

How Much Do We Really Know about Growth and Finance?

PAUL WACHTEL

The author is a professor of economics and the Jules Backman Faculty Fellow at the Stern School of Business at New York University. This paper was presented at a Federal Reserve Bank of Atlanta conference on finance and growth, November 15, 2002, and at the XI Tor Vergata Conference, University of Rome, December 5, 2002.

An earlier version of some of the ideas in this article appears in Wachtel (2001).

The author thanks Peter Rousseau for invaluable comments and advice.

Development economics has changed profoundly in the course of one generation. Twenty-five years ago the emphasis among development economists was on planning and allocation mechanisms, which separated the development community from the core of mainstream market-oriented economics. Academicians who followed development issues were often peripheral to the cutting edge in the economics literature. However, that situation has changed in recent years, and development issues are now at the forefront. As part of this transformation, the term “development” (which connotes a directed process) has been largely replaced by the term “emerging markets.” The very term emphasizes the private sector and the market-oriented paradigm of contemporary economics. In no other area is the change in thinking more striking than in the analysis of the role of the financial sector—banks and capital markets—in the development process.

The modern literature on economic growth starts with Robert Solow’s work in the mid-1950s, for which he was awarded the Nobel Memorial Prize in Economics. The early theoretical and empirical literature focused on the role of capital and labor resources and the use of technology as the sources of growth. For the most part, any possible role of the financial sector in the growth process was ignored. In fact, development economists up until the 1970s often advocated explicit manipulation of

the financial sector in order to achieve development goals. Credit subsidies to favored activities were the rule rather than the exception. Inflation was attractive since a tax on financial assets gave governments with an otherwise weak tax base resources that could be devoted to development projects.

Nevertheless, a few influential economists began to draw attention to the contribution of the financial structure to growth and the benefits of liberalization (in particular, Goldsmith 1969 and McKinnon 1973). Economists slowly acknowledged that credit allocation, interest rates ceilings, and high reserve requirements were undesirable. Generally, high inflation, negative real rates, and inflation taxes create distortions that lead to extensive resource misallocations and discourage saving and the use of intermediaries. The pejorative term “financial repression” was introduced to refer to restrictive policies that inhibited the operation of the financial sector. In 1993 McKinnon could write with confidence that “Now, however, there is widespread agreement that flows of saving and investment should be voluntary and significantly decentralized in an open capital market at close to equilibrium interest rates” (12). However, he characterizes the path toward liberalization as a minefield where one misstep might be the last.

There has been a major shift toward a market-oriented approach to the financial sector over the past twenty-five years. Although capital controls

prevailed around the world in both developed and less developed economies, there have been significant liberalizations in recent years.¹ Today, countries that maintain capital controls are almost self-conscious pariahs in the international community. Liberalization of domestic financial markets has occurred at a somewhat slower pace. Nevertheless, support for directed credit, interest rate ceilings, and government ownership of financial institutions has also disappeared. The prevailing paradigm is that competitive private sector capital markets should be able to gather savings at market rates of interest and allocate capital to the most efficient private sector projects.

There are severe limitations to what we know. The empirical literature has not yet adequately explained what happens when the financial sector deepens and how that deepening affects behavior and economic growth.

The contemporary paradigm hardly needs restatement. Economists now take it for granted that a well-developed, market-oriented financial sector contributes to economic growth. However, it is curious how little solid evidence there is that relates the financial sector to economic growth and stability. The paradigm of financial liberalization was widely accepted before there was evidence to relate it to economic growth.

Only recently, since the early 1990s, has a large body of empirical knowledge accumulated that relates financial sector development—the depth and activity of financial intermediaries—to growth. An impressive array of econometric techniques has been used to show the robustness of the finance-growth relationship. However, it is now time to pause and take stock and ask what this literature has taught us.

This article will briefly describe the approach to assessing the finance-growth relationship that has become virtually standard. The literature provides some important results that relate different dimensions of financial sector development to economic growth. The observed relationships appear convincingly to be causal, from finance to growth, and not an artifact of simultaneity or reverse causality.

However, with all that said, there are severe limitations to what we know. The empirical literature

has not yet adequately explained what happens when the financial sector deepens and how that deepening affects behavior and economic growth. There is convincing evidence that countries with money-to-GDP (gross domestic product) ratios of over 100 percent grow more rapidly than those with ratios of 20 percent. However, no good explanation exists of what happens when financial deepening occurs that causes growth. Thus, it is not easy to provide advice to a country with a weakly developed financial sector. The specific mechanisms that relate financial sector deepening to changes in the behavior of economic agents are still a mystery.

Although the finance-growth link is part of the liberal consensus in modern economics, there are still some detractors. Not everyone shares the same degree of confidence in the consensus conclusions. Economists as disparate as Joan Robinson and Robert Lucas have expressed doubts about the link.² More importantly, a number of authors have been less enthusiastic about the strength of the empirical consensus. There seem to be differences in temperament on either side of the Atlantic. The Americans (Levine, Barro, myself, and others) exhibit unbounded enthusiasm about the strength of the relationship. The Europeans (Temple and Arestis, among others) are much more cautious and give more emphasis to the variability of the effects and the lack of robustness in some studies. It might well be time to temper some of the enthusiasm with an examination of the skeptics.

There is an interesting analogy to this problem in the short-run macroeconomics literature. Monetarist empirical research in the 1960s and 1970s provided an impressive and convincing body of evidence for the influence of money on inflation and output. The econometric evidence about the direction of causality was convincing, and the description of lags in the effects is widely accepted. However, by the 1990s it was clear that our understanding was limited. We knew that money affected inflation but not *how* money did so; there was a mysterious and unknown “black box” that related money and inflation. Research began to investigate the “transmission mechanism” or the channels of influence that relate money to the economy. Empirical investigations of money and price aggregates are no longer in vogue and have been replaced by efforts to use micro data to illustrate particular channels of transmission.

The finance-growth literature is at the same crossroads. Aggregate investigations will soon be going out of style. In fact, empirical efforts to describe specific channels of interest have already begun to appear.

The discussion will first consider the consensus paradigm and selectively summarize the evidence on the aggregate relationships. The focus then turns to concerns about the strength of the econometric evidence. Finally, the newer developments in the literature—efforts to investigate the finance-growth transmission mechanism with disaggregated data—will be discussed.

Why Are Finance and Growth Related?

The financial sector is important because the financial intermediaries are responsible for resource allocation. Well-working financial intermediaries improve the efficiency of capital allocation, encourage savings, and lead to more capital formation. King and Levine (1993b) were among the first to emphasize that the efficiency-enhancing aspect of financial sector development is more important than the impact on the amount of investment. The financial sector's impact on the allocation of resources cannot be overemphasized. Think of countries with high rates of investment and savings and poor growth experience. The Soviet Union always had high savings rates; there was always an abundance of machinery and equipment, which simply was not allocated to effective uses. Generally speaking, countries with higher investment-to-GDP ratios experience higher growth rates, but the evidence is not overwhelming. The simple correlation of investment ratios and subsequent growth rates was 0.43 in the 1980s and 0.24 in the 1990s.³ There is substantial variation in growth rates among countries with similar investment ratios. Countries with similar levels of capital investment can have widely diverse growth experiences. The ability to allocate investments efficiently—the role of the financial services industry—might be responsible for the differences.

In the process of providing payments and intermediary services, the financial industry promotes the efficient allocation of resources. There are at least four ways in which the financial sector contributes to growth. They are described in the surveys

by Pagano (1993) and Levine (1997) and presented as a rationale for the endogenous growth model in King and Levine (1993b). First, the financial sector improves the screening of fund seekers and the monitoring of the recipients of funds, and these activities improve the allocation of resources. Second, the industry encourages the mobilization of savings by providing attractive instruments and savings vehicles. Such encouragement may also increase the savings rate. Third, economies of scale in financial institutions lower costs of project evaluation and origination and facilitate the monitoring of projects through corporate governance. Finally, financial intermediaries provide opportunities for risk management and liquidity. They promote the development of markets and instruments with attractive characteristics that enable risk sharing.

Broadly speaking, the role of the financial sector in all economies is to channel resources from savers to investment projects. In planned economies, the process is conducted by administrative arrangements with few, if any, market-oriented elements of the financial sector. Emerging market economies will often rely on a single institution—the banking sector—to provide intermediary functions. In contrast, modern economies have a wide range of market-oriented institutions for facilitating intermediation. A successful financial sector will have a broad continuum of financing techniques that channel resources to investment opportunities. The effect of entrepreneurial finance—self financing, informal funding, etc.—on growth is not well explored because there is little data. Nevertheless, the role of venture capital financing is an area of considerable research interest in the United States. More is known about bank financing, and many countries have bank-dominated financial sectors. Capital markets are rudimentary in many countries, including some highly developed ones. There continues to be considerable debate concerning the relative merits of bank-dominated financial sectors and those that give equal weight to capital markets.⁴

-
1. The International Monetary Fund (IMF) reports large numbers of countries taking measures to liberalize capital flows while the number of tightening measures has declined (IMF 1999, chap. 3).
 2. Lucas (1988) suggests that the role of finance is overemphasized, and Robinson (1962, 80) argues that “enterprise leads, finance follows.”
 3. Average investment-to-GDP ratios for 1979–83 and 1988–92 are compared to growth in 1980–88 and 1989–98, respectively. GDP growth is real per capita; GDP is converted to dollars using purchasing power parity exchange rates and corrected for U.S. inflation. Investment is gross domestic investment. There are eighty-seven countries with available data and a population of at least 2 million. Data are from the World Bank (2000).
 4. The differences between Anglo-Saxon bank-dominated and European capital-dominated systems have been diminishing in recent years as a result of globalization and technological and regulatory changes. One of the consequences of European unification is the increased importance of capital markets on the continent. In the United States, regulatory changes virtually allow continental-style universal banking in which banks are involved in the entire spectrum of financing.

The Evidence on Financial Sector Development and Growth

Empirical investigations of the relationship between financial sector development and economic growth began to appear in the 1990s with King and Levine's (1993a, b) cross-country studies for the postwar period and Wachtel and Rousseau's (1995) evidence from long-time series for several countries. These studies showed that the depth of financial sector development and greater provision of financial intermediary services are associated with economic growth. In the decade since those studies appeared, there has been a veritable explosion of empirical interest in the finance-growth relationship.

Broadly speaking, the role of the financial sector in all economies is to channel resources from savers to investment projects.

Furthermore, the research has been extensively surveyed elsewhere starting with Levine (1997) and more recently in Theil (2001).

The first cross-country study of growth and financial development was Goldsmith (1969), which introduced the idea of using a broad measure of the size of financial intermediaries (his specific choice was the value of intermediary assets to GDP) as an indicator of the provision of intermediary services. Looking at decade averages for thirty-five countries for about one hundred years, he found broad indications of a relationship between finance and growth. Goldsmith's work was econometrically unsophisticated and did not seem to spur much research interest at that time. More extensive econometric work was needed to (1) hold constant other determinants of growth and (2) identify the direction of causality.

Barro (1991) and King and Levine (1993a, b) introduced growth studies with cross-country data sets for the postwar period that have become the benchmark for other studies. Their empirical specifications are widely used. King and Levine included measures of intermediary activity developed from IMF and World Bank data sources that are available for a large number of countries. Table 1, reproduced from Levine (1997, 705), shows values for the indicators in 1985 for 116 countries divided into quar-

tiles by real GDP per capita. The four measures of financial sector development are the ratios of

- liquid liabilities of the financial system to GDP,
- bank credit to bank and central bank credit,
- claims on the nonfinancial private sector to total domestic credit, and
- gross claims on the private sector to GDP.

The relationships are clear: Richer countries have more developed intermediaries, and market-based private sector institutions are more important than in poorer countries. Financial intermediary liabilities are over two-thirds of GDP in very rich countries and about half as much in below-median-income countries. Central banks allocate as much credit as commercial banks in countries with below-median income while they are only about one-tenth as large in the very rich countries. Almost three-quarters of credit is extended to the private sector in the richest countries, almost twice the percentage in the poorest countries.

The Standard Empirical Framework

This section presents the regression framework for panel data that has become the standard form.⁵ Results from Rousseau and Wachtel (2000, 2001, 2002) are used to illustrate the empirical consensus concerning the relationship between growth and financial depth and to illustrate some of the drawbacks. Econometric investigations with panel data use a regression specification given by

$$X_{it} = \alpha F_{it} + \beta Z_{it} + u_{it}.$$

X_{it} is the growth of per capita real GDP or of the real capital stock or a measure of total factor productivity growth in the i th country for some time period, t . Z_{it} is a standard set of conditioning variables that usually includes the log of initial real GDP per capita (a convergence effect) and the log of the initial secondary school enrollment rate (human capital investment). Additional conditioning variables may include the ratio of government consumption to GDP (measure of private sector activity), the inflation rate, a black market exchange rate premium, or the ratio of exports plus imports to GDP (a measure of openness of the economy), among others. Finally, F_{it} is one of the measures of financial sector development.

There are two econometric problems with regressions of this type. First, there may be simultaneity or reverse causality between the finance variable, F , and economic growth, X . Simply speaking, growing countries might have well-developed

TABLE 1

Aggregate Measures of Financial Development for 116 Countries, 1985

	Very rich	Rich	Poor	Very poor	Correlation with real per capita GDP
Depth	0.67	0.51	0.39	0.26	.51
Bank	0.91	0.73	0.57	0.52	.58
Private	0.71	0.58	0.47	0.37	.51
Privy	0.53	0.31	0.20	0.13	.70
Real GDP per capita (1987 \$)	13,053	2,376	754	241	

Note: "Depth" is the ratio of liquid liabilities of the financial system (currency plus demand and interest-bearing accounts of banks and non-bank intermediaries) to GDP. "Bank" is the ratio of bank credit (domestic deposit money banks) to bank credit plus central bank credit. "Private" is claims on the nonfinancial private sector to total domestic credit. "Privy" is gross claims on private sector to GDP.

Source: Derived from Levine (1997)

financial sectors because the income elasticity of the demand for financial services is large. That is, wealthy people demand banking services. Second, the regression specification assumes that any unobserved country-specific effects are part of the error term. Thus, correlation between the error term and included variables in F or X is likely, which leads to biased estimation of the regression coefficients. Modern econometrics offers a number of approaches to solving these problems.

To deal with simultaneity, researchers have used predetermined (initial) values for the independent variables or instrumental variable estimation. Since the underlying relationship is a long-run one, the time period for observations is often set as a five- or ten-year period. To avoid simultaneity, the independent variables are then measured as the initial (first-year) values of the observation period. For example, if X is the average growth rate for 1960–65, then F and Z are the 1960 values for the respective variables. More recent studies by Levine, Loayza, and Beck (2000) and Rousseau and Wachtel (2000) have introduced the use of instrumental variables to ameliorate the effects of simultaneity between F and X . Typically, the instruments are initial values of the regressors and perhaps some contemporaneous indicators not included as regressors such as the inflation rate and relative size of the government sector and the degree of openness.

Rousseau and Wachtel (2000) argue that neither of these approaches does an adequate job of solving the simultaneity problem. In that study, the pre-

determined components of the F measures remain correlated with the contemporaneous measures. In addition, the X measures tend to be serially correlated. Thus, the techniques described do not remove all doubt of causality from X to F .

Techniques for examining dynamic interactions among variables have long been available for time series where extensive data series are available. Vector autoregression (VAR) is a widely used technique for looking at causality from lagged F to current X and vice versa. Wachtel and Rousseau (1995) and Rousseau and Wachtel (1998), among others, have applied VAR to the handful of countries with adequate data for very long periods of time. The results are consistent with the cross-country data analyses for the postwar period.⁶

Panel VARs with a large number of cross-country observations and relatively few time series observations can be estimated with recently developed econometric techniques (see Holtz-Eakin, Newey, and Rosen 1988; Arellano and Bond 1991). Rousseau and Wachtel (2000) implement the technique to estimate panel VARs with annual data and develop Granger causality tests. Beck, Levine, and Loayza (2000) and Levine, Loayza, and Beck (2000) also find that measures of financial sector development have a significant causal effect on growth in panel VAR estimates.

The second econometric problem noted above was the estimation bias introduced in any panel estimation from unobserved country-specific influences. One way of dealing with this is to include

5. There is some literature that utilizes somewhat different frameworks to address some of the same issues, such as the work done for the Organisation for Economic Co-operation and Development (OECD) growth project (see Leahy et al. 2001) and Graff and Karmann (2001).

6. Both Arestis and Demetriades (1997) and Rousseau (2002) compare time series and cross-section approaches. Arestis is skeptical of cross-country results because of the differences among countries in time series results. Rousseau finds the different approaches to be consistent.

country-fixed effects (dummy variables) in all estimated equations. However, the colinearity between the fixed effects and the phenomenon under investigation leads to very imprecise and unstable coefficient estimates. A measure of the financial structure such as the ratio of credit to GDP varies considerably among countries but changes slowly over time in any given country. Thus, the country-fixed effects explain much of the panel variation in the financial structure variable. The sensitivity of the standard specification to the inclusion of country-fixed effects will be demonstrated below. Although many econometricians would argue in favor of such country-fixed effects, most analysts reject this approach or

Countries with better creditor rights, rigorous enforcement, and better accounting information tend to have more highly developed financial intermediaries.

the simple solution of differencing the data on practical grounds. However, the Arellano-Bond estimator ameliorates the country-specific effects by differencing a VAR specification in levels of the data and leads to better estimates.

A Summary of the Evidence on Financial Depth and Growth

Despite the formidable econometric problems, a wide body of literature has firmly established a consensus in support of a relationship between financial sector development and economic growth. Several studies by Rousseau and Wachtel will illustrate both the approaches taken and the results established.

Rousseau and Wachtel (2000) examine the ratio of the broad money supply to GDP with panel data that include two eight-year average observations for forty-seven countries. Similarly, Rousseau and Wachtel (2001) use seven five-year averages (1960–95) for eighty-four countries. These studies present results with panel data sets using instrumental variables. The first paper also presents panel VAR models with forty-seven countries and sixteen annual observations, estimated with an application of the Arellano and Bond procedures.

The ratio of broad money to GDP averages about 40 percent; it is larger in countries where the depository institutions are more actively intermediating

between savers and investors, and it is smaller where the banks do little more than provide transactions services. The Rousseau and Wachtel results indicate that an exogenous increase in the ratio of 10 percentage points (increasing the activity and depth of the depository institutions) will, particularly in countries without high inflation, increase the rate of growth by between 0.6 and 1 percentage point a year. Over a five-year period, real output would be between 3 and 5 percent higher.

To address the issue of causality more directly, we estimate VAR systems with the same data using the Arellano and Bond approach. We find evidence of significant causality from financial measures to real GDP and no evidence of feedback from GDP to the financial variables. These estimates indicate that an increase in M3 that raises its average share in output by 10 percentage points would raise output per capita over five years by 4.1 percent, or 0.8 percent per year. Interestingly, the results from the two approaches—panel regressions and panel VAR—are remarkably alike.

A change in the ratio of M3/GDP of 10 percentage points is quite large. For any given country, the ratio is serially correlated and trends occur slowly. However, there is a great deal of variation among countries at different stages of financial development, and at any given time the distribution of the ratio across countries is quite diffuse. In 1987, the ratio is less than 40 percent in 38 percent of the countries, between 40 and 60 percent in 34 percent of the countries, and over 60 percent in 38 percent.⁷ Thus, an increase of 10 percentage points is not unreasonable for a country experiencing financial sector deepening. Both the VAR and panel results indicate that such a change would have profound effects on growth.

The results in Beck, Levine, and Loayza (2000), which extend Levine's earlier work and also introduce panel estimation, are very similar to those in Rousseau and Wachtel (2000). This paper introduces an improved measure of financial sector development—the ratio to GDP of credits from financial intermediaries to the private sector from a World Bank data set. This measure excludes credits from the central bank and government and credits among financial intermediaries. The researchers estimate a variant of the now-standard specification with data for seventy-seven countries for 1960–95 in two ways. First, they estimate a cross-section regression with instrumental variables (using thirty-five-year average data). Second, they estimate a panel of five-year averages using the Blundell and Bond (1998) modification of the Arellano and Bond

TABLE 2

Equity Markets, Financial Depth, and Growth: Summary of Panel Regression and VAR Estimates

Ratio to GDP of	Country mean		Effect on growth rate of a 10 percentage point increase (five-year horizon)	
	1987	1995	Panel regression	VAR model
Liquid liabilities (M3)	58.73		0.15	0.8
Market capitalization	29.12	65.11	0.08	0.4
Total value traded	10.75	24.22	0.52	1.0

Source: Calculated from Rousseau and Wachtel (2000)

technique called the systems estimator, which allows information in the levels of the variables to be retained in the procedure rather than be swept away through differencing.

When initial income and average years of schooling are the only conditioning variables, both estimation procedures give very similar results. An increase of the private credit-to-GDP ratio of 10 percentage points from its mean of 27.5 percent results in an increase in the annual growth rate of 0.69 percent with the cross-section and 0.74 percent with the panel. When a broader set of conditioning variables is used, the estimates vary between 0.5 and 1 percent.

The Role of Equity Markets

Equity markets are always of interest because data on equity market activity around the world are available and because the stock market—Wall Street—always attracts attention as the paramount symbol of capitalism. Studies of the finance-growth relationship with aggregate credit measures were quickly followed by studies of the influence of the equity market on growth.

Banks dominate financing in many places and even in the most advanced industrialized countries; equity markets are only a small part of the overall financial markets. Most new investment is funded either internally by firms, through banks and other intermediaries, or directly through bond markets. New issuance of stock is never a large fraction of total sources of funds. Nevertheless, the existence of a stock market is important even when equity issuance is a relatively minor source of funds.

Why is the existence of a stock market so important? First, an equity market provides investors and entrepreneurs with a potential exit mechanism. Second, capital inflows—both foreign direct investment and portfolio investments—are potentially important sources of investment funds for emerging

market and transition economies. Third, the provision of liquidity through organized exchanges encourages both international and domestic investors to transfer their surpluses from short-term assets to the long-term capital market, where the funds can provide access to permanent capital for firms to finance large, indivisible projects that enjoy substantive scale economies. Fourth, the existence of a stock market provides important information that improves the efficiency of financial intermediation generally. Finally, the valuation of company assets by the stock market provides benchmarks for the value of business assets, which can be helpful to other businesses and investors, thereby improving the depth and efficiency of company assets generally.

Atje and Jovanovic (1993) construct a cross-country panel for the 1980s and show that trading volume has a strong influence on growth after controlling for lagged investment while bank credit does not. Demircuc-Kunt and Levine (1996) provide a descriptive investigation. Levine and Zervos (1996, 1998) introduce equity market measures to the standard growth-finance cross-section specifications discussed earlier. Finally, a more comprehensive effort to examine the dynamic relationships is found in Rousseau and Wachtel (2000).

The Rousseau and Wachtel paper uses two measures of stock market development as financial sector indicators in the panel regressions: the ratio of market capitalization to GDP and the ratio of total value traded to GDP. Both have a positive coefficient, but only the latter is significant at the 1 percent level. The study also uses a VAR model to examine causality and dynamic interactions among growth, a measure of financial intermediation, and a stock market indicator. Table 2 summarizes the results of panel equations with alternative measures of financial sector development.

7. This result is based on the sample of forty-six countries with active equity markets.

The results indicate that the development of a liquid and highly capitalized equity market increases growth. The mean ratio of value traded to GDP was just 10 percent in 1987; the panel regression results indicate that an increase in the ratio of 10 percentage points would add 0.5 percent to the growth rate. Similarly, a 10 percentage point increase in the ratio of M3 to GDP (with a 1987 mean of 59 percent) would increase the growth rate by 0.15 percent. The equity market effects are similar in magnitude to the effect of more developed financial intermediaries.

Other Financial Sector Characteristics

Research efforts so far have not examined the impact of other financial markets or instruments

There are systematic differences in the finance-growth relationship among countries with different characteristics. For example, the evidence of finance effects is not as strong among developed countries as it is among less developed countries.

on economic growth in a similar cross-country framework. A major reason for this dearth of research is that data on other types of financial intermediaries (for example, private placements, venture capital, bond issuance, commercial paper, etc.) are not part of any standardized data collection efforts and are often simply not available. Furthermore, the number of countries with these other instruments and markets is not large. Although banks and related intermediaries are found everywhere and equity markets are found in most places, bond markets, commercial paper, organized venture capital industry, and so on are quite rare.

There is a body of work that focuses on the relationship between economic growth and the quality of the financial sector environment. For example, important elements of this environment that might effect growth include clear and universally applied accounting standards and auditing practices and a legal framework for debtor-creditor relationships. The effect of accounting, bankruptcy, and governance standards and procedures on growth and on financial sector development has been recently examined with the standard cross-country framework by Levine, Loayza, and Beck (2000). Among other things, they find that countries with better creditor rights, rigorous enforcement, and better accounting information tend to have more highly developed financial inter-

mediaries. Thus, growth prospects are enhanced because a sound legal environment encourages the development of financial intermediation.

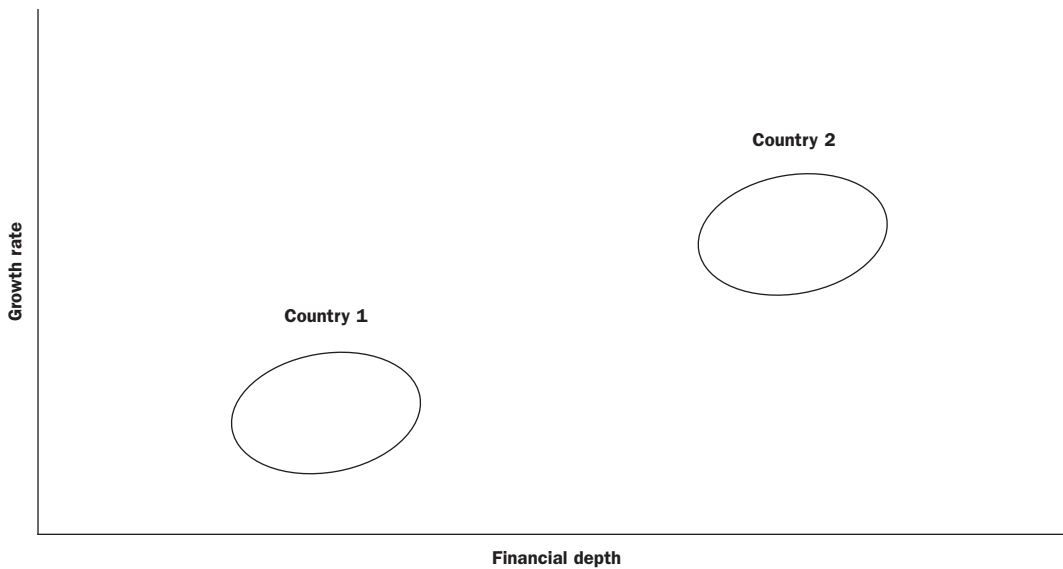
The analysis has already shown that “more banking”—a larger ratio of bank liabilities to GDP—is an important correlate of economic growth. Further investigation examines the type of banking activity, the environment in which it is conducted, and by whom it is conducted. Results indicate that the following banking industry characteristics may be related to growth and stability:

- more competitive and less concentrated banking industry,
- more private as opposed to government ownership or control, and
- more foreign participation in banking.

For example, La Porta, Lopez-de-Silanes, and Shleifer (2002) examine the effect of bank ownership on economic growth with the standard panel framework introduced earlier. They consistently find that higher initial government bank ownership has a negative impact on real per capita growth rates. A 10 percentage point increase in the proportions of assets of the largest banks owned by the government is associated with a decline in the annual growth rate of about 0.2 percent. These preliminary regressions do not address all of the econometric problems, but the overall thrust of these results will probably withstand a more careful empirical investigation.

Several recent papers relate the legal environment for the financial sector to economic growth. Part of the motivation for these inquiries is econometric. The origins of the legal system (for example, English common law or French civil law) are a completely exogenous variable determined by accidents of history (and colonialism). However, the legal systems have different approaches to creditor-debtor relationships that could be relevant to the performance of the financial system and, thus, economic growth (La Porta et al. 1998; Levine 1999). The exogenous characteristics (legal origins) can be used as instruments to improve econometric estimates of the basic finance-growth relationships.

A related issue addressed by Levine (2002) is whether bank-dominated (the German model) or market-dominated (the Anglo-Saxon model) financial systems generate better growth performances. He finds that the quantity of financial services is more important than the structure of the industry that provides them. Convergence of financial systems around the world will probably make this specific question moot over time.

FIGURE 1**Finance and Growth: Hypothetical Data****Drawbacks of the Standard Approach**

The standard results seem to be very robust. The papers by Rousseau and Wachtel are consistent across techniques and data sets and are also consistent with the large body of work by Levine and various coauthors. Moreover, the results that relate growth to equity markets, banking sector structure, and the characteristics of the financial system strengthen the conclusions. Nevertheless, not everyone is convinced by these results. Although I think that the research results are convincing, there are still issues to look at and concerns to note. We should hesitate to declare victory.

Specifically, there are two questions I would like to pose. The first is whether the standard approach does an adequate job in controlling for country-specific effects. The second is whether the estimates of finance effects are robust or vary with other observed phenomena. These questions have come up before in regard to the growth literature in general (Temple 1999; Durlauf 2001; Kenny and Williams 2001). These authors argue that since the relationship between growth theory and empirical specifications is often tenuous, it is not surprising that many empirical results are sensitive to changes in specification.

My concern about the adequacy of efforts to hold country-specific effects constant is illustrated in Figure 1. If observations for growth and financial sector development are clustered by country, as shown in the figure, panel regressions could indicate a spurious aggregate relationship. The observed finance-

growth relationship is due to between-country differences rather than within-country differences over time. In this case, regression results would not provide any reason to make inferences about the effects of financial deepening on growth.

This issue is further investigated with the regressions shown in Table 3. A standard panel specification is shown (with the panel data set from Rousseau and Wachtel 2001). The first equation is estimated by ordinary least squares (OLS), and the independent variables are all initial values (value for the first year of each five-year period). Estimates are indistinguishable from the second equation that uses contemporaneous values for the government and liquid liabilities variables and estimates the equation with instrumental variables. The choice of technique to correct for simultaneity is immaterial. Simultaneity bias does not seem to be an issue.

However, both of these equations include fixed effects for time periods but not for countries. The equation in the last column adds country-fixed effects to the equation. The introduction of country-fixed effects has a profound effect on the results. The fixed effects dominate the equation; the proportion of variance explained almost doubles, and some of the coefficients have the wrong sign. The finance effect is still positive, but the coefficient is very small and barely one-tenth of a standard error from zero. Figure 2 shows the strong relationship between the fixed effect coefficients and the average ratio of liquid liabilities to GDP. The between-country

TABLE 3

Panel Estimates for Five-Year Average Real per Capita GDP Growth

	OLS with initial values	Instrumental variables	OLS with initial values and country-fixed effects
Constant	-0.726 (1.0)	-0.743 (1.0)	
Log of initial real GDP	-0.203 (1.5)	-0.199 (1.5)	-3.447 (5.4)
Log initial secondary school enrollment	0.841 (3.7)	0.819 (3.7)	-1.715 (3.7)
Government expenditure to GDP	-0.060 (2.6)	-0.063 (2.5)	-0.081 (2.3)
Liquid liabilities to GDP	0.027 (4.7)	0.028 (5.0)	0.001 (0.1)
Fixed effects	Time periods	Time periods	Time periods and countries
Corrected R^2	.233	.247	.440

Note: Absolute values of t-statistics are shown in parentheses.

Source: Panel with 426 observations from Rousseau and Wachtel (2001) for 80 countries, 1960–95.

differences in the finance ratios are more important than the differences over time, and thus the fixed country effects and the finance ratios convey largely the same information. Although financial depth measures exhibit much short-run or cyclical volatility, development of financial systems evolves slowly. Data that span less than forty years may not reflect much long-run change in the financial system.

The devastating impact of fixed (country) effects on the estimates of a growth equation has been shown with a different panel specification by Benhabib and Spiegel (2000). They also show that adding fixed effects leads to coefficient instability and a loss of significance on the financial depth measures. Although they recognize this result, they seem reluctant to question the popular consensus that finance matters.

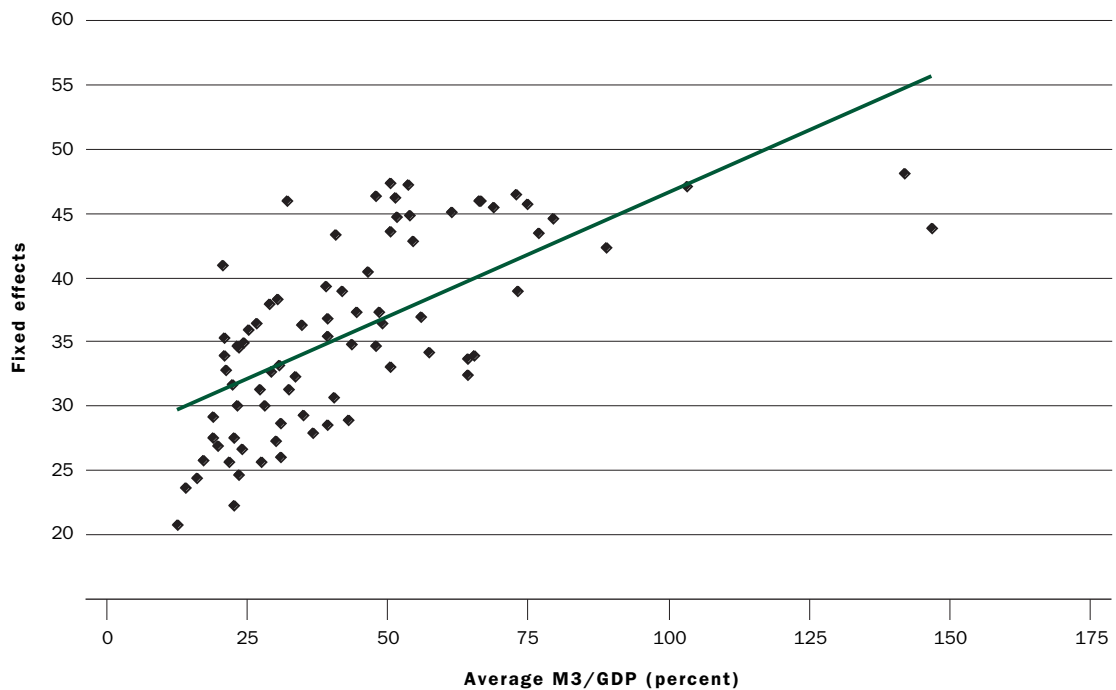
Proponents of the standard growth rate equation would argue that the specification does not call for country-fixed effects. The equation is derived from a production function relationship, so the country-specific unobserved effects disappear with the differencing. But the fact that they enter the equation significantly suggests that the country effects persist. It appears that the standard set of regressors does not provide an adequate framework for making inferences about the change in financial depth on growth from cross-country comparisons.

As noted earlier, there are some skeptics in the growth literature, mostly Europeans who are worried about a possible lack of robustness among empirical results. Kenny and Williams (2001) provide a scathing critique of the empirical growth literature (without any reference to the role of finance). In their view there is little consensus or robustness and most models are overly simple. A formal econometric investigation of robustness issues is found in Florax, de Groot, and Heijungs (2002).

However, this issue highlights the importance of the recent papers with panel VAR estimates that remove the country-fixed effects by differencing and exploit the time series variation more fully. Nevertheless, there are several papers that are concerned with the robustness of VAR results. For example, Luintel and Khan (1999) find some evidence of bidirectional causality between financial sector development and growth in a VAR analysis of developing countries. Similar problems are noted by Shan, Morris, and Sun (2001) in VAR analyses of the OECD countries.

There are systematic differences in the finance-growth relationship among countries with different characteristics. For example, the evidence of finance effects is not as strong among developed countries as it is among less developed countries. In addition, the finance effect varies systematically with a country's inflation experiences (Rousseau and Wachtel 2001, 2002). These two studies find that the impact of financial deepening on growth disappears when inflation is high. This result would not be surprising with hyperinflation that erodes the value of financial intermediation. However, the results indicate that above a threshold inflation rate between 13 and 25 percent, financial deepening ceases to increase economic growth.

Estimation issues aside, there are at least two reasons why the consensus model is only the first stage of an important research agenda. First, even the refined measure of financial depth introduced by Levine, Loayza, and Beck provides a highly aggregated picture. There is wide variation in these financial sector ratios that is hard to understand. For example, the 1987 ratio of M3 to GDP is 73 percent in Spain and 51 percent in Sweden. Does this difference reflect more advanced financial sector development in Spain or greater reliance on bank-based financing? Second,

FIGURE 2**Fixed Effects and Average Ratio of M3 to GDP for Eighty Countries**

Source: Calculated from the regression in the last column of Table 3.

a thrust of the earlier discussion was the variety of financial sector institutions and activities that contribute to efficient intermediation. The aggregate measures mask a rich and diverse set of activities and reveal little about how intermediation affects growth.

The Next Stage

Return for a moment to the analogy with the macro literature on monetary policy effects. The St. Louis model developed in the late 1960s was a standard reduced form that related money growth to output growth and inflation. Later research debated the stability and robustness of the relationship. Today hardly anyone pays attention to the St. Louis model specification. However, it played an important role in the development of monetary economics. Its reliability and usefulness aside, it established the consensus view of the impact of monetary shocks on the economy and set the scene for the next generation of research, which looks inside the black box and tries to explain the transmission mechanism for monetary policy.

The finance-growth empirical literature is in the midst of a similar development. The standard reduced-form equations might not be as robust as originally thought, and their predictive value for explaining the effects of financial deepening is lim-

ited. However, the research agenda of the 1990s firmly established the consensus view that finance matters and set the scene for the next stage of research. Now it is time to look into the black box and develop empirical studies that shed light on the way in which financial sector development improves intermediation and generates economic growth.

The next stage has already begun with a few studies that exploit industry data to better understand how financial sector development works. Rajan and Zingales (1998) were among the first to exploit industry data to gain an understanding about the finance-growth relationship. A well-developed financial system removes or reduces the barriers to external financing for firms. Moreover, some industries tend to depend on external financing more than others because of differences in cash flow patterns, capital intensity, profit margins, and so forth. As a consequence, industries that are more dependent on external financing should do better in countries with better financial systems. Industry data for a number of countries gives Rajan and Zingales the opportunity to test this hypothesis. They examine data for forty-one countries during the 1980s. Their results support the hypothesis.

The innovative use of industry data opens the door toward more specific analysis of finance effects

on growth. The Rajan and Zingales paper is important for this reason although it makes a number of rigid assumptions. In particular, it uses U.S. experience to determine which industries are heavy users of external finance and assumes that these patterns hold elsewhere. Fisman and Love (2002) take issue with this assumption and provide a different interpretation. They are concerned that the Rajan and Zingales results imply that countries with poorly developed financial markets should concentrate on industries that rely on internal financing. Instead Fisman and Love provide support for the hypothesis that finance allows firms to respond to growth opportunities. Industry growth rates across coun-

Although deeper financial intermediation may be a significant causal factor in economic growth, one cannot infer that every expansion of intermediary activity will be beneficial.

tries are more highly correlated when the countries both have well-developed financial sectors. Thus, financial sector development enables industries to take advantage of global growth opportunities.

Cetorelli and Gambera (2001) extend this analysis by examining the effect of bank concentration on industries that rely on external finance. They find, paradoxically, that higher concentration in the banking industry is associated with more growth in industries that require more external finance. However, they also find an across-the-board depressing effect of concentration on growth. All in all, these studies provide specific illustrations of how financial sector development improves allocative efficiency by channeling financial resources.

Wurgler (2000) makes another important step in this literature with an effort to measure the relationship between allocative efficiency and financial sector development. He estimates the efficiency of capital allocation by the elasticity of industry investment to value added across industries in a given country. A higher elasticity indicates the extent to which a country is increasing investment in its growing industries. Using panel data for as many as twenty-eight industries (and up to thirty-two years of data), he obtains elasticity estimates for sixty-five countries. The highest elasticities are in Germany, Hong Kong, and New Zealand, and the lowest in

Bolivia and Swaziland; the United States is thirteenth. Wurgler shows that the elasticities are related to characteristics of financial sector development. A specific mechanism of the finance growth relationship is that deeper financial sectors (measured by the ratio of either stock market capitalization or credit to GDP) help countries add to capital in growing industries. State ownership of industry inhibits this mechanism, and minority investor protections strengthen it.

Wurgler's paper takes some important steps toward identifying the channels of financial sector effects on allocative efficiency and growth. For example, he examines stock market synchronicity, a measure introduced by Morck, Yeung, and Yu (2000). We observed that equity market capitalization affects growth even though new equity issuance is always small. The markets are important because they assist the flow of information, which improves the efficiency of allocation. There will be more firm-specific information in markets where prices are not synchronized and seem to respond to firm-specific information.

Thus, the next stage of research has begun. Whether or not we are satisfied with the empirical literature of the 1990s, the finance growth nexus has become an established part of the economists' canon. The next generation of research is starting to delve into the black box and will show how financial deepening effects are transmitted to the real sector.

Conclusions

There is ample empirical evidence to make a convincing case that financial sector development promotes economic growth. However, this study has outlined some methodological reservations about the evidence used to establish this consensus. Nevertheless, the first decade of research on finance and growth identified relationships between growth and aggregate measures of financial sector development. The next stage, already under way, will identify specific institutional characteristics and financial sector channels that contribute to growth.

Research so far provides little in the way of rigorous guidance about how best to develop the financial sector. Although deeper financial intermediation may be a significant causal factor in economic growth, one cannot infer that every expansion of intermediary activity will be beneficial. Financial sector expansion that results from inflationary liquidity creation or deterioration in lending standards will not enhance long-run growth prospects. The observed association between financial sector deepening and growth does not, therefore, translate into

a simple prescription to encourage the unrestricted growth of financial intermediaries.

Similarly, the research on growth and finance provides policymakers with little guidance about the sequencing of financial sector developments. For example, we know that the expansion of bank credit is growth enhancing, but we do not know how to promote credit expansion without compromising credit standards. Private sector credit evaluation capabilities, public sector regulatory oversight, and a sound legal and accounting infrastructure must all be in place as credit deepening occurs. The sequencing of financial sector developments is enormously important from a policy perspective. The recipe is not simple because the developments are likely to take place concurrently and mistakes are easy to make. Developing institutional capabilities and a legal tradition with enforcement standards is likely to be a slow process. It is easy to see how rapid credit expansion in a booming economy could wreak economic and political havoc even when a government is following a generally prudent prescription for financial sector development.

Recent history is full of examples of poor sequencing or a failure to have a robust institutional framework in place as financial deepening occurs. Bonin and Wachtel (2003) describe the problems that emerged in transition economies that opened equity markets before effective securities regulation was in place. Although securities laws were on the books,

regulators were inexperienced and unable to apply them effectively. Thus, abuses were common, and the ensuing problems set back the development of equity markets.

The IMF has only recently introduced a program for financial sector stability assessments intended to evaluate financial sector developments in member countries and develop financial soundness indicators.⁸ Previously, the IMF monitored macroeconomic developments and paid little attention to the financial sector. Perhaps as a result of some of the empirical research cited here, the IMF now understands that regulatory capabilities and the quality of institutions are as important as the growth of the money and credit aggregates. This change would be welcome since recent empirical work suggests that the quality of institutions is as important as their size.

Fundamental research on the finance-growth relationship has mushroomed in just the last few years. The strong evidence that financial development causes growth has contributed to the increased interest of the economics profession in financial institutions. However, much more needs to be done. Policymakers need to learn how to encourage the expansion of intermediation without creating inflation or excessive leverage. Researchers need to continue to develop the next stage of work on the channels of financial sector effects.

8. The program is described and reports can be found at www.imf.org/external/np/fsap/fsap.asp.

REFERENCES

- Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment fluctuations. *Review of Economic Studies* 58 (April): 277–97.
- Arestis, Philip, and Panicos Demetriades. 1997. Financial development and economic growth: Assessing the evidence. *Economic Journal* 107 (May): 783–99.
- Atje, Raymond, and Boyan Jovanovic. 1993. Stock markets and development. *European Economic Review* 37 (April): 632–40.
- Barro, Robert J. 1991. Economic growth in a cross section of countries. *Quarterly Journal of Economics* 106 (May): 407–43.
- Beck, Thorsten, Ross Levine, and Norman Loayza. 2000. Finance and the sources of growth. *Journal of Financial Economics* 58, no. 1–2:261–300.
- Benhabib, Jess, and Mark M. Spiegel. 2000. The role of financial development in growth and investment. *Journal of Economic Growth* 5 (December): 341–60.
- Blundell, Richard, and Stephen Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87 (August): 115–43.
- Bonin, John P., and Paul Wachtel. 2003. Financial sector development in transition economies: Lessons from the first decade. *Financial Markets, Institutions, and Instruments* 12, no. 1:1–66.
- Cetorelli, Nicola, and Michele Gambera. 2001. Banking structure, financial dependence and growth: International evidence from industry data. *Journal of Finance* 56 (April): 617–48.
- Demirguc-Kunt, Asli, and Ross Levine. 1996. Stock market development and financial intermediaries: Stylized facts. *World Bank Economic Review* 10, no. 2:291–322.
- Durlauf, Steven. 2001. Manifesto for a growth econometrics. *Journal of Econometrics* 100 (January): 65–69.
- Fisman, Raymond, and Inessa Love. 2002. Patterns of industrial development revisited: The role of finance. World Bank Policy Research Working Paper 2877, August.
- Florax, Raymond, Henri de Groot, and Reinout Heijungs. 2002. The empirical economic growth literature: Robustness, significance and size. Tinbergen Institute Discussion Paper TI 2002-040/3.
- Goldsmith, Raymond. 1969. *Financial structure and development*. New Haven, Conn.: Yale University Press.
- Graff, Michael A., and Alexander Karmann. 2001. Does financial activity cause economic growth? Dresden Working Papers in Economics 2/2001, February.
- Holtz-Eakin, Douglas, Whitney Newey, and Harvey S. Rosen. 1988. Estimating vector autoregressions with panel data. *Econometrica* 56 (November):1371–95.
- International Monetary Fund. 1999. *Exchange rate arrangement and currency convertibility: Development and issues*. World Economic and Financial Surveys. Washington, D.C.
- Kenny, Charles, and David Williams. 2001. What do we know about economic growth? Or, why don't we know very much? *World Development* 29, no. 1:1–22.
- King, Robert G., and Ross Levine. 1993a. Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics* 108 (August): 717–37.
- . 1993b. Finance, entrepreneurship, and growth: Theory and evidence. *Journal of Monetary Economics* 32 (December): 513–42.
- La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2002. Government ownership of banks. *Journal of Finance* 57 (February): 265–301.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny. 1998. Law and finance. *Journal of Political Economy* 106 (December): 1133–55.
- Leahy, Michael, Sebastian Schich, Gert Wehinger, Florian Pelgrin, and Thorsteinn Thorgeirsson. 2001. Contributions of financial systems to growth in OECD countries. OECD Economics Department Working Paper No. 280, March.
- Levine, Ross. 1997. Financial development and economic growth: Views and agenda. *Journal of Economic Literature* 35, no. 2:688–726.
- . 1999. Law, finance and economic growth. *Journal of Financial Intermediation* 8 (January): 8–35.
- . 2002. Bank-based or market-based financial systems: Which is better? *Journal of Financial Intermediation* 11 (October): 398–428.
- Levine, Ross, Norman Loayza, and Thorsten Beck. 2000. Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics* 46 (August): 31–77.
- Levine, Ross, and Sara Zervos. 1996. Stock market development and long-run growth. *World Bank Economic Review* 10 (May): 323–40.
- . 1998. Stock markets, banks, and economic growth. *American Economic Review* 88 (June): 537–58.
- Lucas, Robert. 1988. On the mechanics of economic development. *Journal of Monetary Economics* 22 (July): 3–42.
- Luintel, Kul, and Mosahid Khan. 1999. A quantitative reassessment of the finance-growth nexus: Evidence from a multivariate VAR. *Journal of Development Economics* 60 (December): 381–405.
- McKinnon, Ronald I. 1973. *Money and capital in economic development*. Washington, D.C.: The Brookings Institution.

-
- . 1993. *The order of economic liberalization*. 2d ed. Baltimore and London: The John Hopkins University Press.
- Morck, Randall, Bernard Yeung, and Wayne Yu. 2000. The information content of stock markets: Why do emerging markets have synchronous stock price movements? *Journal of Financial Economics* 58, no. 1–2:215–60.
- Pagano, Marco. 1993. Financial markets and growth: An overview. *European Economic Review* 37 (April): 613–22.
- Rajan, Raghuram, and Luigi Zingales. 1998. Financial dependence and growth. *American Economic Review* 88 (June): 559–86.
- Robinson, Joan. 1962. *Essays in the theory of economic growth*. London: Macmillan.
- Rousseau, Peter L. 2002. Historical perspectives on financial development and economic growth. Paper presented at the Federal Reserve Bank of St. Louis 26th Annual Economic Policy Conference, October.
- Rousseau, Peter L., and Paul Wachtel. 1998. Financial intermediation and economic performance: Historical evidence from five industrialized countries. *Journal of Money, Credit, and Banking* 30 (November): 657–78.
- . 2000. Equity markets and growth: Cross country evidence on timing and outcomes, 1980–95. *Journal of Banking and Finance* 24 (December): 1933–57.
- . 2001. Inflation, financial development and growth. In *Economic theory, dynamics and markets: Essays in honor of Ryuzo Sato*, edited by T. Negishi, R. Ramachandran and K. Mino. Boston: Kluwer.
- . 2002. Inflation thresholds and the finance-growth nexus. *Journal of International Money and Finance* 21 (November): 777–93.
- Shan, Jordan Z., Alan G. Morris, and Fiona Sun. 2001. Financial development and economic growth: An egg and chicken problem? *Review of International Economics* 9 (August): 443–54.
- Temple, Jonathan. 1999. The new growth evidence. *Journal of Economic Literature* 37 (March): 112–56.
- Theil, Michael. 2001. Finance and economic growth: A review of theory and the available evidence. European Commission Economic Paper No. 158, July.
- Wachtel, Paul. 2001. Growth and finance: What do we know and how do we know it? *International Finance* 4 (Winter): 335–62.
- Wachtel, Paul, and Peter L. Rousseau. 1995. Financial intermediation and economic growth: A historical comparison of the U.S., U.K. and Canada. In *Anglo-American Finance*, edited by M. Bordo and R. Sylla. Burr Ridge, Ill.: Irwin.
- World Bank. 2000. *World development report 2000/2001: Attacking poverty*. Washington, D.C.: Oxford University Press for the World Bank.
- Wurgler, Jeffrey. 2000. Financial markets and the allocation of capital. *Journal of Financial Economics* 58, no. 1–2:187–214.