Financial intermediation and growth: Causality and causes[☆]

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Abstract

This paper evaluates (1) whether the exogenous component of financial intermediary development influences economic growth and (2) whether cross-country differences in legal and accounting systems (e.g., creditor rights, contract enforcement, and accounting standards) explain differences in the level of financial development. Using both traditional cross-section, instrumental variable procedures and recent dynamic panel techniques, we find that the exogenous components of financial intermediary development is positively associated with economic growth. Also, the data show that cross-country differences in legal and accounting systems help account for differences in financial development. Together, these findings suggest that legal and accounting reforms that strengthen creditor rights, contract enforcement, and accounting practices can boost financial development and accelerate economic growth. © 2000 Published by Elsevier Science B.V. All rights reserved.

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1. Introduction

Do better functioning financial intermediaries – financial intermediaries that are better at ameliorating information asymmetries and facilitating transactions – exert a causal influence on economic growth? Providing evidence on *causality* has implications for policymakers and economists. For instance, Hamilton (1781) argued that 'banks were the happiest engines that ever were invented' for spurring economic growth. Others, however, question whether finance boosts growth. Adams (1819) asserted that banks harm the 'morality, tranquility, and even wealth' of nations.[1] Economic theories mirror these divisions. Some models show that economic agents create debt contracts and financial intermediaries to ameliorate the economic consequences of informational asymmetries, with beneficial implications for resource allocation and economic activity.[2] However, other models note that higher returns from better resource allocation may depress saving rates enough such that overall growth rates actually slow with enhanced financial development (Bencivenga and Smith, 1991; King and Levine, 1993b). Furthermore, Robinson (1952) argues that financial development primarily follows economic growth and the engines of growth must be sought elsewhere.[3] In terms of policy, if financial intermediaries exert an economically large impact on growth, then this raises the degree of urgency attached to legal, regulatory, and policy reforms designed to promote financial development.

This paper rigorously examines whether the exogenous component of financial intermediary development influences economic growth. We also present evidence concerning the legal, regulatory, and policy determinants of financial development. While past work shows that the level of financial development is a good predictor of economic growth (King and Levine, 1993a, b; Levine and Zervos, 1998; Neusser and Kugler, 1998; Rousseau and Wachtel, 1998), these results do not settle the issue of causality. Although this paper does not fully resolve all concerns about causality, it uses new data and new econometric procedures that directly confront the potential biases induced by simultaneity,

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[1] The quotations from Hamilton and Adams are taken from Hammond (1991). For an historical perspective, also see Bagehot (1873) and Schumpeter (1934) on how intermediaries spur economic growth.

[2] Also, see Townsend (1979); Gale and Hellwig (1985); Diamond (1984); Boyd and Prescott (1986); Diamond and Dybvig (1983); and Greenwood and Jovanovic (1990). For reviews of this literature see Gertler (1988) and Levine (1997).

[3] For more on how economic activity influences the financial sector, see Patrick (1966) and Greenwood and Jovanovic (1990).

omitted variables, and unobserved country-specific effects that have plagued previous empirical work on the finance-growth link.[4]

Methodologically, the paper uses two econometric techniques: (1) generalized method-of-moments (GMM) dynamic panel estimators and (2) a cross-sectional instrumental-variable estimator. Whereas the pure cross-sectional estimator follows directly from traditional growth studies, the panel estimator uses pooled cross-country and time-series data to exploit the additional information provided by the over-time variation in the growth rate and its determinants. This added information allows us to obtain more precise estimates and, most importantly, correct for biases associated with existing studies of the finance-growth relationship.

Consider first the GMM dynamic panel estimators, which are specifically designed to address the econometric problems induced by unobserved country-specific effects and joint endogeneity of the explanatory variables in lagged-dependent-variable models, such as growth regressions. We assemble a panel dataset of 74 countries, where the data are averaged over each of the seven 5-year intervals composing the period 1960–1995. The dependent variable is the growth rate of the real per capita gross domestic product (GDP). The regressors include the level of financial intermediary development, along with a broad set of variables that serve as conditioning information. We employ two GMM panel estimators; both are based on the use of lagged observations of the explanatory variables as instruments (thus labeled 'internal' instruments). In the first GMM panel estimator, we (a) difference the regression equation to remove any omitted variable bias created by unobserved country-specific effects, and then (b) instrument the right-hand-side variables (the differenced values of the original regressors) using lagged values of the original regressors to eliminate potential parameter inconsistency arising from simultaneity bias. This *difference* dynamic-panel estimator, developed by Arellano and Bond (1991) and Holtz-Eakin et al. (1990), has increasingly been used in studies of growth (Caselli et al., 1996; Easterly et al., 1997). We also use a second GMM dynamic panel estimator that improves upon the *difference* estimator in so far as the quality of the instruments is concerned. Specifically, lagged values of financial development frequently make weak instruments for forecasting *changes* in financial development. This weak instrument problem can induce biases in finite samples and poor precision even asymptotically (Alonso-Borrego and Arellano, 1996).

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[4] This paper complements recent microeconomic efforts aimed at reconciling whether financial development is simply a good predictor of economic growth. Rajan and Zingales (1998) show that, in countries with well-developed financial systems, industries that are naturally heavy users of external finance grow relatively faster than other industries. Demirgüç-Kunt and Maksimovic (1998) show that firms in countries with better-developed financial systems grow faster than they could have grown without this access. Jayaratne and Strahan (1996) show that when individual states of the United States relaxed intrastate branching restrictions the quality of bank loans rose and per capita GDP growth accelerated.

The second GMM panel estimator mitigates this problem by complementing the *difference* specification with the original regression specified in *levels*. This *system* estimator, developed by Arellano and Bover (1995), offers dramatic improvements in both efficiency and consistency in Monte Carlo simulations (Blundell and Bond, 1997). These GMM estimators have not been used before to examine the relationship between financial intermediary development and economic growth.

Our second econometric method to examine the effect of financial intermediary development on economic growth is a cross-sectional estimator. Data for 71 countries are averaged over the period 1960–1995, so that there is one observation per country. Although the cross-sectional estimator does not deal as rigorously as the panel estimators with the potential problems induced by simultaneity, omitted variables, and unobserved country-specific effects, the cross-sectional results are direct descendants of the cross-country literature on finance and growth (e.g., King and Levine, 1993a; Levine and Zervos, 1998). Also, the cross-sectional estimator serves as a consistency check on the panel findings. Unlike much of the cross-country growth literature, we use instrumental variables to extract the exogenous component of financial intermediary development. For this purpose we use the insight provided by LaPorta *et al.* (1997, 1998; henceforth LLSV). They note that most countries can be divided into countries with predominantly English, French, German, or Scandinavian legal origins and that countries typically obtained their legal systems through occupation or colonization. Moreover, LLSV (1998) show that national legal origin strongly influences the legal and regulatory environment governing financial sector transactions. Since legal origin explains cross-country differences in financial intermediary development and since legal origin is (reasonably) exogenous, we use legal origin as an instrumental variable to control for simultaneity bias.

In conducting this research, we construct a new dataset and focus on three measures of financial intermediation. One measures the overall size of the financial intermediation sector. The second measures whether commercial banking institutions, or the central bank, is conducting the intermediation. The third measures the extent to which financial institutions funnel credit to private sector activities. Our financial development indicators improve on past measures by (i) more accurately deflating nominal measures of intermediary liabilities and assets, (ii) more comprehensively measuring the banking sector, and (iii) more carefully distinguishing who is conducting the intermediation and to where the funds are flowing. While the financial intermediary indicators are still imperfect measures of how well financial intermediaries research firms, monitor managers, mobilize savings, pool risk, and ease transactions, these three measures provide more information about financial intermediary development than past measures and together they provide a more accurate picture than if we used only a single measure. Moreover, they produce similar conclusions.

The GMM dynamic panel estimators and the pure cross-sectional regressions produce very consistent findings: the exogenous component of financial intermediary development is positively and robustly linked with economic growth. In interpreting the results, note that the findings do not reject the view that economic activity influences financial development. Rather, the results show that the positive link between finance and growth is *not only* due to growth influencing financial development; the strong positive relationship between financial intermediary development and long-run growth is at least partly explained by the effect of the exogenous component of financial development on economic growth. Economically, the impact is large. For example, the estimated coefficients suggest that if Argentina had enjoyed the level of financial intermediary development of the average developing country during the 1960–1995 period it would have experienced about one percentage point faster real per capita GDP growth per annum over this period.

The regression results pass a battery of diagnostic and sensitivity tests. The results are robust to modifications in the conditioning information set and alterations in the sample period. Outliers are not producing the results. Specification tests support the appropriateness of the instrumental variables. This gives credence to the conclusion that the estimated positive link between finance and growth is not due to simultaneity bias or insufficient control for other determinants of growth.

The results favor the growth-enhancing view of financial intermediation espoused by Hamilton (1781), Bagehot (1873), and Schumpeter (1934). In turn, the results are less consistent with those that minimize the positive role of financial intermediaries in the growth process (Adams, 1819; Robinson, 1952; Lucas, 1988). Similarly, this paper's findings are consistent with theoretical models that predict that better functioning financial intermediaries accelerate economic growth. Our results do not favor models that emphasize the potentially growth-retarding impact of financial development. Finally, this paper's findings highlight financial reform. If economists can identify legal, regulatory, and policy reforms that promote financial development, this may positively influence economic growth.

Consequently, we also examine whether cross-country differences in particular legal and regulatory system characteristics help explain cross-country differences in the level of financial intermediary development. The degree to which financial intermediaries can acquire information about firms, write contracts, and have those contracts enforced will fundamentally influence the ability of those intermediaries to identify worthy firms, exert corporate control, manage risk, mobilize savings, and ease exchanges. Thus, as argued by LLSV (1997, 1998), the legal and regulatory system will fundamentally influence the ability of the financial system to provide high-quality financial services. LLSV (1997) examine securities markets. In contrast, we combine their data on the legal and regulatory environment with our data on financial intermediation to study the

links between financial intermediary development and cross-country differences in legal and accounting systems.

The results provide useful information to policymakers. The data suggest that countries with legal and regulatory systems that give a high priority to creditors receiving the full present value of their claims on corporations have better functioning financial intermediaries than countries where the legal system provides weaker support to creditors. Moreover, contract enforcement seems to matter even more than the formal legal and regulatory codes. Countries that efficiently impose compliance with laws tend to have better developed financial intermediaries than countries where enforcement is more lax. The paper also shows that information disclosure matters for financial development. Countries where corporations publish relatively comprehensive and accurate financial statements have better developed financial intermediaries than countries where published information on corporations is less reliable. Finally, we confirm these findings when using the legal origin dummy variables (English, French, German, Scandinavian) as instrumental variables to extract the exogenous component of the legal, enforcement, and accounting environment: the legal/regulatory system exerts a powerful influence on financial sector development. While considerable research remains, taken together, this paper's findings provide support for the view that legal and regulatory changes that strengthen creditor rights, contract enforcement, and accounting practices boost financial intermediary development with positive repercussions on economic growth.

The rest of the paper is organized as follows. Section 2 presents the results using purely cross-sectional data, while Section 3 discusses and presents the *difference* and *system* dynamic panel results. Section 4 provides information on how the legal and accounting environment explain cross-country differences in financial development. Section 5 concludes.

2. Finance and growth: Cross-sectional analyses

This section examines the relationship between financial intermediation and growth using a pure cross-sectional estimator. We begin with the pure cross-sectional estimator because it more directly follows from the large cross-country growth literature. The next section uses GMM dynamic panel procedures that more comprehensively confront problems induced by country-specific effects, endogeneity, and the routine use of lagged dependent variables in growth regressions.

2.1. Financial intermediary development

As discussed above, numerous theoretical models show that economic agents may form financial intermediaries to mitigate the economic consequences of information and transaction costs. More specifically, financial intermediaries

emerge to lower the costs of researching potential investments, exerting corporate control, managing risk, mobilizing savings, and conducting exchanges. Theory further suggests that, by providing these services to the economy, financial intermediaries influence savings and allocation decisions in ways that may alter long-run growth rates.[5] Thus, modern economic theory provides an intellectual framework for understanding how financial intermediaries influence long-run rates of economic growth.

To evaluate the empirical predictions advanced by a variety of theoretical models regarding the relationship between finance and growth, therefore, we would ideally like to construct measures of the ability of different financial systems to research and identify profitable ventures, monitor and control managers, ease risk management and facilitate resource mobilization. It is impossible, however, to construct accurate, comparable measures of these financial services for a broad cross-section of countries over the past 35 years. Consequently, to measure the provision of financial services, this paper constructs three indicators of financial intermediary development. (We also consider two additional measures in the sensitivity section.) While each has particular strengths and weaknesses, we improve upon past measures of financial intermediary development.[6]

LIQUID LIABILITIES equals liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP. This is a typical measure of 'financial depth' and thus of the overall size of the financial intermediary sector (King and Levine, 1993a). This commonly used measure of financial sector development has shortcomings. It may not accurately gauge the effectiveness of the financial sector in ameliorating informational asymmetries and easing transactions costs. Also, LIQUID LIABILITIES includes deposits by one financial intermediary in another, which may involve 'double counting'. Under the assumption that the

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[5] For example, see Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), and King and Levine (1993b).

[6] One way this paper improves upon past measures of financial intermediary development is by accurately deflating nominal measures of financial intermediary liabilities and assets. Specifically, while financial intermediary balance sheet items are measured at the end of the year, GDP is measured over the year. Some authors try to correct for this problem by using an average of financial intermediary balance sheet items in year t and $t-1$ and dividing by GDP measured in year t (King and Levine, 1993a). This however does not fully resolve the distortion, especially in highly inflationary environments. This paper deflates end-of-year financial balance sheet items by end of year consumer price indices (CPI) and deflates the GDP series by the annual CPI. Then, we compute the average of the real financial balance sheet item in year t and $t-1$ and divide this average by real GDP measured in year t. This is described more fully in the data appendix. Although we have attempted to be as careful as possible in constructing the data, measurement errors undoubtedly remain. We could not identify any reasons to believe, however, that this would systematically influence this paper's findings since we control for a variety of factors – including the level of economic development – and use instrumental variable procedures.

size of the financial intermediary sector is positively correlated with the provision and quality of financial services, many researchers use this measure of financial depth (Goldsmith, 1969; King and Levine, 1993a; and McKinnon, 1973). Thus, we include it as one measure of financial intermediary development.

COMMERCIAL-CENTRAL BANK equals the ratio of commercial bank assets divided by commercial bank plus central bank assets. COMMERCIAL-CENTRAL BANK measures the degree to which commercial banks versus the central bank allocate society's savings. Again, this measure of financial intermediary development does not directly measure the effectiveness of banks in researching firms, exerting corporate control, mobilizing savings, easing transactions, and providing risk management facilities to clients. Thus, COMMERCIAL-CENTRAL BANK is not a direct measure of the quality and quantity of financial services provided by financial intermediaries. The intuition underlying this measure is that banks are more likely to identify profitable investments, monitor managers, facilitate risk management, and mobilize savings than central banks. Thus, King and Levine (1993a, b) recommend including COMMERCIAL-CENTRAL BANK as an additional measure of financial intermediary development.

PRIVATE CREDIT equals the value of credits by financial intermediaries to the private sector divided by GDP. This measure of financial development is more than a simple measure of financial sector size. PRIVATE CREDIT isolates credit issued to the private sector, as opposed to credit issued to governments, government agencies, and public enterprises. Furthermore, it excludes credits issued by the central bank. PRIVATE CREDIT is our preferred indicator because it improves on other measures of financial development used in the literature. For example, King and Levine (1993a, b) use a measure of gross claims on the private sector divided by GDP. But, this measure includes credits issued by the monetary authority and government agencies, whereas PRIVATE CREDIT includes only credits issued by banks and other financial intermediaries. Also, Levine and Zervos (1998) and Levine (1998) use a measure of deposit money bank credits to the private sector divided by GDP over the period 1976–1993.[7] That measure, however, does not include credits to the private

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[7] Levine and Zervos (1998) also examine whether equity markets substitute for credit issuing intermediaries. They find that the answer is no. Measures of banking sector development and stock market development both enter significantly when included together in simple cross-country growth regressions. Evidently, banks provide different financial services from those provided by securities markets. Specifically, theory suggests that securities markets are particularly good at augmenting liquidity and allowing agents to custom design risk management tools. Theory suggests that intermediaries have a comparative advantage in reducing informational asymmetries. This paper is very different from Levine and Zervos (1998) because we are trying to control formally for simultaneity and omitted variable biases, which they do not do. To do this, we rely on the GMM dynamic panel procedures and use the pure cross-sectional estimator to confirm our results. Unfortunately, there do not exist securities market data over a sufficiently long period and across a sufficiently large number of countries to conduct our analyses with securities market data from Levine and Zervos (1998).

Table 1
Summary statistics: 1960–1995[a]

	Financial Intermediary Development		
	Liquid liabilities	Commercial-central bank	Private credit
Mean	43.44	78.16	38.29
Median	37.48	83.89	27.01
Maximum	143.43	98.99	141.30
Minimum	9.73	23.72	4.08
Std. Dev.	25.61	18.26	28.71
Observations	71	71	71

[a] LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP, times 100. COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

sector by non-deposit money banks and it only covers the period 1976–1993. PRIVATE CREDIT is a broader measure of credit issuing financial intermediaries and its time dimension is twice as long, 1960–1995. We should also emphasize here that these financial intermediary measures are not simply picking up the relative importance of state-owned enterprises and the overall level of nationalization. In the analysis below, we control for the role of state-owned enterprises and this does not affect the conclusions. While PRIVATE CREDIT does not directly measure the amelioration of information and transaction costs, we interpret higher levels of PRIVATE CREDIT as indicating higher levels of financial services and therefore greater financial intermediary development.

Table 1 provides summary statistics on the financial intermediary development indicators. The data are listed country-by-country in Appendix A, Table 8. (Summary statistics and correlations with other variables used in this paper are provided in Tables 10 and 11.) There is considerable variation across countries. For example, PRIVATE CREDIT is less than 10% of GDP in Zaire, Sierra Leone, Ghana, Haiti, and Syria. PRIVATE CREDIT, however, is greater than 85 percent of GDP in Switzerland, Japan, the United States, Sweden, and the Netherlands. Real per capita GDP growth also exhibits considerable cross-country variation. For instance, Korea, Malta, Taiwan, and Cyprus all enjoyed growth rates over greater than 5% per annum over the 35 year period, while Zaire, Niger, Ghana, Venezuela, Haiti, and El Salvador all suffered growth rates of less than *negative* 0.5% per year from 1960 to 1995. Thus, the dataset offers
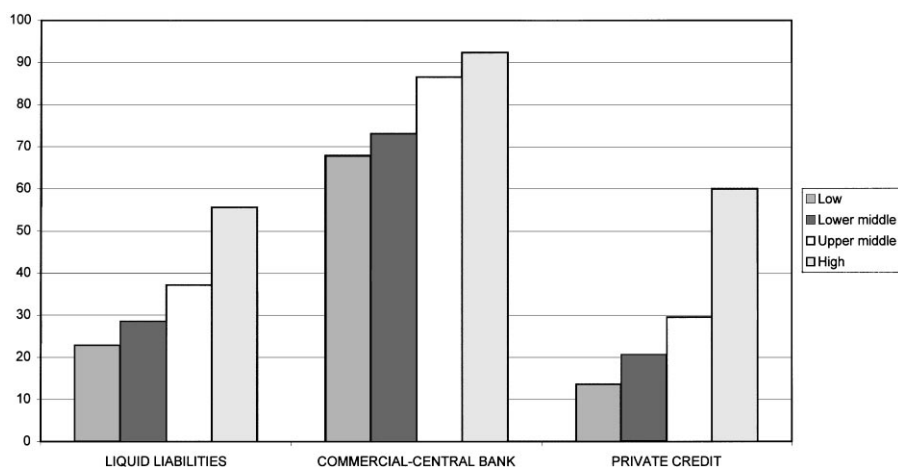
Fig. 1. Financial development across income groups, 1960–1995.

rich cross-country variation for exploring the link between growth and financial intermediary development.

The positive relationship between income per capita and financial development is illustrated in Fig. 1. Fig. 1 shows that all three financial intermediary development indicators tend to increase as we move from low- to high-income countries. Since conditional convergence is a feature of cross-country data sets over the post 1960 period (Barro and Sala-i-Martin, 1995), the positive correlation between income per capita and financial development may then suggest a *negative* relationship between financial development and economic growth. Indeed, four out of the five countries with the highest level of PRIVATE CREDIT have slower than average growth rates (Japan is the lone exception). In any case, these summary statistics highlight the importance of controlling for the level of real per capita GDP – as well as a host of other economic and political factors – in assessing the independent relationship between financial intermediary development and economic growth.

Fig. 2 illustrates that countries with higher levels of PRIVATE CREDIT tend to enjoy faster growth rates over the 1960–1995 period than countries with lower levels of financial intermediary development. Indeed, of the ten fastest growing countries over this 35-year period, all of them had larger-than-average values of PRIVATE CREDIT. Many well-known 'Asian Miracles', such as Malaysia, Thailand, Japan, Taiwan, and Korea, were in the top quartile of countries as ranked by financial intermediary development. It is worth noting that four European countries (Greece, Ireland, Portugal, and Cyprus) were also among the ten fastest growing countries during this sample period. Each of these

Growth: 1960-95
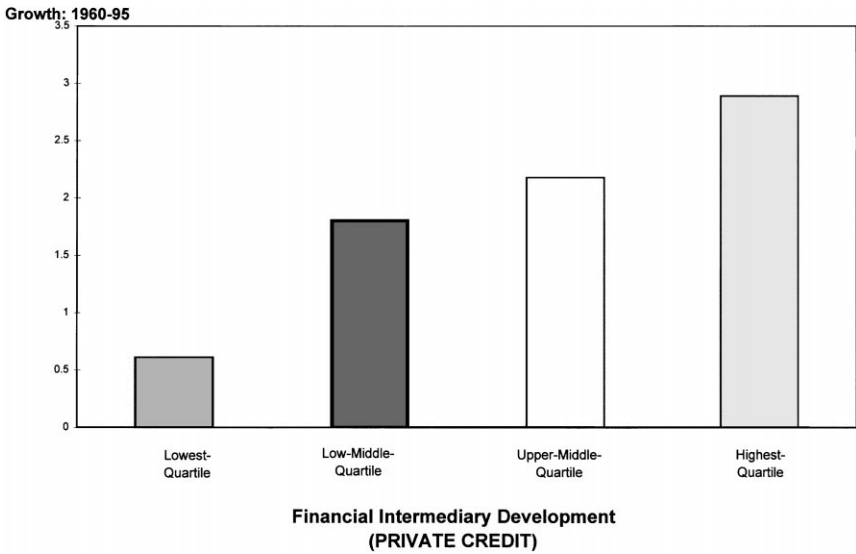
Fig. 2. Economic growth and financial intermediary development, 1960–1995.

countries also had comparatively well-developed financial systems. Certainly, many factors may account for these economic success stories. At the other end of the spectrum, seven of the ten countries with negative growth rates over the 35-year period were in the lowest quartile of countries as defined by financial intermediary development (Zaire, Niger, Ghana, Haiti, Liberia, Sierra Leone, and Guyana). The banking systems of these countries have been in disarray for much of the last 35 years (see, for example, Gelbard and Leite, 1999; Mehran, 1998; Sheng, 1996; Caprio et al., 1994 for discussions of the individual countries). Government ownership of banks, massive official intervention in credit alloca-tion, high levels of nonperforming loans, controls on interest rates, and numer-ous restrictions impede the ability of the financial systems in these countries from mobilizing and allocating capital efficiently.[8] But, these countries suffer many other economic policy and political maladies. Thus, we now turn to regression analyses where we control for an array of factors associated with economic growth (including country specific-factors) and also confront poten-tial biases induced by simultaneity.

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[8] Some countries have effectively improved their financial systems through a range of financial reforms, e.g., Ghana, as documented in Gelbard and Leite (1999). Thus, it is important to exploit the time-series dimension of the data. We do this below.

2.2. Legal origin

To confront the issue of simultaneity, we identify instrumental variables for financial intermediary development. Here, we follow LLSV (1998) in looking to legal origin. Comparative legal scholars place countries into four major legal families, English, French, German, or Scandinavian, that descended from Roman law (Reynolds and Flores, 1996). As described by Glendon et al. (1982), Roman law was compiled under the direction of Byzantine Emperor Justinian in the sixth century. Over subsequent centuries, the *Glossators* and *Commentators* interpreted, adapted, and amended the Law (Berman, 1997). In the 17th and 18th centuries the Scandinavian countries formalized their own legal codes. The Scandinavian legal systems have remained relatively unaffected from the far reaching influences of the German and especially the French Civil Codes.

Napoleon directed the writing of the French Civil Code in 1804. He made it a priority to secure the adoption of the Code in France and all conquered territories, including Italy, Poland, the Low Countries, and the Habsburg Empire. Also, France extended her legal influence to parts of the Near East, Northern and Sub-Saharan Africa, Indochina, Oceania, French Guyana, and the French Caribbean islands during the colonial era. Furthermore, the French Civil Code was a major influence on the Portuguese and Spanish legal systems, which helped spread the French legal tradition to Central and South America.

The German Civil Code *(Bürgerliches Gesetzbuch)* was completed almost a century later in 1896. The German Code exerted a big influence on Austria and Switzerland, as well as China (and hence Taiwan), Czechoslovakia, Greece, Hungary, Italy, and Yugoslavia. Also, the German Civil Code heavily influenced the Japanese Civil Code, which helped spread the German legal tradition to Korea. Unlike these Civil Law countries, the English legal system is common law, where the laws were primarily formed by judges trying to resolve particular cases.

This paper takes national legal origin as an exogenous 'endowment' since the English, French, and German systems were spread primarily through conquest and imperialism. It is critical to recognize, however, that exogeneity is not a sufficient condition for economically meaningful instrumental variables. It must also be the case that there are good reasons for believing that legal origin is closely connected to factors that directly affect the behavior of financial inter-mediaries. LLSV (1998) trace differences in legal origin through to differences in the legal rules covering secured creditors, the efficiency of contract enforcement, and the quality of accounting standards. Thus, legal origin is connected to legal and regulatory characteristics defining financial intermediary activities.

Table 2 presents regressions of the financial intermediary development indicators on the dummy variables for English, French and German legal origin, relative to Scandinavian origin (which is captured in the constant). We extend the LLSV (1998) data set from 44 countries (with financial intermediary data) to

Table 2
Legal origin and financial intermediary development, 1960–1995[a]

| | Financial intermediary development | | | | | |
	Liquid liabilities		Commercial-central bank		Private credit	
C	3.829	0.958	4.506	3.063	4.027	− 0.674
	(0.000)	(0.081)	(0.000)	(0.000)	(0.000)	(0.386)
ENGLISH	− 0.134	0.249	− 0.170	0.022	− 0.717	− 0.090
	(0.325)	(0.038)	(0.002)	(0.716)	(0.002)	(0.646)
FRENCH	− 0.434	− 0.052	− 0.270	− 0.078	− 0.894	− 0.268
	(0.001)	(0.703)	(0.000)	(0.152)	(0.000)	(0.190)
GERMAN	0.477	0.683	0.048	0.152	0.401	0.738
	(0.016)	(0.000)	(0.100)	(0.010)	(0.076)	(0.002)
INCOME		0.330		0.166		0.541
		(0.000)		(0.000)		(0.000)
Obs.	71	71	71	71	71	71
Prob(F-test)	0.001	0.000	0.040	0.000	0.000	0.000
R-square	0.23	0.44	0.12	0.30	0.26	0.55

[a]LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP, times 100. COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100. Values for the financial intermediary development indicators are averages over the 1960–1995 period. ENGLISH = English legal origin. FRENCH = Napoleonic legal origin. GERMAN = German legal origin. Scandinavian legal origin is the omitted category. INCOME = Logarithm of real per capita GDP in 1960.

71 using Reynolds and Flores (1996). The data are listed in Appendix A Table 8. Some of the regressions also control for the level of real per capita GDP. The major message is that countries with a German legal origin have better developed financial intermediaries. While countries with a French legal tradition tend to have less well-developed institutions than other countries on average, this result does not hold when controlling for the overall level of economic development. Also, as indicated by the P-values of the F-test, the legal origin variables explain a significant fraction of the cross-country variation of the financial intermediary development indicators.

2.3. Legal origin and growth in a pure cross-section of countries

2.3.1. Cross-sectional estimator

The pure cross-sectional analysis uses data averaged over 1960–1995, such that there is one observation per country. The basic regression takes the form:

$$\text{GROWTH}_i = \alpha + \beta\text{FINANCE}_i + \gamma'[\text{CONDITIONING SET}]_i + \varepsilon_i,$$

where the dependent variable, GROWTH, equals real per capita GDP growth, FINANCE equals *either* LIQUID LIABILITIES, COMMERCIAL-CEN-TRAL BANK, or PRIVATE CREDIT, and CONDITIONING SET represents a vector of conditioning information that controls for other factors associated with economic growth.[9]

To examine whether cross-country variations in the exogenous component of financial intermediary development explain cross-country variations in the rate of economic growth, the legal origin indicators are used as instrumental variables for FINANCE. Our method of estimation is the generalized method of moments (GMM).[10] In estimation we have only used *linear* moment conditions, which amount to the requirement that the instrumental variables (Z) be uncorrelated with the error term (ε). The economic meaning of these conditions is that the instrumental variables can only affect the dependent variable through the explanatory variables, that is, they cannot have an independent effect on the dependent variable. In the context of the cross-sectional growth regressions, the moment conditions mean that *legal origin* may affect per capita GDP growth only through the financial development indicators *and* the variables in the conditioning information set (that is, the other determinants of growth). We test this condition.

Testing the validity of the moment conditions is crucial to ascertaining the consistency of GMM estimates. The specification test we use is the test of overidentifying restrictions introduced in the context of GMM by Hansen (1982) and further explained in Newey and West (1987).[11] If the regression specification passes the test, then we can safely draw conclusions taking the moment conditions as given. That is, we cannot reject the statistical and economic significance of the estimated coefficient on financial intermediary development as indicating an effect running from financial development to per capita GDP growth. We can safely discard the possibility that the relationship between financial intermediary development and growth is due to simultaneity bias or to omitted variables linked to *legal origin*.

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[9] Due to the potential nonlinear relationship between economic growth and the assortment of economic indicators, we use natural logarithms of the regressors.

[10] Two-stage instrumental variable procedures produce the same conclusions.

[11] Intuitively, the fact that we have more moment conditions (instruments) than parameters to be estimated means that estimation could be done with fewer conditions. We can use this fact to estimate the error term under a set of moment conditions that excludes one instrumental variable at a time; we can then analyze if each estimated error term is uncorrelated with the instrumental variable excluded in the corresponding instrument set. The null hypothesis of Hansen's test is that the overidentifying restrictions are valid, that is, the instrumental variables are not correlated with the error term. The test statistic is simply the sample size times the value attained for the objective function at the GMM estimate (called the *J-statistic*). Hansen's test statistic is distributed as χ^2 with degrees of freedom equal to the number of moment conditions minus the number of parameters to be estimated. We report this statistic in the Tables.

2.3.2. Conditioning information set

To examine the sensitivity of the results, we experiment with different conditioning information sets. We seek to reduce the chances that the cross-country growth regression either omits an important variable or includes a select group of regressors that yields a favored result. We report the results with three conditioning information sets. The *simple conditioning information set* includes the constant, the logarithm of initial per capita GDP and initial level of educational attainment. The initial income variable is used to capture the convergence effect and school attainment is used to control for the level of human capital. The *policy conditioning information set* includes the simple conditioning information set *plus* measures of government size, inflation, the black market exchange rate premium, and openness to international trade.[12] The *full conditioning information set* includes the policy conditioning information set *plus* measures of political stability (the number of revolutions and coups and the number of assassinations per thousand inhabitants (Banks, 1994)) and ethnic diversity (Easterly and Levine, 1997). Thus, for each of the three financial intermediary development indicators, we present regression results for the (i) simple, (ii) policy, and (iii) full conditioning information sets.

2.3.3. Regression results

The results indicate a very strong connection between the exogenous component of financial intermediary development and long-run economic growth. Table 3 summarizes the purely cross-sectional instrumental variable results for nine regressions, where the instrumental variables are the legal origin variables. For brevity, we report only the coefficients on the financial development indicators. Each of the three financial intermediary development indicators (PRIVATE CREDIT, COMMERCIAL-CENTRAL BANK, LIQUID LIABILITIES) is significantly correlated with economic growth at the five percent significance level in the simple, policy, and full conditioning information set regressions. The exogenous component of financial intermediary development is closely tied to long-run rates of per capita GDP growth. Furthermore, the data do not reject the orthogonality conditions at the ten percent level in any of the nine regressions. The inability to reject the orthogonality conditions plus the result that the instruments are highly correlated with financial intermediary development (Table 2) suggest that the instruments are appropriate. These results indicate that the strong link between financial development and growth is not due to simultaneity bias. The estimated coefficient can be interpreted as the effect of the exogenous component of financial intermediary development on growth.

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[12] The black market exchange rate premium is frequently used as an overall index of trade, exchange rate, and price distortions (Easterly, 1994; Levine and Zervos, 1998). The inflation rate and size of the government serve as indicators of macroeconomic stability (Easterly and Rebelo, 1993; Fischer, 1993)

Table 3

Financial intermediation and growth: cross-section regressions, 1960–1995. Dependent variable: Real per capita GDP growth, 1960–1995. Instrumental variables: legal origin dummy variables[a]

Explanatory variable	Coefficient	Standard error	t-statistic	P-value	Number of observations	J-statistic	Hansen-test OIR
Regression Set #1: simple conditioning information set							
PRIVATE CREDIT	2.515	0.814	3.090	0.003	71	0.00189	0.13
COMMERCIAL-CENTRAL BANK	10.861	3.086	3.520	0.001	71	0.01626	1.15
LIQUID LIABILITIES	1.723	0.844	2.041	0.045	71	0.03491	2.48
Regression Set #2: policy conditioning information set							
PRIVATE CREDIT	3.222	1.245	2.589	0.012	63	0.00799	0.50
COMMERCIAL-CENTRAL BANK	9.641	4.039	2.387	0.021	63	0.0373	2.35
LIQUID LIABILITIES	2.173	0.908	2.394	0.020	63	0.037999	2.39
Regression Set #3: full conditioning information set							
PRIVATE CREDIT	3.356	1.150	2.918	0.005	63	0.02239	1.41
COMMERCIAL-CENTRAL BANK	11.289	3.258	3.465	0.001	63	0.00325	0.20
LIQUID LIABILITIES	2.788	0.903	3.089	0.003	63	0.03901	2.46

[a] Critical values for Hansen-Test Over Identifying Restrictions (2 d.f.): 10% 4.61; 5% = 5.99. Simple conditioning information set: logarithm of initial income per capita and schooling. Policy conditioning information set: simple set, plus government size, inflation, black market premium, and openness to trade. Full conditioning information set: policy set, plus indicators of revolutions and coups, political assassinations, and ethnic diversity. LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100. COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

The regression results also indicate an economically large impact of financial development on growth. For example, India's value of PRIVATE CREDIT over the 1960–1995 period was 19.5% of GDP, while the mean value for developing countries was 25% of GDP. The results suggest that an exogenous improvement in PRIVATE CREDIT in India that had pushed it to the sample mean for developing countries would have accelerated real per capita GDP growth by an additional 0.6 of a percentage point per year.[13] Similarly, if Argentina had moved from its value of PRIVATE CREDIT (16) to the developing country sample mean, it would have grown more than one percentage point faster per year. This is large considering that growth only averaged about 1.8% per year over this period. These types of conceptual experiments, however, must be treated as illustrative only; they do not account for *how to increase financial intermediary development.*

2.4. Sensitivity analyses

We have conducted a wide array of sensitivity analyses to gauge the robustness of these findings.[14] First, consider the partial scatter plot of the growth regressions involving Private Credit.[15] Fig. 3 illustrates the relationship between growth and financial intermediary development after controlling for the full conditioning information set. Since Korea, South Africa, and Niger fall particularly far from the regression line, we removed these countries and re-did the estimation. The new GMM results are not substantially different from the Table 3 results.[16] To further check for the potential influence of outliers, we examined the residuals from the GMM estimator. We removed all countries with residuals more than three-standard deviations away from zero (South Africa and Switzerland) and re-ran the regressions. This did not alter the results. Then, we removed

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[13] To get this, recall that the regressors are in logs and note that the $\ln(25) - \ln(19.5) = 0.25$. Then, use the smallest parameter on PRIVATE CREDIT from Table 3, which equals 2.5, so that $2.5*(0.25) = 0.63$.

[14] These sensitivity results are available on request.

[15] The partial scatter plot involves the two-dimensional representation of the relationship between growth and Private Credit controlling for the other regressors. Thus, we regress real per capita GDP growth against the full conditioning information set and collect these growth residuals. Then, we regress Private Credit against the full conditioning information set and collect these Private Credit residuals. The figures in the text plot the growth residuals against the Private Credit residuals along with the regression line. Thus, this regression line is the two-dimensional projection in growth — Private Credit space of the multivariate OLS regression.

[16] Specifically, Private Credit enters with a coefficient of 2.98 and a *t*-statistic of 2.10 and the regression passes all the diagnostic tests discussed above. Furthermore, removing Switzerland, Japan, and Portugal in addition to Niger, South Africa, and Korea did not alter the conclusion either, i.e., Private Credit enters with a coefficient of 4.27 and a *t*-statistic of 2.64.
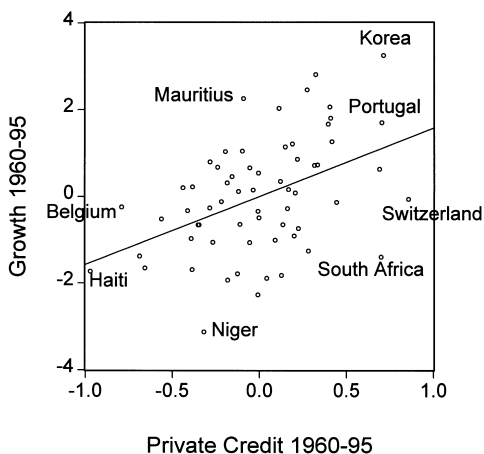
Fig. 3. Partial scatter plot of growth vs. private credit.

seven additional countries with residuals more than two-standard deviations away from zero (Belgium, El Salvador, Guyana, Jamaica, Mauritius, Niger, and Senegal.) This did not change the conclusions either.[17] We followed the same procedures in checking for the effect of outliers for COMMERCIAL-CENTRAL BANK and LIQUID LIABILITIES. In no case did removing outliers alter the results.[18] The strong positive connection between the

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[17] Specifically, when we remove South Africa and Switzerland the coefficient on Private Credit rises to 4.72 and the t-statistics equals 3.65 while the GMM estimate satisfies the litany of diagnostic tests. Similarly, when the seven additional countries are removed, the Private Credit enters with a value of 4.53 and a t-statistic of 3.91, while passing the diagnostic tests.

[18] For the COMMERCIAL-CENTRAL BANK regressions, Haiti's level of financial development is much less than predicted by its country characteristics. Nonetheless, removing Haiti increases the estimated coefficient on COMMERCIAL-CENTRAL BANK to 13.4 (with a t-statistic of 3.35). Moreover, when removing other potential outliers such as Korea, Niger, and Peru, the results are unchanged (coefficient estimate of 9.6 on Commercial-Central Bank and a t-statistic of 2.44). When examining the GMM residuals, Niger, Honduras, Jamaica, Korea, Mauritius, Pakistan, Senegal, and Taiwan are more than two-standard deviations from zero. Removing these countries produces an estimated coefficient of 7.71 on COMMERCIAL-CENTRAL BANK, with a t-statistic of 2.92, and the regression passes the battery of diagnostic tests discussed in the text. In terms of LIQUID LIABILITIES, the robustness checks produce similar results. The partial scatter plots point to Niger and Korea as potential outliers. Removing these countries does not affect the results (The estimated coefficient becomes 2.24 with a t-statistic of 2.71). Similarly, when using the GMM residual criteria, Korea, Jamaica, Switzerland, Taiwan, and Zaire fall more than two-standard deviations away from zero. Removing these countries produces a coefficient estimate of 2.63 on LIQUID LIABILITIES, with a t-statistic of 4.24, and a regression that passes the various diagnostic tests used in this paper.

exogenous component of financial intermediary development and economic growth does not seem to be driven by outliers.

Second, in assessing the independent link between financial development and economic growth, we considered a broad collection of additional control variables. We included measures of the efficiency of the bureaucracy, the level of corruption, the role of the state-owned enterprises in the economy, an index of the strength of property rights, an index of the costs of business regulation, a measure of the risk of expropriation, a measure of the degree to which the country follows the rule of law, and a measure of the accounting standards employed in the country (Knack and Keefer, 1995; Mauro, 1995; LLSV, 1998, 1999). These did not alter our findings.

Third, we considered as instrumental variables measures of the religious composition of each country and the distance of the country from the equator, which have been used in a recent study of the quality of government by LLSV (1999). This did not alter our results. Furthermore, if we use the LLSV (1998) indicators of creditor rights, contract enforcement efficiency, and accounting standards as instrumental variables, we again find that the exogenous component of financial development is positively associated with faster economic growth. These alternative instrumental variable estimations pass the test of the overidentifying restrictions, which implies that these variables, measuring the quality of the legal and accounting environment, affect growth through financial development and the other regressors.[19]

Fourth, as in King and Levine (1993a), we use the measures of financial intermediary development at the beginning of the period (1960) to forecast growth. We find that financial intermediary development in 1960 significantly predicts economic growth over the next 35 years after controlling for an array of country characteristics.[20] We have also restricted the sample to those countries for which LLSV (1998) collect legal data. This did not alter the results.

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[19] This result is consistent with the fact that *legal origin* is a proper instrument for financial development in a growth regression, insofar as the judicial and accounting environment depends on *legal origin*.

[20] While we make the results on the relationship between growth over 1960–1995 period and financial intermediary development measured in 1960 available to readers, there are econometric reasons for using values of the financial development indicators averaged over the entire sample period as we do in the body of the paper. First, the specification tests support the validity of the instruments. This supports the interpretation of the estimated coefficients as being free from endogeneity bias. Second, the instrumental variables procedures address the issue of endogeneity. Thus, there is no reason to discard the informational gain provided by using observations over the entire sample period. Theory stresses the potential connection between growth and the contemporaneous provision of financial services. Third, by using initial values of the explanatory variables, there is not only an efficiency (informational) loss but also a potential consistency loss. Theory suggests that what matters for current growth is the contemporaneous behavior of the explanatory variables. By using initial values, we run the risk of grossly mis-measuring the 'true' explanatory variables, which could bias the coefficient estimates.

Furthermore, we conduct the estimation over the 1980–1995 period. We find the same results: the exogenous component of financial development is positively, significantly, and robustly linked with economic growth.

Fifth, we experimented with two additional measures of financial intermediary development. One measure equals deposit money bank credit to the private sector divided by GDP. This is smaller than PRIVATE CREDIT, which also includes other financial intermediaries. The second additional measure equals the ratio of deposit money bank domestic assets to GDP (and so does not distinguish between credits issued to the private sector and those issued to the public sector). These two additional measures also suggest that the exogenous part of financial intermediary development is positively and robustly associated with economic growth.

3. Finance and growth: Panel procedures

3.1. GMM estimators for dynamic panel models

3.1.1. Motivation

Estimation using panel data, that is pooled cross-section and time-series data, has several advantages over purely cross-sectional estimation. First, besides considering the cross-country relationship between financial development and growth, we also would like to take into account how financial development over time within a country may have an effect on the country's growth performance. Working with a panel, we gain degrees of freedom by adding the variability of the time-series dimension. Specifically, the within-country standard deviation of PRIVATE CREDIT in our panel data set is 15%, which in the panel estimation is added to the between-country standard deviation of 28%. Similarly, the within-country standard deviation for growth is 2.4% and the between-country standard deviation is 1.7%. Thus, adding the time-series dimension of the data substantially augments the variability of the data.

Second, in a pure cross-sectional regression, any unobserved country-specific effect would be part of the error term, potentially leading to biased coefficient estimates. This problem plagues previous studies of the growth-finance relationship. However, in a panel context, we are able to control for unobserved country-specific effects and thereby reduce biases in the estimated coefficients.

Third, our panel estimator controls for the potential endogeneity of all explanatory variables, while the cross-sectional estimator presented previously only controls for the endogeneity of financial development. The way our panel estimator controls for endogeneity is by using 'internal instruments', that is, instruments based on lagged values of the explanatory variables. This method does not allow us to control for full endogeneity but for a weak type of it. To be precise, we assume that the explanatory variables are only 'weakly exogenous',

which means that they can be affected by current and past realizations of the growth rate but must be uncorrelated with future realizations of the error term. Thus, the weak exogeneity assumption implies that future *innovations* of the growth rate do not affect current financial development. This assumption is not particularly stringent conceptually and we can examine its validity statistically. Weak exogeneity does not mean that economic agents do not take into account expected future growth in their decision to develop the financial system; it just means that future (unanticipated) shocks to growth do not influence current financial development. It is the *innovation* in growth that must not affect financial development. Finally, we statistically assess the validity of the weak exogeneity assumption below.

3.1.2. Methodology

We use the generalized-method-of-moments (GMM) estimators developed for dynamic models of panel data that were introduced by Holtz-Eakin et al. (1990), Arellano and Bond (1991), and Arellano and Bover (1995). Our panel consists of data for 74 countries over the period 1961–1995. We average data over non-overlapping, five-year periods, so that data permitting there are seven observations per country (1961–1965; 1966–1970; 1971–1975; etc.). Thus, the subscript 't' designates one of these five-year averages. Consider the following regression equation;

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t}, \tag{1}$$

where y is the logarithm of real per capita GDP, X represents the set of explanatory variables (other than lagged per capita GDP), η is an unobserved country-specific effect, ε is the error term, and the subscripts i and t represent country and time period, respectively.[21] We can rewrite Eq. (1) as

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t}, \tag{2}$$

Now, to eliminate the country-specific effect, take first-differences of Eq. (2),

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}). \tag{3}$$

The use of instruments is required to deal with (1) the likely endogeneity of the explanatory variables, and, (2) the problem that by construction the new error term, $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ is correlated with the lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. Under the assumptions that (a) the error term, ε, is not serially correlated, and (b) the explanatory variables, X, are weakly exogenous (i.e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), the GMM dynamic panel estimator uses the following moment

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[21] We also include time dummies to account for time-specific effects.

conditions:

$$E[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } s \geq 2; t = 3, \dots, T, \tag{4}$$

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad \text{for } s \geq 2; t = 3, \dots, T. \tag{5}$$

We refer to the GMM estimator based on these conditions as the *difference* estimator.

There are, however, conceptual and statistical shortcomings with this difference estimator. Conceptually, we would also like to study the cross-country relationship between financial development and per capita GDP growth, which is eliminated in the *difference* estimator. Statistically, Alonso-Borrego and Arellano (1996) and Blundell and Bond (1997) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises. In small samples, Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients.[22]

To reduce the potential biases and imprecision associated with the usual difference estimator, we use a new estimator that combines in a *system* the regression in differences with the regression in levels (Arellano and Bover, 1995; Blundell and Bond, 1997). The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged *differences* of the corresponding variables. These are appropriate instruments under the following *additional* assumption: although there may be correlation between the levels of the right-hand side variables and the country-specific effect in Eq. (2), there is no correlation between the *differences* of these variables and the country-specific effect. This assumption results from the following stationarity property,

$$E[y_{i,t+p}\eta_i] = E[y_{i,t+q}\eta_i] \text{ and } E[X_{i,t+p}\eta_i] = E[X_{i,t+q}\eta_i]$$
$$\text{for all } p \text{ and } q. \tag{6}$$

The additional moment conditions for the second part of the system (the regression in levels) are[23]

$$E[y_{i,t-s} - y_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \quad \text{for } s = 1, \tag{7}$$

$$E[(X_{i,t-s} - X_{i,t-s-1})(\eta_i + \varepsilon_{i,t})] = 0 \quad \text{for } s = 1. \tag{8}$$

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[22] An additional problem with the simple *difference* estimator relates to measurement error: differencing may exacerbate the bias due to errors in variables by decreasing the signal-to-noise ratio (see Griliches and Hausman, 1986).

[23] Given that lagged levels are used as instruments in the differences specification, only the most recent difference is used as instrument in the levels specification. Using the other lagged differences would results in redundant moment conditions. (see Arellano and Bover, 1995).

Thus, we use the moment conditions presented in Eqs. (4), (5), (7), and (8) and employ a GMM procedure to generate consistent and efficient parameter estimates.

Consistency of the GMM estimator depends on the validity of the instruments. To address this issue we consider two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1997). The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term $\varepsilon_{i,t}$ is not serially correlated. In both the difference regression and the system difference-level regression we test whether the differenced error term is second-order serially correlated (by construction, the differenced error term is probably first-order serially correlated even if the original error term is not).[24]

3.2. Results

The dynamic panel estimates suggest that the exogenous component of financial intermediary development exerts a large, positive impact on economic growth. Table 4 presents the results using the *difference* and *system* estimators described above. We also present the results when the panel estimation is performed purely in *levels* for comparative purposes. In Table 4, only the results on the financial indicators are given. Table 5 gives the full results from *system* dynamic-panel estimation. The analysis was conducted with two conditioning information sets. The first uses the simple conditioning information set, which includes initial income and educational attainment. The second uses the policy conditioning information set, and includes initial income, educational attainment, government size, openness to trade, inflation, and the black market exchange rate premium.[25] Table 5 also presents (1) the Sargan test, where the null hypothesis is that the instrumental variables are uncorrelated with the residuals and (2) the serial correlation test, where the null hypothesis is that the errors in the differenced equation exhibit no second-order serial correlation.

The three financial intermediary development indicators (LIQUID LIABILITIES, COMMERCIAL-CENTRAL BANK, and PRIVATE CREDIT) are significant at the 0.05 significance level in the *levels*, *difference*, and *system* dynamic panel growth regressions, with one exception. The coefficient on LIQUID

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[24] In addition, we used the 'difference-Sargan test', presented in Blundell and Bond (1997), to examine the null hypothesis that the lagged differences of the explanatory variables are uncorrelated with the residuals (which are the additional restrictions imposed in the system estimator with respect to the difference estimator). Giving further support to the system estimator, we could not reject this null hypothesis at usual levels of significance.

[25] We do not use the full conditioning information set with data on political and institutional variables in the panel estimates. These variables frequently have very limited, if any, time-dimension.

Table 4
Financial intermediation and growth: dynamic panel regressions, summary[a]

Estimator	Conditioning information set	LIQUID LIABILITIES	COMMERCIAL- CENTRAL BANK	PRIVATE CREDIT	Observa- tions
System estimator	Simple	2.163 *(0.001)* [0.313]	4.642 *(0.001)* [0.278]	2.185 *(0.001)* [0.183]	359
	Policy	2.952 *(0.001)* [0.713]	2.437 *(0.001)* [0.626]	1.522 *(0.001)* [0.581]	359
First differences	Simple	1.135 *(0.035)* [0.319]	2.007 *(0.002)* [0.184]	1.699 *(0.001)* [0.192]	285
	Policy	1.446 *(0.249)* [0.080]	2.065 *(0.010)* [0.330]	0.663 *(0.001)* [0.315]	285
Levels	Simple	1.848 *(0.012)* [0.472]	4.813 *(0.011)* [0.445]	1.838 *(0.001)* [0.345]	359
	Policy	2.958 *(0.001)* [0.346]	3.267 *(0.001)* [0.155]	2.073 *(0.001)* [0.180]	359

[a]Numbers in parentheses are p-values for the coefficient and numbers in brackets are p-values for the Sargan-test.

Simple conditioning information set:logarithm of initial income per capita, average years of secondary schooling. Policy conditioning information set: simple set plus government size, openness to trade, inflation, black market premium LIQUID LIABILITIES: liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP. COMMERCIAL -CENTRAL BANK: assets of deposit money banks divided by assets of deposit money banks plus central bank assets PRIVATE CREDIT: credit by deposit money banks and other financial institutions to the private sector divided by GDP.

LIABILITIES is insignificant in the *difference* dynamic panel growth regression with the policy conditioning information set. While this may indicate a some-what less robust link when using a purely 'size' measure of financial intermediary development, LIQUID LIABILITIES enters the levels and system dynamic panel growth regressions significantly in all specifications. Put differently, after *controlling* for country-specific effects, endogeneity, and potential problems associated with lagged dependent variables and weak instruments, the data suggest a strong, positive, link between financial intermediary development and economic growth.

The regressions satisfy the specification tests. There is no evidence of second order serial correlation and the regressions pass the Sargan specification test. It

Table 5
Financial intermediation and growth: dynamic panel regressions, system estimator

Regressors	(1)	(2)	(3)
Constant	0.06	− 5.677	4.239
	(0.954)	(0.001)	(0.001)
Logarithm of initial income per capita	− 0.742	− 0.117	− 0.364
	(0.001)	(0.223)	(0.001)
Government size[a]	− 1.341	− 1.13	− 1.987
	(0.001)	(0.001)	(0.001)
Openness to trade[a]	0.325	0.497	0.442
	(0.169)	(0.002)	(0.010)
Inflation[b]	1.748	− 1.772	− 0.178
	(0.001)	(0.001)	(0.543)
Average years of secondary schooling	0.78	0.638	0.639
	(0.001)	(0.001)	(0.001)
Black market premium[b]	− 2.076	− 1.044	− 1.027
	(0.001)	(0.001)	(0.001)
Liquid Liabilities[a]	2.952		
	(0.001)		
Comm. vs. Central Bank[a]		2.437	
		(0.001)	
Private Credit[a]			1.522
			(0.001)
Dummy 71–75	− 1.074	− 0.792	− 0.959
	(0.001)	(0.001)	(0.001)
Dummy 76–80	− 1.298	− 0.825	− 1.177
	(0.001)	(0.001)	(0.001)
Dummy 81–85	− 3.328	− 2.616	− 3.179
	(0.001)	(0.001)	(0.001)
Dummy 86–90	− 2.614	− 1.894	− 2.434
	(0.001)	(0.001)	(0.001)
Dummy 91–95	− 3.631	− 2.77	− 3.308
	(0.001)	(0.001)	(0.001)
Sargan test[c] (p-value)	0.713	0.626	0.581
Serial correlation test[d] (p-value)	0.588	0.957	0.764
	p-values in parentheses		

[a] In the regression, this variable is included as log(variable).
[b] In the regression, this variable is included as log(1 + variable).
[c] The null hypothesis is that the instruments used are not correlated with the residuals.
[d] The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

is also worth noting that many of the other regressors enter significantly with the expected signs (Table 5).

The regression estimates are also economically large. As shown the coefficients that emerge from the dynamic panel estimation are very close to those that we obtain from the purely cross-section, instrumental-variable estimation.

For example, PRIVATE CREDIT has a coefficient of 2.5 in the cross-section results (the simple conditioning information set regression in Table 3), while PRIVATE CREDIT has a coefficient of 2.2 in the system dynamic-panel results reported in Table 4.[26] As noted earlier, these coefficients suggest that exogenous changes in financial intermediary development imply large changes in economic growth.

3.3. Sensitivity analyses and discussion

The dynamic panel results are also robust to a variety of sensitivity analyses. For instance, when we use alternative measures of financial intermediary development (deposit money bank credit to the private sector divided by GDP; and the ratio of total deposit money bank domestic assets to GDP), we still find a strong of finance on growth. Furthermore, if we control for terms of trade changes and population growth, we obtain virtually identical results to those reported in Tables 4 and 5.[27] Finally, when we include the legal origin variables as instruments in the dynamic panel estimates, we still find a strong, positive relationship between the exogenous component of financial intermediary development and economic growth.[28]

4. Searching for determinants of financial intermediary development

This section undertakes a limited search of potential legal and accounting determinants of financial intermediary development. We use LLSV's (1998) data. Instead of examining the links between the legal/regulatory environment

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[26] There is some divergence in coefficient estimates between the *system* dynamic panel estimates, Table 4, and the cross-sectional IV regressions, Table 3, when the conditioning information set is expanded to include the policy conditioning information set. The cross-section regression produces a coefficient estimate of 3.2 on PRIVATE CREDIT, while the panel yields a coefficient of 1.4. Besides exploiting the time-series dimension of the data, the dynamic-panel also recognizes the endogeneity of the other regressors, which may help account for the different coefficient estimates.

[27] Note, that in the *system* dynamic panel regressions with the policy conditioning information set, the number of instrumental variables is larger than the number of cross-sectional observations (i.e., countries). This 'over-fitting' of the data can bias the *t*-statistics upwards. This arises when the variance-covariance matrix is constructed from the first-stage residuals in order to allow for non-spherical distributions of the error term – and thereby get more efficient estimates in the second stage. (However, this 'over-fitting' problem does not plague (a) the simple conditioning information set regressions, or (b) the *level* or *difference* estimators because there are many more countries than instruments in these specifications.) More generally, the two-step GMM estimator sometimes converges to its asymptotic distribution only slowly. Thus, we also considered the first-stage results, which assume homoskedasticity and independence of the error terms. These first-stage results also indicate that financial intermediary development exerts a causal impact on economic growth.

[28] These results are available on request.

and measures of bond market and equity market development as in LLSV (1997, 1998), we study the ties between the legal environment and measures of financial intermediary development. Moreover, unlike earlier studies, we use instrumental variables to assess whether the positive association between legal/regulatory indicators and financial development is due to simultaneity bias.

4.1. The legal and accounting environment

We use three LLSV's (1998) indicators of national legal and regulatory systems: the legal rights of creditors, the soundness of contract enforcement, and the level of corporate accounting standards.

4.1.1. Creditor rights

The degree to which the legal system supports the rights of creditors will fundamentally influence financial contracting and the functioning of financial intermediaries. Specifically, legal systems differ in terms of the rights of creditors to (i) repossess collateral or liquidate firms in the case of default, (ii) remove managers in corporate reorganizations, and (iii) have a high priority relative to other claimants in corporate bankruptcy.

AUTOSTAY equals one if a country's laws impose an automatic stay on the assets of firms upon filing a reorganization petition. AUTOSTAY equals 0 if this restriction does not appear in the nation's legal codes. The restriction would prevent creditors from gaining possession of collateral or liquidating a firm to meet a loan obligation. Thus, all else equal, AUTOSTAY should be negatively correlated with the activities of credit issuing intermediaries.

MANAGES equals one if firm managers continue to administer the firms affairs pending the resolution of reorganization processes, and zero otherwise. In some countries, management stays in place until a final decision is made about the resolution of claims. In other countries, a team selected by the creditors replaces management. If management stays pending resolution, this reduces pressure on management to pay creditors. Thus, MANAGES should be negatively correlated with the activities of credit issuing intermediaries.[29]

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[29] Here it is important to highlight a substantive weakness with AUTOSTAY and MANAGES. They do not measure the efficiency of the legal and regulatory system in coping with bankruptcy. For instance, two countries could have very similar legal codes, such that management stays in place pending the resolution of a bankruptcy hearing and there is an automatic stay on the assets of a firm until the bankruptcy courts process the reorganization petition. However, the two countries legal and regulatory systems may process bankruptcy and reorganization very differently. One country's system may take a long time and be subject to great uncertainty. The other may be very rapid, efficient, and transparent. Thus, a major difference across countries may be the quality of the bankruptcy system, not the laws themselves. Currently, there do not exist cross-country measures of the speed, transparency, and fairness of bankruptcy systems.

The third measure of the legal rights of creditors is SECURED1, which equals one if secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm. SECURED1 equals zero if non-secured creditors, such as the government or workers get paid before secured creditors. In cases where SECURED1 equals zero, this certainly reduces the attractiveness of lending secured credit. SECURED1 should be positively correlated with activities of intermediaries engaged in secured transactions, holding everything else constant.

CREDITOR is a cumulative index of these creditor rights indicators and equals CREDITOR = SECURED1 − AUTOSTAY − MANAGES. CREDITOR takes on values between 1 (best) and − 2 (worst).[30] One would expect countries with higher values of CREDITOR to have stronger creditor rights and better-developed financial intermediaries, all else equal.

Table 6 gives summary statistics on CREDITOR, and the data are listed in Table 8. As shown there is substantial cross-country variation in CREDITOR, where the maximum value is 1, the minimum value is − 2, and the standard deviation is about 1. Brazil, Colombia, France, Mexico, Peru, and the Philippines (all countries with a French legal origin) are countries where CREDITOR = − 2, indicating that their legal systems do not stress the rights of creditors. In contrast, the legal codes of Egypt, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Nigeria, Pakistan, Singapore, Thailand, United Kingdom, and Zimbabwe stress the rights of creditors, such that CREDITOR = 1. CREDITOR is an indicator of legal codes, however, it does not incorporate information regarding enforcement.

4.1.2. Enforcement

The effectiveness of the legal system in enforcing contracts will materially influence financial sector activities. RULELAW, from LLSV (1998), is an assessment of the law and order tradition of the country that ranges from 10, strong law and order tradition, to 1, weak law and order tradition. This measure was constructed by International Country Risk Guide (ICRG) and is an average over the period 1982–1995. Given the contractual nature of banking, higher values of RULELAW are likely to positively influence banking development. CONRISK, also from LLSV (1998), is an assessment of the risk that a government will – and therefore can – modify a contract after it has been signed. CONRISK ranges from 10, low risk of contract modification, to 1, high risk of contract modification. Specifically, 'modification' means repudiation, postponement, or reducing the governments financial obligation. This measure was

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[30] We could have redefined AUTOSTAY and MANAGES such that values of one indicated stronger (instead of weaker) creditor rights. This would have produced values of CREDITOR between 0 and 3 and would not have altered the results. We did not do this for consistency: the variables in this paper are defined the same as the variables in LLSV (1997, 1998).

Table 6
Summary statistics on the legal and accounting environment[a]

	Legal and accounting environment		
	CREDITOR	ENFORCE	ACCOUNT
Mean	− 0.3	7.5	61.2
Median	0	8.2	64.0
Maximum	1	10.0	83.0
Minimum	− 2	3.6	24.0
Std. Dev.	1.1	2.0	13.5
Observations	44	44	40

[a] CREDITOR = index of secured creditor rights. ENFORCE = index of law and contract enforcement. ACCOUNT = index of the comprehensiveness and quality of company reports.
Values for the legal environment indicators are averages over the 1982–1995 period. Values of accounting quality are assessments of company reports in 1990.

constructed by ICRG and is an average over the period 1982–1995. Legal systems that effectively enforce contracts will tend to support banking activities.

ENFORCE equals the average of RULELAW and CONRISK. The empirical analyses focus on this aggregate index of the efficiency of the legal system in enforcing contracts. Summary statistics on ENFORCE are given in Table 6, and the data are listed in Appendix Table 8. As shown, there is substantial cross-country variation in ENFORCE, where the maximum value is 9.99, the minimum value is 3.55, and the standard deviation is 2.0. The countries with very high values of enforcement, values of ENFORCE greater that 9, are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Netherlands, New Zealand, Norway, Sweden, and Switzerland. In contrast, countries where contract enforcement is poor, values of ENFORCE less than 5, include Colombia, Nigeria, Pakistan, Philippines, Peru, and Zimbabwe.

4.1.3. Accounting standards

Information about corporations is critical for exerting corporate governance and identifying the best investments. Accounting standards that simplify the interpretability and comparability of information across corporations will simplify financial contracting. Furthermore, financial contracts that use accounting measures to trigger particular actions can only be enforced if accounting measures are sufficiently clear. ACCOUNT, from LLSV (1998), is an index of the comprehensiveness of company reports. The maximum possible value is 90 and the minimum is 0. The Center for International Financial Analysis and Research assessed general accounting information, income statements, balance sheets, funds flow statement, accounting standards, and stock data in company

reports in 1990. We expect ACCOUNT to be positively correlated with financial intermediary development.[31] As shown in Table 6, ACCOUNT exhibits substantial cross-country variation. The data are listed in Appendix Table 8. The maximum value is 83, Sweden, while the minimum value in our sample is Egypt (24). The United States has a value of 71, which is well above the mean value of 61.

4.2. Determinants of financial intermediary development

Table 7 shows that cross-country differences in creditor rights, enforcement quality, and accounting standards help explain cross-country differences in financial intermediary development, even after controlling for the level of income per capita. Jointly, the variables CREDITOR, ENFORCE, and ACCOUNT explain a significant amount of the cross-country variation in the three financial intermediary indicators (PRIVATE CREDIT, LIQUID LIABILITIES, and COMMERCIAL-CENTRAL BANK). Each of the legal/accounting indicators, however, is not significantly correlated with all of the intermediary measures. For instance LIQUID LIABILITIES is most closely associated with ENFORCE and CREDITOR. In turn, PRIVATE CREDIT is very strongly linked with ENFORCE and ACCOUNT.[32]

Simultaneity bias does not seem to be driving these results. As instrumental variables, we use the legal origin dummy variables for countries with French, English, and German legal origins.[33] Since we only have three instruments, we

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[31] This is not necessarily true and raises the need for a general conceptual qualification. An economy with perfect information, perfect contract enforcement and perfect legal codes (i.e., an economy with essentially zero transaction and information costs) would have little reason for financial intermediaries. Put differently, market frictions motivate the emergence of financial intermediaries, e.g., Boyd and Prescott (1986). Conceptually, this implies that at very high levels of legal system development and information dissemination, a marginal increase in legal efficiency or information quality may cause a *reduction* in the role and importance of financial intermediaries. However, quadratic expressions for ACCOUNT and CONRISK never entered significantly.

[32] Since CREDITOR, ENFORCE, and ACCOUNT are measured over the 1980s and 1990s, we use financial intermediary measures over the same period. However, we get very similar results when the analysis uses financial intermediary measures over the period 1960–1995. These results are available on request.

[33] First, note that the legal origin variables help explain cross-country differences in creditor rights, enforcement quality, and accounting standards. As shown by LLSV (1998), English legal tradition countries have laws that emphasize the rights of creditors to a greater degree than the French, German, and Scandinavian countries. French civil law countries protect creditors the least, with German and Scandinavian civil law countries falling in the middle. In terms of enforcement quality, countries with a French legal heritage have the lowest quality of law enforcement, while countries with German and Scandinavian legal traditions tend to be the best at enforcing contracts. Finally, LLSV (1998) show that countries with an English legal tradition tend to have much better accounting standards than French or German civil law countries.

Table 7
Legal environment and financial intermediary development (1980–1995)[a]

	Liquid liabilities				Commercial-central bank				Private credit			
	OLS	OLS	OLS	IV	OLS	OLS	OLS	IV	OLS	OLS	OLS	IV
C	2.830	3.880	4.830	4.402	3.950	3.640	4.200	4.403	1.480	2.557	4.368	4.322
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.020)	(0.001)	(0.003)
CREDITOR	0.216	0.179			0.009	0.020			0.125	0.088		
	(0.001)	(0.027)			(0.641)	(0.504)			(0.033)	(0.173)		
ENFORCE	0.178	0.229			0.008	0.014			0.200	0.253		
	(0.000)	(0.003)			(0.022)	(0.454)			(0.000)	(0.000)		
ACCOUNT	−0.002	−0.001			0.005	0.004			0.017	0.018		
	(0.745)	(0.866)			(0.024)	(0.042)			(0.005)	(0.002)		
INCOME		−0.174	−0.099	−0.05		0.052	0.031	0.007		−0.179	−0.044	−0.039
		(0.395)	(0.387)	(0.672)		(0.236)	(0.325)	(0.844)		(0.262)	(0.711)	(0.804)
LEGAL			0.412	0.361			0.091	0.115			0.606	0.600
			(0.003)	(0.009)			(0.014)	(0.002)			(0.001)	(0.001)
Obs.	36	36	36	36	36	36	36	36	36	36	36	36
Prob(F-test)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.57	0.59	0.39	0.39	0.51	0.52	0.51	0.50	0.68	0.69	0.66	0.66

[a] LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100. COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100. CREDITOR = index of secured creditor rights. ENFORCE = index of law and contract enforcement. ACCOUNT = index of the comprehensiveness and quality of company reports. LEGAL = index of legal environment. Specifically, LEGAL is the first standardized principal component of CREDITOR, ENFORCE, and ACCOUNT.

construct a general index of the legal and regulatory environment. We compute the first standardized principal component of CREDITOR, ENFORCE, and ACCOUNT and use this as the index of the legal/regulatory environment governing financial transactions. We call this index LEGAL. In the simple OLS regression, LEGAL explains a substantial amount of the cross-country variation in *all* of the financial intermediary development indicators, even after controlling for the level of real per capita GDP. When we use an instrumental variables estimator to control for simultaneity bias, the results are unchanged.[34] The basic message that emerges from Table 7 is that countries with (i) laws that give a high priority to secured creditors, (ii) legal systems that rigorously enforce contracts, and (iii) accounting standards that produce comprehensive and comparable corporate financial statements tend to have better developed financial intermediaries.[35]

4.3. Discussion of causes

These findings – in conjunction with those in LLSV (1998) – are *consistent* with the view that countries with particular legal origins tend to create particular types of laws, regulations, and enforcement mechanisms. These laws, regulations, and enforcement mechanisms directly influence the functioning of financial intermediaries. Financial intermediaries that are better at ameliorating information and transactions costs induce a more efficient allocation of resources and faster growth.[36] While it is difficult to change legal origin, the results offer a strategy for boosting financial development and accelerating long-run growth. Countries can target reforms that ensure that lenders have confidence that the legal system will quickly, transparently, and effectively enforce their claims against borrowers and that outside investors have easy access to high-quality, comprehensive, and comparable information about firms.

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[34] None of these findings changes when the instrumental variable set is expanded to include the LLSV (1999) exogenous variables, i.e., religious composition of the population, ethnic diversity, and distance from the equator. These results are available on request.

[35] The evidence we provide suggests that the strong link between financial sector development on the one hand and the legal/regulatory environment on the other is not due to simultaneity bias. These results do not suggest that the legal/regulatory environment only impacts growth through financial intermediary development. Rather, these results imply that the legal/regulatory environment has an important impact on financial intermediary development.

[36] Put differently, when countries are endowed with a certain legal heritage, this produces a probability distribution regarding the laws, regulations, and enforcement mechanisms that they are likely to adopt. Thus, for example, the data suggest that countries with a French Civil Code have a lower probability of selecting laws that give a higher priority to secured credits, selecting accounting standards that produce high-quality corporate financial statements, and enforcing contracts than countries with English, German, and Scandinavian legal systems. The resultant laws, regulations, and enforcement mechanisms then affect the ability of the financial system to research firms, exert corporate control, mobilize savings, and provide risk management and transactions services.

5. Conclusions

This paper first examined the nature of the effect of financial intermediary development on economic growth. We used two econometric approaches. The first, GMM dynamic panel estimators, are specifically designed to deal with key problems plaguing past studies of the finance-growth nexus: simultaneity bias and omitted variable bias, including that derived from unobserved country-specific effects. As a consistency check, we also used a pure cross-sectional, instrumental variable. The panel and cross-sectional results tell the same story: the exogenous component of financial intermediary development is positively associated with economic growth; specifically, the large, positive link between financial intermediary development and economic growth is not due to potential biases induced by omitted variables, simultaneity or reverse causation. In a sequel to this paper, Beck et al. (2000) examine the channels through which financial intermediary development is associated with growth. In that paper, we argue that the finance-growth nexus runs primarily through total factor productivity growth and not through savings and physical capital accumulation.

Next, we investigated whether cross-country differences in the legal rights of creditors, the efficiency of contract enforcement, and accounting system standards help explain cross-country differences in the level of financial intermediary development. The results are clear: countries with (1) laws that give a high priority to secured creditors getting the full present value of their claims against firms, (2) legal systems that rigorously enforce contracts, including government contracts, and (3) accounting standards that produce high-quality, comprehensive and comparable corporate financial statements tend to have better developed financial intermediaries. The paper's findings are consistent with the view that legal and accounting reforms that strengthen creditor rights, contract enforcement, and accounting practices can boost financial intermediary development and thereby accelerate economic growth. Due to data limitations, however, we do not conduct a comprehensive evaluation of the regulatory determinants of financial intermediary development (e.g., see Calomiris, 1989; Kane, 1985, 1989; Barth et al., 1997; BIS, 1997; Calomiris and Gorton, 1991; Kroszner and Rajan, 1994; Kroszner and Strahan, 1996; Barth et al., 2000). Future work should substantially broaden and deepen our understanding of the determinants of financial intermediary development by obtaining additional measures of the legal, supervisory, and regulatory factors that determine the level of financial intermediary development.

Appendix A

The data are listed country by country in Table 8 and the countries in the sample in Table 9. The summary statistics and correlations with other variables used in the paper are provided in Tables 10 and 11.

Table 8
Economic growth, financial development and policies across countries

| Country code | Country name | Average annual growth rate 1960–1995 | Financial Development Indicators | | | | Policy variables | | | |
			LIQUID LIABILITIES	COMMERCIAL-CENTRAL BANK	PRIVATE CREDIT	Legal origin	CREDITOR	ENFORCE	AC-COUNT
ARG	Argentina	0.62	18.34	74.16	15.69	F	−1	5.13	45
AUS	Australia	1.98	51.73	92.67	54.82	E	−1	9.36	75
AUT	Austria	2.89	67.50	98.44	65.30	G	0	9.80	54
BGD	Bangladesh[a]	0.71	24.69	86.38	13.55	E			
BRB	Barbados[a]	2.65	51.59	91.85	40.79	E			
BEL	Belgium	2.65	49.02	92.01	25.65	F	0	9.74	61
BOL	Bolivia[a]	0.36	16.39	31.60	13.14	F			
BRA	Brazil	2.93	19.16	61.68	22.10	F	−2	6.31	54
CAN	Canada	2.39	56.50	89.00	60.86	E	−1	9.48	74
CHL	Chile	1.45	22.96	52.81	27.81	F	−1	6.91	52
COL	Colombia	2.23	22.41	80.16	22.08	F	−2	4.55	50
CRI	Costa Rica[a]	1.61	29.38	72.82	21.77	F			
CYP	Cyprus[a]	5.38	74.49	92.72	62.39	E			
DNK	Denmark	2.18	49.48	88.10	42.45	S	0	9.66	62
DOM	Dominican Republic[a]	2.50	20.58	73.34	19.11	F			
ECU	Ecuador	2.39	20.05	62.16	17.99	F	1	5.93	
SLV	El Salvador[a]	−0.61	26.94	72.04	22.85	F			
FJI	Fiji[a]	1.85	37.48	96.95	23.65	E			
FIN	Finland	2.80	45.35	97.22	51.78	S	−1	9.58	77
FRA	France	2.43	63.37	96.54	75.47	F	−2	9.09	69
DEU	Germany	2.45	57.46	97.57	76.46	G	0	9.50	62
GHA	Ghana[a]	−0.96	17.58	39.78	5.07	E			
GRC	Greece	3.22	53.34	74.36	36.72	F	−1	6.40	55

GTM	Guatemala[a]	0.93	20.22	75.16	13.32	F			
GUY	Guyana[a]	− 0.28	52.96	58.02	20.52	E			
HTI	Haiti[a]	− 0.66	22.60	23.72	7.71	F			
HND	Honduras[a]	0.60	23.04	76.54	23.86	F			
ISL	Iceland[a]	3.01	31.76	88.94	34.79	S			
IND	India	1.92	32.95	63.68	19.53	E	1	5.14	57
IRL	Ireland	3.25	54.74	94.73	49.14	E	− 1	8.38	
ISR	Israel	2.81	51.95	84.28	37.43	E	1	6.18	64
ITA	Italy	2.93	77.48	87.77	59.03	F	− 1	8.75	62
JAM	Jamaica[a]	0.42	36.85	78.09	24.55	E			
JPN	Japan	4.30	125.94	96.72	128.38	G	0	9.34	65
KEN	Kenya	1.96	35.74	81.27	23.93	E	1	5.54	
KOR	Korea, Republic of	7.16	41.02	83.95	66.52	G	1	6.97	62
LBR	Liberia[a]	− 0.47	9.73	37.90	10.16	E			
MYS	Malaysia	4.11	63.74	96.45	47.20	E	1	7.11	76
MLT	Malta[a]	6.65	143.43	92.57	43.97	E			
MUS	Mauritius[a]	3.02	46.87	82.21	24.36	F			
MEX	Mexico	1.97	25.57	69.38	22.89	F	− 2	5.95	60
NPL	Nepal[a]	0.77	20.27	57.86	7.72	E			
NLD	Netherlands	2.20	71.41	98.10	86.69	F	− 1	9.68	64
NZL	New Zealand	1.12	49.63	82.43	37.59	E	0	9.65	70
NER	Niger[a]	− 2.75	14.43	83.89	13.05	F			
NOR	Norway	3.18	54.04	90.02	81.62	S	− 1	9.86	74
PAK	Pakistan	2.70	38.68	67.89	20.77	E	1	3.95	
PAN	Panama[a]	2.03	33.37	71.97	40.22	F			
PNG	Papua New Guinea[a]	1.12	31.05	89.12	20.84	E			
PRY	Paraguay[a]	2.38	17.62	65.29	14.52	F			
PER	Peru	0.06	18.52	86.04	13.32	F	− 2	3.59	38
PHL	Philippines	1.16	27.50	81.40	27.01	F	− 2	3.77	65
PRT	Portugal	3.65	78.02	90.35	55.01	F	− 1	8.63	36
SEN	Senegal[a]	− 0.44	22.80	84.54	27.51	F			
SLE	Sierra Leone[a]	− 0.34	16.83	49.55	5.07	E			

Table 8 (continued)

| Country code | Country name | Average annual growth rate 1960–1995 | Financial Development Indicators | | | Policy variables | | | |
			LIQUID LIABILITIES	COMMERCIAL-CENTRAL BANK	PRIVATE CREDIT	Legal origin	CREDI-TOR	EN-FORCE	AC-COUNT
ZAF	South Africa	0.39	51.44	94.77	71.94	E	0	5.85	70
ESP	Spain	2.88	70.31	92.74	65.05	F	0	8.10	64
LKA	Sri Lanka	2.70	30.34	57.80	17.11	E	0	3.58	
SWE	Sweden	1.89	53.49	88.94	89.11	S	−1	9.79	83
CHE	Switzerland	1.42	123.41	98.99	141.30	G	−1	9.99	68
SYR	Syrian Arab Rep.[a]	2.51	43.32	46.93	8.83	F			
TWN	Taiwan, China	6.62	66.97	95.72	57.32	G	0	8.84	65
THA	Thailand	4.88	47.79	84.66	48.52	E	1	6.91	64
TGO	Togo[a]	0.46	32.90	82.05	21.88	F			
TTO	Trinidad and Tobago[a]	1.12	37.46	91.72	31.20	E			
GBR	United Kingdom	1.96	48.63	83.55	46.31	E	1	9.10	78
USA	United States	1.71	62.12	93.11	113.07	E	−1	9.50	71
URY	Uruguay	1.03	29.47	59.24	21.21	F	0	6.15	31
VEN	Venezuela	−0.88	36.84	90.90	33.12	F		6.34	40
ZAR	Zaire[a]	−2.81	16.03	28.58	4.08	F			
ZWE	Zimbabwe	0.84	46.92	75.80	23.04	E	1	4.36	

[a]Countries added to the LLSV (1998) sample. LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100. COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100. Values for the financial intermediary development indicators are averages over the 1960–1995 period. Legal origin: E = English, F = French, G = German, S = Scandinavian CREDITOR = index of secured creditor rights. ENFORCE = index of law and contract enforcement. ACCOUNT = index of the comprehensiveness and quality of company reports.

Table 9
Countries in the sample

Algeria[a]	Greece	Norway
Argentina	Guatemala	Pakistan
Australia	Guyana[b]	Panama
Austria	Haiti	Papua New Guinea
Bangladesh[b]	Honduras	Paraguay
Barbados[b]	Iceland[b]	Peru
Belgium	India	Philippines
Bolivia	Indonesia[a]	Portugal
Brazil	Iran[a]	Rwanda[a]
Cameroon[a]	Ireland	Senegal
Canada	Israel	Sierra Leone
Central African Republic[a]	Italy	South Africa
Chile	Jamaica	Spain
Colombia	Japan	Sri Lanka
Costa Rica	Kenya	Sudan[a]
Cyprus	Korea	Sweden
Denmark	Lesotho[a]	Switzerland
Dominican Republic	Liberia[b]	Syria
Ecuador	Malawi[a]	Taiwan[b]
Egypt[a]	Malaysia	Thailand
El Salvador	Malta[b]	Togo
Fiji[b]	Mauritius	Trinidad and Tobago
Finland	Mexico	United States of America
France	Nepal[b]	Uruguay
Gambia[a]	Netherlands	Venezuela
Germany	New Zealand	Zaire
Ghana	Nicaragua[a]	Zimbabwe
Great Britain	Niger	

[a] Not in the 71 country pure cross-sectional data set.
[b] Not in the 74 country panel data set.

Table 10
Descriptive statistics, cross-section 1960–1995

	GDP growth	Initial income per capita	Average years of schooling	Private credit	Commercial-central	Liquid liabilities	Government size	Openness to trade	Inflation rate	Black market premium	Revolution and Coups	Assassinations	Ethnic fractionalization
Mean	1.95	3120	4.06	40.86	79.26	45.21	14.75	59.46	15.56	23.34	0.16	0.29	0.29
Median	1.98	2019	3.65	27.81	83.89	41.02	13.16	54.33	9.08	5.36	0.07	0.10	0.19
Maximum	7.16	9895	10.07	141.30	98.99	143.43	31.37	231.69	90.78	277.42	0.97	2.47	0.87
Minimum	−2.81	367	0.20	4.08	23.72	14.43	6.68	14.05	3.63	0.00	0.00	0.00	0.00
Standard deviation	1.92	2519	2.50	29.16	17.37	26.26	5.23	36.43	18.25	49.31	0.22	0.50	0.27
Observations	63	63	63	63	63	63	63	63	63	63	63	63	63
Correlations													
GDP growth	1												
Initial income per capita	0.04	1.00											
Average years of schooling	0.30	0.82	1.00										
Private Credit	0.43	0.63	0.57	1.00									
Commercial-Central Bank	0.46	0.48	0.43	0.64	1.00								
Liquid Liabilities	0.56	0.39	0.45	0.77	0.59	1.00							
Government size	0.21	0.36	0.46	0.30	0.38	0.30	1.00						
Openness to trade	0.19	−0.18	−0.04	−0.09	0.08	0.30	0.31	1.00					
Inflation rate	−0.28	−0.15	−0.10	−0.38	−0.48	−0.42	−0.24	−0.28	1.00				
Black market premium	−0.38	−0.28	−0.30	−0.37	−0.54	−0.26	−0.11	0.36	0.27	1.00			
Revolution and Coups	−0.24	−0.35	−0.30	−0.40	−0.46	−0.44	−0.42	−0.23	0.41	0.20	1.00		
Assassinations	−0.15	−0.09	−0.14	−0.14	−0.07	−0.17	−0.31	−0.27	0.24	0.02	0.51	1.00	
Ethnic fractionalization	−0.35	−0.43	−0.47	−0.34	−0.20	−0.29	−0.06	0.07	0.03	0.20	0.16	0.01	1.00

Table 11
Descriptive statistics, panel 1960–1995

Variable	GDP growth	Initial income per capita	Average years of sec. schooling	Private credit	Commercial-central bank	Liquid liabilties	Government size	Openness to trade	Inflation rate	Black market premium
Mean	1.56	4710	1.30	42.71	77.67	45.14	14.83	54.44	17.80	74.31
Maximum	9.86	20135	5.15	205.95	99.98	191.44	38.02	180.09	344.40	10990.70
Minimum	−10.02	188	0.04	1.56	14.02	6.72	4.89	9.29	−3.06	−3.68
Standard deviation	2.76	5229	0.95	35.16	20.07	27.07	5.36	27.57	33.03	608.65
Observations	359	359	359	359	359	359	359	359	359	359
Correlations										
GDP growth	1									
Initial income per capita	0.12	1								
Avg. years of sec. schooling	0.13	0.69	1							
Private Credit	0.2	0.76	0.62	1						
Commercial-Central Bank	0.33	0.54	0.34	0.6	1					
Liquid Liabilities	0.22	0.61	0.47	0.84	0.51	1				
Government size	−0.04	0.45	0.27	0.24	0.27	0.21	1			
Openness to trade	0.13	0.05	0.09	0.09	0.22	0.13	0.2	1		
Inflation rate	−0.29	−0.18	−0.08	−0.26	−0.26	−0.26	−0.05	−0.22	1	
Black market premium	−0.2	−0.08	−0.06	−0.09	−0.11	−0.03	0.1	−0.1	0.54	1

Table 12
Variables and sources

Variable	Definition	Original source	Secondary source
Level and growth rate of GDP	Real per capita GDP Real per capita GDP (for initial GDP in cross-section regressions)	World Development Indicators Penn World Tables	Loayza et al. (1998)
Government size	Government expenditure as share of GDP	World Development Indicators	Loayza et al. (1998)
Openness to trade	Sum of real exports and imports as share of real GDP	World Development Indicators	Loayza et al. (1998)
Growth rate of terms of trade	Log difference of the terms of trade, divided by five	World Development Indicators	Loayza et al. (1998)
Population growth rate	Log difference of the total population, divided by five	World Bank, International Economics Department	Loayza et al. (1998)
Inflation rate	Log difference of Consumer Price Index	International Financial Statistics (IFS), line 64	
Average years of schooling	Average years of schooling in the population over 25	Barro and Lee (1996)	
Average years of secondary schooling	Average years of secondary schooling in the population over 15	Barro and Lee (1996)	
Black market premium	Ratio of black market exchange rate and official exchange rate minus one	Pick's Currency Yearbook through (1989) and World Currency Yearbook.	
Liquid liabilities	$\{(0.5)*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$, where F is liquid liabilities (line 55l), GDP is line 99b, P_e is end-of period CPI (line 64) and P_a is the average annual CPI.	IFS	
Commercial-central bank	$DBA(t)/(DBA(t) + CBA(t))$, where DBA is assets of deposit money banks (lines 22a-d) and CBA is central bank assets (lines 12 a-d).	IFS	

Private credit	$\{(0.5*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$, where F is credit by deposit money banks and other financial institutions to the private sector (lines 22d + 42d), GDP is line 99b, P_e is end-of period CPI (line 64) and P_a is the average CPI for the year	IFS
Bank assets	$\{(0.5*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$, where F is domestic assets of deposit money banks (lines 22a–d), GDP is line 99b, P_e is end-of period CPI (line 64) and P_a is the average CPI for the year.	IFS
Bank credit	$\{(0.5*[F(t)/P_e(t) + F(t-1)/P_e(t-1)]\}/[GDP(t)/P_a(t)]$, where F is credit by deposit money banks to the private sector (lines 22d), GDP is line 99b, P_e is end-of period CPI (line 64) and P_a is the average CPI for the year.	IFS
Legal origin	Dummy variables for British, French, German and Scandinavian legal origin	Reynolds and Flores (1996)
Accounting	Index created by examining and rating companies' 1990 annual reports on their inclusion or omission of 90 items in balance sheets and income statements. The maximum is 90, the minimum 0.	Center of International Financial Analysis & Research Inc.
Rulelaw	Measure of the law and order tradition of a country. It is an average over 1982–1995. It ranges from 10, strong law and order tradition, to 1, weak law and order tradition.	International Country Risk Guide (ICRG).
Conrisk	Measure of the risk that a government will modify a contract after it has been signed. It ranges from 10, low risk, to 1, high risk and is averaged over 1982–1995.	ICRG

Sources column (far right):
- Private credit: IFS
- Bank assets: IFS
- Bank credit: IFS
- Legal origin: LLSV (1998) and own coding
- Accounting: LLSV (1998)
- Rulelaw: LLSV (1998)
- Conrisk: Knack and Keefer (1995)

Table 12 (continued)

Variable	Definition	Original source	Secondary source
Autostay, Manages, Secured1	AUTOSTAY equals one if a country's laws impose an automatic stay on the assets of firms upon filing a reorganization petition, and zero otherwise. MANAGES equals one if firm managers continue to administer the firm's affairs pending the resolution of reorganization proces-ses, and zero otherwise. SECURED1 equals one if secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assests of a bankrupt firm, and zero otherwise.	National bankruptcy and reorganization laws	LLSV (1998)
Revolutions and coups	A revolution is defined as any illegal or forced change in the top governmental elite, any attempt at such a change, or any successful or unsuccessful armed rebellion whose aim is independence from central government. Coup d'Etat is defined as an extraconstitutional or forced change in the top government elite and/or its effective control of the nation's power structure in a given year. Unsuccessful coups are not counted. Data are averaged over 1960–1990	Banks (1994)	
Assassinations	Number of assassinations per thousand inhabitants. Data are averaged over 1960–1990	Banks (1994)	
Ethnic fractionalization	Average value of five indices of ethnolinguistic fractionalization, with values ranging from 0 to 1, where higher values denote higher levels of fractionalization.	Atlas Narodov Mira (1964); Muller (1964); Roberts (1962); Gunnemark (1991)	Easterly and Levine (1997)
Bureaucratic efficiency	Average of three indices published by Business International Corporation (1984); efficiency of the judiciary system, red tape and corruption. The data are averages over the period 1980–1983.	Business International Corporation (1984)	Mauro (1995)

Corruption	Measure of corruption, with the scale readjusted to 0 (high level of corruption) to 10 (low level). Data are averaged over 1982–1995.	ICRG	Knack and Keefer (1995)
Index of state-owned enterprises	Measures the role of SOEs in the economy, ranging from 0 to 10, with data averaged over 1975–1995. Higher scores denote countries with less government owned enterprises, which are estimated to produce less of the country's output.	Gwartney et al. (1996)	LLSV (1999)
Property rights	Rating of property rights on a scale from 1 to 5. The more protection private property receives, the higher the score.	Holmes et al. (1997)	LLSV (1999)
Cost of business regulation	Rating of regulation policies related to opening and keeping open a business. The scale is from 0 to 5, with higher scores meaning that regulations are straightforward and applied uniformly to all businesses and that regulations are less of a burden to business.	Holmes et al. (1997)	LLSV (1999)
Risk of expropriation	Assessment of risk of "outright confiscation" or "forced nationalization". It ranges from 0 to 10, with lower scores indicating a higher risk and data are averaged over 1982–1995.	ICRG	Knack and Keefer (1995)
Religious Composition	Percentage of the population that were (1) Roman Catholic, (2) Protestant, and (3) Muslim in 1980.	Barrett (1982), Worldmark Encyclopedia of Nations (1996), Statistical Abstract of the World (1995), United Nations Demographic Yearbook (1995) and CIA World Factbook (1996).	LLSV (1999)
Distance from equator	The distance of the country from the equator, scaled between 0 and 1.	CIA Factbook (1996)	LLSV (1999)

Appendix B

The variables and sources are tabulated in Table 12.

For further reading

The following reference is also of interest to the reader: Political Risk Services, various issues.

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