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Robert G. King; Ross Levine

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FINANCE AND GROWTH: SCHUMPETER MIGHT BE RIGHT*

ROBERT G. KING AND ROSS LEVINE

We present cross-country evidence consistent with Schumpeter's view that the financial system can promote economic growth, using data on 80 countries over the 1960–1989 period. Various measures of the level of financial development are strongly associated with real per capita GDP growth, the rate of physical capital accumulation, and improvements in the efficiency with which economies employ physical capital. Further, the predetermined component of financial development is robustly correlated with future rates of economic growth, physical capital accumulation, and economic efficiency improvements.

In 1911 Joseph Schumpeter argued that the services provided by financial intermediaries—mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating transactions—are essential for technological innovation and economic development. Empirical work by Goldsmith [1969] and McKinnon [1973] illustrates the close ties between financial and economic development for a few countries.[1] But numerous influential economists believe that finance is a relatively unimportant factor in economic development. Notably, Robinson [1952] contends that financial development simply follows economic growth. More recently, Lucas [1988] terms the relationship between financial and economic development "over-stressed." In this paper we study whether higher levels of financial development are positively associated with economic development using data on over 80 countries from 1960 through 1989. Specifically, we investigate whether higher levels of financial development are significantly and robustly correlated with faster current and future rates of

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1. Greenwood and Jovanovic [1990], Bencivenga and Smith [1991], Levine [1991, 1992], King and Levine [1993b], Saint-Paul [1992], and Roubini and Sala-i-Martin [1991, 1992] link financial services with steady-state growth. For recent empirical work, see Gertler and Rose [1992], King and Levine [1992a, 1993a], Roubini and Sala-i-Martin [1991], DeGregorio and Guidotti [1992], Gelb [1989] and the World Bank [1989]. For microeconomic evidence on the effects of financial liberalization, see Schiantarelli et al. [1992].

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economic growth, physical capital accumulation, and economic efficiency improvements.

To examine whether Schumpeter was right, we must define "financial development" empirically. We construct four indicators of financial development that are designed to measure the services provided by financial intermediaries. First, we compute the traditional measure of financial depth, which equals the overall size of the formal financial intermediary system, i.e., the ratio of liquid liabilities to GDP. Second, we distinguish among financial institutions conducting intermediation. Due to data limitations, this means examining the importance of deposit banks relative to the central bank in allocating domestic credit. Banks are likely to offer better risk management and investment information services than central banks. Third, we examine where the financial system distributes assets using two measures: (a) credit issued to nonfinancial private firms divided by total credit (excluding credit to banks) and (b) credit issued to nonfinancial private firms divided by GDP. Financial systems that primarily fund private firms probably provide more services than financial systems that simply funnel credit to the government or state enterprises. Although each financial indicator has shortcomings, using this array of indicators provides a richer picture of financial development than if we used only a single measure.

In the tradition of recent cross-country studies of growth, we study the relationship between financial development and long-run output growth. Furthermore, we undertake a preliminary exploration of the "channels" through which financial development is linked to growth by examining two sources of growth. First, we study the rate of physical capital accumulation, measured both as an estimate of the per capita growth rate of physical capital and the ratio of investment to GDP. Second, we study improvements in the efficiency with which a society allocates capital, which we measure as a growth residual after controlling for physical capital accumulation. For short, we refer to per capita GDP growth, the rate of capital accumulation, and improvements in economic efficiency as "growth indicators."

We report two sets of findings. The first set involves the strength of the contemporaneous relationship between financial development and the growth indicators; we study the strength of the partial correlation of the average level of financial development over the 1960–1989 period with the average rate of real per capita GDP growth, the rate of physical capital accumulation, and the

rate of improvement in economic efficiency over the same period. We find that higher levels of financial development are positively associated with faster rates of economic growth, physical capital accumulation, and economic efficiency improvements both before and after controlling for numerous country and policy characteristics.

The second set of findings focuses on the relationship between the level of financial development and *future* rates of long-run growth, physical capital accumulation, and economic efficiency improvements. We find that the predetermined component of financial development is a good predictor of long-run growth over the next 10 to 30 years. Furthermore, higher levels of financial development are strongly associated with future rates of capital accumulation and future improvements in the efficiency with which economies employ capital. Thus, finance does not only follow economic activity, and the strong relationship between the level of financial development and the rate of economic growth does not simply reflect a positive association between contemporaneous shocks to both financial and economic development.

These results suggest an important link between financial development and long-run growth as suggested by Schumpeter 80 years ago. Furthermore, the significant, robust relationship between the level of financial development and both the current and *future* rate of economic growth contrasts sharply with the weak, fragile partial correlations between growth and a large variety of other economic indicators as shown by Levine and Renelt [1992].

I. Financial Development, Growth, and the Sources of Growth: Contemporaneous Associations

We begin our analysis by studying the contemporaneous associations between financial development, growth, and the sources of growth. First, we examine the strength of the empirical relationship between long-run real per capita GDP growth and four indicators of the level of financial sector development. The design of our study is in the tradition of recent cross-country empirical studies of growth (e.g., Kormendi and Meguire [1985]; Barro [1991]; Mankiw, Romer, and Weil [1992]; and Levine and Renelt [1992]). In particular, after controlling for initial conditions and other economic indicators, we find a positive, significant, and robust partial correlation between the average annual rate of real per capita GDP growth and the average level of financial sector

development over the 1960–1989 period. We term this a study of "contemporaneous" associations because we examine average growth rates and average levels of financial development over the same time period. Second, we explore the "channels" through which financial development and growth are linked. Specifically, we find that financial development is positively associated with both the rate of physical capital accumulation and a measure of improvements in economic efficiency.

A. Data: The Financial Indicators

We conduct both a purely cross-country analysis using data averaged over the 1960–1989 period and a pooled cross-country, time-series study using data averaged over the 1960s, 1970s, and 1980s, so that each country has three observations, data permitting. Our data base includes the 119 developed and developing countries studied in Levine and Renelt [1992], but lack of financial data and elimination of major oil exporters typically restricts the analysis to about 80 countries.

We construct four indicators of the level of financial sector development.[2] The traditional practice (e.g., Goldsmith [1969] and McKinnon [1973]) has been to use the size of the formal financial intermediary sector relative to economic activity to measure financial sector development or "financial depth." Users of financial depth hypothesize that the size of financial intermediaries is positively related to the provision of financial services. One measure of "financial depth" equals the ratio of liquid liabilities of the financial system to GDP, which we term *LLY*. Liquid liabilities consist of currency held outside the banking system plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries.[3] The pure size of the financial system, however, may not be closely related to financial services such as risk management and information processing.

Consequently, we construct a second financial development indicator to measure the relative importance of specific financial institutions. For our set of about 80 countries, the only possible

2. King and Levine [1992] study a broader array of financial indicators.

3. This measure equals "M3" or line 551 from the International Financial Statistics; or when 551 is not available, we use line 34 plus line 35, which equals "M2." The problem of deflating financial stocks (measured at the end of the period) by GDP flow (measured over the period) is mitigated by using the arithmetic average of this year's end-of-period and last year's end-of-period financial stock values. Thus, *LLY* in 1965 is the average of liquid liabilities in 1964 and liquid liabilities in 1965 divided by GDP in 1965.

institutional breakdown is between the central bank and deposit money banks. Consequently, we study the ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets and call this variable *BANK*.[4] Intuitively, banks seem more likely to provide the type of risk sharing and information services emphasized in recent theoretical models than central banks. There are problems with this measure of financial development: banks are not the only financial intermediaries that provide risk management, information acquisition, and monitoring services; governments strongly influence banks in many countries, so that the contrast between banks and central banks may be murky; and the variable *BANK* does not measure to whom the financial system is allocating credit. Nonetheless, by at least partially isolating those financial intermediaries more likely to provide the financial services emphasized in theoretical studies, we believe *BANK* will augment and complement the conclusions that could be drawn from using only financial depth, *LLY*.

The third and fourth financial development indicators are designed to measure domestic asset distribution. A financial system that simply funnels credit to the government or state-owned enterprises may not be evaluating managers, selecting investment projects, pooling risk, and providing financial services to the same degree as financial systems that allocate credit to the private sector. Thus, we compute the proportion of credit allocated to private enterprises by the financial system. This measure equals the ratio of claims on the nonfinancial private sector to total domestic credit (excluding credit to money banks), and we call this indicator *PRIVATE*. We also measure the ratio of claims on the nonfinancial private sector to GDP and term this variable *PRIVY*.[5] There are also problems with these measures of financial sector development. *PRIVATE* and *PRIVY* may reflect the overall size of the public sector and the degree of public sector borrowing and therefore not accurately indicate the level of financial services. Nevertheless, we include this broad array of financial indicators to maximize the information on financial development in our study.

4. Central bank domestic assets are the summation of IFS lines 12a through 12f. Deposit money bank domestic assets are the summation of IFS lines 22a through 22f.

5. Claims on the nonfinancial private sector is IFS line 32d and domestic credit (to nonmoney banks) is IFS lines 32a through 32f excluding 32e.

B. *Growth Indicators: Measuring Growth and the Sources of Growth*

Besides studying the relationship between these four financial indicators and average long-run real per capita GDP growth (GYP), we conduct a preliminary inquiry of the linkages between the financial indicators and the sources of growth. Given our broad set of countries, we could not conduct detailed growth accounting exercises. Consequently, we decompose growth into two components: the rate of physical capital accumulation and everything else. Specifically, let y equal real per capita GDP, k equal the real per capita physical capital stock, x equal other determinants of per capita growth, and α is a production function parameter, so that $y = k^{\alpha}x$. Taking logarithms and differencing yields $GYP = \alpha(GK) + EFF$, where GK is the growth rate of the real per capita physical capital stock and EFF is the growth rate of everything else. As described below, we measure GYP and GK directly. Then we choose different values for α and define EFF as $GYP - \alpha(GK)$. We experimented with values of α between 0.2 and 0.4 and found that our results were not importantly affected; we report the results with $\alpha = 0.3$.[6]

The term EFF may consist of many factors. For example, technology growth, human capital accumulation, increases in the number of hours worked per worker, and improvements in the employment of factor inputs would increase EFF. We attempted to account for human capital accumulation in defining EFF by including literacy rates, school enrollment rates, etc. Inclusion of these variables did not alter our conclusions.[7] Since EFF is constructed to measure the residual of real per capita GDP growth after accounting for the rate of physical capital accumulation, we refer to EFF as improvements in "efficiency."

Benhabib and Spiegel [1992] construct physical capital stock measures for over 120 countries. After assuming that the relationship between the capital-output ratio and the capital-labor ratio is constant across time and countries, they use an iterative procedure using investment data to construct capital stock series. We use their data to compute GK.[8] There are numerous statistical and

6. We obtain similar results using the change in real per capita GDP divided by investment as an alternative measure of "efficiency."

7. We could not get complete, comparable data on the average number of hours worked per worker for the countries in our data set.

8. We get similar results when we use the capital stock series constructed for the World Bank's 1991 World Development Report.

conceptual problems with the construction of physical capital stock data in such a broad cross section of countries over such a long time interval. Consequently, we also study the ties between the financial indicators and the ratio of gross national investment divided by output, *INV*. We call *GYP*, *GK*, *INV*, and *EFF* "growth indicators."

In summary, we study the empirical relationship between four financial indicators and four growth indicators. The four financial indicators are the ratio of the size of the formal financial intermediary sector to GDP (*LLY*), the importance of banks relative to the central bank (*BANK*), the percentage of credit allocated to private firms (*PRIVATE*), and the ratio of credit issued to private firms to GDP (*PRIVY*). Our growth indicator are real per capita GDP growth, the rate of physical capital accumulation (*GK*), the ratio of domestic investment to GDP (*INV*), and a residual measure of improvements in the efficiency of physical capital allocation (*EFF*).

C. Simple Correlations

Tables I–VI present summary statistics on the four financial indicators, growth, and the sources of growth. Each financial indicator is positively and significantly correlated with each growth indicator at the 0.01 significance level. Tables I–IV also illustrate a "step" relationship between financial development, growth, and the sources of growth. For example, in Table II we divide countries into four categories: very fast, fast, slow, and very slow growers, with approximately the same number of countries in each category.

TABLE I
THE AVERAGE LEVEL OF FINANCIAL DEVELOPMENT AND THE CONTEMPORANEOUS GROWTH RATE OF REAL PER CAPITA GDP: 1960–1989

	Very fast	Fast	Slow	Very slow	Correlation with growth	(*P*-value)
LLY	0.60	0.38	0.29	0.22	0.55	(0.001)
BANK	0.81	0.73	0.71	0.60	0.44	(0.001)
PRIVATE	0.70	0.56	0.61	0.51	0.37	(0.001)
PRIVY	0.35	0.27	0.20	0.13	0.50	(0.001)
GYP	0.045	0.026	0.014	−0.005		

Very fast: *GYP* > 0.03, Fast: *GYP* > 0.02 and < 0.03, Slow: *GYP* > 0.005 and < 0.02, Very slow: *GYP* < 0.005.

LLY = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on the nonfinancial private sector to total domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP, *GROWTH* = Average annual real per capita growth, 1960–1989.

Observations: Approximately twenty in each of the four categories.

TABLE II

THE AVERAGE LEVEL OF FINANCIAL DEVELOPMENT AND THE CONTEMPORANEOUS GROWTH RATE OF THE CAPITAL STOCK: 1960–1989

	Very fast	Fast	Slow	Very slow	Correlation with capital growth	(*P*-value)
LLY	0.65	0.38	0.24	0.21	0.69	(0.001)
BANK	0.88	0.75	0.64	0.60	0.57	(0.001)
PRIVATE	0.73	0.62	0.54	0.50	0.50	(0.001)
PRIVY	0.43	0.23	0.16	0.14	0.65	(0.001)
GK	0.014	0.001	−0.007	−0.021		

Very fast: $GK > 0.0072$, Fast: $GK > -0.0022$ and < 0.0072, Slow: $GK > -0.0126$ and < -0.0022, Very slow: $GK < -0.0126$.

LLY = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on the nonfinancial private sector to total domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP, *GK* = Average growth rate of the real per capita capital stock, 1960–1989.

Observations: Approximately twenty in each of the four categories.

As we "step" from countries that experienced slower growth over the 1960–1989 period to countries with faster growth, we see a corresponding increase in financial depth, the importance of banks relative to the central bank, the fraction of credit allocated to the nonfinancial private sector, and the ratio of private sector credit to GDP. Similarly, countries with faster rates of physical capital accumulation (Tables II and III), and countries with more efficient

TABLE III

THE AVERAGE LEVEL OF FINANCIAL DEVELOPMENT AND THE CONTEMPORANEOUS LEVEL OF INVESTMENT: 1960–1989

	Very high	High	Low	Very low	Correlation with investment	(*P*-value)
LLY	0.58	0.42	0.29	0.22	0.54	(0.001)
BANK	0.83	0.76	0.67	0.56	0.58	(0.001)
PRIVATE	0.71	0.63	0.52	0.50	0.51	(0.001)
PRIVY	0.37	0.28	0.17	0.14	0.48	(0.001)
INV	0.273	0.225	0.193	0.130		

Very high: $INV > 0.243$, High: $INV > 0.205$ and < 0.243, Low: $INV > 0.167$ and < 0.205, Very low: $INV < 0.167$.

LLY = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on the nonfinancial private sector to total domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP, *INV* = Ratio of average annual investment to GDP, 1960–1989.

Observations: Approximately twenty in each of the four categories.

TABLE IV
THE AVERAGE LEVEL OF FINANCIAL DEVELOPMENT AND CONTEMPORANEOUS EFFICIENCY: 1960–1989

	Very high	High	Low	Very low	Correlation with efficiency	(*P*-value)
LLY	0.55	0.40	0.31	0.22	0.46	(0.001)
BANK	0.77	0.74	0.73	0.60	0.36	(0.001)
PRIVATE	0.67	0.57	0.64	0.51	0.30	(0.007)
PRIVY	0.35	0.26	0.22	0.14	0.42	(0.001)
EFF	0.040	0.025	0.016	0.001		

Very high: $EFF > 0.0294$, High: $EFF > 0.0204$ and < 0.0294, Low: $EFF > 0.0079$ and < 0.0204, Very low: $EFF < 0.0079$.

LLY = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on the nonfinancial private sector to total domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP, *GK* = Average growth rate of the real per capita capital stock, *EFF* = Average annual efficiency, 1960–1989: $GYP - (0.3) * GK$.

Observations: Approximately twenty in each of the four categories.

capital allocation (Table IV) tend to have more developed financial systems.

Tables V and VI show that the financial indicators are also highly and significantly correlated with each other; the Pearson correlation coefficient ranges between 0.44 and 0.83 for contemporaneous correlations over the 1960–1989 period and between 0.42 and 0.82 for contemporaneous correlations using decade averages.

TABLE V
CONTEMPORANEOUS CORRELATIONS AMONG FINANCIAL DEVELOPMENT INDICATORS: 1960–1989

	LLY	*BANK*	*PRIVATE*	*PRIVY*
GYP	0.55	0.44	0.37	0.50
	[0.001]	[0.001]	[0.001]	[0.001]
LLY		0.58	0.44	0.83
		[0.001]	[0.001]	[0.001]
BANK			0.79	0.62
			[0.001]	[0.001]
PRIVY				0.66
				[0.001]

[*P*-values in brackets]

GYP = Real per capita GDP growth rate, *LLY* = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on nonfinancial private sector to domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP.

TABLE VI
CONTEMPORANEOUS AND LAGGED CORRELATIONS AMONG FINANCIAL DEVELOPMENT INDICATORS: DECADE AVERAGES

	LLY	Lag *LLY*	*BANK*	Lag *BANK*	*PRIVATE*	Lag *PRIVATE*	*PRIVY*	Lag *PRIVY*
GYP	0.25	0.26	0.29	0.09	0.30	0.16	0.27	0.25
	[0.001]	[0.001]	[0.001]	[0.269]	[0.001]	[0.062]	[0.001]	[0.002]
LLY		0.88	0.53	0.52	0.42	0.44	0.81	0.70
		[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Lag *LLY*			0.51	0.60	0.38	0.53	0.78	0.81
			[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
BANK				0.59	0.82	0.51	0.59	0.49
				[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Lag *BANK*					0.46	0.82	0.56	0.58
					[0.001]	[0.001]	[0.001]	[0.001]
PRIVATE						0.60	0.64	0.51
						[0.001]	[0.001]	[0.001]
Lag *PRIVATE*							0.63	0.67
							[0.001]	[0.001]
PRIVY								0.89
								[0.001]

[*P*-values in brackets]

GYP = Real per capita GDP growth rate, *LLY* = Ratio of liquid liabilities to GDP, *BANK* = Deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on nonfinancial private sector to total domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP, Lag = Signifies the value in the previous decade.

Table VI shows that high levels of financial development in one decade are positively and significantly correlated with high levels of financial development in the next decade. Financial depth *LLY* has a Pearson correlation coefficient of 0.88 with *LLY* in the previous decade, while the corresponding correlation for *BANK* is 0.59.

D. Contemporaneous Regressions: 1960–1989

We use cross-country regressions to gauge the strength of the partial correlation between financial development and the growth indicators. In light of recent cross-country empirical studies of growth, we regress *GYP* on the logarithm of initial income (*LYO*), the logarithm of the initial secondary school enrollment rate (*LSEC*), and each financial indicator. In addition to this "base" regression, we also include the ratio of trade (exports plus imports)

TABLE VII
GROWTH AND CONTEMPORANEOUS FINANCIAL INDICATORS CROSS-COUNTRY: 1960–1989

Dependent Variable	*LLY*	*BANK*	*PRIVATE*	*PRIVY*
GYP	0.024***	0.032***	0.034***	0.032***
	(0.009)	(0.010)	(0.010)	(0.010)
	[0.007]	[0.005]	[0.002]	[0.002]
R^2:	0.50	0.50	0.52	0.52
GK	0.022***	0.022**	0.020**	0.025***
	(0.006)	(0.008)	(0.008)	(0.007)
	[0.001]	[0.012]	[0.011]	[0.001]
R^2:	0.65	0.62	0.62	0.64
INV	0.097***	0.133***	0.115***	0.102***
	(0.029)	(0.038)	(0.036)	(0.034)
	[0.001]	[0.001]	[0.002]	[0.004]
R^2:	0.46	0.46	0.45	0.44
EFF	0.018**	0.026**	0.027***	0.025***
	(0.008)	(0.010)	(0.009)	(0.009)
	[0.026]	[0.010]	[0.003]	[0.006]
R^2:	0.42	0.43	0.45	0.44

(standard errors in parentheses) [*P*-values in brackets] Observations = 77

* significant at the 0.10 level, ** significant at the 0.05 level, *** significant at the 0.01 level.

GYP = Real per capita GDP growth rate, *GK* = Average growth rate of the real per capita capital stock, 1960–1989, *INV* = Ratio of average annual investment to GDP, 1960–1989, *EFF* = *GYP* − (0.3)**GK*, *LLY* = Ratio of liquid liabilities to GDP, *BANK* = Deposit bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATE* = Ratio of claims on nonfinancial private sector to domestic credit, *PRIVY* = Ratio of claims on the nonfinancial private sector to GDP.

Other explanatory variables: log of initial income, log of initial secondary school enrollment rate, ratio of government expenditures to GDP, inflation rate, ratio of exports plus imports to GDP.

to GDP (*TRD*), the ratio of government spending to GDP (*GOV*), and the average inflation rate (*PI*) to control for other economic phenomena. Table VII summarizes the results for the coefficients on the four financial indicators including *GOV*, *PI*, and *TRD*.[9] Consistent with the results in Barro [1991], Barro and Sala-i-Martin [1992], and Levine and Renelt [1992], we typically find that (1) initially rich countries tend to grow more slowly than initially poor countries after controlling for the initial level of investment in human capital (i.e., the parameter on *LYO* is significantly nega-

9. The working paper version of this paper [King and Levine, 1993c] presents complete regression results.

tive); and (2) higher initial secondary school enrollment rates are associated with faster subsequent growth (i.e., the parameter on *LSEC* is positive and significant).

Table VII indicates that the four financial development indicators enter with positive and significant coefficients when the dependent variable is one of the growth indicators at the 0.05 level. Thus, financial depth, the relative importance of banks vis-à-vis central banks, the percentage of credit allocated to nonfinancial private firms, and credit to the private sector divided by GDP are strongly associated with growth, the growth rate of physical capital, the investment share, and efficiency after controlling for initial conditions and common economic indicators.

Not only are the coefficients significant, but also the sizes of the coefficients imply that the links between financial development and growth may be economically important. Neglecting causality for the moment, the coefficient of 0.024 on *LLY* suggests that a country that increased *LLY* from the mean of the slowest growing (0.2) to the mean of the fastest growing quartile of countries (0.6) as depicted in Table I would have increased its growth rate by almost 1 percent per annum. Since the difference between the very fast and the very slow growers is about 5 percent (see Table I), the rise in *LLY* alone would eliminate 20 percent of this difference. This seems considerable, though only illustrative. These types of examples address neither causality nor how to achieve these changes in financial depth.

E. Sensitivity Analyses

The links between financial development and both growth and the sources of growth are robust to a number of sensitivity checks. These checks include altering the conditioning set of information, using subsamples of countries and time periods, and examining the statistical properties of the error terms.

Using pooled cross-country, time-series data with data averaged over each decade, we get similar coefficient values with similar *P*-values to the results reported in Table V. Including variables such as population growth, changes in the terms of trade, the number of revolutions and coups, the number of assassinations, or an index of civil liberties also does not alter the conclusions. The results tend to hold on subsamples of countries. Omitting OECD countries does not alter the conclusions. Omitting sub-Saharan African countries (in the pooled decade analysis) weakens the significance of the partial correlation between *LLY* and *GYP* (the

P-value falls to 0.09 because the standard error grows), but does not alter the results on the other three financial indicators. Similarly, including a dummy variable for countries in sub-Saharan Africa and a dummy variable for countries in Latin America weakens the *LLY* results while not affecting the other financial indicator results. We also weighted countries differently. Using White's heteroskedastic consistent coefficient standard errors does not alter the conclusions, and omitting countries with variables that might be considered extremely high or low also does not alter the results.[10]

Based on Levine and Renelt [1992], we also conduct extreme bounds analyses (EBA) of the results in Table V. The EBA involves altering the right-hand-side variables and observing whether the results on the variables of primary interest—the four financial indicators—are robust or fragile to these alterations. Using the "base" regression that always includes *LYO* and *LSEC*, we allow the EBA procedure to choose various combinations of up to three right-hand-side variables from the list of "other" variables used in Levine and Renelt, and we then examine whether the coefficient and significance of the coefficient on the financial development indicators remain stable while altering the conditioning information set. (The "other" variables are the number of revolutions and coups (*REVC*), *GOV*, *PI*, *TRD*, the standard deviation of inflation (*STPI*), the growth rate of domestic credit (*GDC*), and the standard deviation of the growth rate of domestic credit (*STDC*).) The results in Table V are robust; small alterations in the conditioning information set do not alter the inferences on the financial indicator.[11] These robust results on financial development indicators contrast strongly with the Levine and Renelt findings that most other economic indicators have only very fragile associations with long-run growth.

10. For example, *LLY* is greater than one in Japan, Malta, and Switzerland; while *TRD* is greater than 1.5 in Hong Kong, Luxembourg, and Malta.

11. King and Levine [1993c] present these results. Levine and Renelt [1992] run two sets of regressions for every variable of interest. When *GYP* is the dependent variable, the regression always includes a constant, initial income (*YO*), the initial secondary school enrollment rate (*SEC*), population growth (*GPO*), *INV*, and the variable of interest. By including *INV* as a regressor, this is an alternative way of defining economic efficiency. Also, Levine and Renelt use *INV* as the dependent variable. In these regressions only a constant and the variable of interest are always included. When we use this exact procedure for the four financial indicators, all four are robustly correlated with *INV*, but only *LLY* is robustly correlated with *GYP*. This implies that while measures of financial development are robustly linked to growth through investment, the relationship between financial development and efficiency may be sensitive to the empirical definition of efficiency.

II. Initial Financial Development, Growth, and the Sources of Growth

Cross-country studies of long-run growth typically evaluate the strength of partial correlations between growth and economic indicators that are almost certainly determined jointly with growth. With respect to financial services, the finding that financial development is strongly associated with contemporaneous economic growth may be interpreted in a number of ways. Joan Robinson, for example, argued that, "By and large, it seems to be the case that where enterprise leads finance follows" [1952, p. 86]. Other observers may believe that the strong link between financial development and economic growth merely reflects a positive correlation arising from contemporaneous effects of various shocks on financial and economic development. Here, we investigate whether the predetermined component of financial sector development is strongly linked with subsequent growth and the sources of growth. Although we will note some qualifications, the evidence suggests that the predetermined component of financial development is a good predictor of long-run growth and that financial development predicts both the rate of physical capital accumulation and the rate of improvement in the efficiency with which economies allocate physical capital. These results have a number of implications. The link between growth and financial development is not just a contemporaneous association. Finance does not only follow growth; finance seems importantly to lead economic growth. Furthermore, a positive association between contemporaneous shocks to financial development and economic growth does not fully account for the finance-growth link. When countries have relatively high levels of financial development, economic growth tends to be relatively fast over the next 10 to 30 years.

A. Initial Values

We examine the relationship between the initial values of the financial development indicators at the beginning of the period and subsequent economic growth using ordinary least squares regressions. Due to data availability, we focus almost exclusively on the pooled, cross-section, time-series results, where the data are pooled over decades. Nonetheless, it is useful to begin by simply replacing the values of the financial indicators averaged over the period

1960–1989 period with the value in 1960. Since we were able to obtain financial depth data on 57 countries in 1960, Table VIII presents purely cross-section growth results. The dependent variable is average real per capita GDP growth over the 1960–1989

TABLE VIII
GROWTH AND INITIAL FINANCIAL DEPTH: 1960–1989

Independent variable	(1)	(2)	(3)	(4)
c	0.042***	0.035***	0.033***	0.035***
	(0.005)	(0.007)	(0.009)	(0.010)
LYO	−0.014***	−0.016***	−0.016***	−0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
LSEC	0.013***	0.013***	0.013***	0.010***
	(0.002)	(0.002)	(0.002)	(0.003)
GOV in 1960		0.070*	0.072*	0.044
		(0.035)	(0.036)	(0.040)
PI in 1960		0.037	0.032	0.040
		(0.031)	(0.033)	(0.033)
TRD in 1960		−0.003	−0.004	0.001
		(0.006)	(0.006)	(0.001)
Index of civil liberties			0.001	0.001
			(0.002)	(0.002)
Number of revolutions			−0.010	−0.010
			(0.009)	(0.009)
Number of assassinations			−0.001	0.001
			(0.004)	(0.003)
Sub-Saharan Africa dummy				−0.011
				(0.007)
Latin American dummy				−0.010*
				(0.005)
LLY in 1960	0.030***	0.028***	0.028***	0.020**
	(0.007)	(0.007)	(0.008)	(0.009)
R^2	0.57	0.61	0.63	0.66
	(standard errors in parentheses)			

Dependent variable: *GYP* − Real per capita GDP growth, 1960–1989.
Observations: 57
* significant at 0.10 level, ** significant at 0.05 level, *** significant at 0.01 level.
LYO = log of initial real per capita GDP in 1960, *LSEC* = log of secondary school enrollment rate in 1960, *GOV* = government consumption/GDP, *PI* = inflation rate, *TRD* = (imports & exports)/GDP.

period (*GYP*), and the independent variable on which we focus is *LLY*60, the value of financial depth in 1960.[12] As shown, *LLY*60 is highly correlated with economic growth over the next 30 years even after controlling for initial conditions, and various combinations of economic indicators, political stability indexes, and after including dummy variables for countries in sub-Saharan Africa and Latin America. While noteworthy, the small number of observations and the concentration of developed economies in this small sample induced us to undertake a more rigorous study using pooled cross-section, decade data.[13]

Table IX summarizes our results using initial values and pooled decade data. The dependent variable is either *GYP*, *GK*, *INV*, or *EFF* averaged over the 1960s, 1970s, and 1980s, while the initial values of the financial indicators are computed in 1960, 1970, and 1980 as appropriate. The suffix "*I*" indicates initial value, so that *BANKI* is the initial value of our measure of the importance of banks relative to the central bank. We also include as independent variables the logarithm of initial real per capita GDP (*LYO*) (i.e., in 1960, 1970, or 1980 as appropriate), the logarithm of the initial secondary school enrollment rate (*LSEC*), the initial value of the ratio of government expenditures to GDP (*GOVI*), the initial inflation rate (*PII*), the initial ratio of trade to GDP (*TRDI*), and dummy variables for each decade.

As shown in Table IX, when real per capita GDP growth, real per capita capital stock growth, or the investment share is the dependent variable, the coefficients on three of the four financial indicators—the initial value of financial depth (*LLYI*), the initial importance of banks (*BANKI*), and the initial ratio of private credit to GDP (*PRIVYI*)—enter significantly at the 0.05 level, while the relative importance of credit being allocated to the nonfinancial private sector (*PRIVATEI*) enters significantly at the 0.07 level. When efficiency is the dependent variable, *LLYI* and *PRIVYI* enter with coefficients significant at the 0.01 level, while *PRIVATEI* enters insignificantly and *BANKI* is significant at the 0.06 level.

12. Since the data begin in 1960 and given the way in which we construct *LLY*, *LLY*60 uses data in 1961.

13. We also examined the regression results of Table VIII using *GK*, *INV*, and *EFF* as the dependent variable. Financial depth in 1960 is significantly related to all three. When we omit the two high and two low values of *LLY*60 (i.e., use 53 observations), the coefficient on *LLY*60 is unchanged in regressions (1)–(3). However, it becomes insignificant in regression (4).

TABLE IX
GROWTH AND INITIAL FINANCIAL INDICATORS POOLED CROSS-SECTION TIME-SERIES: INITIAL DECADE VALUES

Dependent variable	*LLYI*	*BANKI*	*PRIVATEI*	*PRIVYI*
GYP	0.034***	0.028**	0.016*	0.037***
	(0.009)	(0.011)	(0.009)	(0.011)
	[0.001]	[0.011]	[0.071]	[0.001]
R^2:	0.42	0.40	0.39	0.42
GK	0.022***	0.027***	0.013*	0.028***
	(0.007)	(0.009)	(0.008)	(0.009)
	[0.003]	[0.003]	[0.095]	[0.002]
R^2:	0.37	0.37	0.35	0.37
INV	0.108***	0.102***	0.043*	0.086***
	(0.023)	(0.028)	(0.024)	(0.028)
	[0.001]	[0.001]	[0.068]	[0.003]
R^2:	0.33	0.30	0.26	0.28
EFF	0.025***	0.020*	0.013	0.028***
	(0.009)	(0.010)	(0.009)	(0.010)
	[0.004]	[0.058]	[0.144]	[0.007]
R^2:	0.33	0.31	0.30	0.33

(standard errors in parentheses) [*P*-values in brackets]

* significant at the 0.10 level, ** significant at the 0.05 level, *** significant at the 0.01 level.

GYP = Real per capita GDP growth rate, *GK* = Average growth rate of real per capita capital stock, 1960–1989, *INV* = Ratio of average investment to GDP, *EFF* = *GYP* − (0.3) *GK, *LLYI* = Initial ratio of liquid liabilities to GDP, *BANKI* = Initial deposit money bank domestic credit divided by deposit money bank plus central bank domestic credit, *PRIVATEI* = Initial ratio of claims on nonfinancial private sector to domestic credit, *PRIVYI* = Initial ratio of claims on the nonfinancial private sector to GDP.

Other explanatory variables. Decade dummy variables, log of initial income, log of initial secondary school enrollment rate, initial ratio of government expenditures to GDP, initial inflation rate, initial ratio of exports plus imports to GDP.

The data generally support the hypothesis that the level of financial sector development is a good predictor of subsequent economic growth.[14] Furthermore, financial development is linked to the rate of physical capital formation over the next ten years and the subsequent efficiency of resource allocation. The coefficients in Table IX are very similar (except for *PRIVATEI*) to the corresponding coefficients in Table VII that depict purely cross-sectional

14. These results correspond nicely to the simple correlations of Table VI: (1) high values of the financial development indicators in one decade are positively and significantly correlated with high values of these financial indicators in the next decade; and (2) the financial development indicators are highly correlated with real per capita GDP growth.

results over the 1960–1989 period with contemporaneous values of the financial development indicators. To illustrate the economic size of the coefficients, the results suggest that if in 1970 Zaire had increased the share of domestic credit allocated by banks as opposed to the central bank (*BANK*) from 26 percent to the mean value for developing countries in 1970 (about 57 percent), then Zaire would have grown 0.9 percent faster each year in the 1970s, and by 1980 real per capita GDP would have been about 9 percent larger than it was. Again, note that these illustrative "experiments" do not consider how to increase *BANK* in 1970.

B. Sensitivity Analyses

The results on the link between the predetermined components of financial development and growth are stable. The findings are insensitive to estimation technique. For example, two-stage least squares and three-stage least squares regressions using initial levels of the financial development indicators as instruments give similar results to those reported in Table IX (see King and Levine [1993c] for these regressions). Inclusion of continent dummies or the change in the terms of trade tends to strengthen the results, while adding political stability indexes, population growth, or GDP growth rates from the previous decade does not alter the conclusions. The basic results hold when we restrict the sample to just developing countries, just sub-Saharan African countries, or just nonsub-Saharan African countries. Omitting outliers does not affect the results. Since our residual measure of efficiency may be prone to skepticism, we also estimated the initial value growth regressions (and the instrumental variable regressions) while including the previous decade value of *INV*. This modification did not alter our findings.

III. Conclusions

This paper studied the empirical link between a range of indicators of financial development and economic growth. We find that (1) indicators of the level of financial development—the size of the formal financial intermediary sector relative to GDP, the importance of banks relative to the central bank, the percentage of credit allocate to private firms, and the ratio of credit issued to private firms to GDP—are strongly and robustly correlated with growth, the rate of physical capital accumulation, and improvements in the efficiency of capital allocation; and (2) the predeter-

mined components of these financial development indicators significantly predict subsequent values of the growth indicators. The data are consistent with the view that financial services stimulate economic growth by increasing the rate of capital accumulation and by improving the efficiency with which economies use that capital. We do not, however, link specific financial sector policies with long-run growth. Only by relating measures of executable government policies to subsequent growth can we confidently make policy recommendations.[15]

Based on the empirical results in this paper, we conclude that Schumpeter might have been right about the importance of finance for economic development. This finance-development link, however, is typically not the economic mechanism most closely associated with Schumpeter. The standard statement of the Schumpeterian vision is of "creative destruction," a process by which invention and innovation replace old production methods and goods with better procedures, commodities, and services (see Shleifer [1986]). Yet, an integral part of the Schumpeterian story is that financial intermediaries make possible technological innovation and economic development. "The banker . . . authorizes people, in the name of society as it were, to . . . [innovate]" [Schumpeter, 1911, p. 74].

Recent theoretical research on endogenous technological change emphasizes the Schumpeterian vision of creative destruction (e.g., Romer [1990], Grossman and Helpman [1991], and Aghion and Howitt [1992]). Using these frameworks of endogenous technological change, we are developing a more complete Schumpeterian vision of development by incorporating key roles for financial intermediaries—such as entrepreneurial selection and the financing of tangible and intangible investments that lead to innovation [King and Levine, 1993b]. Within this framework policies that alter the costliness and efficiency of financial intermediation exert a first-order influence on economic growth.

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[Footnotes]

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