FINANCE AND GROWTH: THEORY AND EVIDENCE

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ABSTRACT

This paper reviews, appraises, and critiques theoretical and empirical research on the connections between the operation of the financial system and economic growth. While subject to ample qualifications and countervailing views, the preponderance of evidence suggests that both financial intermediaries and markets matter for growth and that reverse causality alone is not driving this relationship. Furthermore, theory and evidence imply that better developed financial systems ease external financing constraints facing firms, which illuminates one mechanism through which financial development influences economic growth. The paper highlights many areas needing additional research.

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I. Introduction

Economists disagree sharply about the role of the financial sector in economic growth. Finance is not even discussed in a collection of essays by the "pioneers of development economics" (Meier and Seers, 1984), including three Nobel Prize winners, and Nobel Laureate Robert Lucas (1988, p.6) dismisses finance as an "over-stressed" determinant of economic growth. Joan Robinson (1952, p. 86) famously argued that "where enterprise leads finance follows." From this perspective, finance does not cause growth; finance responds to changing demands from the "real sector." At the other extreme, Nobel Laureate Merton Miller (1988, p.14) argues that, "[the idea] that financial markets contribute to economic growth is a proposition too obvious for serious discussion." Drawing a more restrained conclusion, Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), Goldsmith (1969), and McKinnon (1973) reject the idea that the finance-growth nexus can be safely ignored without substantially limiting our understanding of economic growth.

Research that clarifies our understanding of the role of finance in economic growth will have policy implications and shape future policy-oriented research. Information about the impact of finance on economic growth will influence the priority that policy makers and advisors attach to reforming financial sector policies. Furthermore, convincing evidence that the financial system influences long-run economic growth will advertise the urgent need for research on the political, legal, regulatory, and policy determinants of financial development. In contrast, if a sufficiently abundant quantity of research indicates that the operation of the financial sector merely responds to economic development, then this will almost certainly mitigate the intensity of research on the determinants and evolution of financial systems.

To assess the current state of knowledge on the finance-growth nexus, Section II describes and appraises theoretical research on the connections between the operation of the financial sector and economic growth. Theoretical models show that financial instruments, markets, and institutions may arise to mitigate the effects of information and transaction costs. In emerging to ameliorate market frictions, financial arrangements change the incentives and constraints facing economic agents. Thus, financial systems may influence saving rates, investment decisions, technological innovation, and hence long-run growth rates. A comparatively less well-developed theoretical literature examines the dynamic interactions between finance and growth by developing models where the financial system influences growth, and growth transforms the operation of the financial system. Furthermore, an extensive theoretical literature debates the relative merits of different types of financial systems. Some models stress the advantages of bank-based financial systems, while others highlight the benefits of financial systems that rely more on securities markets. Finally, some new theoretical models focus on the interactions between finance, aggregate growth, income distribution, and poverty alleviation. In all of these models, the financial sector provides real services: it ameliorates information and transactions costs. Thus, these models lift the veil that sometimes rises between the so-called real and financial sectors.

Section III reviews and critiques the burgeoning empirical literature on finance and growth, which includes broad cross-country growth regressions, times-series analyses, panel techniques, detailed country studies, and a recent movement that uses more microeconomic-based methodologies to explore the mechanisms linking finance and growth. Besides reviewing the results, I critique the empirical methods and the measures of financial development. Each of the different econometric methodologies that has been used to study the finance-growth nexus

has serious shortcomings. Moreover, the empirical proxies for "financial development" frequently do not measure very accurately the concepts emerging from theoretical models. We are far from definitive answers to the questions: Does finance cause growth, and if it does, how?

Without ignoring the weaknesses of existing work and the absence of complete unanimity of results, three tentative observations emerge. Taken as a whole, the bulk of existing research suggests that (1) countries with better functioning banks and markets grow faster, but the degree to which a country is bank-based or market-based does not matter much, (2) simultaneity bias does not seem to drive these conclusions, and (3) better functioning financial systems ease the external financing constraints that impede firm and industrial expansion, suggesting that this is one mechanism through which financial development matters for growth.

I use the concluding section, Section IV, to (1) emphasize areas needing additional research and (2) mention the fast-growing literature on the determinants of financial development. In particular, this literature is motivated by the following question: If finance is important for growth, why do some countries have growth-promoting financial systems while others do not? Addressing this question is as fascinating and important, as it is multi-disciplined and complex. Developing a sound understanding of the determinants of financial development will require synthesizing and extending insights from many sub-specialties of economics as well as from political science, legal scholarship, and history.

Before continuing, I want to acknowledge and emphasize that this review treats only cursorily some important issues. Here I highlight two, though this list is by no means exhaustive. First, I do not discuss in much depth the relationship between growth and international finance, such as cross-border capital flows and the importation of financial services. A serious discussion of international finance and growth would virtually double the length of this

already long review. There is a critical theoretical, empirical, and policy question, therefore, that receives only limited attention in this essay: Can countries simply import financial services, or are there substantive growth benefits from countries having well-developed domestic financial systems? Second, I treat the political, legal, regulatory, and other policy determinants of financial development in only a perfunctory manner. This is a problem. The links between the functioning of the financial system and economic growth motivate research into the legal, regulatory, and policy determinants of financial development. Moreover, since the financial system influences who gets to use society's savings, political forces have everywhere and always shaped financial sector policies and the operation of the financial system. Again, however, these crucial themes are beyond the scope of this paper. Instead, this chapter reviews the role of the financial system in economic growth and very briefly lists some ongoing work on the determinants of financial development in the conclusion.

II. Financial Development and Economic Growth: Theory

II.A. What is financial development?

The costs of acquiring information, enforcing contracts, and making transactions create incentives for the emergence of particular types of financial contracts, markets and intermediaries. Different types and combinations of information, enforcement, and transaction costs in conjunction with different legal, regulatory, and tax systems have motivated distinct financial contracts, markets, and intermediaries across countries and throughout history.

In arising to ameliorate market frictions, financial systems naturally influence the allocation of resources across space and time (Merton and Bodie, 1995, p. 12). For instance, the emergence of banks that improve the acquisition of information about firms and managers will

undoubtedly alter the allocation of credit. Similarly, financial contracts that make investors more confident that firms will pay them back will likely influence how people allocate their savings. As a final example, the development of liquid stock and bond markets means that people who are reluctant to relinquish control over their savings for extended periods can trade claims to multiyear projects on an hourly basis. This may profoundly change how much and where people save. This section's goal is to describe models where market frictions motivate the emergence of distinct financial arrangements and how the resultant financial contracts, markets, and intermediaries alter incentives and constraints in ways that may influence economic growth.

To organize a review of how financial systems influence savings and investment decisions and hence growth, I focus on five broad functions provided by the financial system in emerging to ease information, enforcement, and transactions costs. While there are other ways to classify the functions provided by the financial system (Merton, 1992; Merton and Bodie, 1995, 2004), I believe that the following five categories are helpful in organizing a review of the theoretical literature and tying this literature to the history of economic thought on finance and growth. In particular, financial systems:

- Produce information ex ante about possible investments and allocate capital
- Monitor investments and exert corporate governance after providing finance
- Facilitate the trading, diversification, and management of risk
- Mobilize and pool savings
- Ease the exchange of goods and services

While all financial systems provide these financial functions, there are large differences in how well financial systems provide these functions.

Financial development occurs when financial instruments, markets, and intermediaries ameliorate – though do not necessarily eliminate – the effects of information, enforcement, and transactions costs and therefore do a correspondingly better job at providing the five financial

functions. Thus, financial development involves improvements in the (i) production of ex ante information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) exchange of goods and services. Each of these financial functions may influence savings and investment decisions and hence economic growth. Since many market frictions exist and since laws, regulations, and policies differ markedly across economies and over time, improvements along any single dimension may have different implications for resource allocation and welfare depending on the other frictions at play in the economy.

In terms of integrating the links between finance and growth theory, two general points are worth stressing from the onset. First, a large growth accounting literature suggests that physical capital accumulation per se does not account for much of long-run economic growth (Jorgenson, 1995, 2005).[1] Thus, if finance is to explain economic growth, we need theories that describe how financial development influences resource allocation decisions in ways that foster productivity growth and not aim the analytically spotlight too narrowly on aggregate savings.

Second, there are two general ambiguities between economic growth and the emergence of financial arrangements that improve resource allocation and reduce risk. Specifically, higher returns ambiguously affect saving rates due to well-known income and substitutions effects. Similarly, lower risk also ambiguously affects savings rates (Levhari and Srinivasan, 1969). Thus, financial arrangements that improve resource allocation and lower risk may lower saving rates. In a growth model with physical capital externalities, therefore, financial development could retard economic growth and lower welfare if the drop in savings and the externality

combine to produce a sufficiently large effect. These ambiguities are general features of virtually all the models discussed below so I do not discuss them when describing each model.

The remainder of this section describes how market frictions motivate the emergence of financial systems that provide five broad categories of financial functions and also describes how the provision of these functions may influence resource allocation and economic growth.

II.B. Producing information and allocating capital

There are large costs associated with evaluating firms, managers, and market conditions before making investment decisions. Individual savers may not have the ability to collect, process, and produce information on possible investments. Since savers will be reluctant to invest in activities about which there is little reliable information, high information costs may keep capital from flowing to its highest value use. Thus, while many models assume that capital flows toward the most profitable firms, this presupposes that investors have good information about firms, managers, and market conditions. (Bagehot, 1873, p. 53)

Financial intermediaries may reduce the costs of acquiring and processing information and thereby improve resource allocation (Boyd and Prescott, 1986). Without intermediaries, each investor would face the large fixed cost associated with evaluating firms, managers, and economic conditions. Consequently, groups of individuals may form financial intermediaries that undertake the costly process of researching investment possibilities for others. In Boyd and Prescott (1986), financial intermediaries look like banks in that they accept deposits and make loans. Allen (1990), Bhattacharya and Pfeiderer (1985), and Ramakrishnan and Thakor (1984) also develop models where financial intermediaries arise to produce information on firms and

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[1] For additional cross-country information, see King and Levine (1994) and Easterly and Levine (2001).

sell this information to savers. Unlike in Boyd and Prescott (1986), however, the intermediary does not necessarily both mobilize savings and invest those funds in firms using debt contracts. For our purposes, the critical issue is that financial intermediaries -- by economizing on information acquisition costs-- improve the ex ante assessment of investment opportunities with positive ramifications on resource allocation.

By improving information on firms, managers, and economic conditions, financial intermediaries can accelerate economic growth. Assuming that many entrepreneurs solicit capital and that capital is scarce, financial intermediaries that produce better information on firms will thereby fund more promising firms and induce a more efficient allocation of capital (Greenwood and Jovanovic, 1990).

The Greenwood and Jovanovic (1990) paper is particularly novel because it formally models the dynamic interactions between finance and growth. Financial intermediaries produce better information, improve resource allocation, and foster growth. There is a cost to joining financial intermediaries, however. Growth means that more individuals can afford to join financial intermediaries, which improves the ability of financial intermediaries to produce better information with positive ramifications on growth. Thus, this research emphasizes (i) the two-way interactions between finance and growth and (ii) the relationship between income distribution and financial development during the process of economic development.

Besides identifying the best production technologies, financial intermediaries may also boost the rate of technological innovation by identifying those entrepreneurs with the best chances of successfully initiating new goods and production processes (King and Levine, 1993b; Galetovic, 1996; Blackburn and Hung, 1998; Morales, 2003; Acemoglu, Aghion, and Zilibotti,

2003).[2] This lies at the core of Joseph Schumpeter's (1912, p. 74) view of finance in the process of economic development:

> *The banker, therefore, is not so much primarily a middleman ... He authorizes people in the name of society ... (to innovate).*

Stock markets may also stimulate the production of information about firms. As markets become larger and more liquid, agents may have greater incentives to expend resources in researching firms because it is easier to profit from this information by trading in big and liquid markets (Grossman and Stiglitz, 1980) and more liquid (Kyle, 1984; and Holmstrom and Tirole, 1993). Intuitively, with larger and more liquid markets, it is easier for an agent who has acquired information to disguise this private information and make money by trading in the market. Thus, larger more liquid markets will boost incentives to produce this valuable information with positive implications for capital allocation (Merton, 1987). While some models hint at the links between efficient markets, information, and steady-state growth (Aghion and Howitt, 1999), existing theories do not draw the connection between market liquidity, information production, and economic growth very tightly.

Finally, capital market imperfections can also influence growth by impeding investment in human capital (Galor and Zeira, 1993). In the presence of indivisibilities in human capital investment and imperfect capital markets, the initial distribution of wealth will influence who can gains the resources to undertake human capital augmenting investments. This implies a

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[2] Note, the model by Acemoglu, Aghion, and Zilibotti (2003) focuses on examining when firms undertake innovative activities and when they adopt existing technologies from the world frontier. But, the existence of financial market frictions leads to financing constraints that help shape firm decisions. By implication, financial development will loosen those constraints and thereby affect innovative and adoption activities, with potential ramifications on aggregate growth rates.

suboptimal allocation of resources with potential implications on aggregate output both in the short and the long run.

II.C. Monitoring firms and exerting corporate governance

Corporate governance is central to understanding economic growth in general and the role of financial factors in particular. The degree to which the providers of capital to a firm can effectively monitor and influence how firms use that capital has ramifications on both savings and allocation decisions.[3] To the extent that shareholders and creditors effectively monitor firms and induce managers to maximize firm value, this will improve the efficiency with which firms allocate resources and make savers more willing to finance production and innovation. In turn, the absence of financial arrangements that enhance corporate governance may impede the mobilization of savings from disparate agents and also keep capital from flowing to profitable investments (Stiglitz and Weiss, 1983). Thus, the effectiveness of corporate governance mechanisms directly impacts firm performance with potentially large ramifications on national growth rates.

Diffuse shareholders may exert effective corporate governance directly by voting on crucial issues, such as mergers, liquidations, and fundamental changes in business strategies, and indirectly by electing boards of directors to represent the interest of the owners and oversee the myriad of managerial decisions. With low information costs, shareholders can make informed decisions and vote accordingly. In the absence of large market frictions and distorted incentives, boards of directors will represent the interest of all shareholders, oversee managers effectively,

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[3] Indeed, standard agency theory defines the corporate governance problem in terms of how equity and debt holders influence managers to act in the best interests of the providers of capital (e.g., Coase, 1937; Jensen and Meckling, 1976; Fama and Jensen, 1983a,b; Myers and Majluf, 1984).

and improve the allocation of resources. Starting from at least Berle and Means (1932), however, many researchers have argued that small, diffuse equity may encounter a range of barriers to exerting sound control over corporations. [4]

An assortment of market frictions, however, may keep diffuse shareholders from effectively exerting corporate governance, which allows managers to pursue projects that benefit themselves rather than the firm and society at large.[5] In particular, large information asymmetries typically exist between managers and small shareholders and managers have enormous discretion over the flow of information. Furthermore, small shareholders frequently lack the expertise and incentives to monitor managers because of the large costs and complexity associated with overseeing mangers and exerting corporate control. This may induce a "free-rider" problem because each stockowner's stake is so small: Each investor relies on others to undertake the costly process of monitoring managers, so there is too little monitoring. The resultant gap in information between corporate insiders and diffuse shareholders implies that the voting rights mechanism will not work effectively. Also, the board of directors may not represent the interests of minority shareholders. Management frequently "captures" the board and manipulates directors into acting in the best interests of the managers, not the shareholders. Finally, in many countries legal codes do not adequately protect the rights of small shareholders and legal systems frequently do not enforce the legal codes that actually are on the books concerning diffuse shareholder rights. Thus, large information and contracting costs may keep

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[4] In the case of the United States, Roe (1994) argues that the corporate structure of the firms has been heavily influenced by politics and therefore is not primarily an outcome of market forces.

[5] For citations and an insightful discussion, see the review of the corporate governance literature by Shleifer and Vishny, 1997).

diffuse shareholders from effectively exerting corporate governance, with adverse effects on resource allocation and economic growth.

One response to the frictions that prevent dispersed shareholders from effectively governing firms is for firms to have a large, concentrated owner, but this ownership structure has its own problems. Large owners have greater incentives to acquire information and monitor managers and greater power to thwart managerial discretion (Grossman and Hart, 1980, 1988; Shleifer and Vishny, 1986; and Stulz, 1988). The existence of large shareholders, however, creates a different agency problem: Conflicts arise between the controlling shareholder and other shareholders (Jensen and Meckling, 1976). The controlling owner may expropriate resources from the firm, or provide jobs, perquisites, and generous business deals to related parties in a manner that hurts the firm and society, but benefits the controlling owner. Indeed, Morck, Wolfenzon, and Yeung (2005) show that concentrated ownership appears to have enduring political and macroeconomic implications. Around the world, controlling owners are frequently powerful families that use pyramidal structures, cross-holdings, and super voting rights to magnify their control over many corporations and banks (La Porta et al., 1999; Morck et al., 2000; Faccio and Lang, 2002; Caprio et al., 2003). Morck et al (2005) marshal an abundance of evidence in arguing that (i) these controlling families frequently translate their corporate power into political influence and (ii) the elite then use their influence to shape public policies in ways that protect them from competition and subsidize their ventures. Thus, highly concentrated ownership can distort corporate decisions and national policies in ways that curtail innovation, encourage rent-seeking, and stymie economic growth.

To the extent that diffuse or concentrated shareholders do not ameliorate the corporate governance problem, theory suggests that other types of financial arrangements may arise to ease

market frictions and improve the governance of corporations.   In what follows, I discuss how various financial arrangements – liquid equity markets, debt contracts, and banks – may arise to enhance corporate governance and accelerate growth. There are countervailing arguments, however, that each of these financial arrangements actually exerts a deleterious influence on corporate governance. I provide a more complete pro and con assessment of these different mechanisms below when I discuss the bank-based versus market-based debate.

Besides the mechanisms discussed thus far, a large and influential literature trumpets the importance of well functioning stock markets in fostering corporate governance (Jensen and Meckling, 1976). For example, public trading of shares in stock markets that efficiently reflect information about firms allows owners to link managerial compensation to stock prices. Linking stock performance to manager compensation helps align the interests of managers with those of owners (Diamond and Verrecchia, 1982; and Jensen and Murphy, 1990). Similarly, if takeovers are easier in well-developed stock markets and if managers of under-performing firms are fired following a takeover, then better stock markets can promote better corporate control by easing takeovers of poorly managed firms. The threat of a takeover will help align managerial incentives with those of the owners (Scharfstein, 1988; and Stein, 1988). Many, however, argue that well functioning stock markets actually hurt corporate governance. I discuss this below when reviewing the bank-based versus market-based debate. Finally, I am not aware of models that assess the role of markets in boosting steady-state growth through its impact on corporate governance.

Some theoretical models indicate that debt contracts may emerge to improve corporate governance, with beneficial ramifications on economic growth. An extensive literature demonstrates how debt contracts may arise to lower the costs of monitoring firm insiders (e.g.,

Townsend, 1979; Gale and Hellwig, 1985; Boyd and Smith, 1994). In terms of growth, Aghion, Dewatripont, and Rey (1999) link the use of debt contracts to growth. Using Jensen's "free cash flow argument," Aghion, Dewatripont, and Rey (1999) show that debt instruments reduce the amount of free cash available to firms. This in turn reduces managerial slack and accelerates the rate at which managers adopt new technologies.

In terms of intermediaries, Diamond (1984) develops a model in which a financial intermediary improves corporate governance. The intermediary mobilizes the savings of many individuals and lends these resources to firms. This "delegated monitor" economizes on aggregate monitoring costs and eliminates the free-rider problem since the intermediary does the monitoring for all the investors. Furthermore, as financial intermediaries and firms develop long-run relationships, this can further lower information acquisition costs.

In terms of economic growth, a number of models show that well-functioning financial intermediaries influence growth by boosting corporate governance. Bencivenga and Smith (1993) show that financial intermediaries that improve corporate governance by economizing on monitoring costs will reduce credit rationing and thereby boost productivity, capital accumulation, and growth. Sussman (1993) and Harrison, Sussman, and Zeira (1999) develop models where financial intermediaries facilitate the flow of resources from savers to investors in the presence of informational asymmetries with positive growth effects. Focusing on innovative activity, De La Fuente and Marin (1996) develop a model in which intermediaries arise to undertake the particularly costly process of monitoring innovative activities. This improves credit allocation among competing technology producers with positive ramifications on economic growth.

From a different perspective, Boyd and Smith (1992) show that differences in the quality of financial intermediation across countries can have huge implications for international capital flows and hence economic growth rates. They show that capital may flow from capital scarce countries to capital abundant countries if the capital abundant countries have financial intermediaries that are sufficiently more effective at exerting corporate control than the capital scarce regions. Thus, even though the physical product of capital is higher in the capital scarce countries, investors recognize that their actual returns depend crucially on the monitoring performed by intermediaries. Thus, poor financial intermediation will lead to sub-optimal allocation of capital.

II.D. Risk amelioration

With information and transactions costs, financial contracts, markets and intermediaries may arise to ease the trading, hedging, and pooling of risk with implications for resource allocation and growth. I divide the discussion into three categories: cross-sectional risk diversification, intertemporal risk sharing, and liquidity risk.

Traditional finance theory focuses on cross-sectional diversification of risk. Financial systems may mitigate the risks associated with individual projects, firms, industries, regions, countries, etc. Banks, mutual funds, and securities markets all provide vehicles for trading, pooling, and diversifying risk. The financial system's ability to provide risk diversification services can affect long-run economic growth by altering resource allocation and savings rates. The basic intuition is straightforward. While savers generally do not like risk, high-return projects tend to be riskier than low-return projects. Thus, financial markets that make it easier for people to diversify risk tend to induce a portfolio shift toward projects with higher expected

returns (Gurley and Shaw, 1955; Patrick, 1966; Greenwood and Jovanovic, 1990; Saint-Paul 1992; Devereux and Smith, 1994; and Obstfeld, 1994).[6]

Acemoglu and Zilibotti (1997) carefully model the links between cross-sectional risk, diversification, and growth. They assume that (i) high-return, risky projects are frequently indivisible and require a large initial investment, (ii) people dislike risk, (iii) there are lower-return, safe projects, and (iv) capital is scare. In the absence of financial arrangements that allow agents to hold diversified portfolios, agents will avoid the high-return, risky projects because they require agents to invest disproportionately in risky endeavors. They show that financial systems that allow agents to hold a diversified portfolio of risky projects foster a reallocation of savings toward high-return ventures with positive repercussions on growth.

In terms of technological change, King and Levine (1993b) show that cross-sectional risk diversification can stimulate innovative activity. Agents are continuously trying to make technological advances to gain a profitable market niche. Engaging in innovation is risky, however. The ability to hold a diversified portfolio of innovative projects reduces risk and promotes investment in growth-enhancing innovative activities (with sufficiently risk averse agents). Thus, financial systems that ease risk diversification can accelerate technological change and economic growth.

Besides cross-sectional risk diversification, financial systems may improve intertemporal risk sharing. In examining the connection between cross-sectional risk sharing and growth, theory has tended to focus on the role of markets, rather than intermediaries. However, in examining intertemporal risk sharing, theory has focused on the advantageous role of intermediaries in easing intertemporal risk smoothing (Allen and Gale, 1997). Risks that cannot

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[6] Though not focused on the endogenous emergence of financial markets, Krebs (2003) shows

be diversified at a particular point in time, such as macroeconomic shocks, can be diversified across generations. Long-lived intermediaries can facilitate intergenerational risk sharing by investing with a long-run perspective and offering returns that are relatively low in boom times and relatively high in slack times. While this type of risk sharing is theoretically possible with markets, intermediaries may increase the feasibility of intertemporal risk sharing by lowering contracting costs.

A third type of risk is liquidity risk. Liquidity reflects the cost and speed with which agents can convert financial instruments into purchasing power at agreed prices. Liquidity risk arises due to the uncertainties associated with converting assets into a medium of exchange. Informational asymmetries and transaction costs may inhibit liquidity and intensify liquidity risk. These frictions create incentives for the emergence of financial markets and institutions that augment liquidity.

The standard link between liquidity and economic development arises because some high-return projects require a long-run commitment of capital, but savers do not like to relinquish control of their savings for long-periods. Thus, if the financial system does not augment the liquidity of long-term investments, less investment is likely to occur in the high-return projects. Indeed, Hicks (1969, p. 143-145) argues that the products manufactured during the first decades of the Industrial Revolution had been invented much earlier. Rather, the critical innovation that ignited growth in 18th century England was capital market liquidity. With liquid capital markets, savers can hold liquid assets -- like equity, bonds, or demand deposits -- that they can quickly and easily sell if they seek access to their savings. Simultaneously, capital markets transform these liquid financial instruments into long-term capital investments. Thus,

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that imperfect sharing of individual human-capital risks can retard long-run economic growth.

the industrial revolution required a financial revolution so that large commitments of capital could be made for long periods (Bencivenga, Smith, and Starr, 1995)

In Diamond and Dybvig's (1983) seminal model of liquidity, a fraction of savers receive shocks after choosing between two investments: an illiquid, high-return project and a liquid, low-return project. Those receiving shocks want access to their savings before the illiquid project produces. This risk creates incentives for investing in the liquid, low-return projects. The model assumes that it is prohibitively costly to verify whether another individual has received a shock or not. This information cost assumption rules out state-contingent insurance contracts and creates an incentive for financial markets -- *markets where individuals issue and trade securities* -- to emerge.

Levine (1991) takes the Diamond Dybvig (1983) set-up, models the endogenous formation of equity markets, and links this to a growth model. Specifically, savers receiving shocks can sell their equity claims to the future profits of the illiquid production technology to others. Market participants do not verify whether other agents received shocks or not. Participants simply trade in impersonal stock exchanges. Thus, with liquid stock markets, equity holders can readily sell their shares, while firms have permanent access to the capital invested by the initial shareholders. By facilitating trade, stock markets reduce liquidity risk. Frictionless stock markets, however, do not eliminate liquidity risk. That is, stock markets do not replicate the equilibrium that exists when insurance contracts can be written contingent on observing whether an agent receives a shock or not. Nevertheless, as stock market transaction costs fall, more investment occurs in the illiquid, high-return project. If illiquid projects enjoy sufficiently large externalities, then greater stock market liquidity induces faster steady-state growth.

Thus far, information costs -- the costs of verifying whether savers have received a shock -- have motivated the existence of stock markets, but trading costs can also hasten the emergence and highlight the importance of liquid stock markets. In Bencivenga, Smith, and Starr (1995), high-return, long-gestation production technologies require that ownership be transferred throughout the life of the production process in secondary securities markets. If exchanging ownership claims is costly, then longer-run production technologies will be less attractive. Thus, liquidity -- as measured by secondary market trading costs -- affects production decisions. Greater liquidity will induce a shift to longer-gestation, higher-return technologies.

Besides stock markets, financial intermediaries may also enhance liquidity, reduce liquidity risk and influence economic growth. As discussed above, Diamond and Dybvig's (1983) model assumes it is prohibitively costly to observe shocks to individuals, so it is impossible to write incentive compatible state-contingent insurance contracts. Under these conditions, banks can offer liquid deposits to savers and undertake a mixture of liquid, low-return investments to satisfy demands on deposits and illiquid, high-return investments. By providing demand deposits and choosing an appropriate mixture of liquid and illiquid investments, banks provide complete insurance to savers against liquidity risk while simultaneously facilitating long-run investments in high return projects. Banks replicate the equilibrium allocation of capital that exists with observable shocks. As noted by Jacklin (1987), however, the banking equilibrium is not incentive compatible if agents can trade in liquid equity markets. If equity markets exist, all agents will use equities; none will use banks. Thus, in this context, banks will only emerge to provide liquidity if there are sufficiently large impediments to

trading in securities markets (Diamond, 1991).[7] Turning back to growth, Bencivenga and Smith (1991) examine a growth model in which pre-existing impediments to the emergence of liquid equity markets highlight the liquidity-enhancing role of banks. They show that, by eliminating liquidity risk, banks can increase investment in the high-return, illiquid asset and therefore accelerate growth.

Financial systems can also promote the accumulation of human capital (Jacoby, 1994). In particular, financial arrangements may facilitate borrowing for the accumulation of skills. If human capital accumulation is not subject to diminishing returns on a social level, financial arrangements that ease human capital creation help accelerate economic growth (DeGregorio, 1996; Galor and Zeira, 1993).

Another form of liquidity involves firm access to credit during the production process, which may reduce premature liquidity of projects and thereby foster investment in longer gestation, higher-return projects. Holmstrom and Tirole (1998) note that firm production processes are long-term, uncertain, and subject to shocks. Thus, some firms may receive shocks after receiving outside financing and need additional injections of capital to complete the project. In the presence of informational asymmetries, intermediaries can sell an option to a line of credit during the initial financing of the firm that entitles the firm to access additional credit at an

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[7] Note that Calomiris and Kahn (1991), Flannery (1994), and Diamond and Rajan (2001) develop models in which the fragile structure of banks, i.e., liquid deposits and illiquid assets, serves as an effective commitment device that keeps banks from assuming excessive risks or from shirking on collecting payment from firms. Put succinctly, the sequential service constraint on bank deposits creates a collective action problem among depositors that induces depositors to run if they acquire information that the bank is not monitoring firms and managing risk appropriately.

intermediate stage in certain states of nature.[8] This improves the efficiency of the capital

allocation process, but the model does not formally link the provision of liquidity with economic

growth. Aghion, Angeletos, Banerjee, and Manova (2004), instead, focus on how the ability of

firms to access credit during the production process influences innovation and long-run growth

when firms face macroeconomic shocks (e.g., recessions). They develop a model where firms

can either invest in short-term, low-return investments or in more risky, growth-enhancing

research and development (R&D). They also assume that there are adjustment costs to R&D. In

this context, under-developed financial systems that are less able to provide firms with funds to

ease these adjustment costs will hinder innovation. Moreover, macroeconomic volatility exerts a

particularly negative impact on innovation and growth in under-developed financial systems

because firms' willingness to undertake R&D depends on their ability to borrow in the future to

meet adjustment costs, which is influenced negatively by the likelihood of experiencing a

recession and positively by the level of financial development. Aghion et al (2004) also provide

empirical evidence consistent with the prediction that financial development reduces the adverse

growth effects of macroeconomic volatility.

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[8] Kashyap, Rajan, and Stein (2002) develop a model to explain why two traditional commercial banking activities, deposit-taking and loan-making, are done jointly within the same intermediary. While Diamond (1984) motivates the existence of loan-making intermediaries, it is not clear why the intermediary should be funded with demand deposits. Similarly, while Gorton and Pennacchi (1990) motivate the existence of deposit-taking intermediaries, it is not clear why the intermediary should make loans. Since banks often lend via committed lines of credit that can be used at the discretion of firms, Kashyap, Rajan, and Stein (2002) argue that a single bank is frequently the lowest cost provider of liquidity on both the liability and asset sides of the balance sheet. This view of intermediation has not, to my knowledge, been incorporated into a model of economic growth.

II.E. Pooling of savings

Mobilization -- *pooling* -- is the costly process of agglomerating capital from disparate savers for investment. Mobilizing savings involves (a) overcoming the transaction costs associated with collecting savings from different individuals and (b) overcoming the informational asymmetries associated with making savers feel comfortable in relinquishing control of their savings. Indeed, much of Carosso's (1970) history of <u>Investment Banking in America</u> is a description of the diverse costs associated with raising capital in the United States during the 19th and 20th centuries.

In light of the transaction and information costs associated with mobilizing savings from many agents, numerous financial arrangements may arise to mitigate these frictions and facilitate pooling. Specifically, mobilization may involve multiple bilateral contracts between productive units raising capital and agents with surplus resources. The joint stock company in which many individuals invest in a new legal entity, the firm, represents a prime example of multiple bilateral mobilizations.

To economize on the costs associated with multiple bilateral contracts, pooling may also occur through intermediaries, where thousands of investors entrust their wealth to intermediaries that invest in hundreds of firms (Sirri and Tufano 1995, p. 83). For this to occur, "mobilizers" have to convince savers of the soundness of the investments (Boyd and Smith, 1992). Toward this end, intermediaries worry about establishing stellar reputations, so that savers feel comfortable about entrusting their savings to the intermediary (DeLong, 1991; and Lamoreaux, 1995).

Financial systems that are more effective at pooling the savings of individuals can profoundly affect economic development by increasing savings, exploiting economies of scale,

and overcoming investment indivisibilities. Besides the direct effect of better savings mobilization on capital accumulation, better savings mobilization can improve resource allocation and boost technological innovation. Without access to multiple investors, many production processes would be constrained to economically inefficient scales (Sirri and Tufano, 1995). Furthermore, many endeavors require an enormous injection of capital that is beyond the means or inclination of any single investor. (Bagehot 1873, p. 3-4) argued that a major difference between England and poorer countries was that in England the financial system could mobilize resources for "immense works." Thus, good projects would not fail for lack of capital. Bagehot was very explicit in noting that it was not the national savings rate per se, it was the ability to pool society's resources and allocate those savings toward the most productive ends. Furthermore, mobilization frequently involves the creation of small denomination instruments. These instruments provide opportunities for households to hold diversified portfolios (Sirri and Tufano, 1995). Acemoglu and Zilibotti (1997) show that with large, indivisible projects, financial arrangements that mobilize savings from many diverse individuals and invest in a diversified portfolio of risky projects facilitate a reallocation of investment toward higher return activities with positive ramifications on economic growth.

II.F. Easing exchange

Financial arrangements that lower transaction costs can promote specialization, technological innovation and growth. The links between facilitating transactions, specialization, innovation, and economic growth were core elements of Adam Smith's (1776) Wealth of Nations. He argued that division of labor -- specialization -- is the principal factor underlying productivity improvements. With greater specialization, workers are more likely to invent better machines or production processes (Smith, 1776, p. 3).

> Men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things.

Smith (1776) focused on the role of money in lowering transaction costs, permitting greater specialization, and fostering technological innovation.[9] Information costs, however, may also motivate the emergence of money. Since it is costly to evaluate the attributes of goods, barter exchange is very costly. Thus, an easily recognizable medium of exchange may arise to facilitate exchange (King and Plosser, 1986; and Williamson and Wright, 1994). The drop in transaction and information costs is not necessarily a one-time fall when economies move to money, however. Transaction and information costs may continue to fall through financial innovation.

Greenwood and Smith (1996) have modeled the connections between exchange, specialization, and innovation. More specialization requires more transactions. Since each transaction is costly, financial arrangements that lower transaction costs will facilitate greater specialization. In this way, markets that promote exchange encourage productivity gains. There

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[9] Wright (2002, p. 212-216) documents that Adam Smith, in the second book of the Wealth of Nations, indicated that well-functioning banks, besides well-functioning corporate governance mechanisms, were crucial for economic development.

may also be feedback from these productivity gains to financial market development. If there are fixed costs associated with establishing markets, then higher income per capita implies that these fixed costs are less burdensome as a share of per capita income. Thus, economic development can spur the development of financial markets.

In the Greenwood and Smith (1996) model, however, the reduction in transaction costs does not stimulate the invention of new and better production technologies. Instead, lower transaction costs expands the set of "on the shelf" production processes that are economically attractive. Also, the model defines better "market" as a system for supporting more specialized production processes. This does not explain the emergence of financial instruments or institutions that lower transactions costs and thereby produce an environment that naturally promotes specialized production technologies. This is important because we want to understand the two links of the chain: what features of the economic environment create incentives for the emergence of financial arrangements, and how do these emerging financial arrangements influence economic activity.

II.G. The theoretical case for a bank-based system

Besides debates concerning the role of financial development in economic growth, financial economists have debated the comparative importance of bank-based and market-based financial systems for over a century (Goldsmith, 1969; Boot and Thakor, 1997; Allen and Gale, 2000; Demirguc-Kunt and Levine, 2001c). As discussed, financial intermediaries can improve the (i) acquisition of information on firms, (ii) intensity with which creditors exert corporate control, (iii) provision of risk-reducing arrangements, (iv) pooling of capital, and (v) ease of making transactions. These are arguments in favor of well-developed banks. They are not reasons for favoring a bank-based financial system.

Rather than simply noting the growth-enhancing role of banks, the case for a bank-based system derives from a critique of the role of markets in providing financial functions.

In terms of acquiring information about firms, Stiglitz (1985) emphasizes the free-rider problem inherent in atomistic markets. Since well-developed markets quickly reveal information to investors at large, this dissuades individual investors from devoting resources toward researching firms. Thus, greater market development, in lieu of bank development, may actually impede incentives for identifying innovative projects that foster growth.[10] Banks can mitigate the potential disincentives from efficient markets by privatizing the information they acquire and by forming long-run relationships with firms (Gerschenkron, 1962; Boot, Greenbaum, and Thakor, 1993). Banks can make investments without revealing their decisions immediately in public markets and this creates incentives for them to research firms, managers, and market conditions with positive ramifications on resource allocation and growth. Furthermore, Rajan

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[10] Using examples from the U.S. in the 18th Century, Wright (2002, p.30-32) shows how securities market participants tended to free-ride off of the information collected by banks in making credit decisions.

and Zingales (1999) emphasize that powerful banks with close ties to firms may be more effective at exerting pressure on firms to re-pay their debts than atomistic markets.

On corporate governance, a large literature stresses that markets do not effectively monitor managers (Shleifer and Vishny, 1997). First, takeovers may not be an effective corporate control device because insiders have better information than outsiders. This informational asymmetry mitigates the takeover threat as a corporate governance mechanism since ill-informed outsiders will outbid relatively well-informed insiders for control of firms only when they pay too much (Stiglitz, 1985). Second, some argue that the takeover threat as a corporate control device also suffers from the free-rider problem. If an outsider expends lots of resources obtaining information, other market participants will observe the results of this research when the outsider bids for shares of the firm. This will induce others to bid for shares, so that the price rises. Thus, the original outsider who expended resources obtaining information must pay a higher price for the firm than it would have paid if "free-riding" firms could not bid for shares in a liquid equity market. The rapid public dissemination of costly information reduces incentives for obtaining information, making effective takeover bids, and wielding corporate control (Grossman and Hart, 1980). Third, existing managers often take actions – poison pills – that deter takeovers and thereby weaken the market as an effective disciplining device (DeAngelo and Rice, 1983). There is some evidence that, in the United States, the legal system hinders takeovers and grants considerable power to management. Fourth, although in theory shareholder control management through boards of directors, an incestuous relationship may blossom between boards of directors and management (Jensen, 1993). Members of a board enjoy their lucrative fees and owe those fees to nomination by management. Thus, boards are more likely to approve golden parachutes to managers and poison pills that reduce the

attractiveness of takeover. This incestuous link may further reduce the effectiveness of the market as a vehicle for exerting corporate control (Allen and Gale, 2000). Chakraborty and Ray (2004) examine bank-based and market-based financial systems in an endogenous growth model, concluding that banks can partially resolve the tendency for insiders to exploit the private benefits of control.

The liquidity of stock markets can also adversely influence resource allocation. Liquid equity markets may facilitate takeovers that while profiting the raiders may actually be socially harmful (Shleifer and Summers, 1988). Moreover, liquidity may encourage a myopic investor climate. In liquid markets, investor can inexpensively sell their shares, so that they have fewer incentives to undertake careful – and expensive – corporate governance (Bhide, 1993). Thus, greater stock market development may hinder corporate governance and induce an inefficient allocation of resources according to the bank-based view. As noted above, Allen and Gale (1997, 2000) argue that bank-based systems offer better intertemporal risk sharing services than markets with beneficial effects on resource allocation.

In response to the problems associated with relying on diffuse shareholders, large, concentrated ownership may arise to prevent managers from deviating too far from the interests of owners, but as stressed above, this brings its own complications. Large investors have the incentives and ability to acquire information, monitor managers and exert corporate control. Concentrated ownership, however, raises other problems. Besides the fact that concentrated ownership implies that wealthy investors are not diversified (Acemoglu and Zilibotti, 1997), concentrated owners may benefit themselves at the expense of minority shareholders, debt holders, and other stakeholders in the firm, with adverse effects on corporate finance and resource allocation. Large investors may pay themselves special dividends, exploit business

relationships with other firms they own that profit themselves at the expense of the corporation, and in general maximize the private benefits of control at the expense of minority shareholders (Dann and DeAngelo, 1985; Zingales, 1994). Furthermore, large equity owners may seek to shift the assets of the firm to higher-risk activities since shareholders benefit on the upside, while debt holders share the costs of failure. Finally, as stressed by Morck, Wolfenzon, and Yeung (2005), concentrated control of corporate assets produces market power that may corrupt the political system and distort public policies. Thus, from this perspective, concentrated ownership is unlikely to resolve fully the shortcomings associated with market-based systems.

In sum, proponents of bank-based systems argue that there are fundamental reasons for believing that market-based systems will not do a good job of acquiring information about firms and overseeing managers. This will hurt resource allocation and economic performance. Banks do not suffer from the same fundamental shortcomings as markets. Thus, they will do a correspondingly better job at researching firms, overseeing managers, and financing industrial expansion.

II.H. The theoretical case for a market-based system

The case for a market-based system is essentially a counterattack that focuses on the problems created by powerful banks.

Bank-based systems may involve intermediaries with a huge influence over firms and this influence may manifest itself in negative ways. For instance, once banks acquire substantial, inside information about firms, banks can extract rents from firms; firms must pay for their greater access to capital. In terms of new investments or debt renegotiations, banks with power can extract more of the expected future profits from the firm (than in a market-base system) (Hellwig, 1991). This ability to extract part of the expected payoff to potentially profitable

investments may reduce the effort extended by firms to undertake innovative, profitable ventures (Rajan, 1992). Furthermore, Boot and Thakor (2000) model the potential tensions between bank-based systems characterized by close ties between banks and firms and the development of well-functioning securities markets.

Banks -- as debt issuers -- also have an inherent bias toward prudence, so that bank-based systems may stymie corporate innovation and growth (Morck and Nakamura, 1999). Weinstein and Yafeh (1998) find evidence of this in Japan. While firms with close to ties to a "main bank" have greater access to capital and are less cash constrained than firms without a main bank, the main bank firms tend to (i) employ conservative, slow growth strategies and do not grow faster than firms without a "main bank," (ii) use more capital intensive processes than non-main bank firms holding other features constant, and (iii) produce lower profits, which is consistent with the powerful banks extracting rents from the relationship.

Allen and Gale (2000) further note that although banks may be effective at eliminating duplication of information gathering and processing, which is likely to be helpful when people agree about what information needs to be gathered and how it should be processed, banks may be ineffective in non-standard environments. Thus, banks may not be effective gatherers and processors of information in new, uncertain situations involving innovative products and processes (Allen and Gale, 1999). Similarly, but in a model of loan renegotiations, Dewatripont and Maskin (1995) demonstrate that in a bank-based system characterized by long-run links between banks and firms, banks will have a difficult time credibly committing to not renegotiate contracts. In contrast, more fragmented banking systems can more easily commit to imposing tighter budget constraints. The credible imposition of tight budget constraints may be necessary for the funding of newer, higher-risk firms. Thus, concentrated banks may be more conducive to

the funding of mature, less risky firms, while more market-based systems, according to these theories, more easily support the growth of newer, riskier industries.

Another line of attack on the efficacy of bank-based systems involves their role in exerting corporate control over firms and the corporate governance of banks themselves. Bankers act in their own best interests, not necessarily in the best interests of all creditors or society at large. Thus, bankers may collude with firms against other creditors. For instance, influential banks may prevent outsiders from removing inefficient managers if these managers are particularly generous to the bankers (Black and Moersch, 1998).[11] For the case of Germany, Wenger and Kaserer (1998) show that bank managers are enormously powerful. They not only have the corporate control power over firms that derives from being large creditors to those firms, banks also vote the shares of a larger number of small stockholders. For instance, in 1992, bank managers exercised on average 61 percent of the voting rights of the 24 largest companies and in 11 companies this share was higher than 75%. This control of corporations by bank management extends to the banks themselves! In the shareholder meetings of the three largest German banks, the percentage of proxy votes was higher than 80 percent, much of this voted by the banks themselves. For example, Deutsche Bank held voting rights for 47 percent of its own shares, while Dresdner votes 59 percent of its own shares (Charkham, 1994). Thus, the bank management has rested control of the banks from the owners of the banks and also exerts a huge influence on the country's major corporations. Wenger and Kaserer (1998) also provide examples in which banks misrepresent the accounts of firms to the public and systematically fail to discipline management. Also, Rajan and Zingales (2002b) argue that in response to adverse

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[11] Bank-based system may also impede the flow of information about firms (Morck et al 2000) and the responsiveness of the economy to market signals (Hoshi, Kashyap, and Scharfstein, 1991; Peek and Rosengren, 1998).

shocks that affect the economy unevenly, market-based systems will more effectively identify, isolate, and bankrupt truly distressed firms and prevent them from hurting the overall economy than a bank-based system. In a bank-based -- relationship-based -- system, bank managers may be more reluctant to bankrupt firms with whom they have had long-term, and perhaps multidimensional, ties. While this may smooth temporary aggregate shocks, it may also impede the efficient adjustment to structural changes. Thus, to the extent that banks actually weaken the corporate governance of firms, bank-based systems represent sub-optimal mechanisms for overseeing firms and improving resource allocation.

Furthermore, relying on a bank-based financial system may be problematic because of the difficulties in governing banks themselves (Caprio and Levine, 2002). While subject to debate, many argue that information asymmetries between bank insiders and outsiders are larger than with nonfinancial corporations (Furfine, 2001; Morgan, 2002). Under these conditions, it will be very difficult for diffuse equity and debt holder to monitor and control bank insiders. The governance problem facing depositors is of course exacerbated in the presence of deposit insurance. Furthermore, greater opacity implies even greater complexities in writing incentive contracts to align managerial incentives with bank equity holders and creditors. Perhaps because of the particularly severe informational impediments to governing banks, banks are even more likely than nonfinancial corporations to have a large, controlling owner (Caprio, Laeven, and Levine, 2003). This concentration of ownership in conjunction with greater opaqueness may make it easier for bank insiders to exploit both other investors in the bank and the government if it is providing deposit insurance. The history of Mexico, for example, is replete with incidents of powerful families using their control over banks to exploit other creditors and taxpayers (Haber, 2004a,b; Maurer and Haber, 2004). For instance, La Porta, Lopez-de-Silanes and Zamarripa

(2003) find high rates of connected lending in Mexico. They find that 20% of total loans go to related parties. These loans benefited from interest rates that were about 415-420 basis points below those to unrelated parties. Related borrowers also benefited from longer maturities, were significantly less likely to have to post collateral, were 33% less likely to pay back, and the recovery rates on these loans were massively less (78 percent lower) than on loans to unrelated parties. Similarly, Laeven (2001) presents evidence that insiders in Russian banks diverted the flow of loans to themselves and then defaulted 71% of the time.

Finally, proponents of market-based financial systems claim that markets provide a richer set of risk management tools that permit greater customization of risk ameliorating instruments. While bank-based systems may provide inexpensive, basic risk management services for standardized situations, market-based systems provide greater flexibility to tailor make products. Thus, as economies mature and need a richer set of risk management tools and vehicles for raising capital, they may concomitantly benefit from a legal and regulatory environment that supports the evolution of market-based activities, or overall growth may be retarded.

II.I. Countervailing views to bank-based vs. market-based debate

Some reject the importance of the bank-based versus market-based debate and instead argue that the issue is overall financial development, not the particular institutional arrangements that provide financial services to the economy. As noted above, information, transaction, and enforcement costs create incentives for the emergence of financial markets and intermediaries. In turn, these components of the financial system provide financial functions: they evaluate project, exert corporate control, facilitate risk management, ease the mobilization of savings, and facilitate exchange. Thus, this "financial functions view" rejects the primacy of distinguishing financial systems as bank-based or market-based (Merton, 1992, 1995; Merton and Bodie, 1995, 2004; Levine, 1997). According to this view, the crucial issue for growth is whether the economy has access to a well-functioning financial system; the exact composition of the financial system is of secondary importance.

Another criticism for emphasizing market-based versus bank-based differences is that markets and banks may provide *complementary* growth-enhancing financial services to the economy (Boyd and Smith, 1998; Levine and Zervos, 1998a; Huybens and Smith, 1999). For instance, stock markets may positively affect economic development even though not much capital is raised through them. Specifically, stock markets may play a prominent role in facilitating custom-made risk management services and boosting liquidity. In addition, stock markets may complement banks. For instance, by spurring competition for corporate control and by offering alternative means of financing investment, securities markets may reduce the potentially harmful effects of excessive bank power. The theoretical literature is making progress in modeling the co-evolution of banks and markets (Boyd and Smith, 1996; Allen and Gale, 2000). Furthermore, microeconomic evidence also emphasizes potential complementarities

between intermediaries and markets. Using firm-level data, Demirguc-Kunt and Maksimovic

(1996) show that increases in stock market development actually tend to increase the use of bank

finance in developing countries. Moreover, Sylla (1998) describes the interdependence of banks

and securities markets in providing financial services to the U.S. economy in the lat 18th and

early 19th centuries. Thus, these two components of the financial system may act as

complements during the development process. In many circumstances, we may not want to view

bank-based and market-based systems as representing a tradeoff. Rather, there may be policy

and analytical advantages to focusing on the legal, regulatory, and policy foundations that allow

both banks and markets to flourish without tipping the playing field in favor of either banks or

markets

One additional argument for not focusing on distinguishing financial systems by whether

they are bank-based or market-based is the view that legal system differences are the

fundamental source of international differences in financial development (La Porta et al., 2000).

The law and finance view holds that finance is a set of contracts. These contracts are defined

and made more or less effective by legal rights and enforcement mechanisms. From this

perspective, a well-functioning legal system facilitates the operation of both markets and

intermediaries. It is the overall level and quality of the financial functions that are provided to

the economy that influences resource allocation and economic growth. The law and finance

view holds that distinguishing countries by the efficiency of national legal systems in supporting

financial transactions is more useful than distinguishing countries by whether they have bank-

based or market-based financial systems. While focusing on the law is not inconsistent with

banks or markets playing a particularly important role, La Porta et al. (2000) clearly argue that

legal institutions are a more useful way to distinguish financial systems than concentrating on whether countries are bank-based or market-based.

II.J. Finance, Income Distribution, and Poverty

Thus far, I have focused on models of aggregate growth. I have not discussed the potential impact of finance on income distribution in general or poverty in particular. Although the focus of this article is on aggregate growth, the relationship between finance and income distribution is independently relevant for understanding the process of economic development and is indirectly related to growth because income distribution can influence savings decisions, the allocation of resources, incentives to innovate, and public policies. Thus, this subsection very briefly reviews a few recent theoretical inquiries into the relationship between the operation of the financial sector and income distribution.

Theory provides conflicting predictions concerning the relationship between financial development and both income distribution and poverty alleviation. Some theories claim that financial intermediary development will have a disproportionately beneficial impact on the poor. Banerjee and Newman (1993), Galor and Zeira (1993) and Aghion and Bolton (1997) show that informational asymmetries produce credit constraints that are particularly binding on the poor because the poor do not have the resources to fund their own projects, nor the collateral (nor the political connections) to access bank credit. These credit constraints, therefore, restrict the poor from exploiting investment opportunities. While these credit constraints may slow aggregate growth by keeping capital from flowing to its highest value use, a poorly functioning financial system will also produce higher income inequality by disproportionately keeping capital from flowing to "wealth-deficient" entrepreneurs. By ameliorating information and transactions costs and therefore by allowing more entrepreneurs to obtain external finance, financial development

improves the allocation of capital, exerting a particularly large impact on the poor. On a more general level, some political economy theories suggest that better functioning financial systems make financial services available to a larger proportion of the population, rather than restricting capital to entrenched incumbents (Haber, Maurer, and Razo, 2003; Rajan and Zingales, 2003; Morck, Wolfenzon, and Yeung, 2005). Thus, by ameliorating credit constraints, financial development may foster entrepreneurship, new firm formation, and economic growth. On the other hand, some argue that it is primarily the rich and politically connected who benefit from improvements in the financial system. Especially at early stages of economic development, access to financial services, especially credit, is limited to the wealthy and connected (Lamoreaux, 1986; Haber, 1991, 2004a,b). Under these conditions, greater financial development may only succeed in channeling more capital to a select few. Thus, it is an open question whether financial development will narrow or widen income disparities even if it boosts aggregate growth.

Other models posit a non-linear relationship between finance and income distribution. Greenwood and Jovanovic (1990) show how the interaction of financial and economic development can give rise to an inverted U-shaped curve of income inequality and financial intermediary development. At early stages of financial development, only a few relatively wealthy individuals have access to financial markets and hence higher-return projects. With aggregate economic growth, more people can afford to joint the formal financial system, with positive ramifications on economic growth. With sufficient economic success, everyone participates in the financial system, enjoying the full range of benefits. The distributional effect of financial deepening is thus adverse for the poor at early stages, but positive after a turning point.

III. Evidence on Finance and Growth

A substantial body of empirical work on finance and growth assesses the impact of the operation of the financial system on economic growth, whether the impact is economically large, and whether certain components of the financial system, e.g., banks and stock markets, play a particularly important role in fostering growth at certain stages of economic development.

This section is organized around econometric approaches to examining the relationship between finance and growth. Thus, the first subsection discusses cross-country studies of growth and finance. The second subsection presents evidence from panel studies, pure time-series investigations, and country case-studies. The third subsection examines industry and firm level analyses that provide direct empirical evidence on the mechanisms linking finance and growth. Then, I summarize existing work on the relationship between financial structure – the degree to which an economy is bank-based or market-based – and economic growth. Finally, I mention recent research on whether financial development influences income distribution and poverty.

The organization of the empirical evidence advertises an important weakness in the finance and growth literature: there is frequently an insufficiently precise link between theory and measurement. Theory focuses on particular functions provided by the financial sector – producing information, exerting corporate governance, facilitating risk management, pooling savings, and easing exchange – and how these influence resource allocation decisions and economic growth. Thus, I would prefer to organize the empirical section around studies that precisely measure each of the functions stressed by theory. Similarly, while empirical studies focus on measures of the size of banks or stock markets, Petersen and Rajan (1997), Demirguc-Kunt and Maksimovic (2001), and Fisman and Love (2003) show that firms frequently act as financial intermediaries in providing trade credit to related firms. This source of financial

intermediation may be very important, especially in countries with regulatory restrictions on financial intermediaries and in countries with undeveloped legal systems that do not effectively support formal financial development. This further advertises the sub-optimal connection between theory and measurement in the finance and growth literature.

While fully recognizing this problem, many of the biggest advances in empirical studies of finance and growth have been methodological. Thus, I organize the discussion around econometric approaches. While serious improvements have been made in measuring financial development, which I discuss below, future research that more concretely links the concepts from theory with the data will substantively improve our understanding of the finance and growth link.

III.A. Cross-Country Studies of Finance and Growth

1. Goldsmith, the question, and the problems

Goldsmith (1969) motivated his path breaking study of finance and growth as follows.

> One of the most important problems in the field of finance, if not the single most important one, … is the effect that financial structure and development have on economic growth. (p. 390)

Thus, he sought to assess whether finance exerts a causal influence on growth and whether the mixture of markets and intermediaries operating in an economy influences economic growth. Toward this end, Goldsmith (1969) carefully compiled data on 35 countries over the period 1860 to 1963 on the value of financial intermediary assets as a share of economic output. He assumed, albeit with ample qualifications, that the size of the financial intermediary sector is positively correlated with the quality of financial functions provided by the financial sector.

Goldsmith (1969) met with varying degrees of success in providing confident answers to these questions. After showing that financial intermediary size relative to the size of the

economy rises as countries develop, Goldsmith graphically documented a positive correlation

between financial development and the level of economic activity. Goldsmith just as clearly

asserted his unwillingness to draw causal interpretations from his graphical presentations. Thus,

Goldsmith ultimately did not take a stand on whether financial development causes growth. In

terms of the relationship between economic growth and the structure of the financial system,

Goldsmith was unable to provide much cross-country evidence because of the absence of data on

securities market development for a broad range of countries.

Goldsmith's (1969) work raises several problems, all of which Goldsmith presciently

stresses, that subsequent work has tried to resolve.

(1) The investigation involves only 35 countries.

(2) It does not systematically control for other factors influencing economic growth.

(3) It does not examine whether financial development is associated with productivity growth and capital accumulation, which theory stresses.

(4) The indicator of financial development, which measures the size of the financial intermediary sector, may not accurately gauge the functioning of the financial system.

(5) The close association between financial system size and growth does not identify the direction of causality.

(6) The study did not shed light on whether financial markets, non-bank financial intermediaries, or the mixture of markets and intermediaries matter for economic growth.

2. More countries, more controls, and predictability

In the early 1990s, King and Levine (1993a, henceforth KL) built on Goldsmith's work.

They study 77 countries over the period 1960-1989, systematically control for other factors

affecting long-run growth, examine the capital accumulation and productivity growth channels,

construct additional measures of the level of financial development, and analyze whether the

level of financial development predicts long-run economic growth, capital accumulation, and productivity growth.

In terms of measures of financial development, KL first examine DEPTH, which is simply a measure of the size of financial intermediaries. It equals liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP. They also construct the variable BANK that measures the relative degree to which the central bank and commercial banks allocate credit. BANK equals the ratio of bank credit divided by bank credit plus central bank domestic assets. The intuition underlying this measure is that banks are more likely to provide the five financial functions than central banks. There are two notable weaknesses with this measure, however. Banks are not the only financial intermediaries providing valuable financial functions and banks may simply lend to the government or public enterprises. KL also examine PRIVY, which equals credit to private enterprises divided by GDP. The assumption underlying this measure is that financial systems that allocate more credit to private firms are more engaged in researching firms, exerting corporate control, providing risk management services, mobilizing savings, and facilitating transactions than financial systems that simply funnel credit to the government or state owned enterprises. While BANK and PRIVY seek to improve upon DEPTH by capturing who is doing the allocating and to whom society's savings are flowing, these measures still do not directly proxy for the five financial functions stressed in theoretical models of finance and growth. KL find very consistent results across the different financial development indicators.

KL then assess the strength of the empirical relationship between each of these indicators of the level of financial development averaged over the 1960-1989 period and three growth indicators also averaged over the 1960-1989 period. The three growth indicators are as follows:

(1) the average rate of real per capita GDP growth, (2) the average rate of growth in the capital stock per person, and (3) total productivity growth, which is a "Solow residual" defined as real per capita GDP growth minus (0.3) times the growth rate of the capital stock per person. In other words, if F(i) represents the value of the ith indicator of financial development averaged over the period 1960-1989, G(j) represents the value of the jth growth indicator (per capita GDP growth, per capita capital stock growth, or productivity growth) averaged over the period 1960-1989, and *X* represents a matrix of conditioning information to control for other factors associated with economic growth (e.g., income per capita, education, political stability, indicators of exchange rate, trade, fiscal, and monetary policy), then they estimated the following regressions on a cross-section of 77 countries:

$$G(j) = \alpha + \beta F(i) \ + \ \gamma X + \varepsilon.$$

Table 1 is adapted from KL and indicates that there is a strong positive relationship between each of the financial development indicators, F(i), and the three growth indicators G(i), long-run real per capita growth rates, capital accumulation and productivity growth. The sizes of the coefficients are economically large. Ignoring causality, the coefficient on DEPTH implies that a country that increased DEPTH from the mean of the slowest growing quartile of countries (0.2) to the mean of the fastest growing quartile of countries (0.6) would have increased its per capita growth rate by almost 1 percent per year. This is large. The difference between the slowest growing 25 percent of countries and the fastest growing quartile of countries is about five percent per annum over this 30-year period. Thus, the rise in DEPTH alone eliminates 20 percent of this growth difference. King and Levine (1993b,c) confirm these findings using alternative econometric methods and robustness checks.

To examine whether finance simply follows growth, KL study whether the value of financial depth in 1960 predicts the rate of economic growth, capital accumulation, and productivity growth over the next 30 years. Table 2 summarizes these results. The dependent variable is, respectively, real per capital GDP growth, real per capita capital stock growth, and productivity growth averaged over the period 1960-1989. The financial indicator in each of these regressions is the value of DEPTH in 1960. The regressions indicate that financial depth in 1960 is a good predictor of subsequent rates of economic growth, physical capital accumulation, and economic efficiency improvements over the next 30 years even after controlling for income, education, and measures of monetary, trade, and fiscal policy. The relationship between the initial level of financial development and growth is economically large. For example, the estimated coefficients suggest that if in 1960 Bolivia had increased its financial depth from 10 percent of GDP to the mean value for developing countries in 1960 (23 percent), then Bolivia would have grown about 0.4 percent faster per annum, so that by 1990 real per capita GDP would have been about 13 percent larger than it was. These examples do not consider what actually causes the change in financial development. They simply illustrate the potentially large long-term growth effects from changes in financial development.

La Porta et al (2001) use an alternative indicator of financial development. They examine the degree of public ownership of banks around the world. To the extent that publicly-owned banks are less effective at acquiring information about firms, exerting corporate governance, mobilizing savings, managing risk, and facilitating transactions, then this measure provides direct evidence on connection between economic growth and the services provided by financial intermediaries. The authors show that (1) higher degrees of public ownership are

associated with lower levels of bank development and (2) high levels of public ownership of banks are associated with slower economic growth.

While addressing many of the weaknesses in earlier work, cross-country growth regressions do not eliminate them. Thus, while KL show that finance predicts growth, they do not deal formally with the issue of causality. While researchers improve upon past measures of financial development, they only focus on one segment of the financial system, banks, and their indicators do not directly measure the degree to which financial systems ameliorate information and transaction costs.

3. Adding stock markets to cross-country studies of growth.

There are good reasons to study the relationship between long-run economic growth and the operation of equity markets. First, as stressed above, theoretical debate exits on whether larger, more liquid equity markets exert a positive or negative influence on economic growth, capital accumulation, and productivity growth. Second, as stressed above, some theories focus on the competing roles of banks and markets in funding corporate expansion, while others stress that banks and markets may arise, coexist, and prosper by providing different financial functions to the economy, and still other theories stress complementarities between banks and markets. Thus, simultaneously considering the potential roles of banks and markets permits one to distinguish among competing theories and provide evidence to policy makers on the independent roles of markets and banks in the process of economic growth.

Levine and Zervos (1998a, henceforth LZ) construct numerous measures of stock market development to assess the relationship between stock market development and economic growth, capital accumulation, and productivity growth in a sample of 42 countries over the period 1976-

93.[12] They control for many other potential growth determinants, including banking sector

development. Their study builds on pioneering work by Atje and Jovanovic (1993).

For brevity, I focus on only one of LZ's liquidity indicators, the turnover ratio. This

equals the total value of shares traded on a country's stock exchanges divided by stock market

capitalization (the value of listed shares on the country's exchanges). The turnover ratio is not a

direct measure of trading costs or of the ability to sell securities at posted prices. Rather, the

turnover ratio measures trading relative to the size of the market. It therefore reflects trading

frictions and information that induces transactions. This ratio exhibits substantial cross-country

variability. Very active markets such as Japan and the United States had turnover ratios of

almost 0.5 during the 1976-93 period, while less liquid markets, such as Bangladesh, Chile, and

Egypt have turnover ratios of 0.06 or less.

As summarized in Table 3, LZ find that the initial level of stock market liquidity and the

initial level of banking development (Bank Credit) are positively and significantly correlated

with future rates of economic growth, capital accumulation, and productivity growth over the

next 18 years even after controlling for initial income, schooling, inflation, government

spending, the black market exchange rate premium, and political stability. Bank credit equals

bank credit to the private sector as a share of GDP.[13]

These results are consistent with the view that stock market liquidity facilitates long-run

growth (Levine, 1991; Holmstrom and Tirole, 1993; Bencivenga et al., 1995), but inconsistent

with models that emphasize the negative aspects of stock markets liquidity (Bhide, 1993).

Furthermore, the results do not lend much support to models that emphasize the tensions

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[12] These measures build on Demirguc-Kunt and Levine (1996a,b).

[13] Note, King and Levine's (1993) PRIVY measures total credit flowing to the private sector, while Levine and Zervos's (1998) Bank Credit measures credit by banks to the private sector.

between bank-based and market-based systems. Rather, the results suggest that stock markets provide different financial functions from those provided by banks, or else they would not both enter the growth regression significantly.

The sizes of the coefficients also suggest an economically meaningful relationship. For example, the estimated coefficient implies that a one-standard-deviation increase in initial stock market liquidity (0.30) would increase per capita GDP growth by 0.80 percentage points per year (2.7*0.3). Accumulating over 18 years, this implies real GDP per capita would have been over 15 percentage points higher by the end of the sample. Similarly, the estimated coefficient on Bank Credit implies a correspondingly large growth effect. That is, a one-standard deviation increase in Bank Credit (0.5) would increase growth by 0.7 percentage point per year (1.3*0.5). Taken together, the results imply that if a country had increased both stock market liquidity and bank development by one-standard deviation, then by the end of the 18-year sample period, real per capita GDP would have been almost 30 percent higher and productivity would have been almost 25 percent higher. As emphasized throughout, these conceptual experiments do not consider the underlying causes of the change in the operation of the financial sector. The examples simply illustrate the potential growth effects of financial development. LZ go onto argue that the link between stock markets, banks, and growth runs most robustly through productivity growth, rather than physical capital accumulation, which is consistent with some theoretical models (Levine, 1991; Bencivenga, Smith, and Starr, 1995).

LZ also find that stock market size, as measured by market capitalization divided by GDP, is not robustly correlated with growth, capital accumulation, and productivity improvements. This is consistent with theory. Simply listing on the national stock exchange

does not necessarily foster resource allocation. Rather, it is the ability to trade the economy's productive technologies easily that influences resource allocation and growth.

There are a number of weaknesses, however, associated with the LZ approach.

First, while they show that stock market liquidity and bank development predict economic growth, they do not deal formally with the issue of causality.

Second, there are difficulties in measuring liquidity as discussed by Grossman and Miller (1988). LZ do not measure the direct costs of conducting equity transactions. Furthermore, they do not control for the possibility that the arrival of information and the processing of that information may differ across countries and thereby induce cross-country differences in trading that does not reflect liquidity as defined by theory. While LZ confirm their results using three additional measures of liquidity, measurement issues remain.[14]

Third, more broadly, the liquidity indicators measure domestic stock transactions on a country's national stock exchanges. The physical location of the stock market, however, may not necessarily matter for the provision of liquidity unless there are impediments to cross-location transactions. Physical location will matter less – and this measurement problem will matter more -- if economies become more financially integrated. Guiso, Sapienza, and Zingales (2002), however, find that local financial conditions matter even in a single country – Italy. They show that local financial conditions influence economic performance across the different regions of Italy. That is, local financial development is an important determinant of the economic success of an area even within a single country. Their results suggest that international financial

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[14] LZ examine three additional measures of liquidity. First, the value traded ratio equals the total value of domestic stocks traded on domestic exchanges as a share of GDP. This measures trading relative to the size of the economy. The next two measures of liquidity measure trading relative to stock price movements: (1) the value traded ratio divided by stock return volatility, and (2) the turnover ratio divided by stock return volatility.

integration is unlikely to eliminate the importance of national financial systems in the near future.[15]

Fourth, even more generally, the link between trading and future economic growth may not represent a link between liquidity and growth as suggested by some theories (Levine, 1991; Bencivenga, Smith, and Starr, 1995). The liquidity-stock market link may be generated by a third factor that produces both a surge in trading and a subsequent acceleration in economic growth, but where trading does not induce the growth acceleration. For instance, positive news about a technology shock may elicit different opinions about which sectors and firms will benefit most from the innovation. This would produce lots of trading today because of these differences of opinion. The subsequently surge in economic growth is due to the positive technology shock, not the increase in stock transactions. In this "model," trading does not necessarily facilitate the ability of the economy to exploit the growth benefits of the technology shock. From this perspective, it is difficult to interpret the LZ results as implying that liquidity fosters economic growth.

Fifth, while LZ include measures of the functioning of stock markets and banks, they exclude other components of the financial sector, e.g., bond markets and the financial services provided by nonfinancial firms. Beck, Demirgüç-Kunt, and Levine (2001) show that in many countries private bond market capitalization is more than half the capitalization of national equity markets and public bond markets are frequently larger than stock markets. Furthermore, over the period 1980-1995, new issuances of private bonds were greater than public offerings of

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[15] Levine and Schmukler (2003, 2004) find that international cross-listing by emerging market firms can hurt the operation of the emerging market itself with potentially adverse implications for economic development according to the conclusions in Guiso, Sapienza, and Zingales (2002). In terms of international banking, Levine (2004) finds that regulatory restrictions on foreign bank entry hurt the efficiency of domestic banking sector operations.

stock in many countries. Fink, Haiss, and Hristoforova (2003) examine the impact of bond market development on real output in 13 highly developed economies over the period 1950-2000. Using Granger causality tests and co-integration methods, the bulk of their evidence indicates that bond market development influences real economic activity. Furthermore, Beck, Demirgüç-Kunt, and Levine (2001) show that life insurance and private pension fund assets rival banks in some countries, while Berger, Hasan, and Klapper (2004) indicate that small, community banks boost growth in many developing countries. Thus, more work remains on incorporating bond markets and nonbank institutions into finance-growth literature.

Sixth, stock markets may do more than provide liquidity. Stock markets may provide mechanisms for hedging and trading the idiosyncratic risk associated with individual projects, firms, industries, sectors, and countries. While a vast literature examines the pricing of risk, there exists very little empirical evidence that directly links risk diversification services with long-run economic growth. While LZ do not find a strong link between economic growth and the ability of investors to diversify risk internationally, they have extremely limited data on international integration. Future work needs to more fully assess the links between stock markets, banks, and economic growth.

4. Using instrumental variables in cross-country studies of growth

While KL and LZ show that financial development predicts economic growth, these results do not settle the issue of causality. It may simply be the case that financial markets develop in anticipation of future economic activity. Thus, finance may be a leading indicator rather than a fundamental cause.

To assess whether the finance-growth relationship is driven by simultaneity bias, one needs instrumental variables that explain cross-country differences in financial development but

are uncorrelated with economic growth beyond their link with financial development and other growth determinants. Levine (1998, 1999) and Levine, Loayza, and Beck (2000) use the La Porta et al (henceforth LLSV, 1998) measures of legal origin as instrumental variables. In particular, LLSV (1998) show that legal origin – whether a country's Commercial/Company law derives from British, French, German, or Scandinavian law – importantly shapes national approaches to laws concerning creditors and the efficiency with which those laws are enforced. Since finance is based on contracts, legal origins that produce laws that protect the rights of external investors and enforce those rights effectively will do a correspondingly better job at promoting financial development. [16] Indeed, LLSV (1998), Levine (1998, 1999, 2001), and Levine, Loayza, and Beck (2000) trace the effect of legal origin to laws and enforcement and then to financial development. Since most countries obtained their legal systems through occupation and colonization, the legal origin variables may be plausibly treated as exogenous.

Following Levine, Loayza, and Beck's (henceforth LLB, 2000) analysis of 71 countries, consider the generalized method of moments (GMM) regression:

$$G(j) = \alpha + \beta F(i) + \gamma X + \varepsilon.$$

G(j) is real per capita GDP growth over the 1960-95 period. The legal origin indicators, Z, are used as instrumental variables for the measures of financial development, F(i). X is treated as an included exogenous variable. LLB use *linear* moment conditions, which amounts to the requirement that the instrumental variables (Z) be uncorrelated with the error term (ε). The economic meaning of these conditions is that *legal origin* may affect per capita GDP growth

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[16] In terms of identifying why legal tradition influences the operation of the financial system, see Beck, Demirguc-Kunt, and Levine (2003b, 2004a).

only through the financial development indicators <u>and</u> the variables in the conditioning information set, X.

LLB extend the King and Levine (1993a,b) measures of financial intermediary development through to 1995, improve the deflating of the financial development indicators, and add a new measure of overall financial development.[17] The new measure of financial development, Private Credit, equals the value of credits by financial intermediaries to the private sector divided by GDP. The measure isolates credit issued to the private sector and therefore excludes credit issued to governments, government agencies, and public enterprises. Also, it excludes credits issued by central banks. Unlike the LZ Bank Credit measures, Private Credit included credits issued by non-deposit money bank. Not surprisingly, there is enormous cross-country variation in Private Credit. Private Credit is less than 10 percent of GDP in Zaire, Sierra Leone, Ghana, Haiti, and Syria, while it is greater than 85 percent of GDP in Switzerland, Japan, the United States, Sweden, and the Netherlands.

The LLB results indicate a very strong connection between the exogenous component of financial intermediary development and long-run economic growth. They use various measures of financial intermediary development and different conditioning information sets, i.e., different X's. They find that the exogenous component of financial development is closely tied to long-run rates of per capita GDP growth. Furthermore, the data do not reject the test of the over-identifying restrictions. The inability to reject the orthogonality conditions plus the finding that

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[17] LLB (2000) improves upon past measures of financial intermediary development by more 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. LLB deflate end-of-year financial balance sheet items by end of year consumer price indices (CPI) and deflate the GDP series by the annual CPI. Then, they 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.

the legal origin instruments (Z) are highly correlated with financial intermediary development indicators (i.e., the null hypothesis that the legal origin variables does not explain the financial intermediary indicators is rejected at the 0.01 significance level), 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.

LLB's (2000) instrumental variable results also indicate an economically large impact of financial development on growth.   For example, India's value of Private Credit over the period 1960-95 was 19.5 percent of GDP, while the mean value for developing countries was 25 percent of GDP. The estimated coefficients in LLB 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.[18] 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 percent per year over this period. As emphasized throughout, however, these types of conceptual experiments must be treated as illustrative because they do not account for how to increase financial intermediary development.

While LLB interpret their results as implying that financial development boosts steady-state growth, Aghion, Howitt, and Mayer-Foulkes (2005) challenge that conclusion. They first develop a model of technological change that predicts that countries with levels of financial development above a critical, threshold level will converge in growth rates. Among these

countries, financial development positively influences the rate of convergence, so the financial development exerts positive but diminishing influence on steady-state levels of real per capita output. They find empirical support for the model's predictions. Financial development explains (i) whether there is convergence or not, and (ii) the rate of convergence (when there is convergence), but Aghion, Howitt, and Mayer-Foulkes (2005) find that financial development does not exert a direct effect on steady-state growth.

III.B. Panel, Time-Series, and Case-Studies of Finance and Growth

Studies of finance and growth have also employed panel data techniques, pure time-series methodologies, and case-studies to ameliorate a number of statistical problems with pure cross-country investigations. This section discusses the panel approach in some depth and finishes with shorter discussions of pure time-series and case-study approaches.

1. The dynamic panel methodology

LLB (2000) and Beck, Levine, and Loayza (2000, henceforth BLL) use a panel GMM estimator that improves upon pure cross-country work in three respects.

The regression equation in levels can be specified in the following form:

$$y_{i,t} = \alpha' X^1_{i,t-1} + \beta' X^2_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \tag{1}$$

where y represents the dependent variable, X^1 represents a set of lagged explanatory variables and X^2 a set of contemporaneous explanatory variables, μ is an unobserved country-specific

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[18] To get this, note that LLB take logarithms of the financial intermediary indicators to reduce the effect of outliers, so that the change in financial development is ln(25) - ln(19.5) = 0.25. Then, use their smallest parameter estimate on Private Credit from their Table 3, which equals 2.5. Thus, the acceleration in growth is given by 2.5*(0.25) = 0.63.

effect , λ is a time-specific effect, ε is the time-varying error term, and i and t represent country and (5-year) time period, respectively.

The first benefit from moving to a panel is the ability to exploit the time-series and cross-sectional variation in the data. LLB construct a panel that consists of data for 77 countries over the period 1960-95. The data are averaged over seven non-overlapping five-year periods. Moving to a panel incorporates the variability of the time-series dimension. Specifically, the within-country standard deviation of Private Credit is 15%, which in the panel estimation is added to the between-country standard deviation of 28%. Similarly, for real per capita GDP growth, the within-country standard deviation is 2.4% and the between-country standard deviation is 1.7%.[19] This also raises a potential disadvantage from moving to panel data. With panel data, we employ data averaged over five-year periods, yet the models we are using to interpret the data are typically models of steady-state growth. To the extent that five years does not adequately proxy for long-run relationships, the panel methods may imprecisely assess the finance growth link.

The second benefit from moving to a panel is that it avoids biases associated with cross-country regressions: With cross-country regressions, the unobserved country-specific effect is part of the error term so that correlation between μ and the explanatory variables results in biased coefficient estimates. Furthermore, if the lagged dependent variable is included in X^1 (which is the norm in cross-country regressions), then the country-specific effect is certainly correlated with X^1. First differencing the regression equation eliminates the country-specific effect.

$$y_{i,t} - y_{i,t-1} = \alpha'(X^1_{i,t-1} - X^1_{i,t-2}) + \beta'(X^2_{i,t} - X^2_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad (2)$$

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[19] The within-country standard deviation is calculated using the deviations from country averages, whereas the between-country standard deviation is calculated from the country averages.

This, however, introduces correlation between the new error term $\varepsilon_{i,t}$ - $\varepsilon_{i,t-1}$ and the lagged dependent variable $y_{i,t-1} - y_{i,t-2}$ when it is included in $X^1_{i,t-1} - X^1_{i,t-2}$. One can use lagged values of the explanatory variables in levels as instruments. Assuming (i) no serial correlation and (ii) the explanatory variables X ($X = [X^1 \, X^2]$) are weakly exogenous, the following moment conditions hold.

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

This *difference estimator* consists of the regression in differences plus equation (3).

The third benefit from moving to a panel is that it permits the use of instrumental variables for all regressors and thereby provides more precise estimates of the finance-growth relationship. As discussed, researchers use legal origin instruments to extract the exogenous component of financial development. These pure cross-sectional estimators, however, do not control for the endogeneity of all the other explanatory variables. This can lead to inappropriate inferences on the coefficient on financial development.

Building on this difference panel estimator, Arellano and Bover (1995) propose a *system estimator* that jointly estimates the regression in levels (equation 1) and the equation in differences (equation 2) in order to (i) re-incorporate the cross-country variation from the levels regression and (ii) reduce the likelihood that weak instruments bias the estimated coefficients and standard errors.

2. Dynamic panel results on financial intermediation and growth

LLB use the system estimator to examine the relationship between financial intermediary development and growth, while BLL examine the relationship between financial development and the sources of growth, i.e., productivity growth, physical capital accumulation, and savings. They examine an assortment of indicators of financial intermediary development and also use a

variety of conditioning information sets to assess the robustness of the results (Levine and Renelt, 1992). Here, we summarize the results in Table 4 using the Private Credit measure of financial development described above and a simple set of control variables.

The results indicate a positive relationship between the exogenous component of financial development and economic growth, productivity growth, and capital accumulation. The regressions pass the standard specification tests. Table 4 presents both (1) instrumental variable results using a pure a cross-sectional analysis where the legal origin variables are the instruments and (2) the dynamic panel results just described. Remarkably the coefficient estimates are very similar using the two procedures and economically significant. Thus, the large, positive relationship between economic growth and Private Credit does not appear to be driven by simultaneity bias, omitted country-specific effects, or the routine use of lagged dependent variables in cross-country growth regressions. While BLL go on to argue that the finance-capital accumulation link is not robust to alternative specifications, they demonstrate a robust link between financial development indicators and both economic growth and productivity growth.

The regression coefficients suggest an economically large impact of financial development on economic growth. For example, Mexico's value for Private Credit over the period 1960-95 was 22.9% of GDP. An exogenous increase in Private Credit that had brought it up to the sample median of 27.5% would have resulted in a 0.4 percentage point higher real per capita GDP growth per year.[20]

While BLL and LLB examine linear models, recent research suggests that the impact of financial development on capital accumulation, productivity growth, and overall real per capita

GDP growth may depend importantly on other factors. Using the same econometric methods and data, Rioja and Valev (2004a) find that finance boosts growth in rich countries primarily by speeding-up productivity growth, while finance encourages growth in poorer countries primarily by accelerating capital accumulation. Furthermore, Rioja and Valev (2004b) find that the impact may be nonlinear. They find that countries with very low levels of financial development experience very little growth acceleration from a marginal increase in financial development, while the affect is larger for rich countries and particular large for middle-income countries. It would be nice to know, however, what produces these nonlinearities. Finally, Rousseau and Wachtel (2002) show that the positive impact of financial development on growth diminishes with higher rates of inflation.

Emphasizing that not all indicators of financial development measure the same forces, Benhabib and Spiegel (2001) examine the relationship between an assortment of financial intermediary development indicators and economic growth, investment, and total factor productivity growth. While they use a panel estimator, they do not use the system estimator described above that allows for the endogeneity of all the regressors and the routine use of lagged dependent variables. They find that the indicators of financial development are correlated with both total factor productivity growth and the accumulation of both physical and human capital. Their paper raises an important qualification, however. Different indicators of financial development are linked with different components of growth (total factor productivity, physical capital accumulation, and human capital accumulation). Their findings reiterate an important qualification running throughout this survey: it is difficult to measure financial development and link empirical constructs with theoretical concepts.

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[20] This results follows from Ln (27.5) − Ln (22.9) = 0.18 and 0.18*2.4=0.43, where 2.4 is the

Loayza and Ranciere (2002) extend this line of empirical inquiry by differentiating between the long-run and short-run relationships connecting finance and economic activity. They note that short-run surges in bank lending can actually signal the onset of financial crises and economic stagnation. They stress that it is therefore crucial to consider simultaneously the short-run and long-run effects of financial development. For instance, while finance is positively associated with economic growth in a broad cross-section of countries, this relationship does not hold in Latin America, which has been subject to severe and repeated banking crises. Using a panel, Loayza and Ranciere (2002) estimate an encompassing model of long-run and short-run effects. Using the LLB measure of financial intermediary development (Private Credit), they find that a positive long-run relationship between financial development and growth co-exists with a generally negative short-run link.[21]

3. Dynamic panel results and stock market and bank development

Rousseau and Wachtel (2000) examine the relationship between stock markets, banks, and growth, using annual data and the difference estimator. Beck and Levine (2004) use data averaged over five-year periods to focus on longer-run growth factors, use the system estimator

parameter estimate from the panel regression.

[21] For more on distinguishing the short-run and long-run effects of financial development, see Fisman and Love (2004).

to mitigate potential biases associated with the difference estimator, and extend the sample through 1998 (from 1995).[22]

Table 5 indicates that the exogenous component of both stock market development and bank development help predict economic growth. As shown, the coefficient estimates from the two methods are very similar. The panel procedure passes the standard specification tests, which increases confidence in the assumptions underlying the econometric methodology. While not shown, stock market capitalization is not closely associated with growth. Thus, it is not listing per se that is important for growth; rather, it is the ability of agents to exchange ownership claims on an economy's productive technologies that is relevant for economic growth.

The Table 5 estimates are economically meaningful and consistent with magnitudes obtained using different methods. If Mexico's Turnover Ratio had been at the average of the OECD countries (68%) instead of the actual 36% during the period 1996-98, it would have grown 0.6 percentage points faster per year. Similarly, if its Bank Credit had been at the average of all OECD countries (71%) instead of the actual 16%, it would have grown 2.6 percentage points faster per year. These results suggest that the exogenous components of both bank and stock market development have an economically large impact on economic growth.

4. Time series studies

A substantial time-series literature examines the finance-growth relationship using a variety of time-series techniques. These studies frequently use Granger-type causality tests and vector autoregressive (VAR) procedures to examine the nature of the finance-growth relationship

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[22] There are additional econometric problems created when studying stock markets, banks, and economic growth. There are many fewer countries and years when incorporating stock markets, which can lead to over-fitting of the data and potential mis-leading inferences. Beck and Levine (2004) describe and use variants of the dynamic panel estimator to reduce the likelihood that over-fitting biases the results.

(e.g., Arestis and Demetriades, 1997). Research has progressed by using better measures of financial development, employing more powerful econometric techniques, and by examining individual countries in much greater depth.

Some initial time-series studies emphasize the importance of measuring financial development accurately, suggesting that studies that use more precise measures of financial development tend to find a growth-enhancing impact of financial development. Jung (1986) and Demetriades and Hussein (1996) use measures of financial development such as the ratio of money to GDP. They find the direction of causality frequently runs both ways, especially for developing economies. However, Neusser and Kugler (1998) use measures of the value-added provided by the financial system instead of simple measures of the size of the financial system. They find that finance boosts growth. Furthermore, Rousseau and Wachtel (1998) conduct time-series tests of financial development and growth for five countries over the past century using measures of financial development that include the assets of both banks and non-banks. They document that the dominant direction of causality runs from financial development to economic growth. Finally, Arestis, Demetriades and Luintel (2000) substantially augment time-series of finance and growth by using measures of both stock market and bank development. They find additional support for the view that finance stimulates growth but raise some cautions on the size of the relationship. They use quarterly data and apply time series methods to five developed economies and show that while both banking sector and stock market development explain subsequent growth, the effect of banking sector development is substantially larger than that of stock market development. The sample size, however, is very limited and it is not clear whether the use of quarterly data and a vector error correction model fully abstract from high frequency

factors influencing the stock market, bank, and growth nexus to focus on long-run economic growth.

Additional econometric sophistication has also been brought to bear on the finance and growth question. In a broad study of 41 countries over the 1960-1993, Xu (2000) uses a VAR approach that permits the identification of the long-term cumulative effects of finance on growth by allowing for dynamic interactions among the explanatory variables.[23] Xu (2000) rejects the hypothesis that finance simply follows growth. Rather, the analyses indicate that financial development is important for long-run growth. More recently, Christopoulos and Tsionas (2004) note that many time-series studies yield unreliable results due to the short time spans of typical data sets. Thus, they use panel unit root tests and panel cointegration analyses to examine the relationship between financial development and economic growth in ten developing countries to yield causality inferences within a panel context that increases sample size. In contrast to Demetriades and Hussein (1996), Christopoulos and Tsionas (2004) find strong evidence in favor of the hypothesis that long-run causality runs from financial development to growth and that there is no evidence of bi-directional causality. Furthermore, they find a unique cointegrating vector between growth and financial development, and emphasize the long-run nature of the relationship between finance and growth.

There has also been a movement away from applying time-series methods to a variety of countries and toward examining individual countries, which allows research to design country-specific measures of financial development and expand the time-series dimension of the analyses in some cases. Rousseau and Sylla (1999) expand Rousseau's (1998) examination of the historical role of finance in U.S. economic growth to include stock markets. They use a set of

multivariate time-series models that relate measures of banking and equity market activity to investment, imports, and business incorporations over the 1790-1850 period. Rousseau and Sylla (1999) find strong support for the theory of "finance led growth" in United States. Moving beyond the U.S., Rousseau and Sylla (2001) study seventeen countries over the period 1850-1997. They also find evidence consistent with the view the financial development stimulated economic growth in these economies. In a study of the Meiji period in Japan (1868-1884), Rousseau (1999) uses a variety of VAR procedures and concludes that the financial sector was instrumental in promoting Japan's explosive growth prior to the First World War. In a different study, Rousseau (1998) examines the impact of financial innovation in the U.S. on financial depth over the period 1872-1929. Innovation is proxied by reductions in the loan-deposit spread. The impact on the size of the financial intermediary sector is assessed using unobservable components methods. The paper finds that permanent reductions of 1% in the spread of New York banks are associated with increases in financial depth that range from 1.7% to nearly 4%. While not a direct link to growth, these findings develop a direct link running from financial innovation to increases in financial depth, which is commonly associated with economic growth in other studies.

Bekaert, Harvey, Lundblad (2001, 2004) examine the effects of opening equity markets to foreign participation.[24] One statistical innovation in their work is the use of over-lapping data. Many time-series studies use annual observations and even quarterly data to maximize the information included their analyses. Bekaert, Harvey, and Lundblad (2004), however, use data

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[23] In a narrower study, Luintel and Khan (1999) find some evidence of bi-directional causality between finance and growth in VAR analysis of developing countries.

[24] For further analyses on the growth effects of international financial liberalization, see Henry (2000, 2003), Levine and Zervos (1998b), Edison, et al (2002), and Klein and Olivei (2002) and the references therein.

averaged over five-year periods to focus on growth rather than higher frequency relationships, but they use over-lapping data to avoid the loss of information inherent in using non-over-lapping data. Specifically, one observation includes data averaged from 1990-1995 and the next period includes data averaged from 1991-1996. They adjust the standard errors accordingly and conduct an array of sensitivity checks, though the procedure does not formally deal with simultaneity bias. Consistent with Levine and Zervos (1998a), Bekaert, Harvey, and Lundblad (2001, 2004) show that financial liberalization boosts economic growth by improving the allocation of resources and the investment rate

5. Novel case-studies

Jayaratne and Strahan (1996) undertake a fascinating examination of the impact of finance on economic growth by examining individual states of the United States. Since the early 1970s, 35 states relaxed impediments on intrastate branching. They estimate the change in economic growth rates after branch reform relative to a control group of states that did not reform. They use a pooled time-series, cross-sectional dataset to assess the impact of liberalizing branching restrictions on state growth.

Jayaratne and Strahan (1996) show that branch reform boosted bank-lending quality and accelerated real per capita growth rates, while Dehejia and Lleras-Muney (2003) confirm and extend these findings by also examining the impact of deposit insurance. By comparing states within the United States, the paper eliminates problems associated with country-specific factors. The paper also uses a natural identifying condition, the change in branching restrictions, to trace through the impact of financial development on economic growth. Importantly, the paper finds little evidence that branch reform boosted lending. Rather, branch reform accelerated economic

growth by improving the quality of bank loans and the efficiency of capital allocation.[25] Some

issues remain, however. While Jayaratne and Strahan (1996) control for state investment and tax

receipts, it is difficult to control fully for other factors influencing growth in the individual states.

Similarly, while the authors show that (i) there is no correlation between the business cycle and

the timing of regulation and (ii) deregulation does not forecast a boom in lending, it is difficult to

rule out the possibility that states liberalize banking due to expected growth-enhancing structural

changes in the economy that do require more lending but better lending. Dehejia and Lleras-

Muney (2003) also examine the growth experiences of states across the U.S. They too find that

financial development boosts growth, but they also show that deposit insurance frequently

induced indiscriminate credit expansions with adverse effects on growth. Again, the results

suggest that it is the quality, not the quantity, of lending that matters. In sum, these innovative

studies provide empirical support for the view that well-functioning banks improve the allocation

of capital and hence economic growth.

In terms of the early years of the United States, Wright (2002) provides a lucid and

detailed examination of how the U.S. financial system drove America's transformation after

1780 from an agricultural economy to a thriving industrial power. The book's core thesis is that

"… the U.S. financial system created the conditions necessary for the sustained domestic

economic growth … that scholars know occurred in the nineteenth century. Most impressively,

Wright's (2002) research is filled with specific examples of the emergence of new financial

arrangement to facilitate the acquisition of information about firms (p. 26-50), to monitor

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[25] Note, Jayaratne and Strahan (1998) show that with bank deregulation, better-managed, lower costs banks expand at the expense of inefficient banks. On an international level, Demirguc-Kunt, Laeven, and Levine (2003) show that regulatory restrictions reduce banking sector efficiency and Beck, Demirguc-Kunt, and Levine (2003d) find that regulatory restrictions on bank competition tend to increase the fragility of banks.

managers and to align the interests of creditors and firm insiders (p.37-41), and to facilitate the trading, hedging, and pooling of risk (p. 51 75). For example, in response to principal-agent problems, U.S. corporations in the 18th century increasingly forced managers to hold large quantities of stock in the corporation to align their personal financial interests with those of the firm (p. 39). As another example, after suffering through high default rates, U.S. bankers quickly learned to monitor borrowers more carefully by continuously reviewing the cash-flows of borrowers to identify unusual activity, forcing debtors to report their actions at regular board meetings and granting additional privileges only to debtors demonstrating good behavior, and forcing borrowers to allocate funds toward very specific investments along with other very restrictive covenants (p.34-35). While the book does not provide formal statistical evidence that financial development accelerated economic growth in the early decades after U.S. independence, Wright (2002) make a different, distinguishing contribution: He documents how specific financial contracts, markets, and institutions arose to ease information and transactions costs and hence influence the resource allocation decisions of a country.

Guiso, Sapienza, and Zingales (2002) examine the individual regions of Italy. Using an extraordinary dataset on households and financial services across Italy, they examine the effects of differences in local financial development on economic activity across the regions of Italy. Guiso, Sapienza, and Zingales (2002) find that local financial development (i) enhances the probability that an individual starts a business, (ii) increases industrial competition, and (iii) promotes the growth of firms. These results are weaker for large firms, which can more easily raise funds outside of the local area. This study ameliorates many of the weaknesses associated with examining growth across countries.

Consider also Haber's (1991, 1997) impressive comparison of industrial and capital market development in Brazil, Mexico, and the United States between 1830 and 1930. Using firm-level data, he finds that capital market development affected industrial composition and national economic performance. Specifically, Haber shows that when Brazil overthrew the monarchy in 1889 and formed the First Republic, it also dramatically liberalized restrictions on Brazilian financial markets. The liberalization gave more firms easier access to external finance. Industrial concentration fell and industrial production boomed. While Mexico also liberalized financial sector policies, the liberalization was much more mild under the Diaz dictatorship (1877-1911), which " . . . relied on the financial and political support of a small in-group of powerful financial capitalists." (p. 561) As a result, the decline in concentration and the increase in economic growth were much weaker in Mexico than it was in Brazil. Haber (1997) concludes that (1) international differences in financial development significantly impacted the rate of industrial expansion and (2) under-developed financial systems that restrict access to institutional sources of capital also impeded industrial expansion.

In a recent firm-level study of China, Allen, Qian, and Qian (2005) find that the linkages between the law, finance and growth are complex. Consistent with broad cross-country findings discussed above, they find that poor legal protection of minority shareholder rights hinders the growth of publicly listed firms (as well as state-owned firms). However, private firms and firms owned by local governments have grown rapidly in absence of sound formal rules governing shareholder rights. This suggests the existence of effective alternative governance and financing mechanisms that promote firm growth. Additional evidence comes from Cull and Xu (2004), who find that private ownership is associated with firm reinvesting a greater proportion of their earnings than in firms with greater public sector ownership.

Firm-level evidence from France also suggests the importance of well-functioning financial intermediaries for economic growth. Bertrand, Schoar, and Thesmar (2004) examine the impact of deregulation in 1985 that eliminated government intervention in bank lending decisions and fostered greater competition in the credit market. They find that after deregulation, banks bailed out poorly performing firms less frequently, increased the cost of capital to poorly performing firms, and induced an increase in allocative efficiency across firms. This lowered industry concentration ratios and boosted both entry and exit rates for firms. While not directly tied to growth, the paper suggests that better functioning banks not only influence bank-firm relations they also exert a first-order impact on the structure and dynamic of product markets.

In two classic studies, Cameron, Crisp, Patrick, and Tilly (1967) and McKinnon (1973) study respectively (1) the historical relationships between banking development and the early stages of industrialization for England (1750-1844), Scotland (1750-1845), France (1800-1870), Belgium (1800-1875), Germany (1815-1870), Russia (1860-1914), and Japan (1868-1914) and (2) the relationship between the financial system and economic development in Argentina, Brazil, Chile, Germany, Korea, Indonesia, and Taiwan in the post World War II period. This research does not use formal statistical analysis to resolve causality issues. Instead, the researchers carefully examine the evolution of the political, legal, policy, industrial, and financial systems of the country. The country-case studies document critical interactions among financial intermediaries, financial markets, government policies, and the financing of industrialization. While well-aware of the analytical limitations, these authors bring a wealth of country specific information to bear on the role of finance in economic growth. Cameron (1967b) concludes that especially in Scotland and Japan, but also in Belgium, Germany, England, and Russia, the

banking system played a positive, growth-inducing role.[26] McKinnon (1973) interprets the mass

of evidence emerging from his country-case studies as suggesting that better functioning

financial systems support faster economic growth. Disagreement exists over many of these

individual cases, and it is extremely difficult to isolate the importance of any single factor in the

process of economic growth. Nonetheless, the body of country-studies suggests that, while the

financial system responds to demands from the nonfinancial sector, well-functioning financial

systems have, in some cases during some time periods, importantly spurred economic growth.

III.C. Industry and Firm Level Studies of Finance and Growth

To better understand the relationship between financial development and economic

growth, researchers have employed both industry-level and firm-level data across a broad cross-

section of countries. These studies seek to resolve causality issues and to document in greater

detail the mechanisms, if any, through which finance influences economic growth.

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[26] A valuable debate exists concerning the case of Scotland between 1750 and 1845. Scotland began the period with per capita income of less than one-half of England's. By 1845, however, per capita income was about the same. While recognizing that the "... dominant political event affecting Scotland's potentialities for economic development was the Union of 1707, which made Scotland an integral part of the United Kingdom" (Cameron, 1967a, p. 60), Cameron argues that Scotland's superior banking system is one of the few noteworthy features that can help explain its comparatively rapid growth. Some researchers, however, suggest that England did not suffer from a dearth of financial services because nonfinancial enterprises provided financial services in England that Cameron's (1967a) measures of formal financial intermediation omit. Others argue that Scotland had rich natural resources, a well-educated work force, access to British colonial markets, and started from a much lower level of income per capita than England. Consequently, it is not surprising that Scotland enjoyed a period of rapid convergence. Finally, still others disagree with the premise that Scotland had a well-functioning financial system and emphasize the deficiencies in the Scottish system (Sidney Pollard and Dieter Ziegler, 1992).

1. Industry level analyses

Consider first the influential study by Rajan and Zingales (henceforth RZ, 1998). They argue that better-developed financial intermediaries and markets help overcome market frictions that drive a wedge between the price of external and internal finance. Lower costs of external finance facilitate firm growth and new firm formation. Therefore, industries that are naturally heavy users of external finance should benefit disproportionately more from greater financial development than industries that are not naturally heavy users of external finance. From this perspective, if researchers can identify which industries are "naturally heavy users" of external finance – i.e., if they can identify which industries rely heavily on external finance in an economy with few market frictions – then this establishes a natural test: Do industries that are naturally heavy users of external finance grow faster in economies with better developed financial systems? If they do, then this supports the view that financial development spurs growth by facilitating the flow of external finance.

RZ assume that (1) financial markets in the U.S. are relatively frictionless, (2) in a frictionless financial system, technological factors influence the degree to which an industry uses external finance, and (3) the technological factors influencing external finance are constant (or reasonably constant) across countries. They then examine whether industries that are technologically more dependent on external finance – as defined by external use of funds in the U.S. – grow comparatively faster in countries that are more financially developed. This approach allows RZ (1) to study a particular mechanism, external finance, through which finance operates rather than simply assessing links between finance and growth and (2) to exploit within-country differences concerning industries.

RZ develop a new methodology to examine the finance-growth relationship. Consider their formulation.

$$Growth_{i,k} = \sum_j \alpha_j Country_j + \sum_l \beta_l Industry_l + \gamma Share_{i,k} + \delta(External_k * FD_i) + \varepsilon_{i,k}. \quad (4)$$

$Growth_{i,k}$ is the average annual growth rate of value added or the growth in the number of establishments, in industry k and country i, over the period 1980-90. *Country* and *Industry* are country and industry dummies, respectively. $Share_{i,k}$ is the share of industry k in manufacturing in country i in 1980. $External_k$ is the fraction of capital expenditures not financed with internal funds for U.S. firms in the industry k between 1980-90. FD_i is an indicator of financial development for country i. RZ interact the external dependence of an industry (*External*) with financial development (*FD*), where the estimated coefficient on the interaction, δ_1, is the focus of their analysis. Thus, if δ is significant and positive, then this implies that an increase in financial development (*FD_i*) will induce a bigger impact on industrial growth *(Growth_{i,k})* if this industry relies heavily on external finance (*External_k*) than if this industry is not a naturally heavy user of external finance. They do not include financial development independently because they focus on within-country, within-industry growth rates. The dummy variables for industries and countries correct for country and industry specific characteristics that might determine industry growth patterns. RZ thus isolate the effect that the interaction of external dependence and financial development/structure has on industry growth rates relative to country and industry means. By including the initial share of an industry, this controls for a convergence effect: industries with a large share might grow more slowly, suggesting a negative sign on γ. RZ include the share in manufacturing rather than the level to focus on within-country, within-industry growth rates.

RZ use data on 36 industries across 42 countries, though the U.S is dropped from the analyses since it is used to identify external dependence. To measure financial development, RZ examine (a) total capitalization, which equals the summation of stock market capitalization and domestic credit as a share of GDP and (b) accounting standards. As RZ discuss, there are problems with these measures. Stock market capitalization does not capture the actual amount of capital raised in equity markets. Indeed, some countries provide tax incentives for firms to list, which artificially boosts stock market capitalization without indicating greater external financing or stock market development. Also, as discussed above, stock market capitalization does not necessarily reflect how well the market facilitates exchange. The accounting standards indicator is a rating of the quality of the annual financial reports issued by companies within a country. The highest value is 90. RZ use the accounting standards measure as a positive signal of the ease with which firms can raise external funds, while noting that it is not a direct measure of the actual amount of external funds that are raised. Beck and Levine (2002) confirm the RZ findings using alternative measures of financial development.

As summarized in Table 6, RZ find that the coefficient estimate for the interaction between external dependence and total capitalization measure, External$_k$*Total Capitalization$_i$, is positive and statistically significant at the one-percent level. This implies that an increase in financial development disproportionately boosts the growth of industries that are naturally heavy users of external finance. [27]

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[27] Fisman and Love (2003b) critique the Rajan and Zingales (1998) methodology, arguing that it does not accurately test whether financial development boosts growth in externally dependent industries. They argue that the method simply tests whether financial intermediaries allow firms to respond to global shocks to growth opportunities, rather than the extent to which financial systems foster the growth of industries with an inherent financial dependence.

RZ note that the economic magnitude is quite substantial. Compare Machinery, which is an industry at the 75th percentile of dependence (0.45), with Beverages, which has low dependence (0.08) and is at the 25th percentile of dependence. Now, consider Italy, which has high total capitalization (0.98) at the 75th percentile of the sample, and the Philippines, which is at the 25th percentile of total capitalization with a value of 0.46. Due to differences in financial development, the coefficient estimates predict that Machinery should grow 1.3 percent faster than Beverages in Italy in comparison to the Philippines.[28] The actual difference is 3.4, so the estimated value of 1.3 is quite substantial. Thus, financial development has a substantial impact on industrial growth by influencing the availability of external finance. RZ conduct a large number of robustness checks and show that financial development influences industrial growth both through the expansion of existing establishments and through the formation of new establishments.[29]

Instead of examining the impact of banking sector development on the growth of externally dependent firms, recent work studies the impact of banking market structure and bank competition on industrial development. Cetorelli and Gambera (2001) examine the role played

[28] More specifically, let I indicate Italy, P indicate the Philippines, M indicate machinery, B indicate beverages, and g represent the growth of an industry in a country, then the differential growth rate of machinery and beverages in Italy from the difference in growth rate of machinery and beverages in the Philippines is as follows: [{g(I,M)} − {g(P,M}] − [{g(I,B)} − {g(P,B}]. Now, inserting estimates one obtains 1.3 =

[{0.069*0.45*0.98} − {0.069*0.45*0.46}] − [{0.069*0.08*0.98} − {0.069*0.08*0.46}].

[29] Beck (2002, 2003) extends the work by RZ to examine the linkages between financial development and international trade patterns. Beck (2002) develops a theoretical model in which higher levels of financial development provide countries with a comparative advantage in sectors with greater scale economies and presents econometric evidence consistent with this prediction. Using cross-industry and cross-country data on trade flows, Beck (2003) finds that countries with more developed financial systems tend to be net exporters in industries that are heavy users of external finance. The results of both papers are consistent with the view that financial development influences the structure of trade balances.

by banking sector concentration on firm access to capital. Using the RZ methodology, they show that bank concentration promotes the growth of industries that are naturally heavy users of external finance, but bank concentration has a depressing effect on overall economic growth. Claessens and Laeven (2004) disagree, however. They note that industrial organization theory indicates that market concentration is not necessarily a good proxy for the competitiveness of an industry. Consequently, they estimate an industrial organization-based measure of banking system competition. Claessens and Laeven (2004) then show that industries that are naturally heavy users of external finance grow faster in countries with more competitive banking systems. They find no evidence that banking industry concentration explains industrial sector growth. The results support the view that banking sector competition fosters the provision of growth enhancing financial services.

Building on RZ, Claessens and Laeven (2003) examine the joint impact of financial sector development and the quality of property rights protection on the access of firms to external finance and the allocation of resources. In particularly, they show that financial sector development hurts growth by hindering the access of firms to external finance and insecure property rights hurts growth by leading to a suboptimal allocation of resources by distorting firms into investing excessively in tangible assets. Thus, even when controlling for property rights protection, financial development continues to influence economic growth. This conclusion is different, however, from Johnson, McMillan, and Woodruff's (2002) study of post-communist countries. They find that property rights dominate access to external finance in explaining the degree to which firms reinvest their profits.

Extending the RZ approach, Beck, Demirguc-Kunt, Laeven, and Levine (2004) highlight another channel linking finance and growth: removing impediments to small firms. They

examine whether industries that are naturally composed of small firms grow faster in financially developed economies. More specifically, as in RZ, they assume that U.S. financial markets are relatively frictionless, so that the sizes of firms within industries in the U.S. reflect technological factors, not financial system frictions. Based on the U.S., they identify the benchmark average firm-size of each industry. Then, comparing across countries and industries, Beck et al (2004) show that industries that are naturally composed of smaller firms grow faster in countries with better-developed financial systems. This result is robust to controlling for the RZ measure of external dependence. These results are consistent with the view that small firms face greater informational and contracting barriers to raising funds than large firms, so that financial development is particularly important for the growth of industries that, for technological reasons, are naturally composed of small firms.

Using a different strategy, Wurgler (2000) also employs industry-level data to examine the relation between financial development and economic growth. Using industry-level data across 65 countries for the period 1963-1995, he computes an investment elasticity that gauges the extent to which a country increases investment in growing industries and decreases investment in declining ones. This is an important contribution because it directly measures the degree to which each country's financial system reallocates the flow of credit. Wurgler (2000) uses standard measures of financial development. He shows that countries with higher levels of financial development both increase investment more in growing industries and decrease investment more in declining industries than financial underdeveloped economies.

2. Firm level analyses of finance and growth

Demirguc-Kunt and Maksimovic (henceforth DM, 1998) examine whether financial development influences the degree to which firms are constrained from investing in profitable

growth opportunities. They focus on the use of long-term debt and external equity in funding firm growth. As in RZ, DM focuses on a particular mechanism through which finance influences growth: does greater financial development remove impediments to the exploitation of profitable growth opportunities. Rather than focusing on the external financing needs of an industry as in RZ, DM estimate the external financing needs of each individual firm in the sample.

DM note that simple correlations between firms' growth and financial development do not control for differences in the amount of external financing needed by firms in the same industry in different countries. These differences may arise because firms in different countries employ different technologies, because profit rates may differ across countries, or because investment opportunities and demand may differ. To control for these differences at the firm-level, DM calculate the rate at which each firm can grow using (1) only its internal funds and (2) only its internal funds and short-term borrowing. They then compute the percentage of firms that grow at rates that exceed each of these two estimated rates. This yields estimates of the proportion of firms in each economy relying on external financing to grow.

The firm-level data consist of accounting data for the largest publicly traded manufacturing firms in 26 countries. Beck, Demirguc-Kunt, Levine, and Maksimovic (2001) confirm the findings using an extended sample. DM estimate a firm's potential growth rate using the textbook "percentage of sales" financial planning model (Higgins 1974). This approach relates a firm's growth rate of sales to its need for investment funds, based on three simplifying assumptions. First, the ratio of assets used in production to sales is constant. Second, the firm's profits per unit of sales are constant. Finally, the economic deprecation rate equals the

accounting depreciation rate. Under these assumptions, the firm's financing need in period t of a

firm growing at g_t percent per year is given by

$$EFN_t = g_t * Assets_t - (1 - g_t) * Earnings_t * b_t \qquad (5)$$

where EFN_t is the external financing need and BT is the fraction of the firm's earnings that are

retained for reinvestment at time t. Earnings are calculated after interest and taxes. While the first

term on the right-hand side of equation (5) denotes the required investment for a firm growing at

g_t percent, the second term is the internally available funds for investment, taking the firms'

dividend payout as given.

The short-term financed growth rate $STFG_t$ is the maximum growth rate that can be

obtained if the firm reinvests all its earnings and obtains enough short-term external resources to

maintain the ratio of its short-term liabilities to assets. To compute $STFG_t$, we first replace total

assets in (5) by assets that are not financed by new short-term credit, calculated as total assets

times one minus the ratio of short-term liabilities to total assets. $STFG_t$ is then given by

$$SG_t = ROLTC_t / (1 - ROLTC_t) \qquad (6)$$

where $ROLTC_t$ is the ratio of earnings, after tax and interest, to long-term capital. The definition

of *STFG* thus assumes that the firm does not access any long-term borrowings or sales of equity

to finance its growth.[30]

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[30] The estimates of internally financed growth (*IFG*) and short-term financed growth (*STFG)* are
conservative. First, they assume that a firm utilizes the unconstrained sources of finance- trade
credit in the case IFG and trade credit and short-term borrowing in the case of STFG - no more
intensively than it is currently doing. Second, firms with spare capacities do not need to invest
and may grow at a faster rate than predicted without accessing external resources. Third, the
financial planning model abstracts from technical advances that reduce the requirements for
investment capital. Thus, it may overstate the costs of growth and underestimate the maximum
growth rate attainable using unconstrained sources of financing.

DM then calculate the proportion of firms whose growth rates exceed the estimate of the maximum growth rate that can be financed by relying only on internal and short-term financing, PROPORTION_FASTER.

To analyze whether financial development spurs firm growth, DM run the following cross-country regression

$$PROPORTION\_FASTER = \beta_1 FD_{i,t} + \beta_2 CV_{i,t,} + \varepsilon_{i,t} \tag{7}$$

where *FD* is financial development, *CV* is a set of control variables, and ε is the error term. To measure financial development, DM use (a) the ratio of market capitalization to GDP (Market Capitalization/GDP), (b) Turnover, which equals the total value of shares traded divided by market capitalization, and (c) Bank Assets/GDP, which equals the ratio of domestic assets of deposit banks divided by GDP. Thus, DM include all domestic assets of deposit banks, not just credit to the private sector. As control variables, DM experiment with different combinations of control variables, including economic growth, inflation, the average market to book value of firms in the economy, government subsidies to firms in the economy, the net fixed assets divided by total assets of firms in the economy, the level real per capita GDP, the law and order tradition of the economy.

As summarized in Table 7, DM (1998) find that both banking system development and stock market liquidity are positively associated with the excess growth of firms. Thus, in countries with high Turnover and high Bank Assets/GDP a larger proportion of firms is growing at a level that requires access to external sources of long-term capital, holding other things constant. Note, consistent with LZ, the size of the domestic stock markets is not related to the excess growth of firms. After conducting a wide-array of robustness checks, DM conclude that the proportion of firms that grow at rates exceeding the rate at which each firm can grow with

only retained earnings and short-term borrowing is positively associated with stock market liquidity and banking system size.

Love (2003) and Beck, Demirguc-Kunt, and Maksimovic (2005) also use firm level data to examine whether financial development eases financing constraints, though they do not explicitly examine aggregate economic growth. Love finds that the sensitivity of investment to internal funds is greater in countries with more poorly developed financial system. Greater financial development reduces the link between the availability of internal funds and investment. Thus, the paper is consistent with the findings of DM and RZ. The paper also shows that financial development is particularly effective at easing the constraints of small firms. Beck, Demirguc-Kunt, and Maksimovic (2005) use a different dataset and methodology to investigate the effect of financial development on easing the obstacles that firms face to growing faster. They show that financial development weakens the impact of various barriers to firm growth and that small firms benefit the most from financial development.[31] In sum and consistent with the industry-level work by Beck, Demirguc-Kunt, Laeven, and Levine (2004), these firm-level studies indicate that financial development removes impediments to firm expansion and exerts a particularly beneficial impact on small firms.

Dyck and Zingales (2003) provide additional firm-level evidence on the mechanisms through which financial development influences growth by examining whether financial development influences the private benefits of controlling a firm. If there are large private benefits of control, this implies that insiders can exploit their positions and help themselves at the expense of the firm. The resultant loss of corporate efficiency could have aggregate growth effects. Dyck and Zingales (2003) estimate the value of control in 393 control transactions

across 39 countries over the period 1990-2000. They find that the benefits of control are greater in countries with poorly-developed financial systems. While not linked with aggregate growth, this suggests that financial development improves the corporate governance of firms.[32]

III.D. Are bank- or market based systems better? Evidence

As noted earlier, Goldsmith (1969) asked whether (1) financial development influences economic growth and whether (2) financial structure – the mix of financial markets and intermediaries operating in an economy -- affects economic growth. As we have seen, a growing body of evidence using very different methodologies and datasets find that financial development exerts a first-order impact on economic growth. We now turn to the empirical analysis of financial structure: Does having a bank-based or market-based financial system matter for economic growth?

Much of the empirical work on financial structure over the last century involves studies of Germany and Japan as bank-based systems and the United States and the United Kingdom as market-based systems.[33] As summarized by Allen and Gale (2000), Demirguc-Kunt and Levine (2001a), and Stulz (2001), this research has produced illuminating insights into the functioning of *these* financial systems. Nonetheless, it is difficult to draw broad conclusions about the long-run growth effects of bank-based and market-based financial systems based on only four

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[31] Kumar, Rajan, and Zingales (2001) show that financial development is associated with larger firms, suggesting that low levels of financial development constraint firm growth.

[32] Dyck and Zingales (2003) also find that non-standard institutions are very important, such as the effectiveness of the media. Dyck and Zingales (2002) go on to further stress the role of the media in influencing corporate managers. This work extends our conception of the institutions involved in exerting corporate control over firms.

[33] See Goldsmith (1969), Hoshi, Kashyap, and Scharfstein (1990), Allen and Gale (1995), Levine (1997), Mork and Nakkamura (1999), Weinstein and Yafeh (1998) and Wenger and Kaserer (1998).

countries, especially four countries that have very similar long-run growth rates. Indeed, given the similarity of their long-run growth rates, many observers may conclude that differences in financial structure obviously did not matter much. Broadening the analysis to a wider array of national experiences is important for garnering greater information on the bank-based versus market-based debate.

Recently, empirical research has expanded the study of financial structure to a much broader set of countries. Beck, Demirguc-Kunt, and Levine (2001) construct a large cross-country, time-series database on the mixture of financial markets and intermediaries across 150 countries for the period 1960-1995, data permitting. Demirguc-Kunt and Levine (2001b) classify countries according to the degree to which they are bank-based or market-based. They also examine the evolution of financial structure across time and countries. They find that banks, nonbank financial intermediaries (insurance companies, pension funds, finance companies, mutual funds, etc.) and stock markets are larger, more active, and more efficient in richer countries and these components of the financial system grow as countries become richer over time. Also, as countries become richer, stock markets become more active and efficient relative to banks. There is a tendency, not without exceptions, for national financial systems to become more market-based as they become richer. Demirguc-Kunt and Levine (2001b) also show that countries with better functioning legal systems and institutions tend to have more market-based financial systems, a point also emphasized by Ergungor (2004).

Turning to economic growth, an expanding body of empirical work uses these newly developed measures of financial structure and assortment of econometric methodologies to study the impact of financial structure and growth. This work employs the same methodologies used in the financial development and growth literature: (1) cross-country regressions, including

instrumental variables regressions, (2) industry-level studies, and (3) firm-level investigations. Since I have already reviewed these methodologies, this subsection succinctly discusses the findings on financial structure and growth.

Using very different econometric methodologies, the literature finds, albeit with exceptions, astonishingly consistent results.

First, in a cross-country context, there is no general rule that bank-based or market-based financial systems are better at fostering growth. Levine (2002) finds that after controlling for the overall level of financial development, information on financial structure does not help in explaining cross-country differences in financial development. These results hold when using instrumental variables to control for simultaneity bias. This research also assesses whether bank-based systems are better at promoting growth in poor countries or countries with poor legal systems or otherwise weak institutions. Allowing for these possibilities, however, did not alter the conclusion: after controlling for overall financial development, cross-country comparisons do not suggest that distinguishing between bank-based and market-based financial systems is a first-order concern in understanding the process of economic growth. Tadesse (2002), however, argues that while market-based systems outperform bank-based systems among countries with developed financial sectors, bank-based systems are far better among countries with underdeveloped financial sectors.

Second, using industry-level data, research finds that financially-dependent industries do not expand at higher rates in bank-based or market-based financial systems. Beck and Levine (2002) confirm that greater financial development accelerates the growth of financially dependent industries. Financial structure per se, however, does not help explain the differential growth rates of financially-dependent industries across countries.

Third, firms' access to external finance is not easier, and firms do not grow faster in either market-based or bank-based financial systems. Demirguc-Kunt and Maksimovic (2002) extend their earlier study and show that overall financial development helps explain the excess growth of firms across countries, i.e., the proportion of firms that grow at rates exceeding the rate at which each firm can grow with only retained earnings and short-term borrowing is positively associated with overall financial development. However, the degree to which countries are bank-based or market-based does not help explain excess growth.

I want to make two cautionary remarks about this research. First, these studies do not necessarily imply that institutional structure is unimportant for growth. Rather, the results may imply that there is not one optimal institutional structure for providing growth-enhancing financial functions to the economy (Merton and Bodie, 2004). While the emergence of financial systems that ameliorate information, contracting, and transactions costs may be crucial for accelerating economic growth, the growth-maximizing mixture of markets and intermediaries may depend on legal, regulatory, political, and other factors that have not been adequately incorporated into current theoretical or empirical research. Second, recent research on financial structure and growth use aggregate, cross-country indicators of the degree to which countries are bank-based or market-based. These indicators may not sufficiently capture the comparative roles of banks and markets. They may not be sufficiently country-specific to gauge accurately national financial structure. Thus, the conclusion from these studies that financial structure is not a particularly useful indicator of the degree to which a financial system promotes growth must be viewed cautiously (Demirguc-Kunt and Levine, 2001a).

Finally, Carlin and Mayer (2003) extend the recent work on financial structure and economic growth by examining the relationship between the structure of the financial system and

types of activities conducted in different countries. They find a positive association between information disclosure (as measured by the effectiveness of the accounting system), the fragmentation of the banking system (as measured by low bank concentration), and the growth of equity-financed and skill-intensive industries. This is consistent with models by Allen and Gale (2000) and Boyd and Smith (1998) that emphasize that high technology firms require financial systems that allow for diverse views, such as equity markets rather than banks which provided more standardized monitoring. This result is also consistent with models by Dewatripont and Maskin (1995) that focus on renegotiations, where fragmented banking systems tend to impose short-term, tighter budget constraints. This may be more appropriate for new, higher-risk firms where the threat of bankruptcy must be credibly imposed. In contrast, concentrated banks with long-run relationships with firms can more easily renegotiate constructs and will have a correspondingly more difficult time credibly committing to not renegotiate. Thus, concentrated banks will tend to be associated with more mature, less risky firms. While not directly linked to aggregate economic growth, this sector-based work improves our understanding of the relationship between financial structure and the types of activities occurring in different economies.

III.E. Finance, Income Distribution, and Poverty Alleviation: Evidence

I conclude the review of empirical work on finance and growth by discussing some very recent research on whether financial development influences income distribution and poverty. As discussed above, theory offers conflicting predictions about the nature of the interactions between finance, income distribution, and poverty.

In cross-country regressions, Beck, Demirguc-Kunt, and Levine (2004) examine whether the level of financial intermediary development influences (i) the growth rate of Gini coefficients

of income inequality, (ii) the growth rate of the income of the poorest quintile of society, and (iii) the fraction of the population living in poverty. The results indicate that finance exerts a disproportionately large, positive impact on the poor and hence reduces income inequality. Even when controlling for the growth rate of real per capita GDP, the data indicate that (i) Gini coefficients fall more rapidly in countries with higher levels of financial intermediary development, (ii) the income of the poorest quintile grows faster than the national average with better-developed financial intermediaries, and (iii) the percentage of the population living on less than one or two dollars per day falls more rapidly in economies that have higher levels of financial development. These results hold when using instrumental variables to control for the endogenous determination of financial development and changes in income distribution and poverty alleviation. The findings lend cautious support to the view that financial development disproportionately boosts the income of the poor and reduces income inequality.[34] At the same time, the extensive battery of methodological weaknesses associated with cross-country regression reviewed above can certainly be levied against these initial findings on finance, income distribution, and poverty. Consequently, applying diverse econometric techniques and datasets to bear on the question of whether financial development influences income distribution and poverty is likely to be an active area of research.

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[34] See Clarke, Xu, and Zou (2003), who study the cross-country relationship between financial intermediary development and the level of the Gini coefficient, rather than the relationship between financial intermediary development the growth rate of the Gini coefficient.

IV. Conclusions

This paper reviewed theoretical and empirical work on the relationship between financial development and economic growth. Theory illuminates many of the channels through which the emergence of financial instruments, markets and institutions affect -- and are affected by -- economic development. A growing body of empirical analyses, including firm-level studies, industry-level studies, individual country-studies, time-series studies, panel-investigations, and broad cross-country comparisons, demonstrate a strong positive link between the functioning of the financial system and long-run economic growth. While subject to ample qualifications and countervailing views noted throughout this article, the preponderance of evidence suggests that both financial intermediaries and markets matter for growth even when controlling for potential simultaneity bias. Furthermore, microeconomic-based evidence is consistent with the view that better developed financial systems ease external financing constraints facing firms, which illuminates one mechanism through which financial development influences economic growth. Theory and empirical evidence make it difficult to conclude that the financial system merely -- and automatically -- responds to economic activity, or that financial development is an inconsequential addendum to the process of economic growth.

In the remainder of this Conclusion, I discuss broad areas needing additional research. In terms of theory, Section II raised several issues associated with modeling finance and growth. Here I simply make one broad observation. Our understanding of finance and growth will be substantively advanced by the further modeling of the dynamic interactions between the evolution of the financial system and economic growth (Smith, 2002). Existing work suggests that it is not just finance following industry. But, neither is there any reason to believe that it is just industry following finance. Thus, we need additional thought on the co-evolution of finance

and growth. Technology innovation, for instance, may only foster growth in the presence of a financial system that can evolve effectively to help the economy exploit these new technologies. Furthermore, technological innovation itself may substantively affect the operation of financial systems by, for example, transforming the acquisition, processing, and dissemination of information. Moreover, the financial system may provide different services at different stages of economic development, so that the financial system needs to evolve if growth is to continue. These are mere conjectures and ruminations that I hope foster more careful thinking.

In terms of empirical work, this paper continuously emphasized that all methods have their problems but that one problem plaguing the entire study of finance and growth pertains to the proxies for financial development. Theory suggests that financial systems influence growth by easing information and transactions costs and thereby improving the acquisition of information about firms, corporate governance, risk management, resource mobilization, and financial exchanges. Too frequently empirical measures of financial development do not directly measure these financial functions. While a growing number of country-specific studies develop financial development indicators more closely tied to theory, more work is needed on improving cross-country indicators of financial development.

Much more research needs to be conducted on the determinants of financial development. To the extent that financial systems exert a first-order impact on economic growth, we need a fuller understanding of what determines financial development. There are at least two levels of analysis. There is a growing body of research that examines the direct laws, regulations, and macroeconomic policies shaping financial sector operations. There is a second research agenda that studies the political, cultural, and even geographic context shaping financial development.

Some research examines how legal systems, regulations, and macroeconomic policies influence finance. LLSV (1997, 1998) show that laws and enforcement mechanisms that protect the rights of outside investors tend to foster financial development. Beck, Demirgüç-Kunt, and Levine (2003b, 2004b) show that legal system adaptability is crucial. The financial needs of the economy are continuously changing, so that more flexible legal systems do a better job at promoting financial development than more rigid systems. Barth, Caprio, and Levine (2004, 2005) and La Porta, Lopez-de-Silanes, and Shleifer (2005) show that regulations and supervisory practices that force accurate information disclosure and promote private sector monitoring, but do not grant regulators excessive power, boost the overall level of banking sector and stock market development.[35] Monetary and fiscal policies may also affect the taxation of financial intermediaries and the provision of financial services (Bencivenga and Smith, 1992; Huybens and Smith, 1999; Roubini and Sala-i-Martin, 1992, 1995). Indeed, Boyd, Levine, and Smith (2001) show that inflation has a large – albeit non-linear – impact on both stock market and bank development.

At a more primitive level, some research studies the forces shaping the laws, regulations, and institutions underlying financial development. LLSV (1998) stress that historically-determined differences in legal tradition shape the laws governing financial transactions. Haber (2004b), Haber, Maurer, and Razo (2003), Pagano and Volpin (2001), Roe (1994), and Rajan and Zingales (2003a) focus on how political economy forces shape national policies toward

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[35] Beck, Demirguc-Kunt, and Levine (2003c) go on to show that bank supervisory practices that force accurate information disclosure ease external financing constraints facing firms, while countries that grant substantial power to government controlled regulators actually make external financing constraints more severe by increasing the degree of corruption in bank lending. Caprio, Laeven, and Levine (2003) show that legal protection of shareholders is more effective at boosting the valuation of banks than strong official bank regulation and supervision. Bodenhorn

financial development. Guiso, Sapienza, and Zingales (2004) examine the role of social capital in shaping financial systems, while Stulz and Williamson (2003) stress the role of religion in influencing national approaches to financial development. Finally, some scholars emphasize the impact of geographical endowments on the formation of long-lasting institutions that form the foundations of financial systems (Engerman and Sokoloff, 1997, 2002; Acemoglu, Johnson, and Robinson, 2001; Beck, Demirguc-Kunt, and Levine, 2003a; Easterly and Levine 2003). This broad spectrum of work suggests that political, legal, cultural, and even geographical factors influence the financial system and that much more work is required to better understand the role of financial factors in the process of economic growth.

(2002) examines the influences of political forces, fiscal demands, and regulations on the development of banking sectors in individual states of the United States.

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Table 1: Growth and Financial Intermediary Development, 1960-89

Dependent Variable	Depth	Bank	Privy
Real per Capita GDP Growth	2.4**	3.2**	3.2**
	(0.007)	(0.005)	(0.002)
R^2	0.50	0.50	0.52
Real per Capita Capital Growth	2.2**	2.2**	2.5**
	(0.006)	(0.008)	(0.007)
R^2	0.65	0.62	0.64
Productivity Growth	1.8**	2.6**	2.5**
	(0.026)	(0.010)	(0.006)
R^2	0.42	0.43	0.44

Source: King and Levine (1993b), Table VII
* significant at the 0.10 level, ** significant at the 0.05 level
(p-values in parentheses)
Observations: 77

Variable definitions:
DEPTH = Liquid Liabilities/GDP
BANK = Deposit bank domestic credit/[deposit bank domestic credit + central bank domestic credit
PRIVY = Gross claims on the private sector / GDP
Productivity Growth = Real per capita GDP growth - (0.3)*(Real per capita Capital growth)

Other explanatory variables included in each of the nine regression results reported above:

logarithm of initial income, logarithm of initial secondary school enrollment, ratio of government consumption expenditures to GDP, inflation rate, and ratio of exports plus imports to GDP.

Notes: King and Levine (1993b) define 2 percent growth as 0.02. For comparability with subsequent tables, we have redefined 2 percent growth as 2.00 and adjusted the coefficients by a factor of 100.

Table 2: Growth and Initial Financial Depth, 1960-89

Dependent Variable	Depth in 1960
Real per Capita GDP Growth, 1960-89	2.8**
	(0.001)
R^2	0.61
Real per Capita Capital Growth, 1960-89	1.9**
	(0.001)
R^2	0.63
Productivity Growth, 1960-89	2.2**
	(0.001)
R^2	0.58

Sources: King and Levine (1993b), Table VIII; and Levine (1997), Table 3
* significant at the 0.10 level, ** significant at the 0.05 level
(p-values in parentheses). Observations: 57
Variable definitions:
DEPTH = Liquid Liabilities/GDP
Productivity Growth = Real per capita GDP growth - (0.3)*(Real per capita Capital growth)
Other explanatory variables included in each of the regression results reported above:

logarithm of initial income, logarithm of initial secondary school enrollment, ratio of government consumption expenditures to GDP, inflation rate, and ratio of exports plus imports to GDP.

Notes: King and Levine (1993b) and Levine (1997) define 2 percent growth as 0.02. For comparability with subsequent tables, we have redefined 2 percent growth as 2.00 and adjusted the coefficients by a factor of 100.

Table 3: Stock Market and Bank Development Predict Growth, 1976-1993

Dependent Variable (1976-93)	Independent Variables (1976)		
	Bank Credit	Turnover	R^2
Real per Capita GDP Growth	1.31** (0.022)	2.69** (0.005)	0.50
Real per Capita Capital Growth	1.48** (0.025)	2.22** (0.024)	0.51
Productivity Growth	1.11** (0.020)	2.01** (0.029)	0.40

Source: Levine and Zervos (1998), Table 3.
* significant at the 0.10 level, ** significant at the 0.05 level. (p-values in parentheses)
Observations: 42 for the real per capita GDP growth regression and 41 for the others.
Variable definitions:

Bank Credit = Bank credit to the private sector / GDP in 1976 or the closest date with data.

Turnover = Value of the trades of domestic shares on domestic exchanges as a share of market capitalization of domestic shares in 1976 or the closest date with data.

Productivity Growth = Real per capita GDP growth - (0.3)*(Real per capita Capital growth)

Other explanatory variables included in each of regression results reported above:

logarithm of initial income, logarithm of initial secondary school enrollment, ratio of government consumption expenditures to GDP, inflation rate, black market exchange rate premium, and frequency of revolutions and coups.

Notes: Levine and Zervos define 2 percent growth as 0.02. For comparability with subsequent tables, we have redefined 2 percent growth as 2.00 and adjusted the coefficients by a factor of 100.

Table 4: Growth, Productivity Growth, and Capital Accumulation, Panel GMM and OLS, 1960-1995

1. Dependent Variable: Real per Capita GDP Growth

Estimation Procedure	Private Credit	Countries	Obs.	OIR-test[1]	Sargan test[2] (p-value)	Serial correlation test[3] (p-value)
IV-Cross-Country	2.22** (0.003)	63	63	0.577		
GMM-Panel	2.40** (0.001)	77	365		0.183	0.516

2. Dependent Variable: Productivity Growth

Estimation Procedure	Private Credit	Countries	Obs.	OIR-test[1]	Sargan test[2] (p-value)	Serial correlation test[3] (p-value)
IV-Cross-Country	1.50** (0.004)	63	63	2.036		
GMM-Panel	1.33** (0.001)	77	365		0.205	0.772

3. Dependent Variable: Capital per Capita Growth

Estimation Procedure	Private Credit	Countries	Obs.	OIR-test[1]	Sargan test[2] (p-value)	Serial correlation test[3] (p-value)
IV-Cross-Country	2.83** (0.006)	63	63	6.750		
GMM-Panel	3.44** (0.001)	77	365		0.166	0.014

Source: Beck, Levine, and Loayza (2000)

[1] The null hypothesis is that the instruments used are not correlated with the residuals from the respective regression

  Critical values for OIR-Test (2 d.f.): 10%= 4.61; 5%= 5.99

[2] The null hypothesis is that the instruments used are not correlated with the residuals from the respective regression

[3] The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation

* significant at the 0.10 level, ** significant at the 0.05 level (p-values in parentheses)

IV-Cross-Country: Cross-country instrumental variables with legal origin as instruments, estimated using GMM

GMM-Panel: Dynamic panel (5-year averages) generalized method of moments using system estimator

Other explanatory variables: logarithm of initial income per capita, average years of schooling

PRIVATE CREDIT: Logarithm (credit by deposit money banks and other financial institutions to the private sector divided by GDP.)

Table 5: Stock Markets, Banks, and Growth: Panel GMM and OLS, 1975-1998

Dependent Variable: Real per Capita GDP Growth

Estimation Procedure	Bank Credit	Turnover	Countries	Obs.	Sargan test[1] (p-value)	Serial correlation test[2] (p-value)
OLS-Cross-Country	1.47** (0.001)	0.79** (0.025)	40			
GMM-Panel	1.76** (0.001)	0.96** (0.001)	40	146	0.488	0.60

Source: Beck and Levine (2004), Tables 2 and 3
* significant at the 0.10 level, ** significant at the 0.05 level. (p-values in parentheses)
OLS: Ordinary Least Squares with heteroskedasticity consistent standard errors.
GMM: Dynamic panel Generalized Method of Moments using system estimator.

[1] The null hypothesis is that the instruments used are not correlated with the residuals.

[2] The null hypothesis is that the errors in the first-difference regression exhibit
    no second-order serial correlation.

Bank Credit = logarithm (credit by deposit money banks to the private sector as a share of GDP.)

Turnover = logarithm (Value of the trades of domestic shares on domestic exchanges as a share of market capitalization of domestic shares)

Other explanatory variables included in each of the regression results reported above:

logarithm of initial income and logarithm of initial secondary school enrollment.

Table 6: Industry Growth and Financial Development

| Dependent Variable: | Growth of value added of industry k in country i, 1980-1990 | | | |

Share $_{i,k}$ of industry k in country i in 1980	External$_k$ * Total Capitalization$_i$	External$_k$ * Accounting Standards$_i$	R^2	Observations
-0.912 (0.246)	0.069 (0.023)		0.29	1217
-0.643 (0.204)		0.155 (0.034)	0.35	1067

Notes:

Source: Rajan and Zingales (1998), Table 4.

The table above reports the results from the regression:

$$Growth_{i,k} = \sum_j \alpha_j Country_j + \sum_l \beta_l Industry_l + \gamma Share_{i,k} + \delta_1(External_k * FD_i) + \varepsilon_{i,k}$$

Two regressions are reported corresponding to two values of FD$_i$, Total Capitalization and Account Standards respectively.

(Heteroskedasticity robust standard errors are reported in parentheses.)

External$_k$ is the fraction of capital expenditures not financed with internal funds for U.S. firms in industry k between 1980-90.

Total Capitalization is stock market capitalization plus domestic credit.

Accounting Standards is an index of the quality of corporate financial reports.

Table 7: Excess Growth of Firms and External Financing

Dependent Variable: Proportion of firms that grow faster than their predicted growth rate[1]

Market Capitalization/GDP	Turnover	Bank Assets/GDP	Adj. R^2	Countries
-0.106	0.311***	0.162***	0.48	26
(0.058)	(0.072)	(0.050)		

Notes:
Source: Demirguc-Kunt and Maksimovic (1998), Table V
(White's heteroskedasticity consistent standard errors in parentheses)
*** indicates statistical significance at the 1 percent level.

1. The proportion of firms whose growth rates exceed the estimate of the maximum growth rate
that can be financed by relying only on internal and short-term financing.
Market Capitalization/GDP: The value of domestic equities listed on domestic exchanges as a share of GDP.
Turnover: The total value of trades of domestic shares on domestic exchanges as a share of market capitalization.

Other regressors: rate of inflation, the law and order tradition of the economy, i.e., the extent to which citizens utilize existing legal system to mediate disputes and enforce contracts, growth rate of real GDP per capita, real GDP per capita, government subsidies to private industries and public enterprises as a share of GDP, and net fixes assets divided by total assets.

Time period: The dependent variable is averaged over the 1986-1991 period. All regressors are averaged over the 1980-1985 period, data permitting.