countries that restrict bank activities – so that banks are unable to diversify their income streams – have a higher probability of failing. The sample in the third regression is substantially small because there is less country coverage on the data used to generate the moral hazard index. These regression results confirm the summary given above of the Barth, Caprio, and Levine (2001b) regressions.

The results raise concerns about the efficacy of a regulatory strategy that relies excessively on powerful official oversight of banks and tight capital regulations. Unfortunately, this is the approach currently being advocated by major international financial institutions. Indeed, the Barth Caprio, and Levine (2001b) results suggest that increasing the power of regulatory agencies tends to be most corrupting in countries with relatively closed political systems. Since developing countries tend to have more closed political systems than developed economies, the international financial institutions may be pushing exactly the wrong type of commercial bank regulatory/supervisory approach on client countries.

The Barth, Caprio, and Levine (2001b) results instead suggest that forcing information disclosure, empowering private sector monitoring of banks, and reducing the generosity of deposit insurance schemes to ease the moral hazard problem will foster improvements in bank performance and stability. These findings do not negate the importance of official supervision and regulation. Rather, the results stress that private-sector monitoring of banks is positively and strongly linked with bank performance.

C. Chile: past and present

Given these findings, we now examine Chile's bank regulatory and supervisory system in an international context. This has advantages and disadvantages. The main disadvantage is that we are not able to examine many details and subtleties associated with bank regulation and supervision in Chile and other countries. The main advantage is that we can place Chile in a broad international context and compare bank regulatory and supervisory strategies around the world.

Table 5 presents data on bank regulation and supervision in Chile, all countries, upper-middle income countries, and Latin American countries. This allows us to compare Chile with different groups of countries. We present data for Chile in 1999 and for the period 1987-90. This allows us to trace changes in commercial bank regulation and supervision in Chile over the last decade.[8]

In terms of restrictions on bank activities, Chile has comparatively tight restrictions on bank activities. The overall restriction index is 12 in Chile in 1999, while it is 9.8 on average both across all countries and other upper-middle income countries, and averages 10.1 in Latin America. Furthermore, this aggregate index of regulatory restrictions on bank activities has not changed much in Chile over the last decade. As Budnevich (2000, p.13) explains, the 1997 reform to the banking law expanded the set of activities that banks can legally perform. This change, however, was not significant enough to alter the aggregate index of restrictions on bank activities constructed by Barth, Caprio and Levine (2001a). As noted above, Barth, Caprio, and Levine (2001b) find that countries with relatively tight restrictions on bank activities tend to have higher levels of government corruption, lower levels of bank performance, and greater bank fragility than countries with fewer restrictions on bank activities.

In terms of openness to competition, while Chile has a comparatively low number of official entry requirements, there have been no new banks. While the average number of new banks in 1999 was about 6 in both Latin America and upper-middle income countries around the world, Chile had zero new banks. While foreign banks could enter Chile, they needed to purchase a domestic bank to enter; they could not simply apply and receive a new banking license. Following the 1997 reform to the banking law, this is

changing in Chile. The 1997 reform specifies a series of objectives and pre-requisites for domestic and foreign bank entry (Budnevich, 2000, p.12). These reforms should make the banking system more transparent and possibly more competitive. Barth, Caprio, and Levine (2001b) show that restrictions on foreign bank entry are positively associated with the likelihood of suffering a major banking crisis.

In terms of capital regulations and official supervisory power, Chile has tightened its regulations considerably over the last decade. Whereas the capital regulatory index was 2 in 1990, it rose to 5 in 1999. Though not quite as dramatically, the official supervisory power index also rose in Chile from 8 to 10. For capital regulations and official supervisory power, Chile is now almost equal to comparator countries. As emphasized above, excessive reliance on official supervision tends to go hand-in-hand with higher levels of corruption but with no corresponding improvement in bank performance or stability (Barth, Caprio, and Levine, 2001b).

In terms of regulations that promote private sector monitoring, Chile is about average and its value has remained constant over the last decade at 6. The average across all countries is 5.9 and the average is 6.1 for upper-income countries. Chile has notably strong bank accounting standards. Specifically, (a) accrued, though unpaid interest/principal do not enter the income statement; (b) financial institutions must produce consolidated accounts covering all bank and non-bank activities; and (c) bank directors are legally liable if disclosed information is erroneous or misleading. Chile, however, has been a particularly fast growing country. As it looks forward for policy reforms that will foster continued economic success over the next decade, enhanced regulations that promote private sector monitoring of banks may offer an opportunity for

some small improvement. Barth, Caprio, and Levine (2001b) show that countries that adopt regulations that foster private sector monitoring enjoy higher levels of banking sector development than countries that do not stress private sector monitoring. For instance, only 50 percent of Chile's top 10 banks were rated by international credit rating agencies in 1999, whereas the figure was 100 percent in Argentina and Brazil.[9] Also, banks do not have to disclose their risk management procedures to the public, while other national regulatory agencies do force their banks to make this information public.

In terms of deposit insurance generosity Chile has a generous program. For instance, the Demirguc-Kunt and Detragiache (2002) index of deposit insurance generosity gives Chile a 2.2.[10] There are countries with more generous schemes. Mexico is tops with an index of 4.0 and the United States has a generosity index of 3.3. Nevertheless, out of the 52 countries for which Demirguc-Kunt and Detragiache (2002) compute the index, Chile ranks 36th, where higher values imply a more generous scheme. Consistent with more generous deposit insurance creating more intense moral hazard problems, Demirguc-Kunt and Detragiache (2001) show that higher levels of deposit insurance generosity positively predict systemic banking crises. Chile's level of deposit insurance generosity has not changed since the 1987-90 period.

D. Discussion

Three points are worth emphasizing. First, Barth, Caprio, and Levine (2001b) identify key aspects of bank regulation and supervision that work – and don't work -- around the world. Specifically, they find that bank development and efficiency are (a) negatively associated with restrictions on bank activities and tight bank entry requirements but (b) positively associated with regulations that promote private sector

monitoring. They also find that generous deposit insurance is negatively associated with bank stability. Second, we compare key characteristics of Chile's regulatory and supervisory regime with the Barth, Caprio, and Levine (2001a,b) data and results. We find the Chile has comparatively tight restrictions on bank activities, tight restrictions on bank entry, weak regulations for promoting private sector monitoring, and generous deposit insurance. Thus, policy makers in Chile may wish to take a close look at policies regarding restrictions on activities, restrictions on entry, regulations that encourage private monitoring of banks, and the generosity of the deposit insurance regime. Third, these cross-country comparisons alone should not be used to motivate policy reforms in Chile. These cross-country comparisons are the most detailed to date. Nevertheless, they do not capture the full range of details and complexities associated with banking sector policies. Our analysis simply motivates concern with and hence more in depth consideration of a few, key regulatory and supervisory policies in Chile.

IV. Conclusions

This paper had two objectives. First, given differing theoretical predictions about the impact of stock markets and banks on economic growth and given shortcomings with existing empirical work, this paper reassess the relationship between stock markets banks and economic growth. The results are consistent with the view the stock markets and banks independently influence long-run growth and the positive link between financial development and growth does not seem to be due to outliers, omitted variable bias, or endogeneity. We also show that Chile is an outlier: Chile has much less liquid markets

and less developed banks than other rapidly growing economies even after controlling for many other growth determinants.

The second goal of the paper was to examine commercial bank regulation and supervision. Barth, Caprio, and Levine (2001a,b) show that bank regulatory and supervisory policy that emphasize private sector monitoring, encourage competitive banking markets, impose few restrictions on bank activities, and that limit the generosity of their deposit insurance regimes enjoy greater banking system success than other policy regimes. This paper shows that Chile has strong commercial bank supervision and regulation. Nevertheless, the paper documents that Chile has comparatively few regulations to boost private sector monitoring, tight restrictions on bank entry, tight restrictions on bank activities, and generous deposit insurance when looking across a broad range of countries. This paper, therefore, motivates a more rigorous review of specific regulation and supervisory practices in Chile.

REFERENCES

Ahn, Seung and Schmidt, Peter. "Efficient Estimation of Models for Dynamic Panel Data," Journal of Econometrics, 1995, 68, pp. 5-27.

Allen, Franklin and Gale, Douglas. Comparing Financial Systems. Cambridge, MA: MIT Press, 2000.

Alonso-Borrego, C. and Arellano, Manuel. "Symmetrically Normalised Instrumental Variable Estimation Using Panel Data," CEMFI Working Paper No. 9612, September 1996.

Arellano, Manuel and Bond, Stephen. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," Review of Economic Studies 1991, 58, pp. 277-297.

Arellano, Manuel, and Bover, Olympia. "Another Look at the Instrumental-Variable Estimation of Error-Components Models," Journal of Econometrics 1995, 68, pp. 29-52.

Arestis, Philip; Demetriades, Panicos O; and Luintel, Kul B. "Financial Development and Economic Growth: The Role of Stock Markets," Journal of Money, Credit, and Banking, 2001, 33, pp. 16-41.

Beck, Thorsten and Levine, Ross. "Industry Growth and Capital Allocation: Does Having a Market- or Bank-Based System Matter? Journal of Financial Economics, *forthcoming*, 2002.

Beck, Thorsten and Levine, Ross. "Stock Markets, Banks, and Growth: Correlation or Causality," University of Minnesota mimeo, 2001.

Beck, Thorsten; Demirgüç-Kunt, Asli; Levine, Ross. (2001b) "The Financial Structure Database," in A. Demirguc-Kunt and R. Levine (eds.) *Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets, and Development*, Cambridge, MA, The MIT Press.

Bencivenga, Valerie R. and Smith, Bruce D. "Financial Intermediation and Endogenous Growth," Review of Economic Studies 1991, 58, pp. 195-209.

Bencivenga, Valerie R.; Smith, Bruce D. and Starr, Ross M. "Transaction Costs, Technological Choice, and Endogenous Growth", Journal of Economic Theory 1995, 67(1), pp. 53-117.

Bhide, Amar. "The Hidden Costs of Stock Market Liquidity," Journal of Financial Economics, August 1993, 34(1), pp. 1-51.

Blundell, Richard and Bond, Stephen. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," Journal of Econometrics, 1998, 87, pp. 115-43.

Boyd, John H. and Prescott, Edward C. "Financial Intermediary-Coalitions," Journal of Economics Theory, April 1986, 38(2), pp. 211-32.

Boyd, John H.; Levine, Ross; and Smith, Bruce D. "The Impact of Inflation on Financial Sector Performance." Journal of Monetary Economics, 2001.

Budnevich, Carlos. "El Sistema Financiero Chileno Y su Institucionalidad Regulatoria; Las Politicas Bancarias en Los Noventa," in Muñoz Goma, Oscar (ed); El Estado y el Sector Privado. Construyendo una nueva economía en los años 90. DOLMEN-FLACSO. Santiago de Chile, 2000.

Budnevich, Carlos. "Banking System Regulation and Supervision in Chile: Past, Present, and Future. Central Bank of Chile, mimeo, 1997.

Calderón, Cesar; Chong, Alberto; and Loayza, Norman. "Determinants of Current Account Deficits in Developing Countries," World Bank Research Policy Working Paper 2398, July 2000.

Demirgüç-Kunt, Asli and Levine, Ross. Financial Structures and Economic Growth. A Cross-Country Comparison of Banks, Markets, and Development, Cambridge, MA: MIT Press, 2001.

Demirgüç-Kunt, Asli and Detragiache, Enrica. "Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation," Journal of Monetary Economics, *forthcoming*, 2001.

Goldsmith, Raymond, W. Financial Structure and Development. New Haven, CT: Yale University Press, 1969.

Griliches, Zvi. and Hausman, Jerry A. "Errors in Variables in Panel Data, " Journal of Econometrics, 1986, 31, pp. 93-118.

King, Robert G. and Levine, Ross. "Finance and Growth: Schumpeter Might Be Right," Quarterly Journal of Economics, August 1993a, 108(3), pp. 717-38.

Levine, Ross. "Financial Development and Economic Growth: Views and Agenda," Journal of Economic Literature, June 1997, 35(2), pp. 688-726.

Levine, Ross. "Bank-Based versus Market-Based Financial Systems: Which is Better?," Journal of Financial Intermediation, *forthcoming*, 2002.

Levine, Ross; Loayza, Norman; Beck, Thorsten. "Financial Intermediation and Growth: Causality and Causes," Journal of Monetary Economics, 2000.

Levine, Ross and Zervos, Sara. "Stock Markets, Banks, and Economic Growth," American Economic Review, June 1998, 88(3), 537-558.

McKinnon, Ronald I. Money and Capital in Economic Development. Washington, DC: Brookings Institution, 1973.

Meier, Gerald M., and Dudley Seers, Pioneers in Development, New York, NY: Oxford University Press, 1984.

Miller, Merton H. "Financial Markets and Economic Growth", Journal of Applied Corporate Finance, Volume 11, Number 3, Fall 1998, pages 8-14.

Rousseau, Peter L. and Wachtel, Paul. "Equity Markets and Growth: Cross-Country Evidence on Timing and Outcomes, 1980-1995, Journal of Business and Finance, November 2000, 24, pp. 1933-57.

Stiglitz, Joseph. E.. "Credit Markets and the Control of Capital." Journal of Money, Credit and Banking, 1985, 17, pp. 133-52.

Valdes Prieto, Salvador. "Aguste Estructural En El Mercado De Capitales: La Evidencia Chilena," in El Model Economico Chileno, Ed: Daniel L Wisecarver. Centro Enternacional Para El Desarrollo Economico. Catholic University of Chile. Santigao, Chile. 1992.

Endnotes:

[1] See, Levine (1997), Boyd and Smith (1998), Huybens and Smith (1999) and Demirguc-Kunt and Levine (2001).

[2] Both the difference and the system estimator present certain problems when applied to samples with a small number of cross-sectional units. As shown by Arellano and Bond (1991) and Blundell and Bond (1998), the asymptotic standard errors for the two-step estimators are biased downwards. The one-step estimator, however, is asymptotically inefficient relative to the two-step estimator, even in the case of homoskedastic error terms. Thus, while the coefficient estimates of the two-step estimator are asymptotically more efficient, the asymptotic inference from the one-step standard errors might be more reliable. This problem is exacerbated when the number of instruments is equal to or larger than the number of cross-sectional units. This biases both the standard errors and the Sargan test downwards and might result in biased asymptotic inference. Consequently, we use an alternative specification of the instruments employed in the two-step system estimator. Typically, researchers treat the moment conditions as applying to a particular time period. This provides for a more flexible variance-covariance structure of the moment conditions because the variance for a given moment condition is not assumed to be the same across time. This approach has the drawback that the number of overidentifying conditions increases dramatically as the number of time periods increases and tends to induce over-fitting and potentially biased standard errors. To limit the number of overidentifying conditions, we follow Calderon, Chong and Loayza (2000) and apply each moment condition to all available periods. This reduces the over-fitting bias of the two-step estimator. However, applying this modified estimator reduces the number of periods in our sample by one. While in the standard DPD estimator time dummies and the constant are used as instruments for the second period, this modified estimator does not allow the use of the first and second period. While losing a period, the Calderon, Chong, and Loayza (2000) specification reduces the over-fitting bias and therefore permits the use of a heteroskedasticity-consistent system estimator.

[3] Thus, the first period covers the years 1976-1980, the second period covers the years 1981-1985, and so on. The last period only comprises the years 1996-98. Financial data are from Beck, Demirguc-Kunt and Levine (2000).

[4] We also experimented with *Value Traded,* which equals the value of the trades of domestic shares on domestic exchanges divided by GDP. *Value Traded* has two potential pitfalls. First, it does not measure the liquidity of the market. It measures trading relative to the size of the economy. Second, since markets are forward looking, they will anticipate higher economic growth by higher share prices. Since *Value Traded* is the product of quantity and price, this indicator can rise without an increase in the number of transactions. Turnover Ratio does not suffer from this shortcoming since both numerator and denominator contain the price.

[5] This is the same indicator of bank development used by Levine and Zervos (1998).

[6] Low turnover in Chile's equity market may reflect many factors besides legal, tax, and regulatory impediments to active share trading. These include concentrated ownership, a large role for the private pension funds that do not trade actively, and the use of ADRS by large Chilean corporations.

[7] Note, removing outliers does not fundamentally alter the relationship between stock market size and economic growth. Namely, there is not a strong statistical relationship between stock market size and economic growth as shown in Table 2 regression 4.

[8] For an excellent review of Chile banking system performance and the impact of the banking system on the macro-economy since the banking crisis of the 1980s, see Vales (1992).

[9] Although in 1989 Chile required private risk assessments of banks (Las Leyes de Valores y de Bancos), credit rating agencies merely copied the risk assessments of the Superintendcia de Bancos (Valdes, 1992, p. 440-1).

[10] See Budnevich (2000) for a review of Chile's deposit insurance scheme.

Table 1: Financial Development and Growth Data: 1975-1998

Country	Bank Credit	Turnover Ratio	Market Capitalization	Per Capita Growth
Argentina	0.16	0.33	0.07	0.96%
Australia	0.48	0.32	0.61	1.75%
Austria	0.82	0.41	0.08	2.16%
Bangladesh	0.17	0.11	0.02	2.49%
Belgium	0.44	0.14	0.30	1.89%
Brazil	0.17	0.54	0.14	1.13%
Canada	0.49	0.36	0.50	1.45%
Chile	0.42	0.07	0.51	4.20%
Colombia	0.14	0.09	0.09	1.74%
Costa Rica	0.17	0.01	0.06	0.93%
Cote d'Ivoire	0.32	0.03	0.06	-0.61%
Denmark	0.39	0.25	0.25	2.21%
Egypt	0.25	0.12	0.09	3.43%
Finland	0.61	0.29	0.29	2.25%
France	0.78	0.38	0.23	1.76%
Germany	0.93	0.87	0.21	1.98%
Greece	0.23	0.23	0.13	1.79%
Hong Kong	1.36	0.39	1.42	4.20%
India	0.22	0.48	0.15	3.05%
Indonesia	0.29	0.27	0.09	3.45%
Israel	0.53	0.52	0.36	1.63%
Italy	0.55	0.38	0.14	2.05%
Jamaica	0.23	0.08	0.26	-0.85%
Japan	1.03	0.48	0.65	2.35%
Jordan	0.55	0.13	0.54	1.36%
Kenya	0.22	0.03	0.14	0.42%
Korea	0.46	1.01	0.23	5.51%
Malaysia	0.59	0.32	1.21	3.76%
Mauritius	0.23	0.10	0.11	1.80%
Mexico	0.14	0.47	0.17	1.23%
Netherlands	0.77	0.46	0.53	1.89%
New Zealand	0.47	0.24	0.56	0.68%
Nigeria	0.11	0.01	0.05	-0.61%
Norway	0.48	0.46	0.21	2.88%
Pakistan	0.23	0.34	0.09	2.55%
Peru	0.09	0.20	0.10	-0.12%
Philippines	0.28	0.28	0.28	0.56%
Portugal	0.69	0.28	0.11	2.93%
Singapore	0.79	0.38	1.27	5.15%
South Africa	0.51	0.08	1.25	-0.60%
Spain	0.78	0.52	0.24	2.02%
Sri Lanka	0.19	0.10	0.13	3.28%
Sweden	0.42	0.35	0.47	1.23%
Switzerland	1.41	1.64	0.89	0.95%
Taiwan	0.83	2.32	0.42	6.14%
Thailand	0.59	0.70	0.26	5.05%
Trinidad and Tobago	0.28	0.08	0.18	1.40%
Tunisia	0.50	0.07	0.10	2.36%
Turkey	0.14	0.65	0.08	2.65%
United Kingdom	0.75	0.38	0.84	1.98%
United States	0.64	0.61	0.69	1.85%
Uruguay	0.29	0.04	0.01	1.75%
Venezuela	0.20	0.13	0.08	-0.86%
Zimbabwe	0.15	0.07	0.18	0.15%

Table 2: Growth and Financial Market Variables

Dependent variable: GDP growth per capita

	Full Sample		Sample Excluding Outliers	
Coefficient	1	2	3	4
Constant	0.0361	0.0374	0.0335	0.0401
	(0.012)	(0.024)	(0.011)	(0.012)
Initial income[1]	-0.0049	-0.0058	-0.0073	-0.0069
	(0.030)	(0.022)	(0.002)	(0.019)
Schooling[1]	0.0044	0.0072	0.0095	0.0072
	(0.450)	(0.284)	(0.077)	(0.285)
Trade[2]	0.0001	0.0001	0.0001	0.00003
	(0.000)	(0.048)	(0.000)	(0.162)
Black market premium[2]	-0.0001	-0.0002	-0.0001	-0.0002
	(0.030)	(0.015)	(0.051)	(0.013)
Government spending[2]	-0.0007	-0.0009	-0.0006	-0.0008
	(0.020)	(0.017)	(0.027)	(0.028)
Inflation[2]	-0.0014	-0.002	-0.0015	-0.0024
	(0.063)	(0.082)	(0.030)	(0.030)
Credit to the private sector[2]	0.0165	0.0352	0.0147	0.0318
	(0.030)	(0.001)	(0.017)	(0.001)
Turnover ratio[2]	0.0189		0.0242	
	(0.000)		(0.005)	
Market capitalization[2]		-0.0095		0.0003
		(0.273)		(0.953)
Number of observations	53	54	46	53
R-squared	0.6024	0.4847	0.699	0.5035

Notes: p values in parenthesis below coefficients.
Outliers excluded from the full sample in column 3 are Chile, Denmark, Jamaica, Korea, Phillipines, South Africa, and Taiwan. In column 4 only South Africa is excluded.
1. Initial value of the variable in logs.
2. Average value.

Table 3: Stock Markets, Banks and Growth, Panel GMM Estimator

Regressors	(1)	(2)	(3)	(4)	(5)
Constant	1.898	6.156	4.582	3.113	1.884
	(0.394)	*(0.182)*	*(0.685)*	*(0.189)*	*(0.430)*
Logarithm of initial income per capita	-0.683	0.048	-0.299	-0.619	-0.723
	(0.275)	*(0.945)*	*(0.691)*	*(0.249)*	*(0.239)*
Average Years of Schooling[2]	-3.004	-3.738	-4.08	-3.221	-2.979
	(0.277)	*(0.119)*	*(0.168)*	*(0.157)*	*(0.283)*
Government Consumption[1]		-2.581			
		(0.111)			
Trade Openness[1]			-0.693		
			(0.753)		
Inflation Rate[2]				-1.976	
				(0.079)	
Black Market Premium[2]					-0.069
					(0.966)
Bank Credit[1]	2.202	1.762	2.133	1.954	2.262
	(0.001)	*(0.025)*	*(0.048)*	*(0.003)*	*(0.001)*
Turnover Ratio[1]	0.993	0.944	0.736	0.950	1.058
	(0.012)	*(0.064)*	*(0.172)*	*(0.008)*	*(0.014)*
Sargan test[3] (p-value)	0.448	0.554	0.649	0.698	0.552
Serial correlation test[4] (p-value)	0.558	0.752	0.528	0.422	0.507
Wald test for joint significance (p-value)	0.001	0.002	0.018	0.001	0.001
Countries	40	40	40	40	40
Observations	106	106	106	106	106
	p-values in parentheses				

[1] In the regression, this variable is included as log(variable)

[2] In the regression, this variable is included as log(1 + variable)

[3] The null hypothesis is that the instruments used are not correlated with the residuals.

[4] The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

*,**,*** indicate significance at the 10%, 5%, and 1% level in the first-stage regression.

Source: Beck and Levine (2001).

Note: uses the Calderon, Chong and Loayza (2000) GMM estimator.

Table 4: Bank Regulation, Supervisory Practices and Bank Performance

Coefficient	Dependent Variable: Bank Credit	Interest Margin [1]	Major Crisis [2]
Constant	0.596 (0.147)	0.019 (0.466)	-8.686 (0.040)
Private Monitoring Index	0.088 (0.002)	-0.005 (0.010)	0.485 (0.159)
Restrictions on Bank Activities Index	-0.048 (0.015)	0.003 (0.045)	0.608 (0.002)
Entry into Banking Requirements	-0.008 (0.837)	0.004 (0.031)	0.276 (0.241)
Capital Regulatory Index	-0.005 (0.823)	-0.001 (0.793)	-0.468 (0.114)
Official Supervisory Power	-0.009 (0.498)	0.001 (0.588)	0.091 (0.566)
Moral Hazard Index			0.817 (0.000)
Number of observations	76	75	48
R-squared	0.27	0.19	0.39

Notes: p values in parenthesis below coefficients.

1. Interest Margin equals interest income less income expense computed from bank level data. (Barth, Caprio, Levine, 2001c)
2. Major Crisis is a binary variable that indicates whether the country has experiences a systemitc banking crisis or not.
   The Major Crisis regression is estimated using a probit regression.
   The R-square is the McFadden R-square statistic for logit regressions.

Table 5

Information on Bank Structural, Regulatory, Supervisory and Deposit Insurance Variables:

Group Averages

Variable	Chile 1999	Chile 1987-1990	All countries	Upper middle income	Latin America	Correlation		
						Financial development	Corruption	GDP/capita
1. Bank Activity Regulatory Variables								
(a) Securities Activities	2.00	2.00	1.80	2.06	2.25	-0.3566*	-0.3446*	-0.2690*
(b) Insurance Activities	3.00	4.00	2.75	2.50	2.33	-0.3764*	-0.3407*	-0.4551*
(c) Real Estate Activities	4.00	4.00	2.80	2.89	2.92	-0.3377*	-0.5331*	-0.4595*
2. Competition Regulatory Variables								
(a) Entry into Banking Requirements	3.00	n.a.	7.29	7.17	7.23	-0.0997	-0.1117	-0.0548
(b) Bank Ownership of Nonfinancial Firms	3.00	3.00	2.43	2.39	2.58	-0.0857	-0.3769*	-0.1507
(c) Restrictions on bank activities index	12.00	13.00	9.77	9.83	10.08	-0.4185*	-0.5637*	-0.4890*
3. Capital Regulatory Variables								
(a) Capital Regulatory Index	5.00	2.00	5.54	5.39	5.38	0.0337	0.0759	0.0494
4. Official Supervisory Action Indices								
(a) Official Supervisory Power	10.00	8.00	10.11	11.11	10.85	-0.0782	-0.3056*	-0.1875
(1) Prompt Corrective Action	3.00	3.00	2.24	3.28	2.23	-0.2355*	-0.2644	-0.1481
(2) Restructuring Power	3.00	1.00	2.55	2.67	2.92	0.0111	-0.3024*	-0.1390
(3) Declaring Insolvency Power	2.00	2.00	1.52	1.72	1.77	-0.1112	-0.2245	-0.2246
(b) Supervisory Forbearance Discretion	0.00	0.00	1.54	1.22	1.23	0.1994	0.2588	0.1540
(c) Loan Classification Stringency	150.00	n.a.	420.51	299.17	318.67	-0.0077	-0.0195	-0.1937
(d) Provisioning Stringency	172.00	170.00	160.03	154.20	147.15	-0.0584	-0.0791	-0.0755
5. Private Monitoring Variables								
(a) 10 Biggest Banks Rated by International Rating Agencies (Yes = 1, No = 0)	0.00	n.a.	0.26	0.33	0.15	0.3172*	0.3541*	0.3603*
(b) Accounting Disclosure and Director Liability	3.00	3.00	2.51	2.83	2.69	0.0806	-0.0032	0.2270
(c) Private Monitoring Index	6.00	6.00	5.88	6.11	5.62	0.4242*	0.3943*	0.4454*
6. Deposit Insurance Scheme Variables								
(a) Deposit Insurer Power	2.00	2.00	0.72	0.67	0.83	-0.0478	-0.1890	0.0517
(b) Deposit Insurance Funds-to-Total Bank Assets	0.00	0.00	0.02	0.00	0.00	0.3236	0.1993	0.1525
(c) Moral Hazard Index	2.20	2.20	-0.04	1.46	-0.16	0.0711	0.1118	0.2547
7. Market Structure Indicators								
(a) Bank Concentration	0.59	0.51	0.66	0.61	0.60	-0.2968*	0.0747	-0.2144
(b) Foreign Bank Ownership	0.32	0.27	0.25	0.27	0.26	-0.1818	-0.0351	-0.2072
(c) Government Owned Banks	0.12	0.19	0.22	0.18	0.17	-0.3063*	-0.4130*	-0.4965*
(d) Number of New Banks: Generated	0.00	n.a.	28.59	5.69	5.91	0.0430	0.1715	0.2333
(1) New Domestic Banks: Generated	0.00	n.a.	22.34	2.62	3.09	0.0064	0.1391	0.1982
(2) New Foreign Banks: Generated	0.00	n.a.	5.52	3.08	2.82	0.4453*	0.3902*	0.3711*
(e) No Entry Applications	1.00	n.a.	0.08	0.23	0.17	0.1600	-0.1010	0.0693
(1) No Domestic Applications	1.00	n.a.	0.21	0.29	0.25	0.1873	-0.0370	0.1778
(2) No Foreign Applications	1.00	n.a.	0.25	0.38	0.33	-0.0200	-0.2034	-0.1111
(f) Fraction of Entry Applications Denied	n.a.	n.a.	0.22	0.11	0.13	-0.2120	-0.4815*	-0.4672*
(1) Domestic Denials	n.a.	n.a.	0.19	0.14	0.11	-0.0826	-0.3637*	-0.1836
(2) Foreign Denials	n.a.	n.a.	0.20	0.05	0.10	-0.3416*	-0.4570*	-0.5994*

Note: The sample includes countries with population above one million and it excludes Gulf oil-producing countries.

Figure 1: Growth vs. Turnover: Partial Scatter Plot

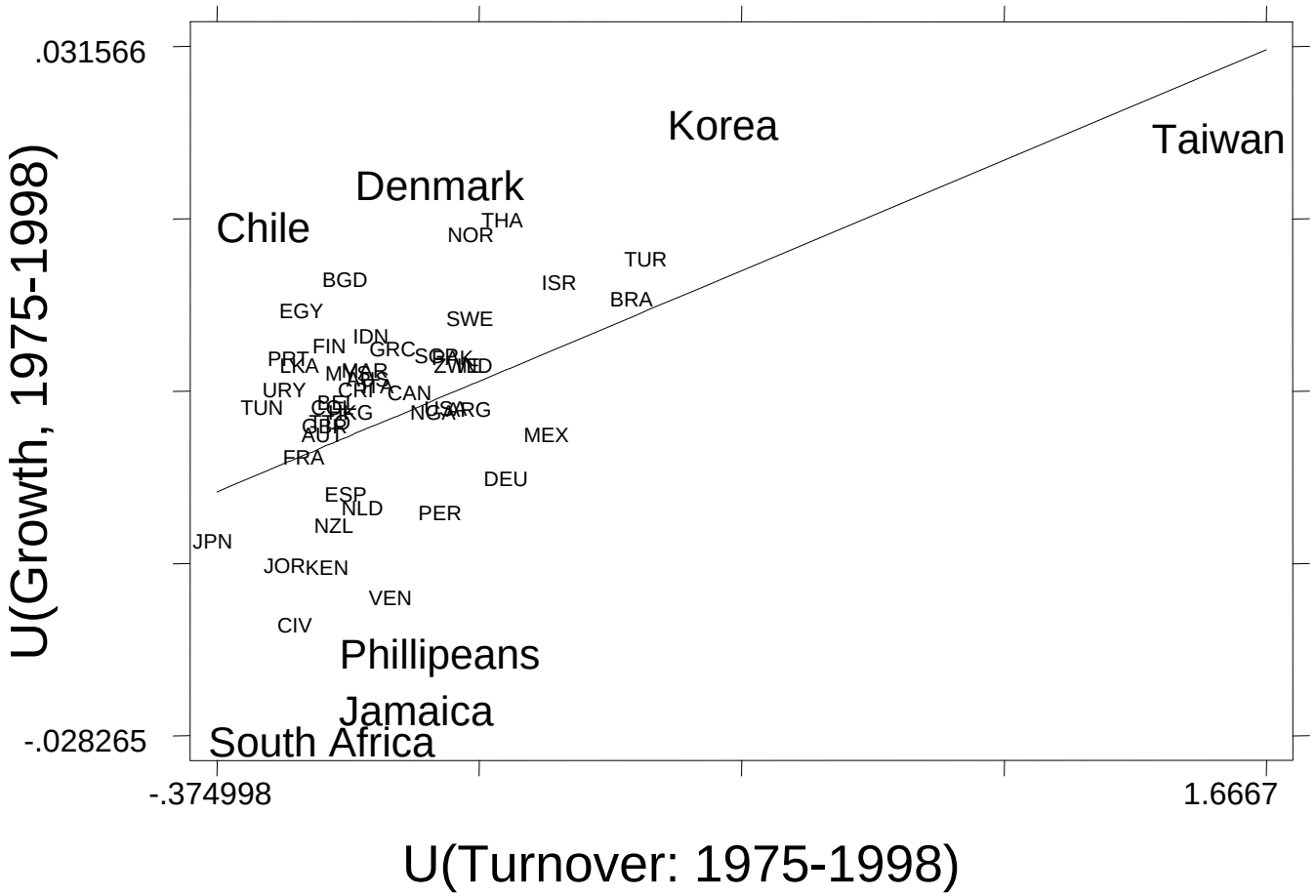
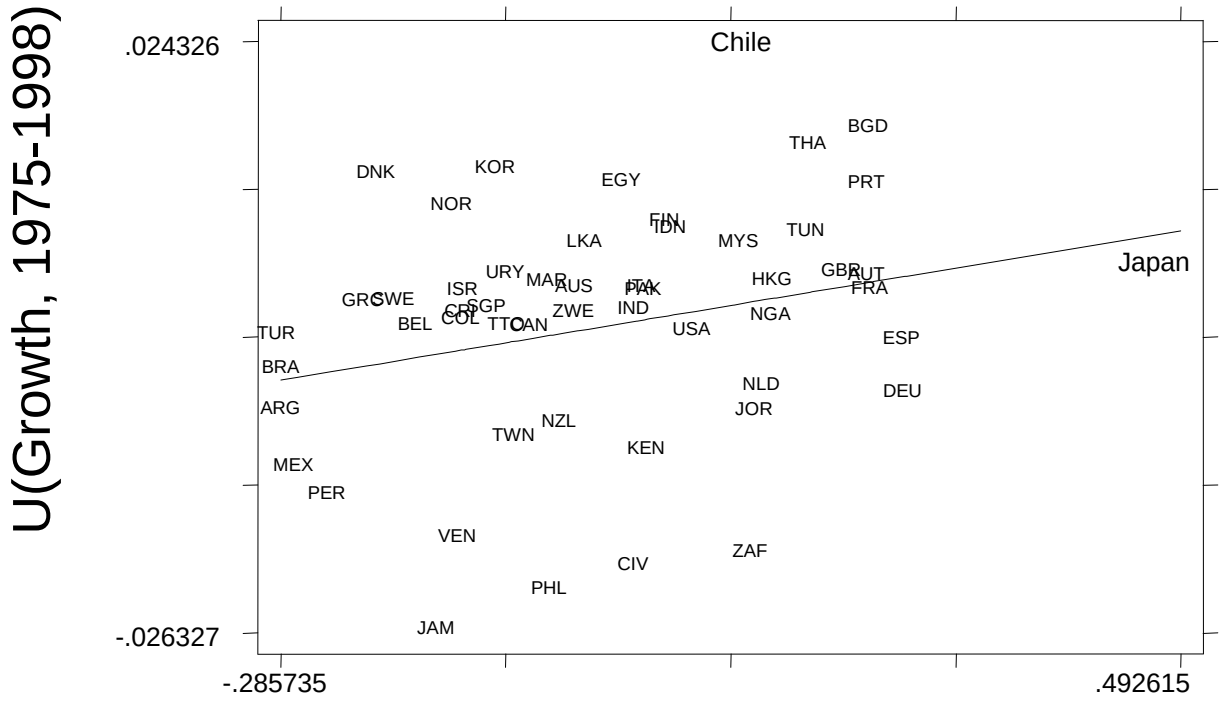


Figure 2: Growth vs. Private Credit: Partial Scatter Plot



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