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Finance, Growth, and Inequality

Ross Levine

***IMF Working Papers* describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Strategy, Policy and Review Department

**Finance, Growth, and Inequality**

**Prepared by Ross Levine<sup>1</sup>**

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**Abstract**

Finance and growth emerged as a distinct field of economics during the last three decades as economists integrated the fields of finance and economic growth and then explored the ramifications of the functioning of financial systems on economic growth, income distribution, and poverty. In this paper, I review theoretical and empirical research on the connections between the operation of the financial system and economic growth and inequality. While subject to ample qualifications, the preponderance of evidence suggests that (1) financial development—both the development of banks and stock markets—spurs economic growth and (2) better functioning financial systems foster growth primarily by improving resource allocation and technological change, not by increasing saving rates. Some research also suggests that financial development expands economic opportunities and tightens income distribution, primarily by boosting the incomes of the poor. This work implies that financial development fosters growth by expanding opportunities. Finally, and more tentatively, financial innovation—improvements in the ability of financial systems to ameliorate information and transaction costs—may be necessary for sustaining growth.

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## I. INTRODUCTION

Finance and growth emerged as a distinct field of economics over the last three decades. Although Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), and especially Goldsmith (1969) emphasized the importance of the financial system for economic development, economic development and finance remained largely separate fields of inquiry until the 1990s. For example, Levine (1997, 2005) notes that textbooks on economic development written at the end of the 1980s did not seriously examine—and often did not even mention—the role of finance in economic development. In turn, financial economics was largely unconcerned with the impact of financial contracts, markets, and intermediaries on long-run economic growth, technological innovation, poverty alleviation, and income distribution.

Starting around 1990, the finance and growth literature took off as researchers merged two bodies of research. The endogenous growth models of Romer (1986, 1990), Lucas (1988), and Aghion and Howitt (1992) provided analytical frameworks for investigating the potential determinants of economic growth. Models from financial economics dissected how market frictions motivated the emergence of financial contracts, markets, and intermediaries that in turn influenced managerial incentives, the operation of firms, and the allocation of resources, e.g., Jensen and Meckling (1976), Townsend (1979), Stiglitz and Weiss (1981), Fama and Jensen (1983a,b), Myers and Majluf (1984), Ramakrishnan and Thakor (1984), Boyd and Prescott (1986), and Grossman and Hart (1986). In the 1990s, researchers began integrating financial frictions into endogenous growth models and exploring how differences in the functioning of financial systems shape economic growth, e.g., Greenwood and Jovanovic (1990), Bencivenga and Smith (1991),

Levine (1991), and King and Levine (1993a). Since then, the theoretical literature on finance and growth has developed rapidly.

Empirical research on the relationship between finance and growth also exploded. Early examples include King and Levine (1993a, 1993b), Jayaratne and Strahan (1996), Demirgüç-Kunt and Maksimovic (1998), Levine and Zervos (1998), and Rajan and Zingales (1998). Building on this early work, researchers have employed numerous empirical methodologies, datasets, and historical studies to draw more confident inferences about and sharper insights into the finance–growth nexus. This work has expanded to study the linkages between finance and technological innovation, poverty alleviation, and income distribution.

This paper reviews the finance and growth literature, where I include research on the connections between finance and inequality under this rubric. I use the framework that I developed in Levine (1997) because I continue to use it when choosing my own research topics and interpreting the findings of others. This framework focuses on what financial systems do, not on the size of any single financial sector component. Specifically, financial contracts, markets, and institutions arise in response to market frictions, such as the various costs associated with acquiring information, enforcing contracts, and conducting transactions. Different types and combinations of information, enforcement, and transaction costs in conjunction with different legal, regulatory, and tax systems shape the existence, structure, and operation of financial instruments, markets, and intermediaries. In emerging to ease market frictions, financial systems provide five financial functions to economies. They (1) screen investments and choose where to allocate resources—and hence economic opportunities, (2) exert corporate governance over the resources that they provide to firms and individuals, (3) provide mechanisms to trade, diversify, and manage risk, (4) mobilize

savings, and (5) facilitate exchange. Therefore, I define financial development in terms of how well financial systems ameliorate – though do not necessarily eliminate – the effects of information, enforcement, and transaction costs on resource allocation. That is, financial development refers to the financial system’s ability to screen investments, exert governance, ease risk management, mobilize resources, and facilitate exchange.

I organize the review as follows. Section II describes theories of finance and growth. The models show how financial instruments, markets, and institutions arise to mitigate the effects of information and transaction costs. In turn, the emergent financial systems shape the incentives, constraints, and opportunities facing individuals and firms. In this way, financial systems influence saving rates, investment decisions, technological innovation, and long-run growth rates. Theories of finance and growth provide the conceptual foundations for empirical examinations of the connections between the functioning of financial systems and economic growth. These theories provide testable predictions about the impact of the functioning of financial systems on growth. The theories also give conceptual shape and substance to the term “financial development,” which should guide econometricians in constructing empirical proxies of financial development.

Section III critiques the burgeoning empirical literature on finance and growth. This work includes broad cross-country growth regressions, time-series analyses, the use of panel techniques, detailed country studies, and industry- and firm-level examinations of the mechanisms linking finance and growth. There are, of course, material shortcomings with each of the particular statistical methodologies used to study the relationship between the functioning of financial systems and economic growth. One common defect, regardless of statistical methodology, is how researchers measure “financial development.” Too often, we

do not accurately measure the concepts that emerge from our theories. These models emphasize the services that financial systems provide to the economy, screening investments, exerting governance, easing risk management, mobilizing resources, and facilitating exchange. Too often, researchers use a measure of the size of one component of the financial system, such as the size of the banking system. Given these shortcomings, I assert that the literature does not yet provide a definitive answer to the questions: Does finance cause growth, and if it does, how?

That said, and without ignoring the weaknesses of existing work and the absence of complete unanimity of results, three tentative conclusions emerge. The bulk of existing research suggests that (1) economies with better functioning banks and stock markets grow faster, and simultaneity bias does not seem to drive this conclusion, (2) better functioning financial systems foster growth by improving resource allocation and technological change, not by increasing savings rates, and (3) better functioning financial systems (a) ease the external financing constraints that impede firm and industrial expansion by improving screening and governance and (b) enhance the management of liquidity risks. These findings suggest a particular link between these financial functions—screening, governance, liquidity creation—and economic growth.

Section IV discusses the literature on the functioning of the financial system, poverty alleviation, and income distribution. Financial development may affect how a person's economic opportunities are determined by individual skill and initiative or by parental wealth, social status, and political connections. The financial system influences who can start a business and who cannot, who can pay for education and who cannot, who can attempt to realize one's economic aspirations and who cannot. Thus, finance can shape the gap between



the rich and the poor and the persistence of that gap across generations. Furthermore, by affecting capital allocation, finance can alter both the economic growth rate and the demand for labor, with potentially profound implications on poverty and income distribution.

Economic theory provides conflicting predictions about the finance-inequality nexus. For instance, financial development might increase the availability of financial services to individuals who had not previously had access to those services because of price or other impediments. Thus, financial development might expand the economic opportunities of disadvantaged groups and reduce the intergenerational persistence of relative incomes. Finance can also enhance the financial services of those already accessing the financial system, which is frequently high-income individuals and well-established firms. In this case, financial development could disproportionately help the rich, widening inequality and perpetuating cross-dynasty differences in economic opportunity. The theory also indicates that finance can affect inequality through indirect mechanisms. Changes in the financial system can influence aggregate production and the allocation of credit, each of which may alter the demand for low- and high-skilled workers with concomitant ramifications on income distribution. For example, improvements in finance that boost the demand for low-skilled workers will tend to tighten income distribution, expanding and equalizing economic opportunities.

A growing body of research empirically evaluates the growth-inequality relationship. Subject to many caveats, the emerging bulk of empirical research points tentatively toward the conclusion that improvements in financial contracts, markets, and intermediaries expand economic opportunities, reduce persistent inequality, and tighten income distribution. This work also suggests that financial development fosters growth by expanding opportunities. By

expanding opportunities and improving the efficient allocation of resources, financial development accelerates growth and reduces inequalities. For example, access to credit markets increases parental investment in the education of their children. Credit access also reduces the degree to which adverse shocks to family income induce families to pull children out of schooling and place them into labor market activities. In this way, financial development not only expands opportunities it fosters a more efficient allocation of resources. Moreover, a growing body of evidence suggests that better functioning financial systems stimulate the formation of new firms and the growth of small firms by expanding access to finance. Research also shows that financial development spurs the dynamism of labor markets. This dynamism means that workers search for work in an environment where many firms compete for their services. Furthermore, financial development can increase the relative demand for low-skilled workers, reducing income inequality and poverty. Much more work is needed on these issues, however. I believe that economists underappreciate the potentially enormous impact of the financial sector—and hence the potential impact of financial sector policies—on the distribution of economic opportunities, inequality, and poverty.

Section V explores the connections between financial innovation and long-run economic growth. Most theoretical models and empirical studies examine the relationship between economic growth and the level of financial development: the degree to which financial systems ameliorate information and transactions costs and enhance the screening and funding of firms and individuals, the governance over the use of those funds, the trading and management of risk, the mobilization of savings, and the exchange of goods, services, and financial claims. This research largely ignores financial innovation: the emergence of

new—and the improvement of existing—financial instruments, markets, and intermediaries. Given the role of novel financial instruments in the global financial crisis and the potentially destabilizing effects of financial innovation, many regulators, researchers, and individuals view financial innovation skeptically. However, an excessive focus on the potential fragilities created by some financial innovations may lead to a correspondingly narrow perspective on the role of financial innovation in economic growth.

For example, theory suggests that financial innovation might be necessary for sustained long-run growth. The very nature of economic growth involves greater specialization and technological complexity. Thus, economic growth may make the “old” financial system less effective at screening and monitoring the new, more complex technologies and providing mechanisms for trading and managing emergent risk. Without commensurate financial innovations, financial systems may become increasingly less effective at identifying, financing, and governing growth-inducing endeavors and increasingly less effective at providing the risk management instruments that foster efficient resource allocation. From this perspective, an absence of financial innovation will lead to slower growth; that is, financial innovation is necessary to maintain the same growth rate. Indeed, a recent report by the International Monetary Fund / World Bank (2019) explains how the creation of new financial technologies may foster inclusive growth that reduces inequality. Researchers need to explore the connections among financial innovation, stability, long-run growth, and income distribution in greater depth.

## II. THEORIES OF FINANCE AND GROWTH

An extensive body of research explores how the costs of acquiring information, enforcing contracts, and conducting transactions explain the emergence of financial instruments, markets, and intermediaries. Different types and combinations of information, enforcement, and transaction costs in conjunction with different legal, regulatory, and tax systems shape the form and operation of financial instruments, markets, and intermediaries. Financial development occurs when financial instruments, markets, and intermediaries ameliorate the effects of information, enforcement, and transaction costs on resource allocation. Financial systems naturally influence resource allocation by addressing such market frictions with potentially large ramifications on economic growth.

Financial systems provide five critical services to the economy in emerging to ease market frictions. In particular, they (1) produce information about possible investments and choose where to allocate capital—and hence economic opportunities, (2) monitor investments and exert corporate governance after providing capital to firms and individuals, (3) provide mechanisms to trade, diversify, and manage risk, (4) mobilize and pool savings from disparate savers, and (5) ease the exchange of goods and services. 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. The remainder of this section describes how (a) market frictions motivate the emergence of financial systems that provide these five broad categories of financial functions and (b) the provision of these functions may influence resource allocation and economic growth.

### **A. Producing Information and Allocating Capital**

In 1912, Joseph Schumpeter argued that, “[T]he banker, therefore, is not so much primarily a middleman ... He authorizes people in the name of society ... to [innovate].” (Schumpeter 1912, p 74) Schumpeter was stressing that one of the key functions of the financial system is deciding which firms and individuals get to use society’s savings. In the terminology of modern finance theory, there are large costs associated with evaluating firms, managers, and market conditions and then allocating scarce resources to the most promising ones. Individual savers may not have the ability to effectively 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. While many economic models assume that capital flows toward its highest-valued use, this presupposes that investors have good information about the possible uses of that capital. If individual investors do not have that information, financial systems may play a key role in screening firms and individuals and shaping the efficiency of capital allocation (Bagehot, 1873, p. 53).

Financial intermediaries may reduce the costs of acquiring and processing information and improve resource allocation (Allen 1990, Bhattacharya and Pfleiderer 1985, Boyd and Prescott 1986, Ramakrishnan and Thakor 1984). Without intermediaries, each investor would face the high, fixed costs of 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. Financial institutions can improve the ex-ante assessment of investment opportunities with positive ramifications on resource allocation by economizing on information acquisition costs.

By improving the 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 be better positioned to fund more promising firms and induce a more efficient allocation of capital and accelerate economic growth, as shown in Acemoglu et al., 2003; Buera, Kaboski, and Shin 2011; Greenwood and Jovanovic, 1990; King and Levine, 1993b; Galetovic, 1996; Townsend and Ueda 2006). Financial market imperfections—and financial developments that ameliorate those frictions—can also influence growth by shaping investments 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 influences who can make human capital augmenting investments. This implies a socially suboptimal allocation of investment in human capital. Under these conditions, financial development may relax financing constraints, improve the efficiency of human capital investment, and foster long-run economic growth.

Research also explores the particular role of stock markets in shaping information production and the allocation of capital. This work emphasizes that larger and more liquid markets lower the costs of trading on and profiting from acquiring new, relevant information on firms. In this way, larger and more liquid markets incentivize investors to expend resources researching firms (Grossman and Stiglitz 1980; Holmstrom and Tirole 1993; Kyle 1984). With larger, 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, thereby boosting incentives to produce this valuable information with positive implications for capital allocation (Merton, 1987).

## **B. Monitoring Firms and Exerting Corporate Governance**

Besides screening firms before allocating capital, the financial system also monitors firms after providing that capital. The effectiveness with which those providing capital to firms monitor and influence how firms use those funds has ramifications on savings and capital allocation (e.g., Coase 1937; Jensen and Meckling 1976; Fama and Jensen 1983a,b; Myers and Majluf 1984). For example, when investors effectively monitor firms and induce managers to maximize firm value, this tends to improve the efficiency with which economies employ scarce resources, spurring economic growth. In turn, ineffective corporate governance tends to impede the mobilization of savings from disparate individuals and the flow of savings to socially beneficial ends (Stiglitz and Weiss, 1983). This line of research suggests that an economy's corporate governance mechanisms shape firm performance with potentially large ramifications on national growth rates.

Shleifer and Vishny (1997) explain that small, individual shareholders often encounter a range of barriers to exerting effective governance over firms. For example, large information asymmetries between managers and small shareholders may prevent small shareholders from monitoring performance and overseeing corporate operations. Also, small shareholders frequently lack the expertise to monitor the managers of large, complex firms. Monitoring costs may also create a "free-rider" problem, as each shareholder relies on others to exert corporate governance. The result is too little monitoring. Furthermore, to the extent that diffuse shareholders cannot effectively acquire information about and monitor the firm, this reduces their ability to use shareholder voting to effectuate sound governance. Also, the board of directors may not represent the interests of minority shareholders; rather, management can "capture" the board and manipulate 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 shareholder rights.

One response to the inability of small shareholders to govern firms effectively is for firms to have a large, concentrated owner. Large owners have greater incentives to acquire information and monitor managers than small shareholders (Grossman and Hart, 1980, 1988; Shleifer and Vishny, 1986; Stulz, 1988). Large shareholders, however, create 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 (e.g., La Porta et al., 1999; Morck et al., 2000; Faccio and Lang, 2002; Caprio et al., 2003). Thus, highly concentrated ownership can distort corporate decisions in ways that curtail innovation, encourage rent-seeking, and stymie growth.

Given these barriers to corporate governance by small and large shareholders, financial intermediaries may arise to monitor firms and managers. Diamond (1984) and Boyd and Prescott (1986), for example, develop models in which a financial intermediary mobilizes savings from many individuals, lends these resources to firms, and then monitors and exerts corporate governance over these firms. The “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.

Several models show that governance-enhancing financial intermediaries can boost economic growth. Bencivenga and Smith (1993) show that financial intermediaries that



improve corporate governance by economizing on monitoring costs reduce credit rationing and 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. 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 their private benefits of control.

Research also explores the connections between stock markets and corporate governance, yielding very diverse predictions about the impact of improvements in stock market efficiency on the efficiency of resource allocation in an economy. For example, public trading of shares in stock markets that efficiently reflect information about firms allows owners to link managerial compensation to stock prices and better align the interests of managers with those of shareholders (Diamond and Verrecchia, 1982; and Jensen and Murphy, 1990). Similarly, if well-developed stock markets facilitate takeovers and underperforming managers are fired following takeovers, better stock markets can promote better corporate control by easing takeovers of poorly-managed firms (Scharfstein, 1988; and Stein, 1988). Many, however, argue that well-functioning stock markets do not effectively govern corporate managers (e.g., Roosenboom, Schlingemann, and Vasconcelos 2014). 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, the takeover threat as a corporate control device may suffer from the free-rider problem. If a potential investor expends lots of resources obtaining information, other market participants will observe and benefit from this research when that investor bids for shares in the firm. Put succinctly, the rapid public dissemination of costly information through liquid financial markets reduces incentives for obtaining information and boosting corporate governance (Grossman and Hart, 1980). Third, existing managers often take actions – poison pills – that deter takeovers and weaken the market as an effective disciplining device (DeAngelo and Rice 1983; Jensen 1993; Allen and Gale 2000). Fourth, stock market liquidity can even hurt governance (Shleifer and Summers, 1988). For example, since investors can inexpensively sell their shares in liquid markets, they have fewer incentives to undertake careful – and expensive – corporate governance, as they can quickly “exit” the stock (Bhide, 1993).

### **C. Providing Mechanisms to Trade, Diversity, and Manage Risk**

If investors cannot trade, diversify, and manage the risks associated with high expected return endeavors, they will be less likely to fund such activities with potentially material, adverse repercussions on economic growth. This highlights another potential avenue through which finance can shape economic growth: offering risk management services.

Traditional finance theory focuses on cross-sectional risk diversification. It explores how financial instruments, markets, and intermediaries allow investors to trade, diversify, and manage the risks associated with individual projects, firms, industries, regions, countries,

etc. A large literature shows that in arising to offer these cross-sectional risk diversification services, financial systems shape resource allocation and savings in ways that facilitate the flow of capital toward projects with higher expected returns, boosting economic growth (Gurley and Shaw, 1955; Patrick, 1966; Greenwood and Jovanovic, 1990; Saint-Paul 1992; Devereux and Smith, 1994; and Obstfeld, 1994; Acemoglu and Zilibotti 1997). For example, King and Levine (1993b) develop a model in which agents try to make technological advances to gain a profitable market niche, but innovation is a risky endeavor. The degree to which the financial system lowers the costs to investors of holding a diversified portfolio of innovative projects can reduce the risk of investing in innovation. Thus, financial systems that ease risk diversification can accelerate technological change and economic growth.<sup>2</sup>

Liquidity risk can also shape savings and investment decisions, with potentially large ramifications on economic growth. Liquidity reflects the cost and speed with which people and firms can convert financial instruments into purchasing power at agreed prices. Liquidity risk reflects the uncertainties associated with converting assets into a medium of exchange. The traditional link between liquidity risk and economic development arises because some high-return projects require a long-run capital commitment, but savers do not like to relinquish control of their savings for long periods. If the financial system does not augment the liquidity of high-return, long-run projects, less investment is likely to occur in those projects with potentially adverse effects on economic activity and growth. Indeed, Hicks (1969, p. 143–145) argues that the products manufactured during the first decades of the

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<sup>2</sup>Besides cross-sectional risk diversification, financial systems may improve intertemporal risk sharing. Risks that investors cannot diversify 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 relatively low returns in boom times and relatively high returns during slack times. Intuitively, this type of risk diversification can improve resource and growth, though I am unaware of models that directly link intertemporal risk-sharing into an endogenous growth model.

Industrial Revolution had been invented much earlier. Rather, the critical innovation that ignited growth in 18<sup>th</sup>-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, the industrial revolution required a financial revolution to facilitate large, long-term capital commitments.

Several models of how financial systems shape growth by reducing liquidity risk are based on Diamond and Dybvig's (1983) seminal model. In the model, a fraction of savers receives a shock 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 project. The model assumes that it is prohibitively costly to verify whether another individual has received a shock. This verification cost rules out state-contingent insurance contracts and creates an incentive for other financial arrangements to address the liquidity risk problem.

For example, Levine (1991) shows how the emergence of equity markets or banks can reduce liquidity risk and spur economic growth. With stock markets, 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. They trade ownership claims in impersonal stock exchanges. With liquid stock markets, equity holders can readily sell their shares if they need access to their wealth, reducing liquidity risk. At the same time, firms have permanent access to the capital invested by the initial shareholders, which reduces disruptions to production. Thus, by facilitating the trade

of equities, stock markets reduce liquidity risk and facilitate investments in high-run, long-run projects. Banks can also reduce liquidity risk and foster growth. Bencivenga and Smith (1991) show that banks could offer liquid deposits to savers and undertake an efficient mixture of liquid, low-return investments to satisfy demands on deposits and illiquid, high-return investments. Banks provide insurance to savers against liquidity risk while simultaneously facilitating long-run investments in high-return projects by providing demand deposits and choosing an appropriate mixture of liquid and illiquid investments.

A related form of liquidity involves firm access to additional credit during the production process. 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 capital injections 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 intermediate stage in certain states of nature. Aghion, Angeletos, Banerjee, and Manova (2004) 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 invest in short-term, low-return investments or 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 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.

#### **D. Pooling of Savings**

Bagehot (1873, p. 3–4) argued that a major difference between England and poorer countries was that the British financial system could mobilize resources for “immense works.” That is, the British financial system was better at mobilizing savings from different individuals, and this allowed Britain to more effectively (a) exploit economics of scale and (b) invest in high-return but indivisible projects, i.e., projects that required a large, minimum injection of capital. Bagehot was very explicit in noting that the crucial mechanism through which mobilization shapes growth is not by changing the savings rate; rather, enhancing mobilization shapes growth by improving the ability of an economy to pool society’s resources and allocate those savings toward the most productive ends. Mobilizing savings, however, involves the costly process of collecting savings from different individuals and overcoming the informational asymmetries associated with making savers feel comfortable in relinquishing control of their savings. To the extent that there are cross-economy differences in the ability of their financial systems to overcome these frictions and mobilize savings efficiently, these financial system differences may help explain differences in national growth rates. Within a model of economic growth, 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.

### E. Easing Exchange

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). Smith (1776) focused on the role of one particular financial instrument, money, in lowering transaction costs, permitting greater specialization, and fostering technological innovation, though many other financial innovations have eased exchange. Greenwood and Smith (1996) illuminated the connections between trade, specialization, and innovation in a model of endogenous growth. 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.<sup>3</sup>

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<sup>3</sup>This is not to suggest that the finance-growth nexus is unidirectional. There may also be feedback from the productivity gains to financial market development. If establishing markets requires fixed costs, 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.

### III. EMPIRICAL FINDINGS ON FINANCE AND GROWTH

#### A. Cross-country Studies

King and Levine (1993a henceforth KL) empirically evaluated the relationship between financial development and economic growth in a study of 77 countries from 1960 through 1989. One of their measures of financial development—credit to private firms divided by Gross Domestic Product, *Private Credit*—has been widely used by researchers.<sup>4</sup> The assumption underlying this measure is that financial systems that allocate more credit to private firms are more engaged in screening firms, exerting corporate control over the firms that they fund, providing risk management services, mobilizing savings, and facilitating transactions than financial systems that play less of a role in funding private firms.<sup>5</sup> KL examine three growth indicators: (1) the average rate of real per capita GDP growth, (2) the average rate of growth in the physical capital stock per person, and (3) the average rate of growth in total productivity growth, i.e., the growth rate of the "Solow residual." KL then use cross-country regressions to assess the relationship between the value of these three growth indicators averaged over the 1960 to 1989 period and (a) the average level of *Private Credit* over the same period and (b) the initial level of *Private Credit*, i.e., the value in 1960. The regressions control for other country-specific factors associated with economic growth,

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<sup>4</sup>Many subsequent studies have developed other measures of financial development. For example, Levine et al. (2000) use a slightly modified version. They define *Private Credit* as the ratio of bank credit to private firms relative to the economy's GDP, which excludes credit issued by non-deposit money banks to private firms and therefore focuses on banks. On comprehensiveness datasets of financial development, see Beck, Demirguc-Kunt, and Levine (2000), Cihak, Demirguc-Kunt, Feyen, and Levine (2010), and Svirydzenka (2016).

<sup>5</sup>La Porta et al. (2001) examine the degree of public ownership of banks. 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, this measure provides complementary information. Consistent with KL, La Porta et al. (2001) show higher degrees of public ownership are associated with slower economic growth.



including initial income per capita, the initial level of education, political stability, and indicators of exchange rate, trade, fiscal, and monetary policies.

KL discover large, positive, and statistically significant relationships between economic growth and financial development. They show that the initial level of *Private Credit* in 1960 predicts (a) real per capita GDP growth, (b) real physical capital per capita growth, and (c) productivity growth over the next thirty years. This result holds even after controlling for initial income and education, political stability, and exchange rate, trade, fiscal, and monetary policies. Moreover, the estimated relationships are economically large. They suggest that if Bolivia had the average value of financial development in 1960, then, holding other things constant, it 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. Although this work shows that financial development predicts growth, the analyses do not formally address causality. It may be that banks develop in anticipation of future economic growth where the mainsprings of that growth lie elsewhere.<sup>6</sup>

As noted in the discussion of the theory of finance and growth, stock markets may also provide financial services to the economy that shape economic growth. As stressed above, theory offers differing views on whether larger, more liquid equity markets exert a positive or negative influence on economic growth, capital accumulation, and productivity growth. This debate has triggered research into the independent role of stock markets in shaping economic development.

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<sup>6</sup>KL also discover large, positive, and statistically significant relationships between the average level of *Private Credit* over the 1960–1989 period and (a) real per capita GDP growth, (b) real physical capital per capita growth, and (c) productivity growth over the same period.

Levine and Zervos (1998a, henceforth LZ) assess how stock market and bank development shape economic growth, capital accumulation, and productivity growth. Building on the cross-country approach in KL and the data in Demirguc-Kunt and Levine (1996a,b), LZ construct stock market and bank development measures for a sample of 42 countries over the period 1976-93. As in KL, they control for many other potential growth determinants, including banking sector development. In focusing on stock market liquidity, LZ use the turnover ratio, which equals the total value of shares traded on a country's stock exchanges divided by stock market capitalization. Although this ratio does not directly measure trading costs or the ability to sell securities at posted prices, it does measure trading relative to the size of the market and hence reflects trading and other frictions.

LZ find that the initial level of stock market liquidity in 1976 and the initial level of banking development in 1976 correlate positively and significantly with the rates of economic growth, capital accumulation, and productivity growth over the next 18 years. These analyses control for initial income, schooling, inflation, government spending, the black market exchange rate premium, and political stability. Critically, these findings suggest that banks and markets provide different services to the economy, as each measure enters positively and significantly. LZ also show that stock market size, as measured by market capitalization divided by GDP, is not robustly correlated with growth, capital accumulation, and productivity improvements. This finding is consistent with the theory. Listing on the national stock exchange does not necessarily enhance resource allocation. Rather, the ability to trade the economy's productive technologies easily facilitates resource allocation and growth.

## B. Instrumental Variables, Panel, and Time-series Studies

Researchers have employed instrumental variable, panel, and time-series strategies to identify the impact of financial development on economic growth. Consider first the use of standard instrumental variables to identify the effect of finance on growth. Levine (1998, 1999) and Levine et al. (2000) use the La Porta et al. (henceforth LLSV, 1998) legal origin indicators as instrumental variables for financial development. LLSV (1998) show that whether a country's Commercial/Company law derives from British, French, German, or Scandinavian legal origins shapes the functioning of financial systems. Beck et al. (2003b, 2004a) and Levine (2001) provide extensive discussions on how legal traditions shape the operation of financial systems. Since most countries obtained their legal systems through occupation and colonization, researchers often use legal origin as an exogenous source of variation in financial development. The instrumental variable results based on using the legal origin indicators as instruments for *Private Credit* confirm the cross-country regression findings: greater financial development is associated with faster economic growth.

Furthermore, the estimated impact of financial development on growth is economically significant. Consider the estimates from Levine et al. (2000) that cover the 1960-1995 period. The estimates suggest that an exogenous increase in Argentina's *Private Credit* (16) to the developing country sample mean (25) would have increased Argentina's real per capita GDP growth by one percentage point. This estimate is large, considering that growth averaged 1.8 percent per year over this period. However, it is crucial to emphasize that this type of conceptual experiment does not account for how to increase Argentina's *Private Credit*.<sup>7</sup>

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<sup>7</sup>There is debate about whether financial development shapes steady-state growth or the speed with which countries converge to their steady-state levels of output per worker. Levine et al. (2000) interpret their results as implying that financial development boosts steady-state growth. Aghion, Howitt, and Mayer-Foulkes (2005) challenge that conclusion and stress that financial development explains the speed with which countries convergence to their steady-state values. Laeven,

(continued...)

Brown, Martinsson, and Petersen (2013) study a large sample of firms across 32 countries and assess the impact of particular shareholder protection laws on access to stock market financing. They find that legal systems that protect shares (a) facilitate the ability of firms to issue shares and (b) foster R&D investment, especially among smaller firms, boosting firm growth. The results from this paper provide microeconomic evidence linking the law, the operation of stock markets, and economic growth through the financing of innovation. Brown, Martinsson, and Petersen (2017) offer additional evidence that the level of stock market development is crucial for R&D investments and high-tech growth. Focusing on law, finance, and economic development, Brown, Cookson, and Heimer (2017) offer additional evidence for how legal systems influence financial development and economic growth by examining differences in legal systems across the Native American reservations.

Levine et al. (2000) and Beck et al. (2000) use panel generalized method of moments (GMM) estimators to assess the impact of financial development, as proxied by *Private Credit*, on the per capita growth rates of real GDP, the physical capital stock, and productivity. One advantage of moving from a cross-country to a panel setting is exploiting the time-series and cross-sectional variation in the data. For example, these authors construct a panel that consists of data for 77 countries over the period 1960–95 and uses data averaged over seven non-overlapping five-year periods. A second advantage is that the panel frameworks allows one to avoid biases associated with omitting time-invariant country traits from the pure cross-country framework. A third advantage of the panel framework is that it allows for instrumenting all regressors, not just for financial development, and provides more precise estimates of the finance-growth relationship.

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Levine, and Michalopoulos (2015) challenge that view. They develop a model and provide empirical evidence suggesting that steady-state growth requires continual improvements in the functioning of financial systems.

These studies find that the exogenous component of financial development is positively associated with growth. The estimated effect of financial development on growth emerging from these panel studies is very similar to those from the pure cross-country and instrumental variable regressions discussed above. Thus, the large, positive relationship between economic growth and *Private Credit* does not appear to be driven by simultaneity bias or omitted country-specific effects that may, in theory, plague cross-country growth regressions. Using the same econometric methods and data, Rioja and Valev (2004a) find that finance boosts growth in rich countries primarily by increasing productivity growth. In contrast, finance encourages growth in poorer countries primarily by accelerating capital accumulation.

Furthermore, Rioja and Valev (2004b) and Arcand, Berkes, and Panizza (2015) find that the relationship between growth and *Private Credit* may be nonlinear. Rioja and Valev (2004b) find that countries with low *Private Credit* experience little growth acceleration from a marginal increase in *Private Credit*. The effect is larger for countries in the middle of the financial development distribution. Arcand, Berkes, and Panizza (2015) find that financial depth starts to slow growth when *Private Credit* reaches 100% of GDP. However, researchers have not explained what causes these nonlinearities. One possible explanation is that the five financial services—screening, governance, risk management, mobilizing savings, and easing transactions—have differential effects on economic growth at different stages of economic, technological, and financial development. A second possible explanation is that the accuracy of *Private Credit* as a measure of financial development varies across economies at different stages of economic, technological, and financial development. For

example, Benhabib and Spiegel (2001) stress the difficulties in constructing reliable empirical measures of financial development.<sup>8</sup>

Botev, Égert, and Jawadi (2019) challenge these findings. They reject the view that there is a threshold beyond which more financial development slows growth using data from emerging and advanced economies. Furthermore, they confirm earlier findings (e.g., Levine and Zervos 1998) that banking and market finance are complementary: the positive effect of bank credit on growth is larger when stock markets are deeper. These findings support the following two interrelated perspectives on finance and growth. First, it is challenging to measure financial development—the degree to which financial systems effectively screen, govern, provide risk management tools, mobilize savings, and ease transactions. Second, increases in any single proxy, such as *Private Credit*, might not accurately gauge improvements in these five financial functions.

Researchers have also applied these panel techniques to study stock markets. For example, Rousseau and Wachtel (2000) examine the relationship between stock markets, banks, and growth, using annual data. Beck and Levine (2004) use data averaged over five-year periods to focus on longer-run growth factors. They confirm the Levine and Zervos (1998) findings using panel methods: the exogenous components of stock market liquidity and bank development help explain economic growth.

Besides examining measures of the size and liquidity of stock markets, researchers have also examined the impact of lowering barriers to foreigners participating in the local stock exchange. For example, Bekaert, Harvey, and Lundblad (2001, 2005), Henry (2000,

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<sup>8</sup>Loayza and Ranciere (2002) argue that short-run surges in bank lending can signal the onset of financial crises and economic stagnation. They find a positive long-run relationship between financial development and growth co-exists with a generally negative short-run link.

2003), and Levine (2001) show that stock market liberalization accelerates economic growth. Henry (2000, 2001, 2003

Researchers also use time-series techniques to assess the relationship between finance and growth. A considerable body of work suggests that finance exerts a causal impact on growth (e.g., Demetriades and Hussein 1996; Arestis and Demetriades 1997; Neusser and Kugler 1998; Rousseau and Wachtel 1998, 2000; Rousseau and Sylla 1999; Arestis, Demetriades and Luintel 2000; Xu 2000; Christopoulos and Tsionas 2004; Ang and Madsen 2012). The bulk of the evidence emerging from these studies pushes against the view that finance simply follows growth. Instead, the results are generally consistent with the view that finance shapes economic growth. This line of work has also produced novel insights on non-bank components of the financial sector and economic growth. For example, Fink, Haiss, and Hristoforova (2003) and Pradhan, Arvin, Bennett, Nair, and Hall (2016) use Granger causality tests and conclude that bond market development exerts a positive, causal impact on economic growth. Furthermore, Ang (2011) and Madsen and Ang (2016) show that financial development boosts patents and R&D expenditures.

### **C. Cross-country, Cross-industry Studies**

In a pioneering study, Rajan and Zingales (henceforth RZ, 1998) explore a specific mechanism through which financial systems may shape economic growth. They stress that a critical function of the financial system is to screen and fund positive net present value projects. Better functioning financial systems lower the costs to worthwhile firms of obtaining external finance. RZ then offer a vital insight: better functioning financial systems should be more important to industries that are naturally heavy users of external finance. As a result, externally dependent industries should benefit disproportionately more from financial

development than industries that are not naturally heavy users of external finance. To identify which industries are “naturally heavy users” 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 firms in an industry use 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 more financially developed economies. 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, but across-industry, differences.

Using data across 36 industries and 42 countries, RZ find that financial development exerts a strong, positive impact on the growth of industries that rely on external finance for technological reasons. To measure financial development, RZ examine capitalization, which equals the summation of stock market capitalization and domestic credit as a share of GDP. RZ find that increases in financial development disproportionately boost the growth of industries that are naturally heavy users of external finance. The estimated effects are large. For example, consider Machinery, an industry at the 75<sup>th</sup> percentile of the cross-industry distribution of external financial dependence (0.45), and Beverages, an industry at the 25<sup>th</sup> percentile of the external financial dependence distribution (0.08). Now, consider Italy and the Philippines. Italy has stock market capitalization at the 75<sup>th</sup> percentile of the sample distribution of countries (0.98). The Philippines has stock market capitalization at the 25<sup>th</sup> percentile of the sample (0.46). Due to differences in financial development, the coefficient



estimates suggest that Machinery grows 1.3 percent faster than Beverages in Italy compared to the Philippines. The actual difference is 3.4, so the estimated value of 1.3 is quite substantial. RZ conclude that financial development has a substantial impact on industrial growth by influencing the availability of external finance.

Researchers have extended these analyses to examine how competition within the banking industry shapes economic growth. Cetorelli and Gambera (2001) show that bank concentration promotes the growth of naturally heavy users of external finance, but bank concentration has a depressing effect on overall economic growth. However, Claessens and Laeven (2004) argue that market concentration is not necessarily a good proxy for competition. Using more direct competition measures, they 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.

Beck et al. (2004) use the RZ approach to examine the connections between finance, small firms, and economic growth. They stress that small firms are often more informationally opaque and difficult to screen. As a result, better functioning financial systems that ameliorate informational asymmetries might be disproportionately beneficial for industries naturally composed of small firms for technological reasons. 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. Beck et al. (2004) discover that industries naturally composed of smaller firms grow faster in countries with better-developed financial systems, suggesting that financial development is especially

important for the growth of industries that, for technological reasons, are naturally composed of small firms.

Researchers have used the methods developed by RZ to explore many aspects of finance and growth (e.g., Fisman and Love 2003, 2004, 2007). Claessens and Laeven (2003) highlight the independent impact of finance on growth by showing that the differential effects of financial development on financially-dependent industries hold even when controlling for the differential effects of property rights protection. Consistent with financial development reducing informational asymmetries, Strieborny and Kukušková (2016) find that firms in industries relying on close relationships with their banks to ameliorate information frictions grow disproportionately faster in countries with better functioning banking systems. Cetorelli and Strahan (2006) highlight another potential mechanism linking financial development and economic growth. They show that financial sector reforms that improve the functioning of banking systems boost new business creation in industries that depend heavily on finance. Turning to stock markets and financial openness more generally, Gupta and Yuan (2009) and Levchenko, Ranciere, and Thoenig (2009) show that financial development more generally disproportionately boosts the growth of firms in industries that depend heavily on external finance.

#### **D. Cross-firm Studies**

Focusing on firms rather than industries, Demirgüç-Kunt and Maksimovic (1998) examine whether financial development influences the degree to which firms are constrained from investing in profitable growth opportunities. Demirgüç-Kunt and Maksimovic (1998) estimate the external financing needs of firms. They then test whether firms requiring more external finance grow comparatively faster in economies with better-developed financial

systems. Demirguc-Kunt and Maksimovic (1998) and Beck, Demirguc-Kunt, Levine, and Maksimovic (2001) find that banking system development and stock market liquidity are positively associated with excess firm growth, which is the growth rate beyond what firms could achieve from internal funds. Consistent with the cross-country, panel, time-series, and industry-level studies, these cross-country, firm-level analyses highlight the role of bank and stock market development in fostering economic growth.

Beck, Demirguc-Kunt, and Maksimovic (2005, 2008) use firm-level survey data to assess the role of financing constraints on firm growth. In particular, Beck, Demirguc-Kunt, and Maksimovic (2005) use data on over four thousand firms across 54 countries to evaluate the impact of firm financing constraints on firm performance. They use survey data, in which firms report on the degree to which finance, national institutions, and government corruption constrain the ability of the firms to grow. They find that financing constraints exert a first-order impact on firm growth, especially on the ability of smaller firms to grow. Furthermore, financial development loosens the growth-constraining effects of institutional defects and corruption on firm growth. Also, see the contributions by Ayyagari, Demirguc-Kung, and Maksimovic (2008; 2012), who provide additional evidence that firms with better access to external finance are more likely to engage in innovative activities associated with growth.

Micro-level studies also explore the causal impact of access to finance and innovation, as measured by R&D expenditures and patenting. In a convincing study, Brown, Fazarri, and Petersen (2009) show that financing constraints in the United States explain a large proportion of cross-firm variation in R&D expenditures, especially among young firms. Their findings suggest a strong link between financial development, technological innovation, and the rate of economic growth. Brown, Martinsson, and Petersen (2012)

enhance the standard methods for using investment-cash flow sensitivities to gauge the severity of financing constraints and apply this framework to a large sample of European firms. They find a strong connection between financial development and growth.

Focusing on stock market liquidity, Fang, Tian, and Tice (2014) examine a longstanding debate on whether stock liquidity enhances or impedes firm innovation. Using firm-level data from the United States, they show that regulatory reforms that increased stock market liquidity reduced innovation. They explain how this can happen. First, suppose stock market liquidity facilitates hostile takeovers. In that case, the greater risk of a hostile takeover could reduce the incentives of corporate executives to make investments that only pay off in the long run, such as investments in innovation. Second, since liquidity makes it easier for investors to sell shares, this could reduce their incentives to engage in the painstaking process of screening and monitoring complex investments, such as investment in innovative. A decline in the screening and governance of innovation can interfere with the efficiency with which firms invest in innovation.<sup>9</sup>

In a novel paper, Berger and Sedunov (2017) examine the impact of one particular function provided by the financial system on economic growth. While Levine and Zervos (1998) examine the connection between economic growth and the ability of stock markets to provide liquidity, Berger and Sedunov (2017) examine how liquidity provision by banks influences economic activity. Theory advertises that liquidity creation is one of the most important services that banks provide to the economy. Berger and Sedunov (2017) are the

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<sup>9</sup>Using cross-country, cross-firm data on the response to the global financial crisis, Duval, Hong, and Timmer (2020) explore how financial development shaped productivity growth following the crisis. They find that firms that faced more severe finance constraints cut back on innovation activities, slowing productivity growth.

first to assess whether such liquidity creation affects economic growth. They find that bank liquidity creation exerts a first-order impact on economic activity.

### **E. Within Country Studies of Finance and Growth**

In a seminal study, Jayaratne and Strahan (1996, henceforth JS) examine the relationship between finance and growth by studying the individual states of the United States. Since each U.S. state regulates its banks, JS focus on changes in bank regulations that intensified competition among banks. They evaluate the connections between these regulatory changes and real Gross State Product (GSP). The different states changed their regulations regarding intrastate branching (and interstate banking) in different years. Thus, the states made similar regulatory changes. However, they made these changes in different years. The nature of these regulatory reforms allows the authors to use a difference-in-differences econometric strategy to assess the impact of regulatory changes that increased bank competition on GSP growth.

JS show that competition-enhancing regulatory reforms accelerated economic growth by boosting the efficiency of credit allocation but had little effect on the quantity of lending. Furthermore, Black and Strahan (2002) and Kerr and Nanda (2009) show that deregulation spurred new business creation, representing another mechanism through which financial development can foster economic growth.

The JS approach has also been used to dissect the connections between bank deregulation across U.S. states and innovation, a key component of economic growth (e.g., Schneider and Zaldokas 2013; Cornaggia, Tian, and Wolfe 2012; Hombert and Matray 2016). As shown by Chava, Oettl, Subramanian, and Subramanian (2013), the impact of deregulation depends on whether it increased or decreased among the banks providing

financial services to firms. Consistent with theories of finance and growth, when financial reforms spur competition and hence improve the quality of financial services offered to firms, this tends to reduce barriers to competition by younger, private firms and spurred more innovation. Acharya, Imbs, and Sturgess (2011) discover that liberalizing intrastate branching and interstate banking restrictions tended to accelerate growth without boosting volatility.

Moving beyond banks, Samila and Sorenson (2011) examine the impact of venture capital (VC) firms on economic growth across US states. They find that plausibly exogenous shocks to the supply of VC investment boost (a) the rate of new business formations, (b) employment, and (c) economic growth.

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 that can more easily raise funds outside of the local area. This study ameliorates many of the weaknesses associated with examining growth across countries.

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 exert a first-order impact on the structure and dynamics of product markets.

Consider Haber's (1991, 1997) comparative study of industrial and capital market development in Brazil, Mexico, and the United States between 1830 and 1930. Using firm-level data, 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 milder 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 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.

#### IV. FINANCE, POVERTY, AND INCOME DISTRIBUTION

Although the bulk of the research discussed above suggests that finance exerts a first-order impact on economic growth, this research does not address the question of who benefits from this growth. Financial development might disproportionately boost the earnings of the rich or the poor. Or finance might have little effect on income distribution. This section examines the connections between finance and income distribution by first outlining a simple framework of factors shaping the persistence of intergenerational income inequality and then discussing the empirical evidence.

##### A. Conceptual framework

Following Demirguc-Kunt and Levine (2009), I organize the discussion using an equation of income, in which dynasty  $i$ 's total income in generation  $t$ ,  $y(i,t)$ , is divided into income from wages and income from claims on physical capital:

$$y(i,t) = h(i,t)w(i,t) + a(i,t)r(i,t), \quad (1)$$

where  $h(i,t)$  is the level of human capital in dynasty  $i$  in generation  $t$ ,  $w(i,t)$  is the wage rate per unit of human capital for dynasty  $i$ ,  $a(i,t)$  is dynastic wealth in dynasty  $i$  in generation  $t$ , and  $r(i,t)$  is the return on assets for dynasty  $i$ . This specification allows for the possibility that the wage rate per unit of human capital and the return on assets differ across dynasties. We discuss this below.

Research shows that financial market imperfections can influence the evolution of intergeneration differences in the incomes of dynasties by shaping human capital, the wages paid to individuals with the same skills, and the accumulation of wealth.



### 1. Finance and the intergenerational persistence in human capital

Since the pioneering studies of Becker and Tomes (1979, 1986), researchers have examined the decision by parents to invest in the human capital of their children and how this decision shapes the persistence of relative income differences. Let  $h(i,t) = h[e(i,t), s(i,t)]$ , where  $e(i,t)$  is the dynastic endowment of ability and  $s(i,t)$  is investment in human capital accumulation (schooling). Further, assume that ability endowments and schooling are complementary inputs into human capital production, so that  $\partial^2 h / \partial e \partial s > 0$ . Thus, it is socially efficient for kids with high ability endowments to receive the most schooling. If one assumes that ability endowments across dynasties are mean-reverting, then ability can be specified as  $e(i,t) = \rho e(i,t-1) + \varepsilon(i,t)$ , where  $0 \leq \rho < 1$ , and  $\varepsilon(i,t)$  is the random component of individual ability.<sup>10</sup> The children of high-ability parents tend to have greater abilities than children of low-ability parents, but the relative difference in ability tends to shrink from generation to generation.

With better-developed financial markets, high-ability people are more likely to get schooling irrespective of parental wealth. With better financial systems, human capital,  $h(i,t)$ , becomes more tightly linked to ability,  $e(i,t)$ , and the economy attains the socially efficient allocation of schooling,  $s(i,t)$ . An individual's economic opportunities are determined more by her abilities, not by parental wealth. Since ability regresses to the mean and individuals can borrow to finance education, initial dynastic wealth differences diminish. There is greater

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<sup>10</sup>Financial market imperfections can also influence the persistence of cross-dynasty relative income differences even when innate abilities are identical across dynasties. Galor and Zeira (1993) assume that individuals have identical innate abilities and instead consider a nonconvex technology for creating human capital in conjunction with financial market frictions. In their model, self-financed investment in human capital is feasible only for rich dynasties, so that financial market imperfections disproportionately impede the accumulation of human capital of the poor.

social efficiency and less intergeneration persistence of inequality with greater access to finance.

We also see that poorly functioning financial systems can increase the persistence of cross-dynasty differences in human capital and, hence, cross-dynastic differences in income and wealth. Even if ability tends to regress toward the mean, poorly functioning financial systems imply that parental wealth constrains schooling wealth. As a result,  $s(i,t)$  is a function of  $a(i,t-1)$  and  $h(i,t) = h[e(i,t), a(i,t-1)]$ , implying greater persistence in income inequality across generations. Children from rich parents with comparatively low abilities receive more schooling than comparatively high-ability children from low-income families. Thus, with poorly functioning financial systems, there is a less efficient allocation of education. This inefficiency contributes to the persistence of intergenerational inequality. Furthermore, when families can neither insure against adverse shocks nor borrow to smooth consumption when those shocks hit, some low-income families will take their kids out of school and employ them in low-wage jobs even though this hinders high-return human capital accumulation (Jacoby and Skoufias 1997; and Baland and Robinson 1998)). Thus, financial market imperfections can exert a profound impact on economic welfare by hindering the ability of low-income families to develop the human capital of their children, which (a) increases the cross-dynasty persistence of relative incomes, (b) reduces the economic opportunities of individuals born into poor dynasties, and (c) lowers the socially efficient allocation of schooling resources.

## 2. Finance and wage inequalities

The wage rate can also differ across individuals with the same human capital due to wage discrimination across individuals from different dynasties, intensifying the intergenerational transmission of income inequality. In particular, employers might discriminate by particular characteristics, such as race, gender, religion, ethnicity, or other characteristics. For example, blacks with the same skills as whites might receive lower wage rates because employers prefer hiring white workers, i.e., employers are willing to forgo some profits to satisfy their “taste” for hiring workers from a preferred group. Becker (1957) noted that owners earning large rents could better afford to satisfy their “tastes for discrimination” by hiring more expensive workers from “preferred” groups rather than hiring equally productive and less expensive workers from “discriminated” groups than otherwise identical owners facing more intense competition and, therefore, earning smaller rents. For example, with perfect competition, owners that discriminate based on race, gender, religion, ethnicity, etc., will be more likely to go bankrupt. Thus, competition tends to reduce inefficiencies, including inefficiencies from bigotry.

By lowering the barriers to the entry of new firms and spurring competition, better functioning financial systems can reduce discrimination, as Levine, Levkov, and Rubinstein (2009) emphasize. While Levine, Levkov, and Rubinstein (2009) focus on the connection between financial development and racial inequality in the United States. Future research should explore the linkages between financial development and discrimination along other dimensions, including gender (e.g., Black and Strahan, 2001) and within other countries. Thus, financial development may influence inequality by shaping the wages paid to workers

with the same amount of human capital, not just by shaping the rate of human capital accumulation.

Financial development can also influence cross-dynastic wage differences through a different mechanism: changing the capital intensity of a firm's operations. Financial development improves the efficiency with which capital is allocated across firms and may also increase capital accumulation. Thus, financial development can lower the cost of capital to promising firms. The ramifications of a lower cost of capital on the distribution of wages and, therefore, on income inequality are theoretically ambiguous. It largely depends on the degree to which capital accumulation increases the relative demand for lower-income or higher-income workers. The drop in the cost of capital may also shape income distribution by altering the comparative returns to capital and labor and the barriers to the entry of new firms. Lower capital costs may encourage the expansion of existing firms and the entry of new firms. These developments could boost labor demand and the competitiveness of labor markets. At the same time, lower capital costs could encourage firms to substitute capital for labor. On net, if the drop in the cost of capital increases the demand for labor and this increase in demand disproportionately applies to lower-income workers, then deregulation could tighten the distribution of income.

### 3. Finance and wealth inequalities

Finance can also affect cross-dynasty returns to investment. Suppose high expected return investments require large capital injections, and there are large information and transaction costs associated with mobilizing savings from many small investors to undertake such investments. In that case, this can lead to environments in which wealthier families have

access to higher expected return investment, which would magnify income and wealth disparities across dynasties. Using the framework above, the level of assets  $a(i,t)$  influences the returns that are available to dynasty  $i$  in generation  $t$  so that  $\partial r[(a(i,t),t)]/\partial a(i,t) > 0$ . To the extent that financial development reduces information and transaction costs and expands the investment opportunity set available to savers, better functioning financial systems will tend to reduce the persistence of income inequality across dynasties.

Greenwood & Jovanovic (1990) examine the dynamics of growth and inequality in a model in which financial development shapes who can access higher expected-return projects. In the model, there are material costs to screening higher expected returns projects. Financial intermediaries enjoy economies of scale in screening projects, but individuals must pay a fee to join those financial intermediaries. As more individuals join the intermediary, this improves the efficiency of resource allocation and expands individuals' access to higher expected return investments.

Under these conditions, the relation between growth and income distribution depends on financial development (Townsend and Ueda 2006). At low levels of economic development, few people join intermediaries because of the high fixed costs relative to income, so growth is slow and income distribution is equal. Over time, some people join the financial intermediary and enjoy greater returns: growth and income inequality increase. Eventually, many people can afford to join the intermediary, which maximizes growth and reduces inequality.

Financial frictions can also impede lower-income individuals from becoming entrepreneurs, with material implications for inequality (Mookherjee and Ray 2003; Jeong and Townsend 2007, 2008; Levine and Rubinstein 2020). In particular, when there are high

fixed costs to becoming an entrepreneur and individuals from lower-income households cannot borrow sufficiently in financial markets, those lower-income households might be cut off from high return activities. In this way, financial frictions increase the intergenerational persistence of income inequalities. That is, low wealth  $[a(i,t)]$  leads to low  $r(i,t)$ , perpetuating the dynasty's relatively low level of income. Furthermore, by impeding talented but low-income individuals from becoming entrepreneurs, credit constraints lower the overall level of economic efficiency (Piketty 2000, p. 455), slowing aggregate growth. Thus, financial development can accelerate growth by equalizing opportunity.

#### 4. Discussion of theories of finance and inequality

As explained, theory suggests several channels through which the functioning of the financial systems can shape the intergenerational persistence of income inequality and income distribution more generally. First, suppose that better-functioning financial systems focus more on a person's ideas and abilities and less on family wealth and political connections when allocating credit. In this case, better-functioning financial systems simultaneously boost economic growth by improving the efficiency of capital allocation and expanding economic opportunities beyond the already rich and connected. Second, finance can also affect income distribution through its effects on (a) the relative demand for more-skilled or less-skilled workers and (b) the competitiveness of labor and product markets. For example, financial developments that reduce information and transaction costs may alter how firms organize production, and these alterations may shape the relative demand for workers with different skills. In this way, changes in the functioning of financial systems can shape income distribution. Furthermore, by influencing the contestability of product markets,

financial development can shape labor markets and hence wages. For example, if financial development lowers barriers to the entry of new firms and creates a more dynamic, competitive labor market, this will tend to boost wages. Furthermore, by intensifying product market competition, financial development can increase the costs to firms from discriminating based on social connections, race, religion, ethnicity, etc. Thus, by reducing discrimination based on non-productivity-related traits, financial development can foster efficiency and expand opportunities. Third, financial development can shape the investments available to individuals with different incomes and wealth, potentially impacting growth and income inequality. In particular, if there are nonconvexities associated with investing in or engaging in high expected return activities, then higher income and wealthier families might have access to higher expected return investments, perpetuating and even magnifying income and wealth inequalities over time. To the extent that financial development allows economies to circumvent those nonconvexities and create a more inclusive investment environment, this would influence the dynamics of income distribution across generations.

## **B. Finance, poverty, and income distribution: Empirical evidence**

A growing body of empirical evidence explores the relationship between the functioning of financial systems and poverty, income distribution, and discrimination. In this subsection, I discuss the results emerging from several studies that evaluate the debates emerging from different theories of the connections between finance, poverty, and income distribution.

### **1. Country-level studies**

Building on the novel study by Clarke, Xu, and Zou (2006), Beck, Demirguc-Kunt, and Levine (2007) examine the relationship between financial development and (a) income

inequality as measured by the Gini coefficient, (b) income growth of the lowest quintile of earners relative to average income growth in the population, and (c) poverty as measured by the fraction of the population living on less than \$2/day. They conduct their study across a large cross-section of countries. When examining income inequality, they use data from 1960 through 2005 for 72 countries. They test whether countries with better developed financial systems tend to experience more rapid reductions in income inequality, as measured by the growth rate of the Gini coefficient of income inequality. When examining the lowest quintile of earners, they use the growth rate of earnings of those in the bottom fifth of the income distribution as the dependent variable. They then control for average earnings growth in the entire population and other controls used in cross-country growth regressions. This allows the authors to assess whether finance disproportionately influences the incomes of the poor? For both the Gini regressions and the regressions focusing on the lowest-fifth of the income distribution, the authors employ cross-country regressions covering the entire period and panel regressions that enhance identification. When examining poverty, they examine how financial development shapes the fraction of the population living on less than \$2/day. These analyses are limited to developing countries over the period from 1980 to 2005. Throughout their analyses, they use Private Credit, the ratio of credit going to privately-owned firms to GDP, to gauge the level of financial development.

They discover that financial development reduces income inequality, disproportionately boosts the incomes of those at the lower end of the income distribution, and reduces extreme poverty, i.e., the proportion of people living on less than \$2/day. These results hold when controlling for many other country characteristics, including the rate of overall growth and the level of economic development. In particular, the Gini coefficient



falls more rapidly in countries with higher levels of financial development. Furthermore, they show that *Private Credit* boosts the income growth of the poorest quintile. Moreover, they find that financial development is associated with a reduction in the fraction of the population living in extreme poverty. Several studies also find a negative relationship between financial development and income inequality, including Clarke, Xu, and Zho (2006), Agnello and Sousa (2012), and Hamori and Hashiguchi (2012). These findings suggest a strong link between finance and income distribution and poverty per se. According to these studies, it is not just that finance accelerates economic growth, which trickles down to the poor; finance exerts a *disproportionately* positive influence on lower-income individuals.

Jeanneney and Kpodar (2011) examine a sample of developing economies. They find that financial development that improves access to savings and transaction services reduces poverty. They also note that financial development tends to increase financial instability, which can be especially detrimental to the poor. Similarly, Meniago and Asongu (2018) examine a panel of 48 African countries and find that financial development tends to reduce income inequality. Delis, Hasan, and Kazakis (2014) find that banking reforms that improve the operation of banking systems decrease income inequality.

However, research also challenges the view that financial development reduces income inequality. Kim and Lin (2011) and Law, Tan, and Azaman-Saini (2014) find that financial development only reduces inequality when countries have specific pre-existing conditions, e.g., sufficiently developed financial and governance institutions. Using time-series techniques, Bahmani-Oskooee and Zhang (2015) find that financial development reduced income inequality in ten out of the 17 countries in their sample. Still, the effects lasted into the long run in only three cases. Using panel data, Jauch and Watzka (2016) and

Haan and Sturm (2017) find that measures of financial development are associated with increases in income inequality. Cihak and Sahay (2020) argue that financial reform policies that focus on providing financial services to more individuals and firms can reduce inequality. Many factors may account for these different findings, including how the researchers measure inequality and financial development, whether researchers use higher or lower frequency data, econometric methodology, the sample of countries, and the sampling period. Future research should explain and rationalize these findings and provide a more confident answer to the question: What is the impact of financial development on income inequality?

## 2. Sub-national studies

The U.S. states provide a unique setting to examine the causal impact of improvements in the functioning of the financial system on income distribution in general and the poor in particular. From the mid-1970s to the mid-1990s, individual U.S. states removed regulatory restrictions on the opening of bank branches within their boundaries. States changed their regulatory policies in different years. The reforms intensified competition and triggered improvements in banking services, reducing interest rates on loans, raising them on deposits, lowering overhead costs, spurring the development of better techniques for screening and monitoring firms, and reducing the proportion of bad loans on the books of banks (Hubbard and Palia 1995, Jayaratne and Strahan 1998). Jayaratne and Strahan (1996, 1998) argue that the driving forces behind these financial reforms were largely independent of state-specific changes in growth, income inequality, and labor market conditions. That is, the reforms represent plausibly exogenous sources of variation in the functioning of financial systems across states. As discussed above, Jayaratne and Strahan

(1996) find that removing geographic restrictions on banking increased states' real per capita income growth.

Beck, Levine, and Levkov (2010) use the approach developed by Jayaratne and Strahan (1996) and discover that easing geographic restrictions on intrastate banking reduced income inequality by increasing the incomes of those at the lower end of the income distribution.<sup>11</sup> After controlling for national trends in income inequality, the Gini coefficient of income inequality drops after bank branch deregulation. The negative relationship between branch deregulation and inequality is robust to using different income distribution measures, examining different components of income, controlling for many time-varying state characteristics, and conditioning on state and year fixed effects. While income inequality widened in the U.S. during this period, state-level bank regulation had a countervailing effect on this national trend. The magnitude is consequential: Deregulation explains 60% of the variation of income inequality during the sample period relative to state and year averages. Furthermore, deregulation reduces income inequality by disproportionately boosting the incomes of the poor, not by hurting the rich.

Further exploiting the Jayaratne-Strahan approach, Levine, Levkov, and Yona Rubinstein (2007) examine whether the easing geographic restrictions on intrastate banking that intensified competition among banks reduced racial discrimination within labor markets. That is, Levine, Levkov, and Yona Rubinstein (2007) evaluate Becker's (1957) prediction that product market competition will reduce the manifestation of racial bigotry in labor markets by increases the costs of using non-productivity-related characteristics in making labor decisions. They use data on hundreds of thousands of individuals across all U.S. states

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<sup>11</sup>Also, see Boustanifar's (2014) examination of U.S. banking reforms and employment.

from 1976 to 2005. Using standard procedures from labor economics, they compute the race gap: The difference between the wage rates of white males and black males after controlling for a wide array of personal characteristics. Then, controlling for state and year fixed effects, they study how this race gap varies with deregulation.

On financial development and income distribution, there is also research focusing on other countries. Baiardi and Morana (2018) find that financial development fosters growth and income inequality in a study of the Euro area.

Levine, Levkov, and Yona Rubinstein (2007) find that the race gap falls after deregulation. After conditioning on individual characteristics and state- and year-fixed effects, the race gap drops by about 20% after a state removes restrictions on intrastate branching. Before a state deregulates, a white man with identical observable characteristics to a black man earns 14% more. After a state deregulates, the race gap falls to 11%. These findings suggest that improving the financial system reduces discrimination, expanding the opportunities of groups that have been disproportionately stuck at the bottom of the income distribution.

Recent evidence also points toward a link between financial development, education, and the broader socio-economic environment in which are raised children grow. For example, Levine and Rubinstein (2013) find that financial reforms that improve the operation of financial systems tend to reduce high school drop rates and increase college enrollment rates among students from lower-income households. Similarly, Sun and Yannelis (2016) show that financial development lowered the costs to students from obtaining loans, boosting education. The functioning of the financial system can also shape crime rates—and hence the

broader socio-economic climate. By influencing economic activity, Garmaise and Moskowitz (2006) find that the competitiveness of the banking market influences crime rates.

Consistent with theories stressing that financial development shapes the degree to which individuals can attempt to realize their entrepreneurial ambitions, Levine and Rubinstein (2020) find that financing constraints exert a first-order impact on whether high-ability individuals become entrepreneurs. Fairlie and Krashinsky (2012), Adelino, Schoar, and Severino (2015), Corradin and Popov (2015), Kerr, Kerr, and Nanda (2015), and Schmalz, Sraer, and Thesmar (2017) offer distinct and insightful research on how financing constraints shape entry into entrepreneurship.

## V. FINANCIAL INNOVATION AND GROWTH

Thus far, we have focused on the level of financial development: the degree to which financial systems ameliorate information and transactions costs and enhance the screening and funding of firms and individuals, the governance over the use of those funds, the trading and management of risk, the mobilization and pooling of savings, and the exchange of goods, services, and financial claims. However, another key consideration is financial innovation: the emergence of new financial instruments, markets, and intermediaries. Many view financial innovations skeptically, given the roles of credit default swaps, collateralized debt obligations, and other newfangled financial instruments in the global financial crisis. From this perspective, financial innovation is less about lowering information and transaction costs and more about fooling investors, circumventing regulations, and boosting financiers' bonuses without enhancing the quality of the services provided by the financial services industry to the economy.

In considering the role of financial innovation, Laeven, Levine, and Michalopoulos (2015) take a step back from recent crises and offer a broader, long-run consideration of financial development and suggest that financial innovation is *essential* for growth. Adam Smith argued that economic growth is a process in which production becomes increasingly specialized and technologies more complex. As firms become more complex, however, the “old” financial system becomes less effective at screening and monitoring firms and less effective at offering sound risk management tools as production becomes more specialized and complex. Therefore, without corresponding innovations in finance that match the increases in complexity associated with economic growth, the ability of the financial system to reduce information and transaction costs diminishes, slowing future growth. Without financial innovation, the financial system becomes worse at screening, governing, managing risks, mobilizing savings, and easing transactions. It is like swimming upstream: financial systems need to innovate to maintain the same growth rate.

Several examples from history illustrate the crucial role of financial innovation in sustaining economic growth. Consider first the financial impediments to railroad expansion in the 19<sup>th</sup> century. The novelty and complexity of railroads made preexisting financial systems ineffective at screening and monitoring them. Although prominent local investors with close ties to those operating the railroad were the primary sources of capital for railroads during the early decades of this new technology, this reliance on local finance restricted growth.

So, financiers innovated. Specialized financiers and investment banks emerged to mobilize capital from individuals, screen and invest in railroads, and monitor the use of those investments, often by serving on the boards of directors (Carosso, 1970). Based on their

expertise and reputation, these investment banks mobilized funds from wealthy investors, evaluated proposals from railroads, allocated capital, and governed the operations of railroad companies for investors. Since the geographical size and complexity of railroads made it difficult for investors to collect, organize, and assess price, usage, breakdown, and repair information, financiers developed new accounting and financial reporting methods.

Next, consider the information technology revolution of the 20<sup>th</sup> century. The financial system that fueled the railroad revolution of the 19<sup>th</sup> century could not fund the information technology revolution. Indeed, as nascent high-tech information and communication firms struggled to emerge in the 1970s and 1980s, traditional commercial banks were reluctant to finance them because these new firms did not yet generate sufficient cash flows to cover loan payments. Adding to bankers' reluctance, the firms were run by scientists with little experience in operating profitable companies (Gompers and Lerner, 2001). Conventional debt and equity markets were also wary because the technologies were too complex for investors to evaluate.

Again, financiers innovated. Venture capital firms arose to screen entrepreneurs and provide technical, managerial, and financial advice to new high-tech firms. In many cases, venture capitalists had become wealthy through their own successful high-tech innovations, which provided a basis of expertise for evaluating and guiding new entrepreneurs. In terms of funding, venture capitalists typically took large, private equity stakes that established a long-term commitment to the enterprise. They generally became active investors, taking seats on the board of directors and helping to solve managerial and financial problems.

Finally, consider the biotechnology revolution of the 21<sup>st</sup> century, for which the venture capital modality did not work well. Venture capitalists could not effectively screen

biotech firms because of the scientific breadth of biotechnologies, which frequently require inputs from biologists, chemists, geneticists, engineers, bio-roboticists, as well as experts on the myriad of laws, regulations, and commercial barriers associated with successfully bringing new medical products to market. It was unfeasible to house all of this expertise in banks or venture capital firms. Again, a new technology promised growth, but the existing financial system could not fund it.

Yet again, financiers innovated. They formed new financial partnerships with the one kind of organization with the breadth of skills to screen biotech firms: large pharmaceutical companies. Pharmaceutical companies (a) employ (or are in regular contact with) a large assortment of scientists and engineers, (b) have close connections with those delivering medical products to customers, and (c) employ lawyers well versed in drug regulations. Furthermore, when an expert pharmaceutical company invests in a biotech firm, this encourages others to invest in the firm. Without financial innovation, improvements in diagnostic and surgical procedures, prosthetic devices, parasite-resistant crops, and other innovations linked to bio-technology would almost certainly occur at a far slower pace.

Laeven, Levine, and Michalopoulos (2015) and Beck, Chen, Lin, and Song (2016) also provide cross-country evidence and perspectives on the policy implications. Using different measures of financial innovation and a panel econometric framework, they find that financial innovation boosts the rate of economic growth. The co-evolution of financial and economic systems has a valuable policy implication. Without denying the potentially harmful effects of some forms of financial innovation, these historical examples and new cross-country empirical findings by Laeven, Levine, and Michalopoulos (2015) suggest that financial innovation is necessary for fostering technological innovations and sustaining



economic growth. Thus, financial regulations that stymie healthy financial innovation could slow, or even stop, economic growth.

Although this line of research advertises the beneficial role—potentially even the necessary role—of financial innovation for sustaining long-run economic growth, this work does not reject the potentially harmful effects of some forms of financial innovation on the economy. For example, some financial innovations could destabilize specific financial institutions or markets that could reverberate throughout the economy. Given the first-order policy implications associated with financial innovation, researchers should devote more attention to assessing the connections between financial innovation, long-run growth, and financial and economic stability.

## VI. CONCLUSION

About three decades ago, economists finally started to examine Goldsmith's (1969) challenging question:

“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)

“ Does finance make a difference ... ?” (p. 408)

The resultant explosion of research focused on answering this question that started in the 1990s has produced many insights and raised still further questions. First, the preponderance of evidence suggests that financial development exerts a first-order impact on economic growth. Finance makes a difference. Second, emerging evidence suggests that finance also matters for income distribution as it shapes the economic opportunities available to individuals. Critically, financial development seems to foster growth by improving resource allocation, where efficient resource allocation means allocating credit and hence opportunity based on talent and initiative, not based on parental wealth or social connections. In this way, financial development spurs growth while enhancing the distribution of economic opportunities. Researchers should dissect the linkages between financial development, income distribution, and poverty alleviation. Third, some research suggests that financial innovation might be necessary for sustained economic growth. While researchers have scrutinized how financial innovations can create financial fragility, we need greater clarity on how financial innovation shapes long-run growth and income inequality.

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