**The legal environment, banks, and long-run economic growth / Comment**
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*Journal of Money, Credit, and Banking;* Aug 1998; 30, 3; ProQuest Central
pg. 596

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# The Legal Environment, Banks, and Long-Run Economic Growth

This paper examines the relationship between the legal system and banking develop-
ment and traces this connection through to long-run rates of per capita GDP growth,
capital stock growth, and productivity growth. The data indicate that countries where
the legal system (1) emphasizes creditor rights and (2) rigorously enforces contracts
have better-developed banks than countries where laws do not give a high priority to
creditors and where enforcement is lax. Furthermore, the exogenous component of
banking development—the component defined by the legal environment—is positively
and robustly associated with per capita growth, physical capital accumulation, and pro-
ductivity growth.

THIS PAPER ADDRESSES TWO QUESTIONS. First, do cross-
country differences in the legal rights of creditors, the efficiency of contract enforce-
ment, and the origin of the legal system explain cross-country differences in the level
of banking development? Second, do better-developed banks cause faster economic
development; that is, is the component of banking development defined by the legal
environment positively associated with long-run rates of economic growth, capital ac-
cumulation, and productivity growth?

Examining the relationship between the legal system and banking development is
valuable irrespective of issues associated with long-run growth. First, banks may in-
fluence the level of income per capita and the magnitude of cyclical fluctuations
(Bernanke and Gertler 1989, 1990). Second, many economists stress that understand-
ing the evolution of legal and financial systems is essential for understanding eco-
nomic development (North 1981; Engerman and Sokoloff 1996). Consequently,
quantitative information on the relationship between the legal environment and banks
will improve our understanding of business cycles and the process of economic de-
velopment.

Furthermore, examining the causal links between banks and economic growth has
both conceptual and policy implications. On the conceptual front, a long literature de-
bates the importance of banks in economic development. Starting as early as Bagehot
(1873), economists have argued that better banks—banks that are better at identifying
creditworthy firms, mobilizing savings, pooling risks, and facilitating transactions—

accelerate economic growth. Others, however, question the importance of the financial system in the development process or disagree with the causal interpretation as discussed in Levine (1997a). Robinson (1952), for example, argues that economic development creates demands for financial services and the financial system responds to provide these services. Evidence on whether banks cause growth will help reconcile these conflicting views. There are also potential policy implications associated with clarifying the causal relationship between banks and growth. For example, if evidence suggests that greater banking development induces faster economic growth and we can identify the legal determinants of banking development, then this supports granting a higher priority to those reforms that improve the functioning of the banking sector. Alternatively, if the component of banking development associated with legal factors is unrelated to economic development, this lowers the priority given to these legal factors in any reform package.

By studying the connection between the legal environment and banking development and then tracing this link through to long-run economic development, this paper fills two gaps in the literature. First, consider research on the relationship between the legal system and financial development. Through arduous data collection and careful analysis, LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1998, 1997; henceforth LLSV) have substantially advanced research into the legal determinants of financial development. LLSV (1998) collect and summarize information on the legal systems of forty-nine countries. LLSV (1997) then use these data to show that legal systems that rigorously protect creditors and enforce contracts encourage better functioning debt and equity markets than legal systems that are more lax in safeguarding creditors and enforcing contracts. This paper complements LLSV (1997) by examining the relationship between legal systems and banking-sector development.

Second, this paper contributes to research on the causal relationship between banking development and long-run economic growth. Although King and Levine (1993a) show that the level of financial development in 1960 is a good predictor of growth over the next thirty years, Rajan and Zingales (1998) note that "financial development may simply be a leading indicator rather than a causal factor." A major impediment to circumventing this critique has been the absence of valid instrumental variables for extracting the exogenous component of banking development. Given the recent work by LLSV (1998), however, this paper examines whether the exogenous component of banking development—the component defined by the legal system—is positively associated with economic development in a cross-section of countries over the 1976–1993 period. LLSV (1998) note that (a) the forty-nine countries in their sample can be divided into countries with predominantly English, French, German, and Scandinavian legal origins and (b) countries typically obtained their legal systems through occupation or colonization. Consequently, I view legal origin as an exogenous "endowment" in studying banking development and growth over the 1976–1993 period. LLSV (1998) go on to show that cross-country differences in legal origin account for a significant amount of cross-country variation in the legal codes defining creditor rights and the efficiency of the legal system in enforcing those codes. In turn, this paper uses cross-country differences in legal origin, creditor rights, and the efficiency of

contract enforcement to identify the exogenous component of banking development. Besides examining the determinants of banking development and tracing this relationship through to per capita GDP growth, this paper also examines the relationship between the exogenous component of banking development and both capital stock accumulation and productivity growth.

The paper finds that cross-country differences in the legal rights of creditors and the efficiency with which legal systems enforce those rights explain over half of the cross-country variation in banking-sector development. Empirically, I define banking development as credit allocated by commercial and other deposit-taking banks to the private sector divided by GDP. The data show that countries with legal systems that give a high priority to banks receiving the full present value of their claims against firms have better-developed banks than countries where the legal codes do not emphasize the rights of creditors. Furthermore, enforcing legal codes is as important as the legal codes themselves. The data indicate that countries that effectively enforce compliance with laws tend to have better-developed banks than countries where enforcement is lax. Finally, the data also indicate that countries with a German legal system tend to have better-developed banks, even after controlling for the level of economic development. Thus, the legal system materially influences banking development.

Next, the paper finds that the component of banking development defined by the legal environment is positively associated with long-run rates of economic growth, capital accumulation, and productivity growth. The paper uses the LLSV (1998) legal indicators as instrumental variables to extract the exogenous component of banking development. The Generalized Method of Moments (GMM) results are robust to changes in the instrumental variables and to changes in the conditioning information set. More specifically, using either (a) the LLSV (1998) measures of creditor rights and contract enforcement or (b) the LLSV (1998) measures of legal origin produces the same conclusions. Also, tests of the overidentifying restrictions indicate that the data do not reject the hypothesis that the instrumental variables are uncorrelated with the error term, which strengthens the confidence one has in the instruments. Furthermore, after controlling for a very wide array of indicators designed to measure economic, political, and cultural characteristics, the data still indicate a statistically significant and economically large relationship between the exogenous component of banking development and the rate of economic growth.

This paper must be viewed as complementing a number of recent efforts aimed at reconciling whether financial development is simply a good predictor of economic growth. Taking a microeconomic approach, Rajan and Zingales (1998) show that, in countries with well-developed financial systems, industries that are naturally heavy users of external financing grow relatively faster than other industries. Alternatively, in countries with poorly developed financial systems, industries that are naturally heavy users of external financing grow more slowly than other industries. Furthermore, Demirguc-Kunt and Maksimovic (1996) show that firms in countries with better-developed financial systems grow faster than they could have grown without this access. While these microeconomic studies must respectively identify (a) the "natur-

al" tendency of industries to use external funding and (b) how fast firms would have grown in different financial environments, the results support the conclusion that better financial systems facilitate economic development. Furthermore, this paper is consistent with Levine (1997b), where I examine the interactions among the legal environment, financial intermediaries, and growth. In contrast to the current paper that focuses on banks, Levine (1997b) uses measures of financial intermediation from King and Levine (1993a, b) that include the activities of nonbank financial intermediaries. Finally, this paper also complements an innovative event study by Jayaratne and Strahan (1996). They 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 remainder of the paper is organized as follows. Section 1 discusses the data and presents evidence on the legal determinants of banking development. Section 2 investigates whether the component of the banking system defined by the legal environment is linked with per capita GDP growth, per capita capital stock growth, and productivity improvements. Section 3 summarizes the results and discusses policy implications.

## 1. THE LEGAL DETERMINANTS OF BANKING DEVELOPMENT

This section examines whether differences in the legal rights of creditors, the efficiency with which legal systems enforce those rights, and legal origin explain differences in banking development. First, the section describes the legal variables used to characterize national legal systems. Second, the section empirically defines the measure of banking development. Finally, I present evidence regarding the legal determinants of banking development.

### A. Legal Determinants

1. *Creditor Rights.* The ability of banks to persuade firms to pay their loans differs across national legal systems. Legal systems differ in terms of the rights of banks to repossess collateral or liquidate firms in the case of default. Legal systems differ in terms of the rights of banks to remove managers in corporate reorganizations. Finally, legal systems differ in terms of the priority given to secured creditors relative to other claimants in corporate bankruptcy.

More specifically, this paper uses four measures of the legal rights of banks.

*AUTOSTAY* equals one if a country's laws impose an automatic stay on the assets of the firm upon filing a reorganization petition. *AUTOSTAY* equals 0 if this restriction does not appear in the legal code. The restriction would prevent bankers from gaining possession of collateral or liquidating a firm to meet a loan obligation.

*MANAGES* equal one if the firm continues to manage its property pending the resolution of the reorganization process, and zero otherwise. In some countries, management stays in place until a final decision is made about the resolution of claims. In other countries, management is replaced by a team selected by the courts or the credi-

tors. If management stays pending resolution, this reduces pressure on management to pay bank loans.

*SECURED*1 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. *SECURED*1 equals zero if nonsecured creditors, such as the government or workers, get paid before secured creditors. In cases where *SECURED*1 equals zero, this certainly reduces the attractiveness of lending secured credit.

*CREDITOR* is a conglomerate index of these three individual creditor rights indicators that is designed to be positively associated with creditor rights. Specifically, *CREDITOR* = SECURED1 − *AUTOSTAY* − MANAGES and takes on values between 1 (best) and −2 (worst). Although I am not able to control for cross-country differences in bankruptcy procedures, I expect countries with higher values of *CREDITOR* to have better-developed banks, all else equal.

The individual country values for *AUTOSTAY, MANAGES, SECURED*1, and *CREDITOR* are provided in Table 2. Summary statistics on *CREDITOR* are given in Table 1. 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. These are measures of the laws on the books, however, and do not incorporate information regarding enforcement.

*2. Enforcement.* The laws governing secured creditors will affect secured creditors only to the extent that the laws are enforced. Consequently, measures of the efficiency of the legal system in enforcing contracts are included from LLSV (1998).

*RULELAW* 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 the *RULELAW* are likely to positively influence banking development.

TABLE 1

SUMMARY STATISTICS: ANNUAL AVERAGES, 1976–1993

| Variable | Mean | Median | Maximum | Minimum | Standard Deviation |
|---|---|---|---|---|---|
| *OUTPUT GROWTH* | 0.023 | 0.018 | 0.097 | −0.014 | 0.022 |
| *CAPITAL STOCK GROWTH* | 0.028 | 0.024 | 0.095 | −0.019 | 0.025 |
| *PRODUCTIVITY GROWTH* | 0.017 | 0.014 | 0.079 | −0.019 | 0.017 |
| *BANK* | 0.844 | 0.760 | 2.678 | 0.122 | 0.536 |
| *CREDITOR* | −0.310 | 0.000 | 1 | −2 | 1.070 |
| *ENFORCE* | 7.451 | 8.310 | 9.990 | 3.545 | 2.154 |
| Observations: 42 | | | | | |

NOTES: *OUTPUT GROWTH* = per capita GDP growth. *CAPITAL STOCK GROWTH* = per capita capital growth. *PRODUCTIVITY GROWTH* = *OUTPUT GROWTH* − (0.3)\**CAPITAL STOCK GROWTH. BANK* = deposit money bank credit to the private sector divided by GDP. *CREDITOR* = index of secured creditor rights. *ENFORCE* = index of law and contract enforcement.

TABLE 2

LEGAL VARIABLES AND BANKING DEVELOPMENT

| Country | CREDITOR | ENFORCE | BANK |
|---|---|---|---|
| Australia | −1 | 9.36 | 0.77 |
| Canada | −1 | 9.48 | 0.83 |
| Hong Kong | 1 | 8.52 | 1.19 |
| India | 1 | 5.14 | 0.46 |
| Israel | 1 | 6.18 | 0.96 |
| Malyasia | 1 | 7.11 | 1.00 |
| New Zealand | 0 | 9.65 | 0.58 |
| Nigeria | 1 | 3.55 | 0.23 |
| Pakistan | 1 | 3.95 | 0.45 |
| Singapore | 1 | 8.72 | 1.50 |
| South Africa | 0 | 5.85 | 0.62 |
| Thailand | 1 | 6.91 | 0.75 |
| United Kingdom | 1 | 9.10 | 1.22 |
| United States | −1 | 9.50 | 0.77 |
| Zimbabwe | 1 | 4.36 | 0.14 |
| Average-English | 0.47 | 7.16 | 0.77 |
| Argentina | −1 | 5.13 | 0.29 |
| Belgium | 0 | 9.74 | 0.53 |
| Brazil | −2 | 6.31 | 0.23 |
| Chile | −1 | 6.91 | 0.75 |
| Colombia | −2 | 4.55 | 0.25 |
| Egypt | 1 | 5.11 | 0.44 |
| France | −2 | 9.09 | 1.51 |
| Greece | −1 | 6.40 | 0.50 |
| Indonesia | 1 | 5.04 | 0.48 |
| Italy | −1 | 8.75 | 0.69 |
| Mexico | −2 | 5.95 | 0.24 |
| Netherlands | −1 | 9.68 | 1.31 |
| Peru | −2 | 3.59 | 0.12 |
| Philippines | −2 | 3.77 | 0.45 |
| Portugal | −1 | 8.63 | 0.96 |
| Spain | 0 | 8.10 | 1.31 |
| Turkey | −1 | 5.57 | 0.35 |
| Average-French | −1.00 | 6.61 | 0.61 |
| Austria | 0 | 9.80 | 1.36 |
| Germany | 0 | 9.50 | 1.64 |
| Japan | 0 | 9.34 | 1.96 |
| Korea | 1 | 6.97 | 0.82 |
| Switzerland | −1 | 9.99 | 2.68 |
| Taiwan | 0 | 8.84 | 1.38 |
| Average-German | 0.00 | 9.07 | 1.64 |
| Denmark | 0 | 9.66 | 0.69 |
| Finland | −1 | 9.58 | 1.22 |
| Norway | −1 | 9.86 | 0.93 |
| Sweden | −1 | 9.79 | 0.87 |
| Average-Scandinavian | −0.75 | 9.72 | 0.93 |

NOTES: Countries are divided into those with English, French, German, and Scandinavian legal origins. *CREDITOR* is an index of the legal rights of secured creditors, with values between −2 and 1, and where larger values indicate greater creditor rights. *ENFORCE* is an index of the efficiency of the legal system in enforcing contracts, with values potentially between 0 and 10, and where larger values indicate greater contract enforcement efficiency. *BANK* equals bank credit to the private sector divided by GDP.

*CONRISK* 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 either repudiation, postponement, or reducing the government's financial obligation. This measure was 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, *ENFORCE*, and the aggregate index of creditor rights, *CREDITOR*.

Again, the individual country values for *RULELAW, CONRISK,* and *ENFORCE* are provided in Table 2. Summary statistics on *ENFORCE* are given in Table 1. 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 2.2. The countries with very high values of enforce, values of *ENFORCE* greater than 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.

*3. Origin.* LLSV (1998) collect and summarize information on the legal systems of forty-nine countries. Based on the work of comparative legal scholars, LLSV (1998) place these forty-nine countries into four legal families, either English, French, German, or Scandinavian. The English legal system is common law, where the laws were primarily formed by judges trying to resolve particular cases. In contrast, French, German, and Scandinavian legal systems are based on the civil law tradition, where the laws were generally formed by legal scholars.

As described in Glendon, Gordon, and Osakwe (1982), Roman law was compiled under the direction of Byzantine Emperor Justinian in the sixth century. Over subsequent centuries, the *Glossators* and *Commentators* interpreted Roman law and adapted the law to the problems of their own day. The initial Justinian texts plus the work of the Glossators and Commentators became known as *the jus commune,* the common law, of Europe. Eventually, individual countries decided to formalize their own legal codes. The Scandinavian countries did this in the seventeenth and eighteenth centuries. These countries have remained relatively unaffected from the far-reaching influences of the German and especially the French civil codes.

The French Civil Code of 1804 is concise, meant to be accessible to the general population, and relies heavily on the *jus commune.* Napoleon saw the permanence of the Code as more important than the fleeting nature of his military conquests. He made it a priority to secure its adoption 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 Guiana, 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 appeared almost a century later. Following the unification of Germany under Bismarck in 1871, it took over twenty years to complete the code (*Burgerliches Gesetzbuch*) in 1896. In terms of consistency, technical precision, and detail, the German civil code was unprecedented. The German code exerted a big in-

fluence 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.

Since the English, French, and German systems were spread primarily through conquest and imperialism, this paper takes national legal origin as an exogenous "endowment" in examining the relationship between the legal system and banking development over the period 1976–1993.

Furthermore, LLSV (1998) trace differences in legal origin through to differences in the legal rules covering secured creditors and the quality of contract enforcement in forty-nine countries. They show that laws and enforcement quality vary systematically with legal origin. More specifically, LLSV (1998) show that common law countries—countries based on the English tradition—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. LLSV (1998) also examine 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. Table 2 summarizes some of these findings.

### B. Banking Development

A large literature examines the ties between banks and economic activity. Ideally, researchers would construct cross-country measures of how well banks identify profitable activities, exert corporate governance, mobilize resources, manage risk, and facilitate transactions. In practice, however, economists have been unable to accurately measure these financial services for a broad cross-section of countries. Consequently, researchers traditionally use measures of the overall size of the banking sector to proxy for "financial depth." Financial depth, however, does not measure where the financial system allocates capital. To minimize this problem, I use a measure of banking development, *BANK,* constructed by Levine and Zervos (1998).

*BANK* equals the value of loans made by commercial banks and other deposit-taking banks to the private sector divided by GDP. *BANK* improves upon traditional financial depth measures of banking development by isolating credit issued by banks to the private sector, as opposed to credit issued to governments or public enterprises. As Table 1 and Table 2 illustrate, there is a wide variation in the value of *BANK.* The values presented in Tables 1 and 2 are average values of *BANK* over the 1976–1993 period. The maximum value is 2.7 (Switzerland), the minimum is 0.1 (Peru, Zimbabwe), and the standard deviation is 0.5.

### C. Evidence on the Legal Determinants of Bank Development

The data suggest a strong, positive relationship between banking development and both the rights of creditors and the efficiency of contract enforcement. Table 3 presents the results of regressing *BANK* on different combinations of the legal indicators.

TABLE 3

BANKING DEVELOPMENT AND LEGAL SYSTEMS, 1976–1993

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Constant | −0.32 [0.028] | −2.23 [0.001] | 0.52 [0.248] | −0.15 [0.807] | 0.93 [0.000] | −1.45 [0.014] |
| INITIAL OUTPUT | | 0.37 [0.001] | −0.13 [0.083] | 0.03 [0.766] | | 0.26 [0.000] |
| CREDITOR | 0.09 [0.020] | 0.17 [0.001] | | 0.09 [0.103] | | |
| ENFORCE | 0.16 [0.000] | | 0.19 [0.000] | 0.16 [0.000] | | |
| German | | | | | 0.51 [0.017] | 0.66 [0.001] |
| English | | | | | −0.19 [0.199] | 0.08 [0.639] |
| French | | | | | −0.30 [0.038] | −0.06 [0.714] |
| R-square | 0.56 | 0.43 | 0.51 | 0.56 | 0.30 | 0.50 |

NOTES: *INITIAL OUTPUT* = Initial logarithm of real per capita GDP. *CREDITOR* = index of secured creditor rights. *ENFORCE* = index of law and contract enforcement. *German, English, French* = Dummy variables for corresponding legal origin.
The null hypothesis that the regressors excplain none of the cross-country variation in banking development is rejected at the 0.001 level in all of the regressions.
[Heteroskedasticity-consistent *P*-values in square brackets]

I compute the value of *BANK* as the average over the 1976–1993 period. Thus, there is one observation per country. In regression (1), the regressors are *CREDITOR* and *ENFORCE*. Each legal indicator enters positively and significantly at the 5 percent level. Regressions (2), (3), and (4) also include the logarithm of per capita GDP (*INITIAL OUTPUT*) to control for the overall level of economic development. When *INITIAL OUTPUT* is included along with either *CREDITOR* [equation (2)] or *ENFORCE* [equation (3)], the legal variables enter significantly at the 1 percent level. When *INITIAL OUTPUT, CREDITOR*, and *ENFORCE* are simultaneously included [equation (4)], the *P*-value on *CREDITOR* rises to about 0.1 while the results on *ENFORCE* do not change.

Moreover, the empirical relationship between the legal system indicators and banking development are economically meaningful. For example, a one standard deviation increase in *CREDITOR* (1.1) would increase *BANK* by 0.1 (using the smallest value of the estimated coefficients), which is about 12 percent of the mean value of *BANK*. More impressively, a one standard deviation increase in *ENFORCE* (2.2) would increase *BANK* by 0.35, which is over 40 percent of the mean value of *BANK*. Thus, the legal rights of creditors and the ability to enforce those rights are strongly tied to the ratio of bank credit to the private sector as a share of GDP. As shown by the regression $R^2$s, the creditor rights and enforcement indicators account for over half of the cross-country variation in banking-sector development.

The data also suggest that legal origin has a profound impact on bank development. The regressors in regression (5) of Table 3 are dummy variables for German, English, and French legal origin as defined by LLSV (1998) and shown in Table 2. Regression (6) also includes *INITIAL OUTPUT*. The major message that emerges from regressions (5) and (6) is that countries with a German legal origin have better-developed banks. While countries with a French legal tradition tend to have less well developed banks than other countries on average [regression (5)], this result does not hold when controlling for the overall level of economic development [regression (6)]. In contrast, the dummy variable for a German legal tradition enters with a positive and significant coefficient even after controlling for *INITIAL OUTPUT*.

In sum, the legal system matters for banking development. Differences in banking development can be traced back to the legal origin of the country. Even after controlling for the level of economic development, countries with a German legal system tend to have better-developed banks. Moreover, the data identify particular aspects of the legal system that are important for banking-sector development. Countries where the legal system gives a high priority to banks getting the full present value of their loans to firms have better-developed banks. Furthermore, countries where the legal system effectively enforces contracts tend to have better-developed banks than countries that less efficiently enforce contracts.

## 2. BANKS AND GROWTH

This section examines whether the exogenous component of banking development—the component associated with national legal characteristics—is related to rates of per capita GDP growth, capital stock growth, and productivity growth. Specifically, this section uses the legal determinants of banking development examined in section 1 as instrumental variables. The data suggest that the component of banking development defined by the legal environment is positively and robustly associated with long-run rates of economic development.

### A. Methodology

In the tradition of recent cross-country empirical studies of economic growth, this paper uses data averaged over long periods, such that there is one observation per country. The basic regression takes the form:

$$G(i) = \alpha(i) + \beta(i)BANK + \gamma(i)\mathbf{X} + \varepsilon(i), \tag{1}$$

where the dependent variable, *G(i)*, is either real per capita GDP growth, per capita capital stock growth, or productivity growth (index *i* distinguishes among these dependent variables), *BANK* equals credit to the private sector divided by GDP, and **X** represents a matrix of conditioning information that controls for other factors associated with economic growth (for example, income per capita, education, political sta-

bility, ethnic diversity, civil rights, bureaucratic efficiency, and indicators of trade, fiscal, and monetary policy). Given data availability, the data cover the period 1976–1993.

In contrast to traditional cross-country investigations, however, this paper seeks to examine whether cross-country variations in the exogenous component of banking-sector development explain cross-country variations in the rate of economic development. Thus, I use the legal determinants of banking development as instrumental variables for *BANK*. Specifically, I select a vector of instrumental variables **Z** for the equations specified by equation (1). Assuming that $E[\varepsilon] = 0$ and that $E[\varepsilon\varepsilon'] = \Omega$, where $\Omega$ is unrestricted, implies a set of orthogonality conditions, $E[\mathbf{Z}'\varepsilon] = 0$. This produces a nonlinear instrumental variable estimator of the coefficients in equation (1). After computing these GMM estimates, I use a standard Lagrange multiplier test of the overidentifying restrictions to see whether the instrumental variables are associated with growth beyond their ability to explain cross-country variation in banking-sector development.

### B. The Growth Indicators

As indicated by equation (1), this paper examines three dependent variables: per capita GDP growth (*OUTPUT GROWTH*), per capita capital stock growth (*CAPITAL STOCK GROWTH*), and productivity growth (*PRODUCTIVITY GROWTH*). Specifically, define *PRODUCTIVITY GROWTH* as follows:

$$PRODUCTIVITY\ GROWTH = OUTPUT\ GROWTH -$$
$$\kappa*(CAPITAL\ STOCK\ GROWTH).$$

To obtain empirical estimates, I (a) obtain *OUTPUT GROWTH* from national accounts data, (b) use *CAPITAL STOCK GROWTH* from King and Levine (1994), (c) select a standard value for $\kappa$ ($\kappa = 0.3$), and then compute *PRODUCTIVITY GROWTH*.

### C. Conditioning Information, **X**

This paper examines whether the exogenous component of banking development has a robust, independent relationship with the growth indicators. To enhance confidence in the analysis, it is important to control for "other factors." That is, I want to reduce the chances that regression (1) omits an important explanatory variable (Levine and Renelt 1992). Given that the maximum sample size is only forty-three countries, there are limits on the number of variables that can be included in **X** in any one regression. Consequently, the analysis includes three different conditioning information sets in all of its analyses.

Conditioning information set 1 included a constant, the logarithm of initial per capita GDP, and initial secondary school enrollment. The initial income variable is used to capture the convergence effect highlighted by Barro and Sala-i-Martin (1995).

As in many cross-country analyses, initial secondary school enrollment is used to control for investment in human capital accumulation. I sometimes refer to conditioning information set 1 as the "simple" conditioning information set.

Conditioning information set 2 includes conditioning information set 1 plus the ratio of government consumption to GDP, the inflation rate, and the black market exchange rate premium. All of these variables are averaged over the 1976–1993 period. 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). Thus, conditioning information set 2 is designed to control for policy distortions in studying the relationship between banking development and economic development. I sometimes refer to conditioning information set 2 as the "policy" conditioning information set.

Conditioning information set 3 includes conditioning information set 1 plus the number of revolutions and coups (Banks 1994), the number of assassinations per thousand inhabitants (Banks 1994), an index of political rights, an index of civil liberties (Gastil 1990), an index of bureaucratic red tape (Mauro 1995), and the degree of ethnic diversity (Easterly and Levine 1997). This group of conditioning information is designed to control for bad policies, bad bureaucracies, bad institutions, and bad politics, as emphasized by Knack and Keefer (1995). I sometimes refer to conditioning information set 3 as the "political" conditioning information set.

### D. GMM Results with CREDITOR and ENFORCE as Instruments

Table 4 summarizes the instrumental variable results from nine regressions. The dependent variable is either *OUTPUT GROWTH, CAPITAL STOCK GROWTH,* or *PRODUCTIVITY GROWTH.* For each of these three dependent variables, Table 4 presents the regressions results for the three conditioning information sets, that is, the simple, policy, and political conditioning information sets. In the Table 4 results, the instrumental variables are *CREDITOR* and *ENFORCE,* which measure the degree to which legal codes emphasize the rights of creditor and the efficiency of the legal system in enforcing laws and contracts respectively. Furthermore, I treat the $X$ matrix as exogenous because I am focussing on examining whether the exogenous component of banking development as defined by the legal environment is associated with economic development. For conciseness, I present only the statistics on the *BANK* coefficients as well as the tests of the overidentifying restrictions.

The results indicate a very strong connection between the exogenous component of banking development and the growth indicators. *BANK* enters all nine of the regressions positively and significantly at the 1 percent level. The component of *BANK* defined by creditor rights and the efficiency of contract enforcement is closely tied to long-run rates of per capita GDP growth, capital stock growth, and productivity growth. Furthermore, the data do not reject the orthogonality conditions at the 10 percent level in any of the nine regressions. Thus, the results are consistent with the statement that the creditor rights indicator and the contract enforcement indicator

TABLE 4

BANKS, GROWTH, AND THE SOURCES OF GROWTH

| Independent Variable | Conditioning Information | Dependent Variable | | |
|---|---|---|---|---|
| | | OUTPUT GROWTH | CAPITAL STOCK GROWTH | PRODUCTIVITY GROWTH |
| BANK | 1 | 0.056 | 0.058 | 0.046 |
| | | (0.011) | (0.012) | (0.009) |
| | | [0.001] | [0.001] | [0.001] |
| | | {0.01} | {0.40} | {0.01} |
| BANK | 2 | 0.056 | 0.061 | 0.042 |
| | | (0.017) | (0.018) | (0.014) |
| | | [0.003] | [0.002] | [0.004] |
| | | {0.21} | {0.06} | {0.05} |
| BANK | 3 | 0.043 | 0.035 | 0.038 |
| | | (0.009) | (0.010) | (0.008) |
| | | [0.001] | [0.001] | [0.001] |
| | | {0.38} | {2.13} | {0.21} |

NOTES: (Heteroskedasticity-consistent standard errors in parentheses)
[P-values in square brackets]
{LM-test of overidentifying restrictions in braces}
Critical values for LM-Test (1 d.f.): 10% = 2.71; 5% = 3.84.
Conditioning information 1: Other regressors include a constant, logarithm of initial per capita GDP, and initial secondary school enrollment rate. Observations = 40.
Condition information 2: Other regressors include conditioning information 1, plus the ratio of government consumption spending to GDP, inflation rate, and the black market exchange rate premium. Observations = 40.
Condition information 3: Other regressors include conditioning information 1, plus the number of revolutions and coups, the number of assassinations per thousand inhabitants, index of political rights, index of civil liberties, index of bureaucratic red tape, and degree of ethnic diversity. Observations = 38.
Instruments: conditioning information set plus CREDITOR and ENFORCE, which are indexes of secured creditors legal rights and the efficiency of law enforcement.

influence the growth indicators only through their impact on banking development. Also, the results are economically meaningful. As noted earlier (Table 3), a one standard deviation increase in *both CREDITOR* and *ENFORCE* would increase *BANK* by 0.45 (which is about one-half of the mean value of *BANK*). According to Table 4, a rise in the exogenous component of *BANK* by 0.45 would increase the rate of per capita GDP growth by almost 2 percent per year (0.45*0..043) over the sample period. (This example uses the political conditioning information set results, which have the smallest *BANK* coefficients.) Accumulating over the eighteen years of the sample, the results suggested that real per capita GDP would have been about 40 percent higher in 1993 given this 0.45 increase in the exogenous component of banking-sector development. The estimates imply an economically large relationship between banking-sector development and economic performance. Legal reforms that enhance creditor rights and contract enforcement may substantially accelerate long-run rates of per capita GDP growth, capital accumulation, and productivity growth.

### E. GMM Results with Legal Origin Dummies as Instruments

Table 5 presents additional results regarding the relationship between the three growth indicators and the exogenous component of banking-sector development using an alternative instrument set. Specifically, the instrumental variables are dummy variables for legal origin, either English, French, or German. Some view these instruments as better than *CREDITOR* and *ENFORCE* because legal origin is less prone to

TABLE 5

BANKS, GROWTH, AND THE SOURCES OF GROWTH: ALTERNATIVE INSTRUMENTS

| Independent Variable | Conditioning Information | Dependent Variable | | |
|---|---|---|---|---|
| | | OUTPUT GROWTH | CAPITAL STOCK GROWTH | PRODUCTIVITY GROWTH |
| BANK | 1 | 0.052 | 0.037 | 0.046 |
| | | (0.020) | (0.015) | (0.017) |
| | | [0.013] | [0.020] | [0.010] |
| | | {0.56} | {0.37} | {2.12} |
| BANK | 2 | 0.043 | 0.034 | 0.017 |
| | | (0.018) | (0.015) | (0.012) |
| | | [0.019] | [0.032] | [0.175] |
| | | {0.80} | {0.19} | {5.46} |
| BANK | 3 | 0.019 | 0.020 | 0.016 |
| | | (0.009) | (0.010) | (0.007) |
| | | [0.033] | [0.052] | [0.027] |
| | | {3.32} | {0.03} | {5.57} |

NOTES: (Heteroskedasticity-consistent standard errors in parentheses)
[P-values in square brackets]
{LM-test of overidentifying restrictions in braces}
Critical values for LM-Test (2 d.f.): 10% = 4.61; 5% = 5.99.
Conditioning information 1: Other regressors include a constant, logarithm of initial per capita GDP, and initial secondary school enrollment rate. Observations = 43.
Condition information 2: Other regressors include conditioning information 1, plus the ratio of government consumption spending to GDP, inflation rate, and the black market exchange rate premium. Observations = 43.
Condition information 3: Other regressors include conditioning information 1, plus the number of revolutions and coups, the number of assassinations per thousand inhabitants, index of political rights, index of civil liberties, index of bureaucratic red tape, and degree of ethnic diversity. Observations = 41.
Instruments: conditioning information set plus dummy variables for legal origin.

endogeneity problems than measures of the legal rights of creditors and the efficiency of the judicial system. On the negative side, dummy variables for legal origin give less guidance regarding the particular characteristics of the legal system that are important for banking-sector development. For this section's purposes, the relevant point is that the two sets of instruments give similar results.

Table 5 summarizes the results from nine regressions, where the dependent variable is either OUTPUT GROWTH, CAPITAL STOCK GROWTH,, or PRODUCTIVITY GROWTH. For each of these three dependent variables, Table 5 presents the regression results for the simple, policy, and political conditioning information sets. In all of the OUTPUT GROWTH regressions, BANK enters positively and significantly at the 5 percent level. Also, BANK enters positively and significantly in two out of the three CAPITAL STOCK GROWTH regressions and in two out of the three PRODUCTIVITY GROWTH regressions. With the political conditioning information set, BANK enters the CAPITAL STOCK GROWTH regression with a P-value of 0.052. With the policy conditioning information set, BANK enters the PRODUCTIVITY GROWTH regression with a P-value of 0.18. With these two exceptions noted, the data indicate a strong, positive relationship between the growth indicators and the exogenous component of banking development. While the legal origin instruments tend to produce smaller coefficients than the CREDITOR and ENFORCE instruments, the coefficients still indicate an economically large relationship between banking sector development and long-run growth. Using the same example as above, a rise in the exogenous component of BANK by 0.45 would increase the rate of per capita GDP

growth by 0.9 of 1 percent per year (0.45*0.019) over the sample period. Accumulating over the eighteen years of the sample, the results suggest that real per capita would have been about 18 percent higher in 1993 with a 0.45 increase in the exogenous component of banking-sector development.

The hardy links between banking development and long-run rates of per capita GDP growth, capital stock growth, and productivity growth pass some additional diagnostic tests. The data do not reject the orthogonality conditions at the 5 percent level in the nine regressions. At the 10 percent level, the *PRODUCTIVITY GROWTH* regressions with the policy and political conditioning information sets reject the null hypothesis that the instrumental variables are uncorrelated with the error term. In these regressions and at this higher *P*-value, the data suggest that legal origin may not be specific enough; that is, legal origin may be associated with growth beyond its link to banking-sector development. In general, however, the results are consistent with the statement that the legal environment affects the rate of economic development by influencing banking-sector development.

### F. Cautionary Note

It is important to be clear about what these results do not show. The paper does *not* show that economic growth does not influence the banking system. The results do not contradict theories by Patrick (1966), Greenwood and Jovanovic (1990), and Greenwood and Smith (1997), which suggest that causality runs in both directions; banking development influences economic growth, and economic growth influences banking-sector development. This paper provides evidence for the hypothesis that the exogenous component of banking development promotes economic growth. Furthermore, this paper examines neither the determinants nor the effects of various financial regulations. Thus, I do not consider the determinants or effects of deposit insurance (Calomiris 1989; Demirguc-Kunt and Detragiache 1997; Kane 1985,1989), restrictions on banking activities (Kroszner and Rajan 1994; Calomiris 1995), or a wide array of supervisory and regulatory issues that may affect bank stability and performance (Barth, Nolle, and Rice 1996; BIS 1997; Calomiris and Gorton 1991; Kroszner and Strahan 1996). Rather, this paper makes a more limited point: the legal environment influences the banking sector and this component of banking-sector development is strongly linked with long-run rates of economic growth.

### 3. SUMMARY AND CONCLUSIONS

This paper first examined the connection between the legal environment and banking development and then studied the link between that part of banking-sector development associated with the legal environment and rates of economic growth, capital accumulation, and productivity improvements. The data indicate a close relationship between the legal system and banking development. Countries where legal codes emphasize the rights of creditors have better-developed banks, as measured by bank credit to the private sector divided by GDP, than countries where laws do not give a

high priority to creditors in the case of corporate bankruptcy or reorganization. Furthermore, enforcement matters. Countries with legal systems that rigorously enforce laws and contracts have better-developed banks than countries where enforcement is more lax. Moreover, these differences can be traced back to the legal origin of the country. As noted by LLSV (1998), English common law countries have laws that emphasize the rights of creditors to a greater degree than the French, German, and Scandinavian countries. On average, French civil law countries protect creditors the least. In terms of law enforcement, countries with a French legal heritage have, on average, the lowest quality of law enforcement, while countries with German and Scandinavian legal traditions tend to be the best at enforcing laws and contracts.

The paper also finds that the exogenous component of banking development—the component defined by the legal environment—is positively associated with economic growth. This finding was robust to changes in the conditioning information set and to alterations in the instrumental variables. The policy implications are clear. Although changing legal codes and improving the efficiency with which legal systems enforce laws and contracts is difficult, the economic returns to improving the legal environment appear very large. For many countries, these reforms could begin at the level of regulation and implementation. For example, it may be prohibitively difficult—or undesirable—to change a country's law that imposes an automatic stay on the assets of a firm upon filing a reorganization petition. Nevertheless, corporate reorganization procedures could be improved to reduce delays and uncertainty, so that bankers feel greater confidence about receiving the full present value of their loans. Thus, this paper's results emphasize the prominent role that legal reforms—defined broadly—can have in stimulating economic development by improving the functioning of the banking system.

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## Comment on THE LEGAL ENVIRONMENT, BANKS, AND LONG-RUN ECONOMIC GROWTH, *by Shaghil Ahmed*

The purpose of this paper by Ross Levine is to examine empirically the impact of bank development on economic growth. The paper does so by isolating the legal determinants of bank development and examining the relationship between these determinants and economic growth in a cross-country setting.

The study differs from the previous literature in this area—which includes many of Levine's own papers—in two important respects. First, it focuses on banks directly, rather than financial development in general. Second, it attempts to overcome the "reverse-causation" critique of this literature by isolating the component of banking development that is exogenous to growth.

The empirical results are obtained in two stages. In the first stage, the author demonstrates that variables capturing the legal environment clearly matter for the degree of banking development. Two alternative sets of legal environment variables are used: one set captures creditors' rights and degree of enforcement of contracts, while the other set contains dummy variables reflecting what type of legal system a country has (English, French, German, or Scandinavian). In the second stage, the effects of banking development on economic growth are estimated using the above legal environment variables as instruments to address the simultaneity bias problem.

The paper has three main results: (1) the rights given to creditors under the legal system and the degree to which these rights are enforced are crucial determinants of banking development and there is also some evidence that the German legal system promotes bank development; (2) the component of bank development that is explained by the legal environment (the "exogenous component") strongly affects steady-state economic growth, capital accumulation, and productivity growth; and (3) robustness checks, in terms of using a whole bunch of different conditioning variables and specification tests of the validity of the instruments used, indicate that the *causal* influence of banks on growth has indeed been isolated. As is stressed in the paper, this does not, of course, mean that causality does not also run in the other direction.

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Rather, it means that the magnitude of it in one direction at least, namely, from banking development to growth, has been isolated.

## GENERAL REMARKS

The paper addresses a question that is clearly important, and one that has proved controversial and difficult to answer, mainly because of the reverse-causation problem. Ross Levine tackles this problem head on and comes up with a clear-cut answer, using rigorous empirical analysis. The paper is very clear and forms a significant contribution to this literature.

The paper is primarily empirical, although clearly motivated by the theoretical literature on the role that banks play in an economy. As such, my comments will mainly delve into empirical issues. While these comments show several concerns, it should be possible to address most of these in a fairly straightforward manner. But in the end, one substantive reservation will remain; this has to do with some inherent limitations of a pure cross-section study of this type to be able to isolate the *causal* influence of bank development on growth.

## SPECIFIC COMMENTS

### Could Bank Development Be Proxying for Something Else?

Levine and Renelt (1992) have argued for the importance of examining robustness in cross-country growth regressions to account for the possibility of omitted variable bias. In the present context, this would mean that a missing third variable could be influencing both bank development and economic growth. The paper goes to great lengths to control for this by using three alternative sets of conditioning variables when examining the effect of the bank development variable. These are the "simple" conditioning set (which includes the variables initial per capita GDP and initial school enrollment), the "policy" conditioning set (which adds government size, inflation, and the black market exchange rate variables to the simple set to control for government policy effects), and the "political" conditioning set (which adds a number of political variables to the simple set).

However, two potential candidates for variables that might create omitted variable bias are still missing. These are the government budget deficit as a fraction of GDP and a variable measuring the general degree of capital market development.

First, let's consider why it could be important to control for the government budget deficit. Banking development is defined in the paper as credit allocated by commercial banks and other deposit-taking banks to the *private* sector divided by GDP. Presumably the banks considered include public as well as private banks. In many developing countries, we know that governments often rely on public banks to a large extent for their borrowing requirements. Other things equal, a rise in lending to the public sector crowds out lending to the private sector. Thus, the bank development variable might

be proxying for the government budget deficit. If bigger government deficits hurt growth, this would tend to create a spurious positive relationship between bank development and growth, in a regression which omitted the government deficit variable. While the paper does control for government size, the government budget deficit would likely be a more appropriate conditioning variable in the present context.

It is also important to condition on the general degree of capital market development. Elsewhere, Levine and Zervos (1998) have argued that it is not a question of whether it is banks *or* stock markets that matter for growth, but that banks *and* stock markets both matter. However, in the present paper, we do not see a simple regression that contains both proxies for stock market development and bank development simultaneously to convince us of this. As the results stand, it could be that banks are not really special in that they do not play a major role in promoting growth in countries where capital markets are well developed already, but only matter when capital markets are underdeveloped or restricted. The role of banks apart from that of capital markets in general needs to be isolated.

### *Do We Get Effects of Banking Development on Economic Growth That Are Plausible in Size?*

A one standard deviation increase in the variables *CREDIT* and *ENFORCE* (which measure creditors' rights and the degree of enforcement of these rights, respectively) increases the mean value of *BANK* (the ratio of bank credit to the private sector to GDP) by 0.43 (about half its mean), which in turn adds about two percentage points to per capita growth per year.

These effects seem to be quite large and may partly be a result of the functional form chosen for the auxiliary regression of *BANK* on *CREDITOR* and *ENFORCE* reported in Table 3 of the paper. Since the variables *CREDITOR* and *ENFORCE* are entered linearly in the regressions in Table 3, the effect of creditors' rights on bank development is independent of the degree to which these rights are enforced. For example, according to the results in Table 3, whether *ENFORCE* is at its lowest level of 2 or its highest level of 20, a one unit increase in *CREDITOR* would increase *BANK* by 0.09 units in either case. This is quite implausible and argues against using the linear functional form in the Table 3 regressions. The variables *CREDITOR* and *ENFORCE* should be allowed to interact with each other in some way to come up with something like "the expected value of creditor rights, taking into account the probability of enforcement."

### *Is the Consolidation of the Legal Variables into Two Summary Measures Valid?*

The dummy variables *AUTOSAY* (measuring whether a country's law imposes an automatic stay on the assets of the firm upon the filing of a reorganization petition), *MANAGES* (measuring whether a firm continues to manage its property pending the resolution of the reorganization process), and *SECURED*1 (measuring whether secured creditors are ranked first in the distribution of the proceeds from a bankrupt firm) are combined into one measure of creditors' rights in the variable *CREDITOR* =

SECURED1-*AUTOSTAY-MANAGES*. Similarly the degree to which the rule of law is strictly enforced takes the variables *RULELAW* (an index of the general law-and-order situation) and *CONRISK* (representing the ability of government to modify contracts) and combines them into one measure, *ENFORCE* = 1/2 [*RULELAW* + CONRISK].

There is no reason why the individual variables should be aggregated in this way with equal weights. Since the variables are available individually, the restrictions implied in the above consolidations are testable and should be tested and imposed only if found to be valid.

### Are There Important Differences across Countries?

By its very nature, a pure cross-section study like this imposes the effects to be the same across countries. But there are reasons to expect that, in particular, the effects of bank development on growth may not be the same in magnitude in developing countries and industrial economies (and may well change over time within countries, too). Thus, due to country aggregation we cannot answer interesting questions such as: how do the effects of banking development in a country such as the United States differ from those in Zimbabwe, say? If one were pursuing the strategy of estimating a dynamic panel, obtaining answers to such questions would be more feasible, in principle at least. It would also be useful to report some sensitivity analysis results that would demonstrate that the results are not being driven by the presence of a few "outlier" countries.

When differences across countries such as the ones mentioned above exist, aggregation over countries can create well-known problems that are discussed in Ericsson, Irons, and Tryon (1993), among the other problems that they also discuss.

### Has the Reverse-Causation Critique Been Overcome?

The reverse-causation problem refers to the inability of a regression of growth on banking development to distinguish whether higher growth implies increased demand for bank loans and the financial system responds by supplying these loans, or whether *exogenous* increases in the supply of loans imply higher growth. This is a difficult problem to address and Granger-causality tests do not necessarily solve it. For example, in models where expectations of future variables affect current decisions, it may well be that financial development may simply be a leading indicator, rather than a causal factor, as is clearly acknowledged in the paper.

Since the reverse-causation problem is essentially a simultaneity problem, Levine solves it in this paper by the use of instrumental variables. Normally if the instruments are valid, this takes care of the simultaneity problem. But, drawing on the paper by Ericsson, Irons, and Tryon (1993) and extending some of their results on the time-aggregation problem, I would like to argue that, *when the simultaneity problem arises purely due to time-aggregation, instrumental variables need not take care of it*. To demonstrate this, consider the following two examples:

EXAMPLE I. The purpose of this simple example, reproduced from Ericsson, Irons,

and Tryon (1993), is to show how a simultaneity problem can arise from *time-aggregation* even when there is none to begin with. Putting their example in the context of the present paper, suppose $y$ represents the growth rate of real GDP and $x$ represents the degree of bank development. Further, suppose the dynamic behavior of these two variables is determined by the following model:

$$y_t = ax_{t-1} + e_t \tag{1}$$

$$x_t = by_{t-1} + u_t \tag{2}$$

where $e$ and $u$ are zero-mean, i.i.d. error processes. Note that there is no simultaneity problem and, if time series on $x$ and $y$ are available, (1) and (2) can easily be estimated by OLS to give consistent estimates of $a$ and $b$.

Suppose, however, that we time-average $x$ and $y$ and then regress $y$ on $x$. For simplicity, just consider two-period averaging to illustrate the point. Let

$$\bar{y}_t = \frac{y_t + y_{t-1}}{2}; \quad \bar{x}_t = \frac{x_t + x_{t-1}}{2}. \tag{3}$$

If we now regress the time-averaged $y$ on the time-averaged $x$, the probability limit of the OLS estimator, $\beta_{OLS}$, can be shown to be

$$plim\beta_{OLS} = \frac{a + b\sigma}{2}; \quad \sigma = \frac{a^2\sigma_u^2 + \sigma_e^2}{\sigma_u^2 + b^2\sigma_e^2} \tag{4}$$

where $\sigma_u^2$ and $\sigma_e^2$ represent the variances of $u$ and $e$, respectively. Clearly, unless $b = 0$, the regression of $y$ on $x$ with time-averaged data is giving us a mixture of $a$ and $b$, rather than just $a$, which, representing the effect of banks on growth, is the parameter we are interested in. The simple intuition for this result is that with a lag, causality does run in both directions in the true model.

EXAMPLE 2. To examine whether the use of instrumental variables will take care of this problem, I extend the above example from Ericsson, Irons, and Tryon to the case of three variables. So, now add a variable $z$, which can be the legal environment variable in the context of this paper, and suppose the dynamic model is given by

$$y_t = ax_{t-1} + e_t \tag{5}$$

$$x_t = by_{t-1} + dz_{t-1} + u_t \tag{6}$$

$$z_t = fz_{t-1} + gx_{t-1} + v_t \tag{7}$$

where $e$, $u$, $v$ are zero-mean, i.i.d. error processes. Again, there is no simultaneity problem without time-averaging and all the parameters can be consistently estimated using OLS with time series data. Furthermore, $z_{t-1}$ has the characteristics of a valid instrument for equation (5) in that it is correlated with $x$ but uncorrelated with the er-

ror term $e$. Now suppose we time-average the data using two-period averages, as before. Then, we regress the time-averaged $y$ on the time-averaged $x$, using the time-averaged $z$ as an instrument to get the instrumental variable estimate (IVE) labeled $\beta_{IV}$.

Two cases need to be distinguished: Case I, in which $g = 0$, but $f \neq 0$, so that there is no feedback from bank development to things like creditors' rights; and Case II, in which $f = 0$, but $g \neq 0$, so that there is feedback from $x$ to $z$.

In Case I, the probability limit of the IVE is given by

$$plim\beta_{IV} = fa . \tag{8}$$

Thus, when there is no feedback from $x$ to $z$, we are still not getting $a$, but at least the estimated effect is not being contaminated with the reverse effect of growth on banking development, as was the case with the OLS estimate.

However, in Case II, the probability limit of the IVE is given by

$$plim\beta_{IV} = \frac{2ag}{(1+ab)g + d\sigma*}; \quad \sigma* = \frac{g^2 b^2 \sigma_e^2 + (1-a^2 b^2)\sigma_v^2}{b^2 \sigma_e^2 + d^2 \sigma_v^2} \tag{9}$$

where $\sigma_e^2$, $\sigma_u^2$, $\sigma_v^2$ represent the variances of $e$, $u$, $v$, respectively. In this case, time-averaging again leads to a mixing together of $a$—the effect of bank development on growth (which is the parameter of interest)—and $b$ (the effect of growth on bank development), along with other parameters of the dynamic model, even when the legal variables are used as instruments. Thus, the *time-averaged z is not a valid instrument*. The basic problem is that, in the dynamic model, not only does causality run in both directions between $x$ and $y$, it also runs in both directions between $x$ and $z$, so that using the time-averaged $z$ as an instrument does not help.

One could note that the above problem would only potentially arise when *CREDITOR* and *ENFORCE* are used as instruments. It would not arise when the dummy variables representing the legal system (English, French, German, or Scandinavian) are used as instruments, since these variables are not time varying. However, it should also be noted that the effect of these variables on the bank development variable was not very strong in the first place, once the initial level of economic development was controlled for. Thus, these legal system variables were not very powerful instruments to begin with.

CONCLUDING REMARKS

In sum, this paper clearly shows that the degree of bank development and economic growth are positively related after conditioning on a host of other influences on growth. However, as I have argued, the conditioning variables should also include a proxy for the degree of *general* capital market development and the government budget deficit to further delineate the role of banks per se. The paper also provides persuasive evidence that the interaction between banking development and the legal environment is strong.

Both these results are interesting and the paper makes a nice contribution in demonstrating them. However, for reasons discussed above, reservations remain about the ability of a purely cross-sectional study such as this to isolate the magnitude of the *causal* effect of bank development on economic growth.

The idea of using the exogeneity of the legal determinants of bank development to get at the issue of causality is a fine one. However, a dynamic panel setting is more appropriate and would overcome the time-aggregation issues inherent in a purely cross-sectional study. A quick reading of Laporta, Lopez-de-Silanes, Shleifer, and Vishny (1997)—the author's source for data on the legal variables—indicates that some time series data on the legal environment variables are available. Thus, it would seem that the estimation of a dynamic panel, which would better get at the causality issue, is feasible.

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