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# Stock Market Development and Long-Run Growth

Ross Levine and Sara Zervos

*Is the financial system important for economic growth? One line of research argues that it is not; another line stresses the importance of the financial system in mobilizing savings, allocating capital, exerting corporate control, and easing risk management. Moreover, some theories provide a conceptual basis for the belief that larger, more efficient stock markets boost economic growth. This article examines whether there is a strong empirical association between stock market development and long-run economic growth. Cross-country growth regressions suggest that the predetermined component of stock market development is positively and robustly associated with long-run economic growth.*

To assess whether stock markets are merely burgeoning casinos where more and more players are coming to place bets, or whether stock markets are importantly linked to economic growth, this article reviews a diffuse theoretical literature and presents new empirical evidence. In terms of theory, a growing literature argues that stock markets provide services that boost economic growth. Greenwood and Smith (forthcoming) show that large stock markets can lower the cost of mobilizing savings and thereby facilitate investment in the most productive technologies. Bencivenga, Smith, and Starr (1996) and Levine (1991) argue that stock market liquidity—the ability to trade equity easily—is important for growth. Although many profitable investments require a long-run commitment of capital, savers do not like to relinquish control of their savings for long periods. Liquid equity markets ease this tension by providing an asset to savers that they can quickly and inexpensively sell. Simultaneously, firms have permanent access to capital raised through equity issues. Moreover, Kyle (1984) and Holmstrom and Tirole (1993) argue that liquid stock markets can increase incentives for investors to get information about firms and improve corporate governance. Finally, Obstfeld (1994) shows that international risk sharing through internationally integrated stock markets improves resource allocation and can accelerate the rate of economic growth.

Ross Levine is with the Policy Research Department at the World Bank, and Sara Zervos is with the Finance Department at Brunel University. This article was originally prepared for the World Bank conference on Stock Markets, Corporate Finance, and Economic Growth, held in Washington, D.C., February 16–17, 1995. The authors acknowledge helpful advice from Mark Baird, John Boyd, Gerard Caprio, Aslı Demirgüç-Kunt, William Easterly, Michael Gavin, Robert Korajczyk, Lant Pritchett, Sergio Rebelo, William Schwert, Bruce Smith, Alan Stockman, David Zervos, and two anonymous referees.

Theoretical disagreement exists, however, about the importance of stock markets for economic growth. Mayer (1988) argues that even large stock markets are unimportant sources of corporate finance. Stiglitz (1985, 1994) says that stock market liquidity will not enhance incentives for acquiring information about firms or exerting corporate governance. Moreover, Devereux and Smith (1994) emphasize that greater risk sharing through internationally integrated stock markets can actually reduce saving rates and slow economic growth. Finally, the analyses of Shleifer and Summers (1988) and Morck, Shleifer, and Vishny (1990a, 1990b) suggest that stock market development can hurt economic growth by easing counterproductive corporate takeovers.

We use cross-country regressions to examine the association between stock market development and economic growth. To conduct this investigation, we need measures of stock market development. Theory does not provide a unique concept or measure of stock market development, but it does suggest that stock market size, liquidity, and integration with world capital markets may affect economic growth. Consequently, we use a conglomerate index of overall stock market development constructed by Demirgüç-Kunt and Levine (1996).[1]

More specifically, we use pooled cross-country, time-series regressions to evaluate the relationship between stock market development and economic growth. Using data on forty-one countries over the period from 1976 to 1993, we split the sample period, so that each country has two observations (data permitting) with data averaged over each subperiod. In the tradition of recent work (Barro 1991), we regress the growth rate of gross domestic product (GDP) per capita on a variety of variables designed to control for initial conditions, political stability, investment in human capital, and macroeconomic conditions. We then include the conglomerate index of stock market development. Thus, we evaluate whether there is a relationship between economic growth and stock market development that is independent of other variables associated with economic growth.

Our article builds on Atje and Jovanovic's (1993) study of stock market trading and economic growth in two ways. First, we use indexes of stock market development that combine information on stock market size, trading, and integration. Second, we control for initial conditions and other factors that may affect economic growth in light of the evidence that many cross-country regression results are fragile to changes in the conditioning information set (Levine and Renelt 1992). Thus, we gauge the robustness of the relationship between overall stock market development and economic growth to changes in the conditioning information set. We find a strong correlation between overall stock market development and long-run economic growth. After controlling for the initial level of GDP per capita, initial investment in human capital, political instability, and measures of monetary, fiscal, and exchange rate policy, stock market development remains positively and significantly correlated with long-run eco-

1. When we ran the regressions using the other aggregate indexes in Demirgüç-Kunt and Levine (1996), the results were similar to those presented in table 1.

nomic growth. The results are consistent with theories that imply a positive relationship between stock market development and long-run economic growth. The results are inconsistent with theories that predict no correlation or a negative association between stock market development and economic performance.

Cross-country growth regressions suffer from measurement, statistical, and conceptual problems. In terms of measurement problems, country officials sometimes define, collect, and measure variables inconsistently across countries. Further, people with detailed country knowledge frequently find discrepancies between published data and what they know happened. In terms of statistical problems, regression analysis assumes that the observations are drawn from the same population; yet vastly different countries appear in cross-country regressions. Many countries may be sufficiently different to warrant separate analyses. Conceptually, we should interpret the coefficients from cross-country regressions cautiously. When averaging over long periods, many changes are occurring simultaneously: countries change policies, economies experience business cycles, and governments rise and fall. Thus, aggregation may blur important events and differences across countries. Analysts should extend this research by examining the time-series relationship between stock market development and economic growth. Also, cross-country regressions do not resolve issues of causality. Consequently, we should not view the coefficients as elasticities that predict the magnitude of the change in growth following a particular policy reform. Instead, the coefficient estimates and the associated *t*-statistics should be used to evaluate the strength of the partial correlation between stock market development and economic growth.

These measurement, statistical, and conceptual problems, however, should not detract from the benefits that can accrue from cross-country comparisons. Elucidating cross-country empirical regularities between stock market development and economic growth will influence beliefs about this relationship and shape future theoretical and empirical research. Put differently, beliefs about stock markets and growth not supported by cross-country comparisons will be viewed more skeptically than those views confirmed by cross-country regressions.

Section I reviews the theoretical literature on the functioning of stock markets and economic growth. Section II turns to the data and constructs a conglomerate measure of stock market development. Section III evaluates the strength of the empirical link between stock market development and long-run economic growth. Section IV summarizes the findings.

## I. Theoretical Framework

Is the financial system important for economic growth? One line of research argues that the financial system is unimportant for economic growth; another line stresses the importance of the financial system in mobilizing savings, allocating capital, exerting corporate control, and easing risk management. Fur-

thermore, some theories provide a conceptual basis for believing that larger, more efficient stock markets boost economic growth.

In a recent survey of development economics, Stern (1989) does not mention the role of the financial system in economic growth. At the end of his review, Stern lists various issues that he did not have sufficient space to cover. Finance is not even included in the list of omitted topics. Similarly, a recent collection of essays by the pioneers of development economics, including three Nobel prize-winners, does not describe the role of the financial system in economic growth (Meier and Seers 1984). Clearly, according to these economists, the financial system plays an inconsequential role in economic development. Furthermore, 1995 Nobel prizewinner Robert Lucas argues that economists frequently exaggerate the role of financial factors in economic development (Lucas 1988). Such a view is not limited to the recent past; Robinson (1952) argues that the financial system does not spur economic growth; financial development simply responds to developments in the real sector. Thus, many influential economists give a very minor role, if any, to the financial system in economic growth.[2]

In contrast, a prominent line of research stresses the role of the financial system in economic growth. Bagehot (1962), Schumpeter (1932), Cameron and others (1967), Goldsmith (1969), and McKinnon (1973) provide conceptual descriptions of how, and empirical examples of when, the financial system affects economic growth. Building on these seminal contributions, Gelb (1989), Ghani (1992), King and Levine (1993a, 1993b), and De Gregorio and Guidotti (1995) show that measures of banking development are strongly correlated with economic growth in a broad cross-section of countries. According to this vein of research, a well-functioning financial system is critical for sustained economic growth.

Besides evaluating the general importance of the financial system, this article provides empirical evidence regarding the growing debate concerning the specific role of stock markets in economic growth. A burgeoning theoretical literature suggests that the functioning of equity markets affects liquidity, risk diversification, acquisition of information about firms, corporate control, and savings mobilization. By altering the quality of these services, the functioning of stock markets can alter the rate of economic growth. Debate exists, however, over the sign of this effect. Specifically, some models suggest that stock market development has a negative effect on growth, while other models predict a positive relationship between stock market development and economic growth.

Stock markets may affect economic activity through their *liquidity*. Many high-return projects require a long-run commitment of capital. Investors, however, are generally reluctant to relinquish control of their savings for long periods. Therefore, without liquid markets or other financial arrangements that promote liquidity, less investment may occur in the high-return projects. Levine (1991) and Bencivenga, Smith, and Starr (1996) show that stock markets may

2. Many of these references are from Chandavarkar's (1992) insightful discussion of financial and economic development.

arise to provide liquidity: savers have liquid assets—such as equities—while firms have permanent use of the capital raised by issuing equities. Liquid stock markets reduce the downside risk and costs of investing in projects that do not pay off for a long time. With a liquid equity market, the initial investors do not lose access to their savings for the duration of the investment project because they can quickly, cheaply, and confidently sell their stake in the company. Thus, more liquid stock markets ease investment in long-run, potentially more profitable projects, thereby improving the allocation of capital and enhancing prospects for long-term growth. Theory is unclear, however, about the effects of greater liquidity on growth. Bencivenga and Smith (1991) show that by reducing uncertainty, greater liquidity may reduce saving rates enough to slow growth.

*Risk diversification* through internationally integrated stock markets is another vehicle by which stock market development may influence economic growth. Saint-Paul (1992), Devereux and Smith (1994), and Obstfeld (1994) demonstrate that stock markets provide a vehicle for diversifying risk. These models also show that greater risk diversification can influence growth by shifting investment into higher-return projects. Intuitively, because projects with high expected returns also tend to be comparatively risky, better risk diversification through internationally integrated stock markets will foster investment in projects with higher returns. Again, however, theory suggests circumstances in which greater risk sharing slows growth. Devereux and Smith (1994) and Obstfeld (1994) show that reduced risk through internationally integrated stock markets can depress saving rates, slow growth, and reduce economic welfare.

Stock markets may also promote the *acquisition of information about firms* (Grossman and Stiglitz 1980; Kyle 1984; Holmstrom and Tirole 1993). In larger and more liquid markets it will be easier for an investor who has gotten information to trade at posted prices. The investor will thus be able to make money before the information becomes widely available and prices change. The ability to profit from information will stimulate investors to research and monitor firms. Better information about firms will improve resource allocation and spur economic growth. Opinions differ, however, on the importance of stock markets in stimulating the acquisition of information. Stiglitz (1985, 1994), for example, argues that well-functioning stock markets quickly reveal information through price changes. Quick public revelation will reduce—not enhance—incentives for expending private resources to obtain information. Thus, theoretical debate still exists on the importance of stock markets in enhancing information.

Stock market development may also influence *corporate control.* Diamond and Verrecchia (1982) and Jensen and Murphy (1990) show that efficient stock markets help mitigate the principal-agent problem. Efficient stock markets make it easier to tie manager compensation to stock performance. A closer link helps to align the interests of managers and owners. Furthermore, Laffont and Tirole (1988) and Scharfstein (1988) argue that takeover threats induce managers to maximize a firm's equity price. Thus, well-functioning stock markets that ease corporate takeovers can mitigate the principal-agent problem and promote effi-

cient resource allocation and growth. Opinion differs on this issue, too. Stiglitz (1985) argues that outsiders will be reluctant to take over firms because outsiders generally have worse information about firms than do owners. Thus, the takeover threat will not be a useful mechanism for exerting corporate control; stock market development, therefore, will not improve corporate control significantly (Stiglitz 1985). Moreover, Shleifer and Vishny (1986) and Bhide (1993) argue that greater stock market development encourages more diffuse ownership and this diffusion of ownership impedes effective corporate governance. Finally, Shleifer and Summers (1988) note that by simplifying takeovers, stock market development can stimulate welfare-reducing changes in ownership and management.

In terms of raising capital, Greenwood and Smith (forthcoming) show that large, liquid, and efficient stock markets can ease *savings mobilization*. By agglomerating savings, stock markets enlarge the set of feasible investment projects. Since some worthy projects require large capital injections and some enjoy economies of scale, stock markets that ease resource mobilization can boost economic efficiency and accelerate long-run growth. Disagreement exists, however, on the importance of stock markets for raising capital. Mayer (1988), for example, argues that new equity issues account for a very small fraction of corporate investment.

## II. Measures of Stock Market Development

Each theoretical model in the literature focuses on one characteristic of the functioning of stock markets, such as size, liquidity, or integration. Consequently, one research strategy is to evaluate empirically, characteristic by characteristic, the predictions from each individual theoretical model. Although useful, this strategy is model-specific and focuses narrowly on individual characteristics. We take a different approach here, as do Demirgüç-Kunt and Levine (1996) and Demirgüç-Kunt and Maksimovic (1996). We use a multifaceted measure of overall stock market development that combines the different individual characteristics of the functioning of stock markets. Thus, we provide an empirical assessment of whether overall stock market development is strongly connected with long-run economic growth.

### *Individual Stock Market Development Indicators*

We use individual indicators of size, liquidity, and risk diversification. We measure the *size* of the stock market using the ratio of market capitalization divided by GDP. Market capitalization equals the total value of all listed shares. The assumption underlying the use of this variable as an indicator of stock market development is that the size of the stock market is positively correlated with the ability to mobilize capital and diversify risk.

We measure the *liquidity* of the stock market in two ways. First, we compute the ratio of total value of trades on the major stock exchanges to GDP. This ratio measures the value of equity transactions relative to the size of the economy.

This liquidity measure complements the measure of stock market size because markets may be large but inactive. Second, we compute the ratio of the total value of trades on the major stock exchanges divided by market capitalization. This ratio, frequently called the turnover ratio, measures the value of equity transactions relative to the size of the equity market. The turnover ratio also complements the measure of stock market size as well as the total value of equity transactions divided by GDP, because markets may be small (compared with the whole economy) but liquid. The liquidity indicators do not directly measure the ease with which agents can buy and sell securities at posted prices. They do, however, measure the degree of trading, compared with the size of both the economy and the market. Since liquidity may significantly influence growth by easing investment in large, long-term projects and by promoting the acquisition of information about firms and managers, we include these two liquidity measures in our stock market development index.

Theory suggests that the ability to *diversify risk*—by investing in an internationally diversified portfolio of stocks—can influence investment decisions and long-run growth rates (Devereux and Smith 1994; Obstfeld 1994). Barriers to international capital flows—such as taxes, regulatory restrictions, information asymmetries, and sovereign risk—may impede the ability of investors to diversify risk internationally. Thus, international capital flow barriers will impede risk diversification, reduce capital market integration, and keep arbitrageurs from equalizing the price of risk internationally. To measure the ability of agents to diversify risk internationally, we use Korajczyk's (1996) estimate of the degree of international integration of national stock markets.

Korajczyk (1996) uses a multifactor International Arbitrage Pricing Model (IAPM) to measure stock market integration. The IAPM implies that the expected excess return on each asset is linearly related to a linear combination of benchmark portfolios. For the benchmark portfolios, $P$, Korajczyk (1996) estimates the common factors based on an international portfolio of equities using the asymptotic principal components procedures of Connor and Korajczyk (1986). Given $m$ assets and $T$ periods, consider the following regression:

$$(1) \qquad R_{i,t} = \alpha_i + b_i P_t + \varepsilon_{i,t}, \qquad i = 1, 2, \ldots, m; \qquad t = 1, 2, \ldots, T$$

where $R_{i,t}$ is the excess return on asset $i$ in period $t$ above the return on a risk-free asset or zero-beta asset. In perfectly integrated stock markets, the intercept in a regression of any asset's excess return on $P$ should be zero. Specifically, the IAPM plus the assumption of perfect integration imply that

$$(2) \qquad \alpha_1 = \alpha_2 = \ldots = \alpha_m = 0.$$

Rejection of the restrictions defined by equation 2 can be defined as rejection of the underlying asset pricing model or rejection of the assumption of market integration.

Korajczyk (1996) refers to $\alpha_i$ as the mispricing of asset $i$ relative to the benchmark portfolio. We interpret estimates of the absolute value of the intercept terms from equation 1 as measures of market integration and the ability of agents to diversify risk internationally. Larger absolute values imply less integrated stock markets. To compute estimates of stock market integration for each national market, we compute the average of the absolute value of $\alpha_i$ across all assets in each country.[3]

### *Simple Indexes of Stock Market Development*

To measure overall stock market development, we construct an index called STOCK by averaging the means-removed values of the market capitalization ratio, the total value traded ratio, the turnover ratio, and the IAPM pricing error measure of stock market integration.[4] Note that we multiply the absolute value of Korajczyk's (1996) pricing error measure by −1 before constructing the index, STOCK. Thus, larger (less negative) values imply better stock market development. The means-removed market capitalization ratio for country $i$ equals the market capitalization ratio for country $i$ minus the mean for all countries, divided by the mean for all countries. Then we take a simple average of the means-removed market capitalization ratio, the total value traded ratio, the turnover ratio, and the IAPM integration measure to obtain an index of stock market development. More formally, let $S(i, j)$ equal the average value (over the relevant period) of variable $j$ for country $i$. Let $S(j)$ equal the average value of variable $j$ across all countries. Define the means-removed value of $S(i, j)$ as $s(i, j)$, where

$$s(i, j) = [S(i, j) - S(j)] / S(j). \tag{3}$$

Then STOCK1 for country $i$ is

$$\text{STOCK1}(i) = \Sigma_j\, s(i, j) \tag{4}$$

where we take the average across all the variables for country $i$.

### *Financial Depth*

Gelb (1989), Ghani (1992), King and Levine (1993a, 1993b), and De Gregorio and Guidotti (1995) identify a significant correlation between financial depth and long-run economic growth rates in broad cross-country samples. To measure financial depth, these authors typically use a measure of broad money, such

3. For alternative ways of measuring the ability of agents to diversify risk internationally, see Bekaert and Harvey (1995).

4. STOCK equals the stock market development index, INDEX2, of Demirgüç-Kunt and Levine (1996). All of the indexes discussed by Demirgüç-Kunt and Levine (1996) yield similar results in the growth regressions. Thus, we simply report the results using one index. We call this index STOCK instead of INDEX2 for expositional purposes. Also, the IAPM pricing errors are available only for twenty-four countries. Since the indexes are means-removed averages of the *available* indicators, STOCK has values for all forty-one countries. For twenty-four countries, STOCK aggregates information on size, liquidity, and IAPM pricing errors. For the remaining seventeen countries, STOCK aggregates information only on size and liquidity.

as M2, divided by GDP. We use the King and Levine (1993a, 1993b) measure of financial depth, DEPTH, to evaluate whether stock market development is significantly correlated with growth even after controlling for financial depth.

DEPTH is defined as the ratio of liquid liabilities of the financial system to GDP. Liquid liabilities consist of currency held outside the banking system plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries.

## III. Stock Market Development and Long-Run Economic Growth

This section describes the framework and presents the results for the cross-country growth regressions to analyze the impact of stock market development on long-run economic growth.

### *Cross-Country Growth Regression*

This section empirically evaluates whether the index of stock market development, STOCK, is strongly linked to long-run economic growth. To conduct this analysis, we use pooled cross-country, time-series growth regressions. We have data on forty-one countries during the period from 1976 to 1993. Each country has two observations, data permitting. The first observation for each country uses data from 1976 to 1985. The second observation uses data from 1986 to 1993. Thus, the dependent variable, GROWTH, is the real per capita growth rate averaged over the relevant period.

The structure of our regression equation is the following:

$$\text{GROWTH} = \alpha X + \beta(\text{STOCK}) + u \tag{5}$$

where $X$ is a set of control variables, $\alpha$ is a vector of coefficients on the variables in $X$, $\beta$ is the estimated coefficient on STOCK, and $u$ is an error term.[5]

The goal of the empirical analysis is to assess the strength of the independent partial correlation between stock market development and economic growth. Consequently, we use a large set of control variables, $X$, to control for a variety of factors that may be associated with economic growth. $X$ includes initial income (the logarithm of initial real per capita GDP), initial education (the logarithm of the initial secondary school enrollment rate), a measure of political instability (the number of revolutions and coups), the ratio of government consumption expenditures to GDP, the inflation rate, and the black market exchange rate premium.

5. Throughout the analysis we use heteroskedasticity-consistent standard errors as developed by White (1980). We also examine the statistical distribution of the error term and check for the importance of outliers. Bekaert and Harvey (1995) find that stock returns are often not normally distributed. Consequently, some readers may have concerns about the distribution of the error term. However, we do not use data on stock returns but an aggregate index of stock market size, liquidity, and integration. For a discussion of the properties of the error term from cross-section, time-series regressions involving asset pricing errors, see Bekaert and Harvey (1995).

We include initial income and initial education because recent theoretical work suggests an important link between long-run growth and the initial per capita levels of physical and human capital (Lucas 1988; Mankiw, Romer, and Weil 1992). We follow Barro (1991), Barro and Sala-i-Martin (1992), and others in using the secondary school enrollment rate and initial income to proxy for the initial levels of per capita human and physical capital. We include political instability because it may be negatively associated with economic growth.

We include a variety of macroeconomic indicators to evaluate the strength of the partial correlation between stock market development indexes and economic growth (Levine and Renelt 1992; Levine and Zervos 1993). We include the government consumption ratio and the rate of inflation because the evidence suggests a strong connection between macroeconomic policy and economic activity, as shown by Fischer (1993), Easterly and Rebelo (1993), and Bruno and Easterly (1995). We include the black market exchange rate premium because international price distortions may impede economic growth, as suggested by Dollar (1992) and Levine and Zervos (1994). We expect the government consumption ratio, the rate of inflation, and the black market exchange rate premium to enter negatively.

We use instrumental variables to estimate equation 5 for two reasons. First, instrumental variables will help us examine the relationship between growth and the predetermined component of stock market development. If the predetermined component of stock market development (as identified by the instruments) is positively correlated with economic growth, this correlation will indicate that (a) stock market development does not simply follow economic development, and (b) contemporaneous shocks to both stock market development and economic growth are not the only factors that are driving the results. Thus, we use two-stage least squares to examine whether predetermined stock market development is closely associated with economic growth. In addition, because the IAPM pricing errors are generated regressors, which can lead to inconsistent standard errors, we use two-stage least squares to derive consistent standard errors as suggested by Pagan (1984).[6]

For the instrumental variables, we use the logarithm of initial real per capita GDP, the logarithm of the initial secondary school enrollment rate, political instability (the number of revolutions and coups), the initial black market exchange rate premium, the initial inflation rate, the initial ratio of government

6. The two-stage least squares estimator is consistent. Furthermore, we use White's (1980) heteroskedasticity-consistent standard errors. Although the generalized method of moments (GMM) estimator is sometimes used in pooled cross-section, time-series samples to obtain more efficient estimators in the presence of heteroskedasticity and serial correlation in large samples, GMM does not offer much value added in the current context. As we show, the results are already highly significant, so that a potentially more efficient estimator will only make the *t*-statistics larger. Furthermore, we are working with a small sample of only seventy-nine observations, and we do not have a true time-series dimension to the data. We consider only two periods because we average the data over long time periods in order to focus on the relationship between stock market development and *long-run* growth.

spending to GDP, the initial ratio of exports plus imports to GDP, the initial ratio of market capitalization to GDP, the initial ratio of total value traded to GDP, and the initial turnover ratio.[7] These instruments, except for political instability, are predetermined. We use these instrumental variables to extract the predetermined component of the government consumption ratio, the rate of inflation, the black market exchange rate premium, and STOCK.

We obtained the stock market data from the International Finance Corporation's (IFC's) Emerging Markets Data Base and IMF (various issues). Data on real per capita GDP growth, secondary school enrollment rate, and government consumption ratio, and information on exports and imports are from the World Bank's National Accounts Data Base. We obtained the number of revolutions and coups from Barro (1991) and computed per capita GDP from Summers and Heston (1988). Data on the black market exchange rate premium are from *Picks Currency Yearbook* (various issues) and International Currency Analysis, Inc. (various issues).

## *Results*

Table 1 summarizes the results on the links between stock market development and economic growth. Regression 1 presents the regression results when we only include a constant, per capita GDP, the secondary school enrollment rate, and political instability. Regression 2 includes also the government consumption ratio, the rate of inflation, and the black market exchange rate premium. All of the variables enter with the anticipated signs, but only initial income and political instability are consistently significant at the 0.05 level.

Regressions 3 and 4 include the index STOCK. There is a significant, positive correlation between the predetermined component of stock market development and real per capita GDP growth. The relationship between STOCK and growth remains significant at the 0.05 level whether or not we control for the government consumption ratio, rate of inflation, and black market exchange rate premium. Thus, stock market development is positively correlated with economic growth even after controlling for other factors associated with long-run growth.

As shown by Demirgüç-Kunt and Levine (1996), stock market development is positively correlated with measures of financial intermediary development. Consequently, to assess the independent empirical link between stock market development and growth, we include the measure of financial depth, DEPTH, in the growth regression. As shown in regression 5, the predetermined component of DEPTH is positively and significantly correlated with long-run growth at the 0.05 significance level when STOCK is excluded. When all of the variables are included together in regression 6, the predetermined component of STOCK remains positively and significantly correlated with growth. DEPTH, however,

7. The term "initial" refers to variables measured at the start of the estimation period. Since we use pooled cross-country time-series data for the period from 1976 to 1985 and from 1986 to 1993, "initial" refers to 1976 and 1986 measures.

Table 1. *Stock Market Development and Economic Growth, 1976–93*

| | *Regression* | | | | | |
|---|---|---|---|---|---|---|
| *Independent variable* | *1* | *2* | *3* | *4* | *5* | *6* |
| Constant | 0.023 | 0.061 | 0.041 | 0.050 | 0.042 | 0.047 |
| | (1.367) | (2.147) | (2.772) | (1.726) | (2.451) | (1.540) |
| | [0.176] | [0.035] | [0.007] | [0.089] | [0.017] | [0.128] |
| Initial real per capita GDP[a] | −0.011 | −0.007 | −0.012 | −0.010 | −0.015 | −0.007 |
| | (2.256) | (1.378) | (2.625) | (1.835) | (2.637) | (1.430) |
| | [0.027] | [0.172] | [0.011] | [0.071] | [0.010] | [0.157] |
| Secondary school enrollment rate[a] | 0.023 | 0.013 | 0.020 | 0.019 | 0.018 | 0.022 |
| | (2.044) | (0.838) | (2.095) | (1.218) | (1.468) | (1.431) |
| | [0.045] | [0.405] | [0.040] | [0.227] | [0.146] | [0.157] |
| Number of revolutions and coups | −0.019 | −0.018 | −0.015 | −0.016 | −0.011 | −0.021 |
| | (2.710) | (2.362) | (2.514) | (2.337) | (1.518) | (2.241) |
| | [0.008] | [0.021] | [0.014] | [0.022] | [0.133] | [0.028] |
| Ratio of government consumption expenditures to GDP | | −0.128 | | −0.090 | | −0.121 |
| | | (1.911) | | (1.805) | | (1.671) |
| | | [0.060] | | [0.075] | | [0.099] |
| Inflation rate | | −0.022 | | −0.020 | | −0.035 |
| | | (2.001) | | (2.354) | | (1.844) |
| | | [0.049] | | [0.021] | | [0.069] |
| Black market exchange rate premium | | −0.0002 | | −0.00001 | | 0.0001 |
| | | (1.179) | | (0.973) | | (0.234) |
| | | [0.242] | | [0.812] | | [0.816] |
| DEPTH[b] | | | | | 0.026 | −0.021 |
| | | | | | (4.349) | (0.965) |
| | | | | | [0.001] | [0.338] |
| STOCK[c] | | | 0.015 | 0.012 | | 0.020 |
| | | | (5.513) | (4.503) | | (2.205) |
| | | | [0.000] | [0.000] | | [0.031] |

*Note*: Regression results are from pooled, cross-country instrumental variables estimation. The dependent variable is average annual growth rate of per capita GDP. Instruments include the constant term; logarithm of initial real per capita GDP; logarithm of initial secondary school enrollment rate; the number of revolutions and coups; and initial values of the ratio of government consumption expenditures to GDP, the rate of inflation, the black market exchange rate premium, market capitalization, total value traded, the turnover ratios, and the ratio of international trade to GDP. Standard errors are in parentheses; *P*-values are in brackets. Data are for forty-one economies for two periods, 1976–85 and 1986–93. Each regression has seventy-nine observations (data are available for only one period for New Zealand, Pakistan, and Turkey). The forty-one economies are Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Israel, Italy, Japan, Jordan, the Republic of Korea, Luxembourg, Malaysia, Mexico, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Portugal, Singapore, Spain, Sweden, Taiwan (China), Thailand, Turkey, the United Kingdom, the United States, Venezuela, and Zimbabwe.

a. Logarithm of initial value: 1976 for the 1976–85 period and 1986 for the 1986–93 period.

Table 1. *(continued)*

b. DEPTH is a measure of financial depth, the ratio of liquid liabilities of the financial intermediaries to GDP.

c. STOCK is the stock market development index, the average of means-removed values of the market capitalization, total value traded, turnover ratios, and asset pricing theory (APT) mispricing indicator. STOCK includes data on stock market size and liquidity for all forty-one economies. For the IAPM pricing error indicator, data are included for twenty-four economies: Argentina, Australia, Brazil, Chile, Colombia, Greece, India, Indonesia, Japan, Jordan, the Republic of Korea, Malaysia, Mexico, Nigeria, Pakistan, the Philippines, Portugal, Taiwan (China), Thailand, Turkey, the United Kingdom, the United States, Venezuela, and Zimbabwe.

*Source*: Authors' calculations based on stock market data from the IFC's Emerging Markets Data Base and IMF (various issues); data on real per capita GDP growth, the secondary school enrollment rate, and the government consumption ratio and information on exports and imports from the World Bank's National Accounts Data Base; number of revolutions and coups from Barro (1991); data used to compute per capita GDP from Summers and Heston (1988); and data on the black market exchange rate premium from *Picks Currency Yearbook* (various issues) and International Currency Analysis, Inc. (various issues).

becomes insignificant.[8] The instrumental variable results show that the predetermined component of stock market development as extracted by the first-stage regression is strongly, positively correlated with growth.

The empirical relationship between stock market development and long-run growth remains strong even after controlling for initial conditions, inflation, the size of the government, the black market exchange rate premium, and the predetermined component of financial depth. Moreover, the results hold after checking for outliers and removing individual countries. As discussed in the introduction, measurement, statistical, and conceptual problems plague cross-country growth regressions. Nonetheless, the results suggest a comparatively strong link between the functioning of stock markets and economic growth.

## IV. Summary

This article empirically evaluated the relationship between stock market development and long-run growth. The data suggest that stock market development is positively associated with economic growth. Moreover, the instrumental variables procedures indicate a strong connection between the predetermined component of stock market development and long-run economic growth. Although these cross-country growth regressions imply a strong link between stock market development

8. Note that these results do not necessarily conflict with the findings of Gelb (1989), Ghani (1992), King and Levine (1993a, 1993b), and De Gregorio and Guidotti (1995). First, these studies of financial depth typically cover eighty countries over thirty years. This article, because of limited data availability on stock market development, covers only forty-one countries over eighteen years. Second, financial depth is a widely available indicator of overall financial sector development. In contrast, the stock market development index measures the functioning of only one part of the financial system. Clearly, researchers should attempt to build models of and develop data on the links between growth and the different components of the financial system: banks (private and public), nonbanks (mutual funds, private pension funds, insurance companies, and others), stock markets, bond markets, and derivatives markets. By adding stock markets to the study of the ties between finance and growth, we see this article as a small building block toward this longer-term objective.

and economic growth, the results should be viewed as suggestive partial correlations that stimulate additional research rather than as conclusive findings.

Much work remains to better understand the relationship between stock market development and economic growth. Careful case studies might better identify the causal interactions between the two. Future research also needs to identify the policies that will ease sound securities market development.

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