

FINANCE AND GROWTH: NEW EVIDENCE AND POLICY ANALYSES FOR CHILE

María Carkovic
University of Minnesota

Ross Levine
University of Minnesota

Nobel Prize winners sharply disagree about the role of the financial sector in economic growth. Finance is not even discussed in a collection of essays by the so-called pioneers of development economics, including three winners of the Nobel Prize in Economics (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] 1962), Schumpeter ([1912] 1934), Goldsmith (1969), and McKinnon (1973), 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). Nobel Laureate Merton Miller (1998, p. 14) similarly rejects the more dismissive views of the finance-growth nexus, remarking, “[the idea] that financial markets contribute to economic growth is a proposition almost too obvious for serious discussion.”

The recent empirical investigations of the impact of stock markets and banks on economic growth have their shortcomings, however. Researchers either use pure cross-country analyses that do not account for possible biases induced by endogeneity and omitted variables (Levine and Zervos, 1998) or complex, hard-to-interpret panel estimates that do not address the potential influence of outliers (Rousseau and Wachtel,

We thank Veronica Mies for obtaining historical data on commercial bank regulations and supervisory practices in Chile and Fernando LeFort and Norman Loayza for helpful comments.

Economic Growth: Sources, Trends, and Cycles, edited by Norman Loayza and Raimundo Soto, Santiago, Chile. © 2002 Central Bank of Chile.

2000; Beck and Levine, 2002b). Furthermore, most studies use data through the mid-1990s and thus do not capture the financial and economic disruptions of 1998. Yet researchers must incorporate data on the recent financial crisis if they are to provide a balanced assessment of the connection between economic growth and both stock market and bank development.

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 to examine the importance of outliers for the results. We complement these cross-country regressions with panel techniques to control for a variety of statistical biases. We also document how Chile fits into these analyses and highlight distinguishing characteristics of 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 on 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 itself is an outlier, however. The country has remarkably large stock markets as measured by the ratio of market capitalization to gross domestic product (GDP). Just as remarkably, 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. Chile's economic growth rate is similarly 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 Hong Kong, Malaysia, Singapore, Taiwan, and Thailand. Although Chile and a few other countries are outliers in the cross-country growth regression, the estimated growth-finance relationship remains strong and positive even when omitting these outliers, using panel techniques that eliminate country-specific effects, and controlling for a variety of growth determinants.

Given that finance promotes inquiry into the legal, regulatory, market and bank development. Development and stock market liquidity economic growth. Part two then turns to a national dataset to examine the impact of regulations and supervisory practices.

The second part of the paper examines bank development and commercial bank development and compares Chile and assesses how Chile compares to other countries. Caprio, and Levine (2001a) assess the impact of supervisory and regulatory practices on bank development and supervisory practices on economic stability (Barth, Caprio, and Levine 2001). Barth, Caprio, and Levine (2001) examine where Chile stands in the cross-country literature through informative discussions by regulatory and supervisory practices in other countries and then juxtaposing Chile's experience. In conducting these analyses, we compare Chile's commercial bank regulations and supervisory practices during the 1987–1990 period. We then compare Chile's conditions and supervision to see how Chile's experience responds with successful international practices.

Our results demonstrate that Chile's supervisory strategies that emphasize competitive banking markets, and our comparisons highlight important features of Chile's supervisory system that may be a broad measure of the extent to which regulations and supervisory practices promote and facilitates the ability of banks, Chile is slightly below average for other countries. This is a relevant issue, as it relates to how to promote private sector monitoring and supervision (Barth, Caprio, and Levine 2001). Chile imposes comparatively tight regulations on nontraditional activities, and it imposes tight requirements to grant new banking licenses. Tight regulations on bank activities and entry have been shown to also grants comparatively general supervision. The evidence indicates that overly

more, most studies use data to capture the financial and economic aspects. Studies must incorporate data on both sides to provide a balanced assessment of the relationship between the financial system and both stock market and economic growth.

Some of the shortcomings of the current literature, and economic growth while using the pure cross-country analysis, is the impact of the financial crisis on the results. We complete the analysis using panel techniques to control for unobserved heterogeneity and document how Chile fits into the emerging characteristics of Chile's financial system.

The financing role of stock markets in Chile's experience. Subject to the fact that banks each exert an independent influence on economic growth. Endogeneity, omitted variables, and outliers do not drive these results. In the regression and the panel data analysis, Chile itself is an outlier, however, stock markets as measured by the market-to-book ratio and domestic product (GDP). Just as surprising is the illiquid nature of the market capitalization relative to the level of stock market development. And not through size, Chile's stock market that has maintained a growth rate is similarly more consistent with banking development, which is surprising as a share of GDP. As measured by stock market capitalization, Chile is higher than the level of financial development in rapidly growing economies, such as Taiwan, and Thailand. All of these are outliers in the cross-country relationship between the financial system and economic growth. Controlling for these outliers, using fixed effects, and controlling

Given that finance promotes growth, this paper motivates an inquiry into the legal, regulatory, and policy factors that support stock market and bank development. Part one finds that banking sector development and stock market liquidity exert a positive impact on economic growth. Part two then 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 the paper both reviews the connections between bank development and commercial bank regulation and supervision and assesses how Chile compares internationally. Specifically, Barth, Caprio, and Levine (2001a) assemble a large cross-country dataset on supervisory and regulatory practices. They then consider which regulatory and supervisory practices best support bank development and stability (Barth, Caprio, and Levine, 2001c). In this paper, we use the Barth, Caprio, and Levine (2001a, 2001c) data and findings to identify where Chile stands in the cross-section of countries. Our aim is to foster informative discussions by documenting those commercial bank regulatory and supervisory practices that have led to success in other countries and then juxtaposing them with current practices in Chile. In conducting these analyses, we were able to obtain information on commercial bank regulations and supervisory practices in Chile during the 1987–1990 period. We thus document recent changes in regulations and supervision to see how the direction of change in Chile corresponds with successful international practices.

Our 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 a relevant issue, given that regulatory structures that promote private sector monitoring of banks tend to boost bank development (Barth, Caprio, and Levine, 2001c). In terms of competitiveness, Chile imposes comparatively tight restrictions on banks engaging in nontraditional 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. Chile also grants comparatively generous deposit insurance, whereas the evidence indicates that overly generous deposit insurance augments

bank fragility (Demirgüç-Kunt and Detragiache, 2002). In terms of changes over the last decade, Chile has significantly strengthened capital regulations and official supervisory power, but it has maintained a generous deposit insurance regime and 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, however, because we have detailed data on bank regulation and supervisory practices around the world (from Barth, Caprio, and Levine, 2001a, 2001c). In contrast, we do not 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, 2002a; Levine, 2002).

We need to make two additional caveats before continuing. The paper's two parts are logically connected: the fact that stock markets and banks influence long-run growth motivates our 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, our analysis has serious limitations. The broad, cross-country regressions—both the pure cross-sectional and the 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. For example, we do not have information on the use of international financial markets or the special role played by Chile's private pension system. We therefore 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 suboptimal performance in a broad

cross-section of countries. One of our findings is that Chile based on these observations has a relatively light specific regulatory and supervisory framework that deserves additional attention in Chile.

1. STOCK MARKETS, BANKS, AND ECONOMIC GROWTH

This section discusses existing theory and presents new evidence on the connection between financial markets and economic growth. We also discuss the literature conditionally in terms of the relationship between financial markets and economic growth.

1.1 Theory

Theory provides conflicting evidence on the relationship between financial development on growth, financial markets and banks. Many models suggest that financial intermediaries and market actions costs and thereby foster long-run growth (Bencivenga and Starr, 1995; King and Levine, 1993). Financial development may accelerate economic growth and thus encouraging higher-return, projects. Theoretical models suggest that financial development can hurt growth through the returns to saving, financial markets through well-known income risk diversification in some models therefore may lower aggregate growth associated with capital accumulation and reduce welfare. Theoretical models about the growth effects of financial markets are mixed.

Theory also generates conflicting evidence on whether financial markets and banks are substitutable. More conducive to growth than the Prescott (1986) model the critical role of information frictions and improving financial markets and Bhide (1993) stress that stock markets benefits as banks. On the other hand, financial markets mitigate the inefficiencies of banks and that the competitive nature of

cross-section of countries. One should not recommend policy reforms in Chile based on these observations alone, but the observations do highlight specific regulatory and supervisory areas that might benefit from additional attention in Chile.

1. 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 these factors.

1.1 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 faster long-run growth (Bencivenga and Smith, 1991; Bencivenga, Smith, and Starr, 1995; King and Levine, 1993). Similarly, financial market development may accelerate economic growth by enhancing risk diversification and thus encouraging risk-averse investors to shift toward higher-return, projects. Theory, however, also shows that financial development can hurt growth. 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. Theory thus provides ambiguous predictions about the growth effects of financial development.

Theory also generates conflicting predictions about whether stock markets and banks are substitutes or compliments and 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 improving resource allocation, and Stiglitz (1985) and Bhidé (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 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 the central issue is not banks or markets, but banks *and* markets: these different components of the financial system ameliorate different information and transaction costs.¹

1.2 New Evidence on Stock Markets, Banks, and Economic Growth

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:

$$g_i = \alpha y_{i0} + \beta' X_i + \varepsilon_i, \quad (1)$$

where, g_i is real per capita GDP growth over the period 1975–1998 for country i , y_{i0} is the logarithm of initial real per capita GDP in 1975 for country i , X_i represents additional explanatory variables averaged over the period 1975–1998 for country i (including stock market development and bank development), and e is the error term.

The problems associated with the standard cross-country growth regression are well known. There may be omitted country-specific factors that induce omitted variable bias. Standard regressions do not control for endogeneity, which may cause simultaneity bias, and cross-country regressions do 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. Researchers, however, typically correct for statistical problems with standard cross-country growth regressions by moving 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:

$$y_{it} - y_{it-1} = \alpha y_{it-1} + \beta' X_{it} + \eta_i + \varepsilon_{it}, \quad (2)$$

1. See, Levine (1997); Boyd and Smith (1996); Huybens and Smith (1999); Demirgüç-Kunt and Levine (2001).

where y is the logarithm of a set of explanatory variables including our indicators of stock market development. Subscripts i and t represent country and time, respectively. Time dummies are included in the regression for the presentation.

Arellano and Bond (1991) use the following instrument to estimate the country specific component:

$$(y_{it} - y_{it-1}) - (y_{it-1} - y_{it-2}) = \alpha (y_{it-1} - y_{it-2}) + \beta' (X_{it} - X_{it-1}) + \varepsilon_{it}$$

This, however, introduces a bias because y_{it-1} is correlated with the lagged error term. To avoid this, Arellano and Bond (1991) use the two-step generalized method of moments (GMM) estimator. In the first step, the error terms are assumed to be homoskedastic across countries. In the second step, the residuals obtained in the first step are used to estimate the variance-covariance matrix of the error terms. This estimator is therefore asymptotically efficient. The first-step estimator is therefore asymptotically efficient.

Rousseau and Wachtel (2001) use annual data to study the relationship between financial development and economic growth. This differs from the previous studies, however. First, it eliminates the bias between financial development and economic growth. Second, it can produce biased coefficients. Third, it may exacerbate the bias resulting from the use of instruments (Griliches and Hausman, 1974).

We reduce these shortcomings by combining the regression in differences with the instrumental variables system (Arellano and Bover, 1995). This method uses instruments for the regression in differences and the corresponding variables.

an excessively conservative (2000). Finally, some theories suggest that stock markets, but banks and the financial system ameliorate the costs.¹

Stocks, Banks, and Growth

In this section, we evaluate the relationship between stock market development and economic growth in a panel, we use

country growth regression:

(1)

for the period 1975–1998 for real per capita GDP in 1975 for the explanatory variables averaged over the period of stock market development and the error term.

Standard cross-country growth regressions do not control for country-specific factors and standard regressions do not control for simultaneity bias, and cross-country dimension of the data. Panel regressions provide a simple benchmark for growth, which implies using panel regressions by moving from cross-section to time series as closely to theory. Panel methods to confront potential biases. Consider a generalized

(2)

(Huybens and Smith (1999);

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, η 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:

$$(y_{it} - y_{it-1}) - (y_{it-1} - y_{it-2}) = \alpha(y_{it-1} - y_{it-2}) + \beta'(X_{it} - X_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}). \quad (3)$$

This, however, introduces a new bias. The new error term, $e_{it} - e_{it-1}$, is correlated with the lagged dependent variable, $y_{it-1} - y_{it-2}$. 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 generalized method of moments (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 therefore asymptotically more efficient relative to the first-step estimator.

Rousseau and Wachtel (2000) use this difference estimator and annual data to study the relationship between stock markets, banks, and economic growth. This difference estimator has three main shortcomings, however. First, it eliminates the cross-country relationship between financial development and growth. Second, weak instruments can produce biased coefficients in small samples. Finally, differencing may exacerbate the bias resulting from measurement errors in variables (Griliches and Hausman, 1986).

We reduce these shortcomings by using an estimator that combines the regression in differences and the regression in levels in one system (Arellano and Bover, 1995; 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, as well as on the validity of the instruments. We use two specification tests to address these issues. The first is a Sargan test of overidentifying 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_{it} , is not serially correlated. Failure to reject the null hypotheses of both tests gives support to our model.

Data

We analyze the link between stock markets, banks, and economic growth. The cross-country regressions use up to fifty-four countries. For the panel, data are averaged over five five-year periods between 1976 and 1998, data permitting.³ The panel analyses are based on forty

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. Researchers typically 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 overfitting and potentially biased standard errors. To limit the number of overidentifying conditions, we follow Calderón, Chong, and Loayza (2000) and apply each moment condition to all available periods. This reduces the overfitting 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 Calderón, Chong, and Loayza (2000) specification reduces the overfitting bias and therefore permits the use of a heteroskedasticity-consistent system estimator.

3. The first period thus covers the years 1976–1980, the second period covers the years 1981–1985, and so on. The last period only comprises the years 1996–1998. Financial data are from Beck, Demirgüç-Kunt and Levine (2001).

countries and 106 observations. The countries included in the cross-country analysis are: Argentina, Australia, Canada, France, Germany, Hong Kong, India, Italy, Japan, Korea, Mexico, New Zealand, Norway, Singapore, South Africa, Sweden, Switzerland, Taiwan, Thailand, United Kingdom, and the United States. A minimum of thirteen observations is required for each country. The data for each country have observations for each year from 1976 to 1998. The theories we are evaluating are based on relationships between stock markets, banks, and economic growth. We use five-year averages rather than annual data to avoid spurious relationships (Rousseau and Wachtel, 2000).

To measure stock market liquidity, we use the measure of market liquidity, ML , which is defined as the ratio of trading volume on domestic exchanges divided by the market capitalization. This variable indicates the trading volume of the market. The models predict that countries with high ML are more incentives to long-run investment. We use the variable ML to sell one's stake in the firm. We use the variable ML to reduce disincentives to long-run investment. We use the variable ML to provide a ready exit-option for investors. We use the variable ML to resource allocation and faster economic growth (Rousseau and Starr, 1995).

We also experiment with the variable ML . The value of listed shares divided by the market capitalization variable is that theory does not predict that ML will influence resource allocation. We use the variable ML to show that market capitalization is not a good indicator of growth. Our results confirm that ML is not a good indicator of growth.

To measure bank development, we use the variable BL . BL is defined as claims on the private sector by banks divided by the market capitalization. This measure isolates loans given by banks. We use the variable BL to measure bank development. It excludes loans issued to government and financial institutions.

We assess the strength of the relationship between stock markets and economic growth.

4. We also experimented with the variable ML . The trades of domestic shares on the market, $TRADED$, has two potential pitfalls. First, $TRADED$ is relative to the market, but trading relative to the market, forward looking, they will anticipate price changes. Since $VALUE\ TRADED$ is a relative variable, it can rise without an increase in the price. $TRADED$ does not suffer from this shortcoming. We use the variable $TRADED$ to contain the price.

5. This is the same indicator of growth.

meter estimates than in
depends on the validity of
exhibit serial correlation,
We use two specification
an test of overidentifying
of the instruments by ana-
tions used in the estima-
hypothesis that the error
reject the null hypotheses

ets, banks, and economic
up to fifty-four countries.
ve-year periods between
analyses are based on forty

present certain problems when
al units. As shown by Arellano
mptotic standard errors for the
tep estimator, however, is as-
timator, even in the case of
nt estimates of the two-step
ptotic inference from the one-
blem is exacerbated when the
umber of cross-sectional units.
st downwards and might result
an alternative specification of
timator. Researchers typically
r time period. This provides for
ment conditions because the
d to be the same across time.
overidentifying conditions in-
creases and tends to induce
it the number of overidentifying
2000) and apply each moment
verfitting bias of the two-step
reduces the number of periods
imator time dummies and the
d, this modified estimator does
losing a period, the Calderón,
overfitting bias and therefore
tem estimator.
980, the second period covers
ly comprises the years 1996-
t and Levine (2001).

countries and 106 observations. The difference in the number of coun-tries included in the cross-country and panel investigations arises be-cause in the cross-section analysis we require countries to have a mini-mum of thirteen observations, whereas for the panel, we require that countries have observations for a minimum of four out of the five pan-els. The theories we are evaluating focus on the long-run relationships between stock markets, banks, and economic growth. We thus use five-year averages rather than annual data to focus on longer-term rela-tionships (Rousseau and Wachtel, 2000).

To measure stock market development, we use the turnover ratio measure of market liquidity, which equals the value of the shares traded on domestic exchanges divided by total value of listed shares. It indi-cates the trading volume of the stock market relative to its size. Some models predict that countries with illiquid markets will create disin-centives 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 pro-vide 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. The main shortcoming of this variable is that theory does not suggest that the mere 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

We assess the strength of the independent link between both stock markets and economic growth and bank development and

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, but 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).

Table 1. Financial Development and Growth Data, 1975–1998

Country	Bank credit	Turnover ratio	Market capitalization	Per capita growth (in percent)
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
Côte 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

growth by controlling 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 to control for human capital accumulation. We also control for the black market premium; the share of exports plus imports to GDP (trade); the inflation rate; and the ratio of government expenditures to GDP.

Table 1 presents data on financial development and growth over the period 1975–98. Bank and stock market development vary widely across the sample. While Taiwan had a turnover ratio of 232 percent of GDP over the 1975–98 period, the corresponding ration in Nigeria was only 1 percent of GDP. Switzerland's banks lent 141 percent of GDP to

Table 1. (continued)

Country	Bank credit	Turnover ratio
Malaysia	0.59	
Mauritius	0.23	
Mexico	0.14	
Netherlands	0.77	
New Zealand	0.47	
Nigeria	0.11	
Norway	0.48	
Pakistan	0.23	
Peru	0.09	
Philippines	0.28	
Portugal	0.69	
Singapore	0.79	
South Africa	0.51	
Spain	0.78	
Sri Lanka	0.19	
Sweden	0.42	
Switzerland	1.41	
Taiwan	0.83	
Thailand	0.59	
Trinidad and Tobago	0.28	
Tunisia	0.50	
Turkey	0.14	
United Kingdom	0.75	
United States	0.64	
Uruguay	0.29	
Venezuela	0.20	
Zimbabwe	0.15	

the private sector over the period 1975–98. Switzerland's banks lent only 9 percent of GDP. Singapore, Taiwan, Hong Kong, Korea, Singapore, Taiwan, and Singapore had the highest per capita growth over the 1975–98 period, while many countries had negative growth. Table 1 also indicates that Chile, Indonesia, and Korea had a stock market (as measured by turnover ratio) that was larger than the market (as measured by turnover ratio)

6. Low turnover in Chile's equity market, high government ownership, and regulatory impediments to the use of American depository receipts are likely to have contributed to the low growth rate.

Growth Data, 1975-1998

Market capitalization	Per capita growth (in percent)
0.07	0.96
0.61	1.75
0.08	2.16
0.02	2.49
0.30	1.89
0.14	1.13
0.50	1.45
0.51	4.20
0.09	1.74
0.06	0.93
0.06	-0.61
0.25	2.21
0.09	3.43
0.29	2.25
0.23	1.76
0.21	1.98
0.13	1.79
1.42	4.20
0.15	3.05
0.09	3.45
0.36	1.63
0.14	2.05
0.26	-0.85
0.65	2.35
0.54	1.36
0.14	0.42
0.23	5.51

Table 1. (continued)

Country	Bank credit	Turnover ratio	Market capitalization	Per capita growth (in percent)
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

terminants. We include P (initial income) to con- initial average years of umulation. We also con- share of exports plus im- the ratio of government development and growth over development vary widely ver ratio of 232 percent of ling ration in Nigeria was ent 141 percent of GDP to

the private sector over the 1975-1998 period, whereas Peru's banks lent only 9 percent of GDP. Similarly, Chile and the Asian Tigers (Hong Kong, Korea, Singapore, Taiwan, and Thailand) enjoyed greater than 4 percent per capita growth on an average annual basis over the 1975-1998 period, while 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 turnover ratio).⁶

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 American depository receipts (ADRs) by large Chilean corporations.

Table 2. Growth and Financial Market Variables^a

Regressor	Full sample		Sample excluding outliers ^b	
	(1)	(2)	(3)	(4)
Constant	0.0361 (0.012)	0.0374 (0.024)	0.0335 (0.011)	0.0401 (0.012)
Initial income ^c	-0.0049 (0.030)	-0.0058 (0.022)	-0.0073 (0.002)	-0.0069 (0.019)
Schooling ^c	0.0044 (0.450)	0.0072 (0.284)	0.0095 (0.077)	0.0072 (0.285)
Trade ^d	0.0001 (0.000)	0.0001 (0.048)	0.0001 (0.000)	0.00003 (0.162)
Black market premium ^d	-0.0001 (0.030)	-0.0002 (0.015)	-0.0001 (0.051)	-0.0002 (0.013)
Government spending ^d	-0.0007 (0.020)	-0.0009 (0.017)	-0.0006 (0.027)	-0.0008 (0.028)
Inflation ^d	-0.0014 (0.063)	-0.0020 (0.082)	-0.0015 (0.030)	-0.0024 (0.030)
Credit to the private sector ^d	0.0165 (0.030)	0.0352 (0.001)	0.0147 (0.017)	0.0318 (0.001)
Turnover ratio ^d	0.0189 (0.000)		0.0242 (0.005)	
Market capitalization ^d		-0.0095 (0.273)		0.0003 (0.953)
<i>Summary statistics</i>				
No. observations	53	54	46	53
R ²	0.6024	0.4847	0.699	0.5035

a. The dependent variable is per capita GDP growth; *p* values are in parenthesis below coefficients.

b. Outliers excluded from the full sample in column 3 are Chile, Denmark, Jamaica, Korea, the Philippines, South Africa, and Taiwan. In column 4, only South Africa is excluded.

c. Initial value of the variable in logs.

d. Average value.

Cross-country results

Table 2 present pure cross-country, OLS growth regressions over the 1975–1998 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 with a *p* value of 0.03. The control variables also enter with the expected signs: initial income,

Finance and Growth

government spending, inflation, and bank credit, with negative coefficients, while market capitalization has a positive coefficient.

The coefficients on the financial variables are generally large. For instance, a one-standard-deviation increase in the turnover ratio would increase long-run per capita GDP growth by 0.35 percentage points per year (0.35×0.0189), which is only 1.9 points per year. This is quite large, especially that if Chile increased its level of banking sector capitalization existing in Thailand (0.70), it would increase its percentage point of extra per capita GDP growth. Similarly, a one-standard-deviation increase in government spending would increase per capita growth by 0.27 percentage points (0.27×0.017), which is quite large. Countries that grew more slowly than the average would increase its level of banking sector capitalization 0.42 to the level in Thailand and increase its percentage points of extra per capita GDP growth by about 0.3 percentage points. These results would eventually eliminate the growth rate differential between Chile (0.050). These conceptual effects should not be viewed as exact, but they do illustrate the strong positive relationship between banking sector capitalization and economic growth.

Consistent with Levine and Zingales (1995), the relationship between market capitalization and growth shown in regression 2 of table 2 (market capitalization and turnover ratio) is positively and significantly related. Market size is not. Banking sector capitalization is a positive and significant coefficient.

We focus on outliers and the relationship between market capitalization and growth in a partial scatter plot of growth rate versus market capitalization. The multivariate regression plane in the two dimensional space defined by market capitalization and growth rate shows that some countries do not fall near the regression line. In particular, Chile and Denmark have market capitalization associated with countries with low growth rates (after controlling for many other variables). South Africa, Korea, and Taiwan also have much slower growth rates than the regression line (namely, South Africa, Korea and Taiwan are also

Control Variables^a

Sample excluding outliers ^b	
(3)	(4)
0.0335 (0.011)	0.0401 (0.012)
-0.0073 (0.002)	-0.0069 (0.019)
0.0095 (0.077)	0.0072 (0.285)
0.0001 (0.000)	0.00003 (0.162)
-0.0001 (0.051)	-0.0002 (0.013)
-0.0006 (0.027)	-0.0008 (0.028)
-0.0015 (0.030)	-0.0024 (0.030)
0.0147 (0.017)	0.0318 (0.001)
0.0242 (0.005)	
	0.0003 (0.953)
46	53
0.699	0.5035

^a In parenthesis below coefficients.

^b Denmark, Jamaica, Korea, the Philippines, and Taiwan.

Stock market growth regressions over the sample period. This regression includes the broad set of control variables with bank credit and the same as the first except that it uses the turnover ratio. The turnover ratio enters with a positive and significant coefficient with a *p* value of 0.03. The other control variables have mixed signs: 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 can 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 given that 17 percent of the countries grew more slowly than this over the 1975–1998 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 jump about 0.3 percentage points per year (0.17×0.017), which would virtually eliminate the growth gap between Chile (0.042) and Thailand (0.050). These conceptual experiments are purely illustrative and should not be viewed as exploitable elasticities, but 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 (the 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 the first equation 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 those associated with countries with low levels of stock market liquidity (after controlling for many other growth determinants). Some countries also have much slower growth rates than predicted by the regression line (namely, South Africa, Jamaica, and the Philippines). Korea and Taiwan are also outliers.

Figure 1. Growth versus Turnover: Partial Scatter Plot

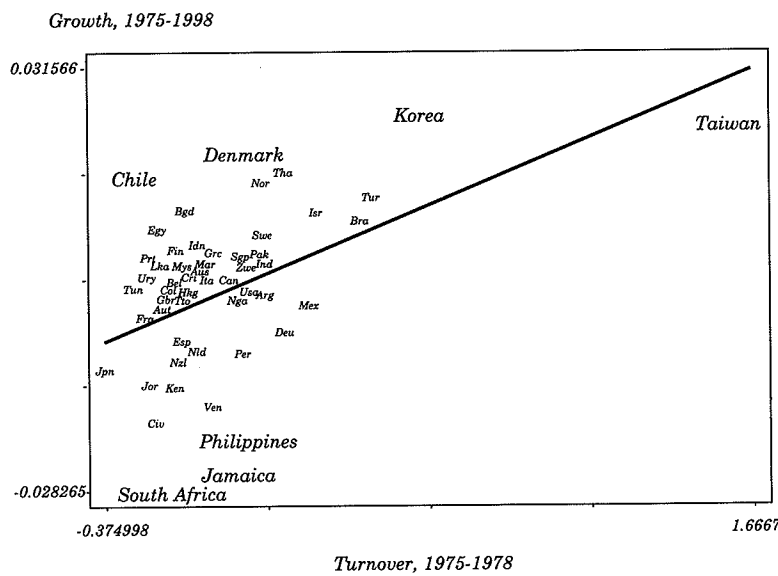


Figure 2. Growth versus P

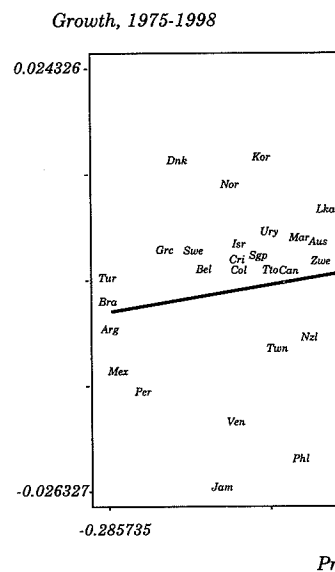


Figure 2 shows the partial scatter plot of growth relative to bank credit. Chile again enjoys faster growth than the regression line predicts. Even after controlling for many other growth determinants, Chile experienced unpredictably rapid economic growth relative to its level of banking sector development.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

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 the third regression of table 2. 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

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).

Panel results

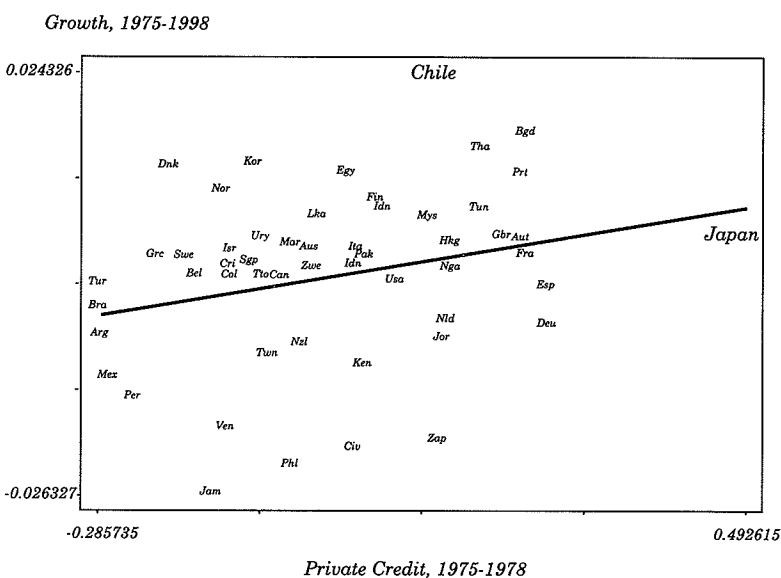
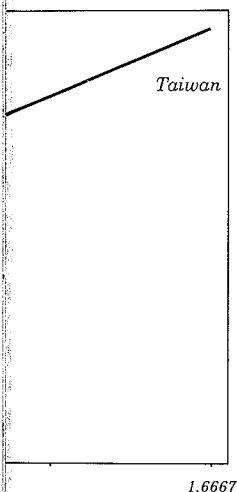
The dynamic panel results and stock market liquidity effects (see table 3). These results are dynamic panel results show the bias, country fixed effects, and capita GDP in the regression, positive relationship with economic growth, we do not simultaneously information set in a single regression variables one at a time to demonstrate

Discussion

The results strongly suggest financial development and economic growth. The results are robust to the inclusion of initial conditions and including the initial

al Scatter Plot

Figure 2. Growth versus Private Credit: Partial Scatter Plot



growth relative to bank in the regression line growth determinants, economic growth relative to generally, Chile does fitted values from the while its actual growth

gression, we still get a both turnover and bank of table 2. Thus, across n stock markets, banks, other growth determi-

alter the relationship be- rely, there is not a strong economic growth (as shown

Panel results

The dynamic panel results confirm that banking sector development and stock market liquidity exert a positive influence on economic growth (see table 3). These results are based on Beck and Levine (2002b). The dynamic panel results show that even after controlling for simultaneity bias, country fixed effects, and the biases induced by including lagged per capita GDP in the regression, financial development still has a robust, positive relationship with economic growth. Owing 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.

Discussion

The results strongly suggest a positive relationship between financial development and economic growth. Even after controlling for outliers and including the initial years of the Asian financial crisis, we

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

Regressor	(1)	(2)	(3)	(4)	(5)
Constant	1.898 (0.394)	6.156 (0.182)	4.582 (0.685)	3.113 (0.189)	1.884 (0.430)
Log of initial per capita income	-0.683 (0.275)	0.048 (0.945)	-0.299 (0.691)	-0.619 (0.249)	-0.723 (0.239)
Average years of schooling ^c	-3.004 (0.277)	-3.738 (0.119)	-4.080 (0.168)	-3.221 (0.157)	-2.979 (0.283)
Government consumption ^b		-2.581 (0.111)			
Trade openness ^b			-0.693 (0.753)		
Inflation rate ^c				-1.976 (0.079)	
Black market premium ^c					-0.069 (0.966)
Bank credit ^b	2.202 (0.001)	1.762 (0.025)	2.133 (0.048)	1.954 (0.003)	2.262 (0.001)
Turnover ratio ^b	0.993 (0.012)	0.944 (0.064)	0.736 (0.172)	0.950 (0.008)	1.058 (0.014)
<i>Summary statistics</i>					
Sargan test ^d (<i>p</i> value)	0.448	0.554	0.649	0.698	0.552
Serial correlation test ^e (<i>p</i> value)	0.558	0.752	0.528	0.422	0.507
Wald test for joint significance (<i>p</i> value)	0.001	0.002	0.018	0.001	0.001
Number of countries	40	40	40	40	40
Number of observations	106	106	106	106	106

Source: Beck and Levine (2001).

a. The regressions use the Calderón, Chong and Loayza (2000) GMM estimator; *p* values are in parentheses.

b. In the regression, this variable is included as log(variable)

c. In the regression, this variable is included as log(1 + variable)

d. The null hypothesis is that the instruments used are not correlated with the residuals.

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

continue to find that 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 predicted growth rate (1.9 percent) is less than half of the actual growth rate experienced by Chile (4.2 percent). 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. The regression do not account for the development and superior growth process in Chile is fundamental that Chile should not be included should not be used to assess growth variables; (c) the regression is not (d) Chile will need to improve bank liquidity substantially to continue to cannot unequivocally distinguish we do not know of convincing mentally different. Nor do we have results, because we confirmed the variables and employing panel effects. The estimated regression along some important dimensions when using cross-country regression panel techniques over five-year

2. BANK REGULATION AND

As noted in the introduction, supervision and not stock market new dataset on bank regulation. Caprio, and Levine, 2001a, 2001 on stock market policies. The and not by an assessment of the markets. Indeed, although Chile's system relative to its rapid growth, market liquidity and growth is more our focus on bank regulation. that banks are crucial to economic nation of bank regulation and the last section's study of banks does not, however, link the two sectors.

2.1 Data and Issues

This subsection briefly reviews the debates surrounding key issues

Growth: Panel GMM

(3)	(4)	(5)
4.582 (0.685)	3.113 (0.189)	1.884 (0.430)
-0.299 (0.691)	-0.619 (0.249)	-0.723 (0.239)
-4.080 (0.168)	-3.221 (0.157)	-2.979 (0.283)
-0.693 (0.753)		
	-1.976 (0.079)	
		-0.069 (0.966)
2.133 (0.048)	1.954 (0.003)	2.262 (0.001)
0.736 (0.172)	0.950 (0.008)	1.058 (0.014)
0.649 0.528 0.018	0.698 0.422 0.001	0.552 0.507 0.001
40 106	40 106	40 106

estimator; *p* values are in parentheses.

ed with the residuals.
exhibit no second-order serial correlation.

liquidity and banking sector
n growth.

well. As noted, the predicted
e actual growth rate experi-
specific relationship between
market liquidity than other
l variables included in the
between low stock market

liquidity and fast growth in Chile. Chile also has average bank development but grew very rapidly. Again, the other control variables included in the regression do not account for 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, such that 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 misspecified 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. Nor do we believe that omitted variables drive the results, because we confirmed the results using an assortment of control variables and employing panel techniques that eliminate country-specific effects. The estimated regression could conceivably be severely misspecified along some important dimension, but we get remarkably similar results when using cross-country regressions over long horizons and when using panel techniques over five-year intervals.

2. BANK REGULATION AND SUPERVISION

As noted in the introduction, we examine bank regulation and supervision and not stock market policies because we have access to a new dataset on bank regulation and supervision around the world (Barth, Caprio, and Levine, 2001a, 2001c), but we do not have comparable data on stock market policies. The choice is thus driven by data availability and not by an assessment that banks are more important than markets. Indeed, although Chile has a notably underdeveloped banking system relative to its rapid growth, the disparity between stock market liquidity and growth is much more notable. Another motivation for our focus on bank regulation, as emphasized in the introduction, is that 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.

2.1 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, 2001c). Those two papers discuss the data in detail and also provide a more complete description of the theoretical and policy debates. This paper differs from the analyses undertaken in Barth, Caprio, and Levine (2001a, 2001c) in that we focus on comparing Chile with other countries.

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 limiting their ability to own nonfinancial firms reduces conflicts of interest, constrains the banks' ability to assume excessive risk, and keeps financial intermediaries from becoming too large to supervise. On the other hand, others 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, 2001c) measure the degree to which the national regulatory authorities in the sample countries allow banks to engage in the following activities. Countries receive a value between 1 and 4, where 1 means the activity is allowed within the bank, 2 means it is allowed within a subsidiary, 3 means there are regulatory restrictions on the activity, and 4 means it is prohibited.

Securities activities: the ability of banks to engage in the business of securities underwriting, brokering, and dealing, as well as all aspects of the mutual fund industry.

Insurance activities: the ability of banks to engage in insurance underwriting and selling.

Real estate activities: the ability of banks to engage in real estate investment, development, and management.

Bank ownership of nonfinancial firms: the ability of banks to own and control nonfinancial firms.

Restrictions on bank activities: total restrictions, including 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 the first four variables.

Competition regulatory variables

Economic theory provides conflicting views on the need for and the effects of regulations on entry into the banking sector. A Pigouvian

view holds that government should shut out bad banks, and thereby prevent bank failures. Also, banks with considerable franchise value should be treated as a special case. Alternatively, some authors argue that economic reasons for regulating entry include the use of entry restrictions to reward banks for their support, and collect bribes (Shleifer and Vishny, 1998). In an open, competitive banking system, one to produce powerful institutions in ways that adversely affect the economy.

We use two of the Barth, Caprio, and Levine (2001a, 2001c) measures of regulatory impediments to entry:

Requirements for entry: the number of legal requirements for obtaining a license (might be prudent requirements that their effects remain an empirical question).

Fraction of entry applications denied: the fraction of applications denied, subdivided into domestic and foreign applications denied) and the fraction of applications denied).

Capital regulations

Bank regulators and supervisors use capital regulations. Capital, or net worth, is added, with limited liability, to the assets of bank owners to shift the risk of insurance (whether implicit or explicit) to help align bank owners' incentives with those of creditors. Researchers, however, disagree about the effects of capital requirements and whether the capital standards are those that would be demanded by market participants. Many hold that one should increase risk-taking behavior by relaxing restrictions on whether capital requirements affect performance and stability.

We use the Barth, Caprio, and Levine (2001a, 2001c) measure of stringency to measure each of the following:

Capital regulatory index:

All of the data are taken (c). Those two papers describe a complete description of which differs from the analyses (2001a, 2001c) in that we es.

s
about the efficacy of imposing banks. Many argue that insurance, and real estate on financial firms reduces ability to assume excessive becoming too large to submitting banks to engage in to exploit economies of ctive financial services.

c) measure the degree to the sample countries alities. Countries receive a ctivity is allowed within iduary, 3 means there are means it is prohibited.

to engage in the business dealing, as well as all as-

s to engage in insurance

s to engage in real estate

the ability of banks to own

ictions, including restrictions activities plus restrictions financial firms. This variable first four variables.

vs on the need for and the cing 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. Alternatively, some authors argue that while there may exist valid economic reasons for regulating entry, politicians and regulators often use entry restrictions to reward friendly constituents, extract campaign support, and collect bribes (Shleifer and Vishny, 1993). Furthermore, an open, competitive banking sector may be less likely than a restricted one to produce powerful institutions that unduly influence policymakers in ways that adversely affect bank performance and stability.

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

Requirements for entry into banking: a measure of the specific legal requirements for obtaining a license to operate as a bank. These might be prudent requirements or excessive regulatory barriers, so their effects remain an empirical issue.

Fraction of entry applications denied: a measure of the fraction of applications denied, subdivided into foreign denials (the fraction of foreign applications denied) and domestic denials (the fraction of domestic applications denied).

Capital regulations

Bank regulators and supervisors frequently focus on capital regulations. Capital, or net worth, serves as a buffer against losses. In addition, with limited liability, greater capital reduces the incentives for bank owners to shift toward more risky activities. With deposit insurance (whether implicit or explicit), higher levels of capital may help align bank owners' incentives with those of depositors and other creditors. Researchers, however, disagree on whether the imposition of capital requirements actually reduces risk taking. Many doubt whether the capital standards set by regulators and supervisors mimic those that would be demanded by well-informed, private-market participants. Many hold that official capital requirements frequently increase risk-taking behavior. Theory thus provides conflicting predictions on whether capital requirements curtail or promote bank performance and stability.

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

Capital regulatory index: measures the extent of regulatory re-

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

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, while banks are prone to contagious and socially costly bank runs stemming from informational asymmetries. 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. Powerful supervision and regulation may thus 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 their internal organizational structure; force banks to constitute provisions; suspend dividends, bonuses, and management fees; declare a bank insolvent; and remove and replace management and directors. It ranges in value from 0 to 14, with higher values signifying greater official supervisory power.

Private monitoring variables

Many countries promote private monitoring of banks. They do this by requiring banks to obtain certified audits or ratings (or both) from international rating agencies, by 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 mar-

kets, accounting standards, and perspective, countries with weak financial supervision and regulation, and sector monitoring.

We use a variety of measurements to encourage private sector monitoring. *Required certified audit:* certified audit is required of the financial institutions. A certified audit would presumably indicate an independent assessment of the accounts to the public.

Rating of ten biggest banks: the percentage of the top ten banks that are rated by rating agencies. The greater the percentage, the more aware of the overall conditions of the banks is an independent third party.

No explicit deposit insurance: the absence of an explicit deposit insurance scheme would indicate more private monitoring.

Bank accounting: takes a value of 1 if it includes accrued or unpaid interest on deposits when banks are required to provide a statement.

Private monitoring index: is the sum of the three measures above, as well as three other measures. If the sum of the percent of ten biggest banks that are rated by agencies, the index equals 1 if the

Deposit insurance schemes

The pros and cons of deposit insurance have been debated for a century. Countries often adopt deposit insurance for protection for unsophisticated depositors. Deposit insurance prevents—or at least reduces—the risk of withdrawing their funds all at once. Potential gains from a deposit are reduced, however. Deposit insurance encourages depositors to have fewer incentives to monitor banks.

Moral hazard index: based on the work of (2002), who use principal component analysis to identify the sign features of deposit insurance. The index of deposit insurance generosity

that banks must have relationships with the source of funds that is other than cash or government. Whether the sources of capital are government authorities. The index ranges from 0 to 14, indicating greater stringency.

ables

ally important for development. The line of reasoning is neither the ability nor the extent to which official supervision is prone to contagious and informational asymmetries. Market failures and thereby

ve implications of powerful supervisory agencies. Powerful supervisory agencies and extract constituents and extract may thus boost corruption or stability.

extent to which official supervision is prone to contagious and informational asymmetries. Market failures and thereby have implications of powerful supervisory agencies. Powerful supervisory agencies and extract constituents and extract may thus boost corruption or stability.

oring of banks. They do this through ratings (or both) from bank directors legally liable or by compelling banks to provide consolidated information on the management procedures. Some countries have a high level of trust in private sector and a well developed capital mar-

kets, 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.

Required certified audit: 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.

Rating of ten biggest banks by international rating agencies: the percentage of the top ten 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.

No explicit deposit insurance scheme: takes a value of 1 if there is an explicit deposit insurance scheme, and 0 otherwise. A lower value would indicate more private monitoring.

Bank accounting: 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.

Private monitoring index: includes the four preceding variables, as well as three other measures are included in the index based. In the case of the percent of ten biggest banks that are rated by international rating agencies, the index equals 1 if the percentage is 100; 0 otherwise.

Deposit insurance scheme variables

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 prevents—or at least restrains—poorly informed depositors from withdrawing 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 (2002), who use 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 nine specific

components. Here, we list the specific components, summarize the Demirgüç-Kunt and Detragiache (2002) findings, and note Chile's policies according to each component.

(a) 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.)

(b) They find that coinsurance—in which depositors face a deductible on their deposits—limits the generosity of the deposit insurance regime and the extent of moral hazard. (Chile has some coinsurance.)

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

(d) They find that the coverage of foreign currency deposits increases moral hazard. (Chile covers foreign currency deposits.)

(e) They find that the coverage of interbank loans increases moral hazard. (Chile does not cover interbank deposits.)

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

(g) They find that government-funded deposit insurance schemes are associated with greater moral hazard than bank-funded schemes. (Chile's deposit insurance system is funded by the government.)

(h) 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.)

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

2.2 Past Results on Regulation, Supervision, and Bank Performance

Barth, Caprio, and Levine (2001c) 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 powerful official supervisory agencies, restrictions on bank activities, and tight entry restrictions, but it is negatively associated with regulations that promote private sector monitoring.

Finance and Growth

Bank development is negatively associated with bank activities and tight entry restrictions. Tight entry restrictions with regulations that promote bank development.

Generous deposit insurance is negatively associated with bank fragility.

Capital regulations, restrictions on bank activities, and official supervision do not mitigate the moral hazard associated with deposit insurance.

These results are summarized in Table 1. The regression coefficients on the link between bank development and bank fragility are on the one hand, and bank development and bank growth on the other. The regression results are similar to those of Barth (2001c), who also conduct a battery of regressions on many other explanatory variables, including bank capitalization, and use instrumental variables to control for endogeneity bias. The first regression examines the impact of capital and supervisory practices that restrict bank activities and permit banks to engage in riskier activities. These banks tend to have better-developed supervisory practices that restrict bank activities and do not implement capital requirements that encourage private sector monitoring. The regression examines interest margin, interest income and interest expense. The second regression examines the impact of regulatory restrictions on bank activities, including bank interest income margin, bank capitalization, and the impact of regulations and supervisory practices. The dependent variable in regression 2 is bank fragility. The regression examining whether the country engages in bank development. The dependent variable in logit regression to assess the impact of deposit insurance, which is reflected in a higher probability of suffering from bank fragility in countries that restrict bank activities and do not diversify their income streams. The sample in the third regression is the same as the sample in the first regression. The regression results confirm the findings of Barth, Caprio, and Levine (2001c) re-

8. See Barth, Caprio, and Levine (2001c) re-

Bank development is negatively associated with restrictions on bank activities and tight entry restrictions; but it 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 (2001c), 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 promote private sector monitoring of banks and permit banks to engage in a 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.⁸ 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 small because there is little 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 (2001c) regressions.

8. See Barth, Caprio, and Levine (2001c) for details.

Table 4. Bank Regulation, Supervisory Practices, and Bank Performance^a

Regressor	Dependent variable		
	Bank credit	Interest margin ^b	Major crisis ^c
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)
<i>Summary statistics</i>			
No. observations	76	75	48
R ²	0.27	0.19	0.39

a. The major crisis regression is estimated using a probit regression. The *R* squared statistic is the McFadden *R* squared statistic for logit regressions; *p* values in parenthesis below coefficients.

b. Interest margin equals interest income less income expense computed from bank level data (Barth, Caprio, Levine, 2001b).

c. Major crisis is a binary variable that indicates whether the country has experienced a systematic banking crisis.

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 (2001c) 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 client countries to adopt exactly the wrong approach to commercial bank regulation and supervision.

The Barth, Caprio, and Levine (2001c) results instead suggest that forcing information disclosure, empowering private sector monitoring

Finance and Growth

of banks, and reducing the general moral hazard problem, to ease the moral hazard problem and improve performance and stability. These findings suggest that official supervision and regulatory restrictions, private sector monitoring of bank performance, and bank performance.

2.3 Chile: Past and Present

Given these findings, we now examine the impact of the supervisory system in an international context. We are able to include many details about the impact of regulation and supervision in Chile on bank performance in a broad international context. We compare supervisory strategies around the world.

Table 5 presents data on bank performance in Chile as well as in samples of all countries in the world and Latin American countries. We compare the performance of different groups of countries. We examine the impact of the period 1987–1990 to trace the impact of regulation and supervision in Chile over time.

Chile has comparatively low restrictions. The overall restriction index is 9.8, on average, both across all countries and middle-income countries and Latin American countries. Furthermore, this aggregate index of restrictions on bank activities has not changed much since 1987. Budnevich (2000, p. 13) explains that the 1980 law expanded the set of activities that banks can engage in. This change, however, was not reflected in the aggregate index of restrictions on bank activities (Barth, Caprio and Levine (2001a). As shown in Table 5, Barth (2001c) find that countries with fewer restrictions on bank activities tend to have higher levels of bank performance, and that countries with fewer restrictions

9. For an excellent review of the impact of the banking system on economic growth in the 1980s, see Valdés (1992).

Dependent variable

Interest margin ^b	Major crisis ^c
0.019 (0.466)	-8.686 (0.040)
-0.005 (0.010)	0.485 (0.159)
0.003 (0.045)	0.608 (0.002)
0.004 (0.031)	0.276 (0.241)
-0.001 (0.793)	-0.468 (0.114)
0.001 (0.588)	0.091 (0.566)
	0.817 (0.000)
75 0.19	48 0.39

a. The *R* squared statistic is the McFadden
below coefficients.
b. Computed from bank level data (Barth, Caprio,
c. Country has experienced a systematic banking crisis.

efficacy of a regulatory strat-
ical oversight of banks and
is is the approach currently
ancial institutions. Indeed,
Its suggest that increasing
e most corrupting in coun-
ns. Since developing coun-
ems than developed econo-
ons may be pushing client
h to commercial bank regu-

results instead suggest that
g 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.

2.3 Chile: Past and Present

Given these findings, we now examine Chile's bank regulatory and supervisory system in an international context. Although we are not able to include many details and subtleties associated with bank regulation and supervision in Chile and other countries, 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, as well as in samples of 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 1987–1990 to trace changes in commercial bank regulation and supervision in Chile over the last decade.⁹

Chile has comparatively tight restrictions on bank activities. The overall restriction index is 12 in Chile in 1999, compared with 9.8, on average, both across all countries and among other upper-middle-income countries and 10.1, on average, 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 (2001c) 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.

9. For an excellent review of Chile's banking system performance and the impact of the banking system on the macroeconomy since the banking crisis of the 1980s, see Valdés (1992).