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Finance and Growth

Schumpeter Might Be Right

Robert G. King
and
Ross Levine

Finance matters. The level of a country's financial development helps predict its rate of economic growth for the following 10 to 30 years. The data are consistent with Schumpeter's view that the services provided by financial intermediaries stimulate long-run growth.

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This paper — a product of the Financial Policy and Systems Division, Country Economics Department — is part of a larger effort in the department to understand the ways policies can affect long-term growth. The study was funded by the Bank's Research Support Budget under research project "How Do National Policies Affect Long-Run Growth?" (RPO 676-66). Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Daniele Evans, room N9-057, extension 38526 (February 1993, 43 pages).

Joseph Schumpeter argued in 1911 that the services provided by financial intermediaries — mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating transactions — stimulate technological innovation and economic development.

King and Levine present evidence that supports this view.

Examining a cross-section of about 80 countries for the period 1960-89, they find that various measures of financial development are strongly associated with both current and later rates of economic growth. Each measure has shortcomings but all tell the same story: Finance matters.

King and Levine present three main findings, which are robust to many specification tests:

- The average level of financial development for 1960-89 is very strongly associated with growth for the period.

- Financial development precedes growth. For example, financial depth in 1960 (the ratio of broad money to GDP) is positively and significantly related to real per capita GDP growth over the next 30 years even after controlling for a variety of country-specific characteristics and policy indicators.

- Financial development is positively associated with both the investment rate and the efficiency with which economies use capital.

Much work remains to be done, but the data are consistent with Schumpeter's view that the services provided by financial intermediaries stimulate long-run growth.

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Finance and Growth: Schumpeter Might Be Right

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I. Introduction

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 over the 1960-1989 period. Specifically, we investigate whether higher levels of financial development are significantly and robustly correlated with faster current and future rates of 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

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[1] Also, see Gertler and Rose [1992], King and Levine [1992a,b], DeGregorio and Guidotti [1992], and the World Bank [1989]. For microeconomic evidence, see Schiantarelli, et.al. [1992]. On theoretical linkages, see Greenwood and Jovanovic [1990], Bencivenga and Smith [1991], Levine [1991, 1992], Saint-Paul [1992], and Roubini and Salai-i-Martin [1991, 1992].

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 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 financial development and <u>future</u> 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. These results emerge from simple procedures that link the growth indicators with lagged values of the financial indicators and from a range of instrumental variables procedures that link the growth indicators with the predictable components of the financial development indicators. 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].

II. 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 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, 70s, and 80s, 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

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[2] King and Levine [1992a] 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

closely related with 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 institutional break-down 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

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liabilities in 1964 and liquid liabilities in 1965 divided by GDP in 1965.

[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.

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.

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 and 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]

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[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.

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

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 are 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 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 (GYP), the rate of physical capital accumulation (GK), the ratio of

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[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.

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. 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 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 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) to GDP (TRD), the ratio of government spending to GDP (GOV), and the average inflation rate (PI) to control for other economic phenomenon. 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 negative); 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-a-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, 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

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[9] See Tables VIIa-VIId in the Appendix for complete regression results.

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 sub-samples 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 sub-samples 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 [1992], 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 [1992] findings that most other economic indicators have only very fragile associations with long-run growth.

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[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] Table VIIe in the Appendix presents 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 the economic efficiency. Also, Levine and Renelt [1992] 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.

III. 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 to importantly 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 period (GYP), and the independent variable on which we focus is LLY60 - the value of financial depth in 1960.[12] As shown, LLY60 is highly correlated with economic growth over the next thirty 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, 70s, and 80s, 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.

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[12] Since the data begin in 1960 and given the way in which we construct LLY, LLY60 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 LLY60 (i.e., use 53 observations), the coefficient on LLY60 is unchanged in regressions (1) - (3), however, it becomes insignificant in regression (4).

As shown in Table IX, when real per capita GDP growth, real per capita capital stock growth, or the investment share are 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. 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 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, these illustrative "experiments" do not consider how to increase BANK in 1970.

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[14] These results correspond nicely with 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.

B. Instrumental variables

We use two stage least squares (2SLS) and three stage least squares (3SLS) to evaluate whether the predictable component of financial development is related to economic growth and the sources of economic growth. Since the 2SLS results are almost identical to the 3SLS results, we report the 3SLS and note differences in the text. We allow the constant to differ across decades but restrict the slope parameters to be equal across periods.[15] For instruments, we use LYO, LSEC, GOVI, PII, TRDI, and the predetermined values of the corresponding financial development indicators.

Table X summarizes the 3SLS results for the coefficients on our four financial indicators. (See Appendix Tables Xa-Xd for complete results.) The predictable components of (a) financial depth, (b) the relative importance of banks as opposed to central banks, and (c) the ratio of domestic credit issued to nonfinancial private firms to GDP are significantly related to each growth indicator. Although PRIVATE generally enters insignificantly in Table VIII, PRIVATE enters significantly in the growth equation when the regression includes dummy variables for Sub-Saharan Africa and Latin America. Inclusion of these continent dummy variables does not importantly alter the conclusions on the other financial indicators as shown in the Appendix, Table Xe. Thus, the predictable component of financial development appears strongly related to growth and the sources of growth. Interestingly, the predictable component of the other economic indicators - GOV, PI, and TRD - are not strongly linked with growth. (See Appendix Table Xa-Xd.)

C. Sensitivity analyses

We find the results on the predetermined and predictable components of financial development to be fairly stable. As noted, the findings are insensitive to estimation technique. Inclusion of continent dummies or the change in the terms of trade tends to strengthen the results, while adding

[15] Below, we discuss the results when all the coefficients are allowed to vary across decades.

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 non-Sub-Saharan African countries. Omitting outliers does not affect the results. To test for country effects (as opposed to continent effects), we subtracted the 1960-1989 mean of each variable from its value in each decade, computed the 3SLS results, and did a Hausman-type test to determine whether the coefficients on the two sets of results are significantly different from one another. This amounts to including dummy variables for each country and testing whether the coefficients on the financial indicators change. We find that the coefficients are not significantly different, which implies that we are not missing crucial country specific effects. However, numerous coefficients change noticeably, but the standard error in the means-removed-regression is such that means-removed coefficients are frequently less than one standard error away from the values in Table VIII. Thus, there may be some important country specific effects that we are missing. As Easterly, et. al. [1992] show, real per capita GDP growth varies much more across decades than the economic indicators used to explain growth. Put differently, it will be difficult for cross-country growth regressions to explain fully a country's growth experience because much of growth seems rooted in country specific characteristics that are difficult to capture using available data on many countries over long time periods. The first stage results (see appendix Table Xf) indicate that the best predictor of the average level of financial development is past financial development. This emphasizes the relative lack of variability in the explanatory variables we are using to explain growth. Finally, we conduct the analysis over each decade. The results for the 1960s and especially the 1980s are similar to the results reported in Table X. In the 1970s, LLY and PRIVY enter with significant coefficients in the 3SLS growth results.

Since our residual measure of efficiency may be particularly prone to skepticism, we performed the 3SLS with GYP as the dependent variable and INV

as an endogenous explanatory variable. We add the investment share in the previous decade as an instrument. Table XI summarizes the results. While these results should be viewed with caution, the predictable component of (1) financial depth, (2) the relative importance of banks, and (3) the ratio of private sector credit to GDP are all significantly related to growth after including the predictable component of investment. Interestingly, the "exogenous" component of investment does not enter with a significant coefficient (and indeed enters with a negative coefficient). More effort should be devoted toward examining the characteristics of the endogenous relationship between investment and growth.

IV. 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 predetermined or predictable components of these financial development indicators are significantly related with 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 with subsequent growth can we confidently make policy recommendations.[16]

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[16] See Giovannini and DeMelo [1990] and Chamley and Honohan [1990].

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 [1992], 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, 1992c]. 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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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)
GROWTH	0.045	0.026	0.014	-0.005		

Very fast: GROWTH > 0.03
Fast: GROWTH > 0.02 and < 0.03
Slow: GROWTH > 0.005 and < 0.02
Very slow: GROWTH < 0.005

LLY = Liquid liabilities to GDP
BANK = Deposit money bank domestic credit divided by deposit money bank + central bank domestic credit
PRIVATE = Claims on the nonfinancial private sector to total domestic credit
PRIVY = Gross claims on private sector to GDP
GROWTH = Average annual real per capita growth 1960-1989

Observations: Approximately 20 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 = Liquid liabilities to GDP
BANK = Deposit money bank domestic credit divided by deposit money bank + central bank domestic credit
PRIVATE = Claims on the nonfinancial private sector to total domestic credit
PRIVY = Gross claims on private sector to GDP
GK = Average growth rate of the real per capita capital stock 1960-1989

Observations: Approximately 20 in each of the four categories.

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 = Liquid liabilities to GDP
BANK = Deposit money bank domestic credit divided by deposit money bank + central bank domestic credit
PRIVATE = Claims on the nonfinancial private sector to total domestic credit
PRIVY = Gross claims on private sector to GDP
INV = Average annual investment to GDP 1960-1989

Observations: Approximately 20 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 = Liquid liabilities to GDP
BANK = Deposit money bank domestic credit divided by deposit money bank + central bank domestic credit
PRIVATE = Claims on the nonfinancial private sector to total domestic credit
PRIVY = Gross claims on 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 20 in each of the four categories.

Table V

Contemporaneous Correlations Among Financial Development Indicators:

1960-1989

	LLY	BANK	PRIVATE	PRIVY
GYP	0.55 [0.001]	0.44 [0.001]	0.37 [0.001]	0.50 [0.001]
LLY		0.58 [0.001]	0.44 [0.001]	0.83 [0.001]
BANK			0.79 [0.001]	0.62 [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 bank domestic credit divided by domestic bank domestic credit central bank domestic credit
PRIVATE = Ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Gross claims on the 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 [0.001]	0.26 [0.001]	0.29 [0.001]	0.09 [0.269]	0.30 [0.001]	0.16 [0.062]	0.27 [0.001]	0.25 [0.002]
LLY		0.88 [0.001]	0.53 [0.001]	0.52 [0.001]	0.42 [0.001]	0.44 [0.001]	0.81 [0.001]	0.70 [0.001]
Lag LLY			0.51 [0.001]	0.60 [0.001]	0.38 [0.001]	0.53 [0.001]	0.78 [0.001]	0.81 [0.001]
BANK				0.59 [0.001]	0.82 [0.001]	0.51 [0.001]	0.59 [0.001]	0.49 [0.001]
Lag BANK					0.46 [0.001]	0.82 [0.001]	0.56 [0.001]	0.58 [0.001]
PRIVATE						0.60 [0.001]	0.64 [0.001]	0.51 [0.001]
Lag PRIVATE							0.63 [0.001]	0.67 [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 bank domestic credit divided by domestic bank domestic credit central bank domestic credit
PRIVATE = Ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Gross claims on the private sector to GDP

Lag = Signifies the value in the previous decade

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)	(0.011)	(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 = Real per capita capital stock growth rate
INV = Ratio of investment to GDP
EFF = GYP - (0.3)*GK
LLY = Ratio of liquid liabilities to GDP
BANK = Deposit bank domestic credit divided by domestic bank domestic credit central bank domestic credit
PRIVATE = Ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Gross claims on the 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.

Table VIII

Growth and Initial Financial Depth: 1960-89

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

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]

Observations = 169

* 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 = Real per capita capital stock growth rate
INV = Ratio of investment to GDP
EFF = GYP - (0.3)*GK
LLYI = Initial ratio of liquid liabilities to GDP
BANKI = Initial deposit bank domestic credit divided by domestic bank domestic credit plus central bank domestic credit
PRIVATEI = Initial ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Initial gross claims on the 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.

Table X

Growth and Financial Indicators
Pooled Cross-Section Time-Series: Three Stage Least Squares

Dependent Variable	LLY	BANK	PRIVATE	PRIVY
GYP	0.035***	0.036***	0.014	0.035***
	(0.006)	(0.011)	(0.010)	(0.009)
	[0.001]	[0.001]	[0.184]	[0.001]
R^2:	0.47	0.39	0.33	0.54
GK	0.027***	0.034***	0.011	0.032***
	(0.005)	0.009)	(0.008)	(0.008)
	[0.001]	[0.001]	[0.187]	[0.001]
R^2:	0.48	0.54	0.42	0.51
INV	0.064***	0.010***	0.055**	0.060**
	(0.018)	(0.031)	(0.026)	(0.028)
	[0.001]	[0.002]	[0.044]	[0.035]
R^2:	0.27	0.18	0.24	0.32
EFF	0.030***	0.035***	0.005	0.028**
	(0.007)	(0.011)	(0.010)	(0.011)
	[0.001]	[0.003]	[0.660]	[0.012]
R^2:	0.39	0.40	0.22	0.47

(standard errors in parentheses)
[p-values in brackets]

Observations = 169

* 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 = Real capital stock per capita growth rate
INV = Ratio of investment to GDP
EFF = GYP - (0.3)*GK
LLY = Ratio of liquid liabilities to GDP
BANK = Deposit bank domestic credit divided by domestic bank domestic credit plus central bank domestic credit
PRIVATE = Ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Gross claims on the 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, and ratio of exports plus imports to GDP.

Instruments: Decade dummy variables, log of initial income, log of initial secondary school enrollment rate, initial ratio of government expenditures to GDP, initial inflation rate, and initial ratio of exports plus imports to GDP, and the initial value of the financial indicator.

Table XI

Efficiency: Links to Financial Indicators
Pooled Cross-Section Time-Series: Decade Averages

Instrumental Variables

DEPENDENT VARIABLE	INV	FINANCIAL INDICATOR
		LLY
GYP	-0.027	0.034***
	(0.079)	(0.012)
	[0.731]	[0.005]
		BANK
GYP	-0.044	0.041**
	(0.080)	(0.016)
	[0.840]	[0.012]
		PRIVATE
GYP	-0.016	0.020*
	(0.073)	(0.012)
	[0.830]	[0.094]
		PRIVY
GYP	-0.035	0.041***
	(0.076)	(0.014)
	[0.648]	[0.003]

(standard errors in parentheses)
[p-values in brackets]

Observations = 169

* significant at 0.10 level
** significant at 0.05 level
*** significant at 0.01 level

GYP = Real per capita GDP growth rate
INV = Ratio of investment to GDP
LLY = Ratio of liquid liabilities to GDP
BANK = Deposit bank domestic credit divided by domestic bank domestic credit plus central bank domestic credit
PRIVATE = Ratio of claims on nonfinancial private sector to domestic credit
PRIVY = Gross claims on the 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, and ratio of exports plus imports to GDP.

Instruments: 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 initial value of the financial indicator, and INV in the previous decade.

Appendix Tables

APPENDIX TABLE VIIa

SOURCES OF GROWTH: LINKS TO CONTEMPORANEOUS FINANCIAL INDICATORS

Cross-Section 1960-89

indep.vars.:		C	LYO	LSEC	GOV	PI	TRD	LLY	R^2
dependent var:	OBS								
GYP	77	0.03**	-0.008**	0.008**				0.028**	0.48
		(0.01)	(0.003)	(0.002)				(0.008)	
GYP	77	0.03**	-0.008**	0.009**	0.02	-0.00003	0.003	0.024**	0.50
		(0.01)	(0.003)	(0.002)	(0.04)	(0.00004)	(0.006)	(0.009)	
GK	77	-0.002	0.001	0.004**				0.024**	0.64
		(0.004)	(0.002)	(0.001)				(0.006)	
GK	77	-0.004	-0.000	0.005**	0.03	-0.00001	0.000	0.022**	0.65
		(0.005)	(0.002)	(0.001)	(0.03)	(0.00003)	(0.004)	(0.006)	
INV	77	0.17**	0.004	0.004				0.103**	0.31
		(0.02)	(0.009)	(0.006)				(0.030)	
INV	77	0.12**	-0.004	0.007	0.14	0.00022*	0.068**	0.097**	0.46
		(0.02)	(0.009)	(0.006)	(0.13)	(0.00012)	(0.020)	(0.029)	
EFF3	77	0.03**	-0.008**	0.007**				0.021**	0.40
		(0.01)	(0.002)	(0.001)				(0.007)	
EFF3	77	0.03**	-0.008**	0.007**	0.01	-0.00003	0.003	0.018**	0.42
		(0.01)	(0.002)	(0.002)	(0.03)	(0.00003)	(0.005)	(0.008)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

GYP = real per capita GDP growth rate
GK = growth in per capita capital stock
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP, 1960
LSEC = log secondary school enrollment, 1960
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
LLY = liquid liabilities as share of GDP

APPENDIX TABLE VIIb

SOURCES OF GROWTH: LINKS TO CONTEMPORANEOUS FINANCIAL INDICATORS

Cross-Section 1960-89

indep.vars.:		C	LYO	LSEC	GOV	PI	TRD	BANK	R^2
dependent var:	OBS								
GYP	77	0.02**	-0.011**	0.010**				0.036**	0.49
		(0.01)	(0.003)	(0.002)				(0.010)	
GYP	77	0.02**	-0.011**	0.010**	0.03	-0.00004	0.003	0.032**	0.50
		(0.01)	(0.003)	(0.002)	(0.04)	(0.00004)	(0.006)	(0.011)	
GK	77	-0.01	-0.001	0.006**				0.023**	0.61
		(0.01)	(0.002)	(0.001)				(0.007)	
GK	77	-0.01	-0.002	0.007**	0.04	-0.00001	-0.003	0.022**	0.62
		(0.01)	(0.002)	(0.001)	(0.03)	(0.00003)	(0.004)	(0.008)	
INV	77	0.11**	-0.011	0.012**				0.168**	0.39
		(0.03)	(0.010)	(0.006)				(0.035)	
INV	77	0.09**	-0.015	0.015**	0.15	0.00018	0.045**	0.133**	0.46
		(0.03)	(0.010)	(0.006)	(0.13)	(0.00012)	(0.021)	(0.038)	
EFF3	77	0.02**	-0.010**	0.008**				0.029**	0.42
		(0.01)	(0.002)	(0.001)				(0.009)	
EFF3	77	0.02**	-0.010**	0.009**	0.01	-0.00003	-0.002	0.026**	0.43
		(0.01)	(0.003)	(0.001)	(0.03)	(0.00003)	(0.006)	(0.010)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

GYP = real per capita GDP growth rate
GK = growth in per capita capital stock
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP, 1960
LSEC = log secondary school enrollment, 1960
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
BANK = deposit money bank domestic credit divided by deposit money bank + central bank domestic credit

APPENDIX TABLE VIIc

SOURCES OF GROWTH: LINKS TO CONTEMPORANEOUS FINANCIAL INDICATORS
Cross-Section 1960-89

indep.vars.:		C	LYO	LSEC	GOV	PI	TRD	PRIVATE	R^2
dependent var:	OBS								
GYP	77	0.02**	-0.012**	0.011**				0.037**	0.50
		(0.01)	(0.003)	(0.002)				(0.010)	
GYP	77	0.02**	-0.012**	0.012**	0.04	-0.00004	-0.001	0.034**	0.52
		(0.01)	(0.003)	(0.002)	(0.04)	(0.00004)	(0.006)	(0.010)	
GK	77	-0.00	-0.001	0.007**				0.022**	0.60
		(0.01)	(0.002)	(0.001)				(0.007)	
GK	77	-0.00**	-0.002**	0.007**	0.04	-0.00002	-0.002	0.020**	0.62
		(0.01)	(0.002)	(0.001)	(0.03)	(0.00002)	(0.005)	(0.008)	
INV	77	0.16**	0.011	0.015**				0.135**	0.33
		(0.02)	(0.011)	(0.006)				(0.037)	
INV	77	0.11**	-0.017	0.018**	0.20	0.0002	0.056**	0.115**	0.45
		(0.03)	(0.010)	(0.006)	(0.13)	(0.0001)	(0.021)	(0.036)	
EFF3	77	0.02**	-0.012**	0.009**				0.030**	0.43
		(0.01)	(0.002)	(0.001)				(0.009)	
EFF3	77	0.02**	-0.012**	0.009**	0.03	-0.00003	-0.000	0.027**	0.45
		(0.01)	(0.003)	(0.001)	(0.03)	(0.00003)	(0.005)	(0.009)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

GYP = real per capita GDP growth rate
GK = growth in per capita capital stock
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP, 1960
LSEC = log secondary school enrollment, 1960
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
PRIVATE = claims on the non-financial private sector to total domestic credit

APPENDIX TABLE VIId

SOURCES OF GROWTH: LINKS TO CONTEMPORANEOUS FINANCIAL INDICATORS

Cross-Section 1960-89

indep.vars.:		C	LYO	LSEC	GOV	PI	TRD	PRIVY	R^2
dependent var:	OBS								
GYP	77	0.03**	-0.010**	0.009**				0.036**	0.50
		(0.00)	(0.003)	(0.002)				(0.009)	
GYP	77	0.03**	-0.011**	0.010**	0.03	-0.00003	-0.004	0.032**	0.52
		(0.01)	(0.003)	(0.002)	(0.04)	(0.00004)	(0.006)	(0.010)	
GK	77	0.00	-0.001	0.005**				0.026**	0.63
		(0.00)	(0.002)	(0.001)				(0.007)	
GK	77	-0.00	-0.002	0.006**	0.04	-0.00001	0.001	0.025**	0.64
		(0.00)	(0.002)	(0.001)	(0.03)	(0.00003)	(0.004)	(0.007)	
INV	77	0.20**	-0.001	0.009				0.098**	0.27
		(0.02)	(0.010)	(0.006)				(0.036)	
INV	77	0.14**	-0.011	0.012**	0.16	0.0002	0.072**	0.102**	0.44
		(0.02)	(0.010)	(0.006)	(0.13)	(0.0001)	(0.021)	(0.034)	
EFF3	77	0.03**	-0.010**	0.008**				0.028**	0.42
		(0.01)	(0.002)	(0.001)				(0.008)	
EFF3	77	0.03**	-0.010**	0.008**	0.02	-0.00003	0.004	0.025**	0.44
		(0.01)	(0.003)	(0.001)	(0.03)	(0.00003)	(0.005)	(0.009)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

GYP = real per capita GDP growth rate
GK = growth in capital stock
INV = investment share of GDP
EFF3 = real GDP growth - .3*GK
LYO = log of initial real GDP, 1960
LSEC = log secondary school enrollment, 1960
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
PRIVY = gross claims on the financial sector to GDP

APPENDIX TABLE VIIe

Extreme Bounds Analysis of Financial Indicators: 1960-1989

	Beta	Standard Error	T-Statistic	Countries	R^2	Other Variables	Robust/Fragile (≠)
Liquid Liabilities Share (LLY)							
High	0.033	0.006	4.98	84	0.56	GOV,GDC,STDD	
Base	0.033	0.006	5.12	92	0.50		Robust
Low	0.024	0.006	3.87	88	0.56	PI,TRD,GOV	
Deposit Money Bank Domestic Credit Share (BANK)							
High	0.041	0.012	3.54	83	0.48	PI,STPI,TRD	
Base	0.037	0.010	3.79	83	0.46		Robust
Low	0.028	0.011	2.44	86	0.53	PI,STPI,GDC	
Claims on Private Sector to Total Domestic Credit (PRIVATE)							
High	0.035	0.011	3.20	77	0.49	TRD,STDD,REVC	
Base	0.035	0.010	3.60	82	0.45		Robust
Low	0.028	0.010	2.74	75	0.54	STPI,PI,GDC	
Claims on Private Sector to GDP (PRIVY)							
High	0.043	0.011	3.87	95	0.35	-	
Base	0.043	0.011	3.87	95	0.35		Robust
Low	0.028	0.011	2.67	91	0.43	GOV,PI,TRD	

Notes:

The base beta is the estimated coefficient from the regression with the financial indicator and the always included variables (LYO and LSEC). The high beta is the estimated coefficient on the financial indicator from the regression with the extreme high bound (β on the financial indicator + 2-standard deviations) after the extreme bounds procedure searches over all combination of (up to three) "other variables;" the low beta is the coefficient on the financial indicator from the regression with the extreme lower bound after the extreme bounds procedure searches over all combinations of (up to three) "other variables."

The set of "other variables" from which the extreme bounds procedure chooses groups of right-hand-side variables are the number of revolutions and coups (REVC), the ratio of government expenditures to GDP (GOV), inflation (PI), the ratio of trade to GDP (TRD), the rate of domestic credit growth (GDC), the standard deviation of inflation (STPI), and the standard deviation of domestic credit growth (STDD). In the Table the listed "other variables" are the variables that produce the extreme high and low betas. In the case of PRIVY, the base regression also produces the high beta.

The Robust/Fragile designation indicates whether the financial indicator is robust or fragile to alterations in the condition information set.

APPENDIX TABLE Xa
SOURCES OF GROWTH: LINKS TO FINANCIAL INDICATORS
Pooled Cross-Section Time Series: Decade Averages
Three Stage Least Squares

dependent var:	indep.vars.: OBS	C	LYO	LSEC	GOV	PI	TRD	LLY	R^2
GYP <A>	241	0.07**	0.006	0.009**				0.035**	0.40
		(0.03)	(0.003)	(0.003)				(0.007)	
GYP <B>	231	0.09**	-0.006**	0.010**	-0.03	-0.0001	-0.010**	0.035**	0.47
		(0.02)	(0.003)	(0.002)	(0.03)	(0.0001)	(0.005)	(0.006)	
GK <A>	237	0.00	-0.000	0.004**				0.027**	0.50
		(0.02)	(0.002)	(0.002)				(0.004)	
GK <B>	224	0.00	0.001	0.004*	-0.01	-0.0001	-0.008**	0.028**	0.48
		(0.02)	(0.002)	(0.002)	(0.02)	(0.0001)	(0.004)	(0.005)	
INV <A>	244	0.16**	0.005	0.008				0.09**	0.31
		(0.06)	(0.007)	(0.006)				(0.02)	
INV <B>	232	0.12**	0.007	0.004	-0.23**	-0.0001	0.069**	0.064**	0.27
		(0.05)	(0.006)	(0.003)	(0.08)	(0.0002)	(0.013)	(0.018)	
EFF3 <A>	233	0.07*	-0.006	0.007*				0.031**	0.34
		(0.04)	(0.005)	(0.004)				(0.008)	
EFF3 <B>	223	0.10**	-0.008**	0.009**	-0.01	-0.0001	-0.014**	0.030**	0.39
		(0.03)	(0.003)	(0.003)	(0.03)	(0.0001)	(0.005)	(0.007)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

<A> INSTRUMENTS: C LYO SEC LLYI
<B> INSTRUMENTS: C LYO SEC GOVI PII TRDI LLYI

GYP = real per capita GDP growth rate
GK = capital per capita growth rate
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP(1960,70,80)
LSEC = log secondary school enrollment, decade initial values
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
LLY = liquid liabilities as a share of GDP
Suffix (I) indicates initial value (1960,70,80)

APPENDIX TABLE Xb
SOURCES OF GROWTH: LINKS TO FINANCIAL INDICATORS
Pooled Cross-Section Time Series: Decade Averages
Three Stage Least Squares

indep.vars.: dependent var:	OBS	C	LYO	LSEC	GOV	PI	TRD	BANK	R^2
GYP <A>	197	0.07**	-0.006**	0.013**				0.022**	0.25
		(0.02)	(0.003)	(0.002)				(0.009)	
GYP <B>	190	0.10**	-0.008**	0.013**	-0.02	-0.0001	-0.019**	0.036**	0.39
		(0.02)	(0.003)	(0.002)	(0.03)	(0.0001)	(0.006)	(0.011)	
GK <A>	190	0.03*	-0.005**	0.009**				0.028**	0.54
		(0.02)	(0.002)	(0.002)				(0.007)	
GK <B>	182	0.04*	-0.005**	0.010**	0.01	-0.0001	-0.015**	0.034**	0.54
		(0.02)	(0.002)	(0.002)	(0.03)	(0.0001)	(0.004)	(0.009)	
INV <A>	198	0.20**	-0.010	0.021**				0.144**	0.19
		(0.06)	(0.008)	(0.006)				(0.028)	
INV <B>	190	0.17**	-0.005	0.016**	-0.06	-0.0001	0.052**	0.103**	0.18
		(0.06)	(0.008)	(0.006)	(0.10)	(0.0001)	(0.017)	(0.031)	
EFF3 <A>	189	0.09**	-0.007**	-0.011**				0.017*	0.27
		(0.03)	(0.003)	(0.003)				(0.009)	
EFF3 <B>	182	0.10**	-0.010**	0.012**	0.01	-0.0001	-0.024**	0.035**	0.26
		(0.02)	(0.003)	(0.003)	(0.03)	(0.0001)	(0.006)	(0.011)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

<A> INSTRUMENTS: C LYO SEC BANKI
<B> INSTRUMENTS: C LYO SEC GOVI PII TRDI BANKI
GYP = real per capita GDP growth rate
GK = capital per capita growth rate
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP(1960,70,80)
Suffix (I) indicates initial value (1960,70,80)
LSEC = log secondary school enrollment, decade initial values
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
BANK = deposit money bank domestic credit divided by deposit money bank + central bank domestic credit

APPENDIX TABLE Xc
SOURCES OF GROWTH: LINKS TO FINANCIAL INDICATORS
Pooled Cross-Section Time Series: Decade Averages
Three Stage Least Squares

indep.vars.: dependent var:	OBS	C	LYO	LSEC	GOV	PI	TRD	PRIVATE	R^2
GYP <A>	187	0.08**	-0.005	0.012**				0.011	0.33
		(0.03)	(0.003)	(0.003)				(0.010)	
GYP <B>	180	0.09**	-0.004	0.012**	-0.02	-0.0001	-0.017**	0.014	0.33
		(0.02)	(0.003)	(0.003)	(0.04)	(0.0001)	(0.006)	(0.010)	
GK <A>	181	0.02	-0.001	0.008**				0.010	0.43
		(0.02)	(0.002)	(0.002)				(0.007)	
GK <B>	173	0.02	-0.001	0.008**	0.01	-0.0001	-0.013**	0.011	0.42
		(0.02)	(0.002)	(0.002)	(0.03)	(0.0001)	(0.005)	(0.008)	
INV <A>	188	0.20**	-0.002	0.024**				0.075**	0.20
		(0.06)	(0.008)	(0.006)				(0.026)	
INV <B>	180	0.17**	0.002	0.018**	-0.13	-0.0001	0.047**	0.055**	0.24
		(0.06)	(0.008)	(0.006)	(0.10)	(0.0002)	(0.016)	(0.026)	
EFF3 <A>	180	0.09**	-0.005*	0.011**				0.001	0.23
		(0.03)	(0.003)	(0.003)				(0.010)	
EFF3 <B>	173	0.09**	-0.005*	0.011**	0.01	-0.0001	-0.022**	0.005	0.22
		(0.02)	(0.003)	(0.003)	(0.03)	(0.0001)	(0.006)	(0.010)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

<A> INSTRUMENTS: C LYO SEC PRIVATEI
<B> INSTRUMENTS: C LYO SEC GOVI PII TRDI PRIVATEI

GYP = real per capita GDP growth rate
GK = capital per capita growth rate
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP(1960,70,80)
Suffix (I) indicates initial value (1960,70,80)

LSEC = log secondary school enrollment, decade initial values
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
PRIVATE = claims on the non-financial private sector to total domestic credit

APPENDIX TABLE Xd
SOURCES OF GROWTH: LINKS TO FINANCIAL INDICATORS
Pooled Cross-Section Time Series: Decade Averages
Three Stage Least Squares

indep.vars.: dependent var:	OBS	C	LYO	LSEC	GOV	PI	TRD	PRIVY	R^2
GYP <A>	246	0.09**	-0.008**	0.010**				0.044**	0.52
		(0.03)	(0.004)	(0.002)				(0.010)	
GYP <B>	235	0.10**	-0.007**	0.011**	-0.02	-0.0001	-0.007	0.035**	0.54
		(0.02)	(0.003)	(0.002)	(0.03)	(0.0001)	(0.005)	(0.009)	
GK <A>	242	0.02	-0.002	0.007**				0.033**	0.54
		(0.02)	(0.002)	(0.002)				(0.007)	
GK <B>	228	0.02	-0.002**	0.006**	0.02	-0.0001	-0.005	0.032**	0.51
		(0.02)	(0.002)	(0.002)	(0.02)	(0.0001)	(0.004)	(0.008)	
INV <A>	249	0.14**	0.007	0.011*				0.065**	0.25
		(0.07)	(0.008)	(0.006)				(0.030)	
INV <B>	236	0.11**	0.007	0.005	-0.15*	-0.0001	0.093**	0.060**	0.32
		(0.06)	(0.007)	(0.005)	(0.08)	(0.0002)	(0.014)	(0.027)	
EFF3 <A>	238	0.05	-0.002	0.005				0.030**	0.40
		(0.05)	(0.006)	(0.004)				(0.014)	
EFF3 <B>	227	0.09**	-0.007*	0.009**	-0.00	-0.0001	-0.011**	0.028**	0.47
		(0.03)	(0.003)	(0.002)	(0.03)	(0.0001)	(0.005)	(0.011)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

<A> INSTRUMENTS: C LYO SEC PRIVYI
<B> INSTRUMENTS: C LYO SEC GOVI PII TRDI PRIVYI

GYP = real per capita GDP growth rate
GK = capital per capita growth rate
INV = investment share of GDP
EFF3 = GYP - .3*GK
LYO = log of initial real GDP(1960,70,80)
LSEC = log secondary school enrollment, decade initial values
GOV = government consumption as share of GDP
PI = average annual inflation rate
TRD = imports + exports as share of GDP
PRIVY = gross claims on the financial sector to GDP
Suffix (I) indicates initial value (1960,70,80)

APPENDIX TABLE Xe

GROWTH AND FINANCIAL INDICATORS

Pooled Cross-Section Time-Series: Three Stage Least Squares

Dependent Variable	LLY	BTOT	PRIVATE	PRIVY
GYP	0.019***	0.030***	0.019**	0.024**
	(0.007)	(0.011)	(0.009)	(0.090)
	[0.005]	[0.008]	[0.042]	[0.015]
R-Square	0.49	0.41	0.42	0.57
GK	0.015***	0.026***	0.015*	0.021***
	(0.005)	(0.009)	(0.007)	(0.008)
	[0.004]	[0.007]	[0.052]	[0.008]
R-Square	0.52	0.58	0.56	0.34
INV	0.044**	0.097***	0.058**	0.038
	(0.019)	(0.032)	(0.026)	(0.028)
	[0.021]	[0.004]	[0.029]	[0.180]
R-Square	0.25	0.39	0.41	0.34
EFF	0.019**	0.028**	0.010***	0.020*
	(0.007)	(0.011)	(0.009)	(0.011)
	[0.016]	[0.017]	[0.278]	[0.076]
R-Square	0.41	0.24	0.25	0.48

(STANDARD ERRORS IN PARENTHESES)
[P-VALUES IN BRACKETS]

Observations = 169

* 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 = Real capital stock per capita growth rate
INV = Ratio of investment to GDP
EFF = GYP - (0.3)*GK
LLY = Ratio of liquid liabilities to GDP
BANK = Deposit bank domestic credit divided by domestic bank domestic credit plus central bank domestic credit
PRIVATE = Ratio of claims on non-financial private sector to domestic credit
PRIVY = Gross claims on the 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, continent dummy variables for Sub-Saharan Africa and Latin America.

Instruments: 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, continent dummy variables, and the initial value of the financial indicators.

APPENDIX TABLE Xf

FIRST STAGE RESULTS

Pooled Cross-Section Time-Series: Decade Averages

indep.vars.:		C	LYO	LSEC	GOVI	PII	TRDI	FINANCIAL INDICATOR(I)	R^2
dependent var:	OBS								
LLY	169	0.003	-0.002	0.007	0.06	-0.00005	0.021	LLYI 1.091**	0.90
		(0.09)	(0.011)	(0.010)	(0.13)	(0.00039)	(0.021)	(0.037)	
BANK	169	-0.05	0.021	0.003	0.03	-0.00086**	-0.034**	BANKI 0.857**	0.82
		(0.11)	(0.014)	(0.011)	(0.14)	(0.00042)	(0.023)	(0.047)	
PRIVATE	169	-0.07	0.023	0.001	0.14	-0.00182**	-0.062**	PRIVATEI 0.837**	0.81
		(0.11)	(0.014)	(0.012)	(0.16)	(0.00044)	(0.025)	(0.042)	
PRIVY	169	-0.08	0.017**	0.007	-0.07	-0.00035	-0.009	PRIVY 0.980**	0.91
		(0.07)	(0.008)	(0.008)	(0.10)	(0.00028)	(0.015)	(0.015)	
GOV	169	-0.03	0.005*	0.006*	0.84**	-0.00007	0.007	LLYI 0.004	0.81
		(0.03)	(0.003)	(0.003)	(0.04)	(0.00011)	(0.006)	(0.011)	
PI	169	8.51	2.481	1.832	-79.74	1.66089**	-12.079	LLYI -21.581	0.39
		(44.46)	(5.194)	(4.939)	(63.29)	(0.18281)	(9.790)	(17.540)	
TRD	169	0.08	-0.003	0.006	0.09	-0.00031	0.846**	LLYI 0.051	0.89
		(0.12)	(0.014)	(0.013)	(0.17)	(0.00049)	(0.026)	(0.047)	

(STANDARD ERRORS IN PARENTHESES)

* significant at .10 level
** significant at .05 level

LSEC = log secondary school enrollment, decade initial values
GOV = government consumption as share of GDP
TRD = imports + exports as share of GDP
BANK = deposit money bank domestic credit divided by deposit money bank + central bank domestic credit
(I) indicates initial value (1960,1970,1980)

LYO = log of initial real GDP (1960,70,80)
PI = average annual inflation rate
LLY = liquid liabilities as share of GDP
PRIVY = Gross claims on Private Sector to GDP
PRIVATE = claims on the non-financial private sector to total domestic credit

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