Macroeconomic Dynamics, **19**, 2015, 270–287. Printed in the United States of America.
doi:10.1017/S1365100513000382

AN EXPLANATION FOR THE DIVERSITY OF FINANCIAL STRUCTURE

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This paper seeks to provide a theoretical explanation for the weak association between measures of financial structure—as defined by the mixture of bank-based and market-based financial systems in an economy—and economic development. Lenders fund risky investment projects of firms by drawing up loan contracts in the presence of an informational asymmetry. An optimal contract entails the issue of debt, equity, or a mix of the two. The equilibrium choice of contract and the financial structure depend on the state of the economy, which in turn depends on the contracting regime. Based on this analysis, the paper provides a theory that can explain the wide diversity of financial structure among middle-income countries.

Keywords: Financial Structure, Economic Development

1. INTRODUCTION

It has been widely recognized for some time among development experts that financial development is a multifaceted process that takes place through various distinct stages—from the emergence and expansion of bank-intermediated debt finance to the materialization of stock markets and the increasing use of equity as an additional instrument by which firms are able to raise funds [e.g., Gurley and Shaw (1955, 1960); Goldsmith (1969)]. In the past 15 years or so, a substantial volume of empirical research has been directed at obtaining a deeper understanding of this process. The results point to the fact that both banks and security markets are larger and more active in developed countries than in low-income countries. Also, there is a general tendency for financial markets to become more market-based as we move from low-income to high-income countries [see, for example, Demirgüç-Kunt and Levine (2001) and Demirgüç-Kunt et al. (2011)]. Yet a robust positive relation between the level of economic development and market-based financial structure has remained elusive for the entire sample. Take, for example, a widely

The authors are grateful to an associate editor and two anonymous referees for insightful comments on the earlier version of the paper. All remaining errors and omissions are the sole responsibility of the authors. This paper is also based on work performed during Niloy Bose's appointment at the National Science Foundation. Any opinions, conclusions, and recommendations expressed in the paper are those of the authors and do not necessarily reflect the views of the National Science Foundation. Address correspondence to: Niloy Bose, Department of Economics, University of Wisconsin–Milwaukee, Milwaukee, WI 53201, USA; e-mail: nbose@uwm.edu.

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TABLE 1. Correlation of financial structure and real GDP

	Correlation coefficient (significance)	Correlation coefficient (significance)
Measures of financial structure	All countries	Middle-income countries
Composite financial structure (mean removed)	0.2275 (0.0258) $n = 96$	0.0663 (0.6726) $n = 43$
Private credit to stock market capitalization	−0.2029 (0.0408) $n = 102$	−0.0421 (0.7740) $n = 49$
Capitalization vs. Bank	0.3904 (0.0000) $n = 102$	0.1119 (0.4441) $n = 49$
Trading vs. Bank Credit	0.5823 (0.0000) $n = 101$	0.3261 (0.0253) $n = 47$
Trading vs. Overhead Costs	0.4031 (0.0000) $n = 105$	0.2415 (0.0983) $n = 48$

Composite financial structure is the mean-removed average of three measures—Capitalization vs. Bank, Trading vs. Bank Credit, and Trading vs. Overhead Costs [see Demirgüç-Kunt and Levine (2001)]. Higher values of this composite structure signify a more market-based financial system. We use the variable *rgdpl*, defined as PPP Converted GDP Per Capita (Laspeyres), derived from growth rates of c, g, i, at 2005 constant prices and measured in 2005 international dollars per person. Other measures of real GDP provide similar results. Private credit to stock market capitalization is measured as private credit by deposit money banks to GDP relative to stock market capitalization to GDP (where higher values indicate a more bank-based financial structure). Capitalization vs. Bank is defined as stock market capitalization to GDP relative to deposit money bank assets to GDP. Trading vs. Bank Credit is defined as stock market value traded relative to private credit to GDP. Trading vs. Overhead Costs is defined as stock market value traded times overhead costs.

used benchmark measure of financial structure—private credit by deposit money banks to GDP relative to stock market capitalization to GDP (where higher values indicate a more bank-based financial structure).[1] The correlation between the mean value of this measure for a sample of 106 countries for the period 1980–2009 and real per capita GDP is as little as −0.192.[2] A broader measure (using private credit by banks and other financial institutions) depicts a similar picture. Demirgüç-Kunt and Levine (2001) suggest a composite measure of financial structure as a mean-removed (from the series) average of three key variables—*Capitalization vs. Bank*, *Trading vs. Bank Credit*, and *Trading vs. Overhead Costs*.[3] Higher values of this composite structure signify a more market-based financial system. According to their calculations, for a sample size of 57 countries for the years 1980–1997, the correlation of this composite measure and per capita real GDP (from the Penn world tables) is around 0.29. Table 1 (column labeled "all countries") shows that the strength of this association is about the same, with a correlation coefficient of 0.23, when we extend the sample size using a more recent series of World Bank Financial Structure Data for 96 countries for the period 1980–2009.

This weak association between market-based financial structure and the level of economic development is mainly due to the fact that countries do not necessarily follow a unique path while making the transition from a predominantly bank-based financial structure to a market-based financial structure along the course of development. Although market-based structures are less common in low-income

https://doi.org/10.1017/S1365100513000382 Published online by Cambridge University Press

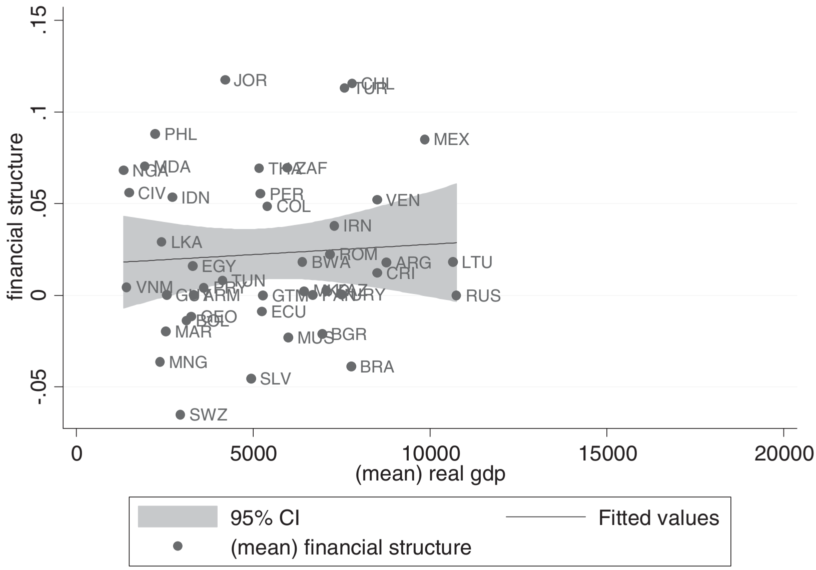

FIGURE 1. Financial structure and real GDP. Mean per capita real GDP and mean composite financial structure over the period 1980–2009 for 43 lower-middle- and upper-middle-income countries (based on World Bank income classification—see http://data.worldbank.org/about/country-classifications). Composite financial structure is the mean-removed average of three measures—Capitalization vs. Bank, Trading vs. Bank Credit, and Trading vs. Overhead Costs [see Demirgüç-Kunt and Levine (2001)]. Measures of financial structure are available from the World Bank Financial Structure Database [see Beck et al. (2009)]. Per capita real GDP is from Penn World Table Version 7.0 [Heston et al. (2011)]. We use the variable *rgdpl*, defined as PPP Converted GDP Per Capita (Laspeyres), derived from growth rates of c, g, i, at 2005 constant prices and measured in 2005 International dollars per person. Other measures of real GDP provide similar results.

countries, the financial structure becomes very diverse as soon as one moves to middle-income countries. Figure 1 presents a fitted scatterplot showing the relation between the mean per capita real GDP and the mean composite financial structure over the period 1980–2009 for 43 lower-middle- and upper-middle-income countries (using the World Bank income groups). For this group, the correlation between the two variables is almost zero (0.066), and there are numerous cases where countries with comparable levels of economic development differ significantly in terms of financial structure. In Table 1, we report the correlation coefficients between real GDP and various measures of financial structure separately for the entire sample and for the middle-income countries. The weaker correlations for the middle-income countries, in conjunction with Figure 1, convey a more convincing picture of the diverse nature of the financial structures in the middle-income group.

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But why do countries choose such diverse paths? The existing literature offers valuable insights that are based on differences in institutional and regulatory arrangements across countries. According to this literature, the financial structure of a country is also shaped by variables such as the country's legal origin, legal codes and their enforcement, the quality of accounting standards and information availability, political systems, and so on. For example, La Porta et al. (1998) explain how countries with different legal origins develop distinct laws governing debt and equity contracts, which in turn have influenced the evolution of banks and security markets. Similarly, differences in accounting standards and in the level of corruption have been seen as responsible for the differences in equity market development among otherwise similar countries [e.g., Demirgüç-Kunt and Levine (2001)]. Without discounting these explanations, the main goal of this paper is to establish the claim that the observed pattern of financial structures can still be explained by appealing to a more fundamental and well-evidenced mechanism—the two-way interaction between the financial sector and the real sector of an economy.

There is a plethora of evidence to suggest that the current activities in the financial sector influence both current and future outcomes in the real sector. It is also the case that financial decisions and market activities depend not only on the current, but also on the future state of the real variables. This feedback loop between financial decisions and the state of the economy lies at the core of our analysis. To fix ideas, consider a firm facing a decision of raising funds through either the issue of debt or the issue of equity when the market is plagued with informational friction between borrowers and lenders and the market's ability to resolve the informational friction is limited. In such circumstances, it is likely that the firms will face an informational dilution cost—a cost that is incurred by a firm when the firm is pooled together with inferior quality firms, with the result that the contract offered to the firm falls short of the first-best contract, which the firm obtains under full information. Now, consider that a project output is determined by the type of firm operating the project and the type is the firm's private information. Under an equity contract, the cash flows that a lender receives are fully correlated with the project outcome and the firm's type. Ceteris paribus, this relationship is weaker under a debt contract because the debt contract specifies a mutually agreed fixed payment and lenders' earnings are not fully linked to the project output. As a result, firms face higher dilution costs under an equity contract. On the flip side, when raising funds through debt, a firm faces the possibility of incurring a bankruptcy cost—the loss that a firm would incur in current and/or future profit when the firm is unable to honor the agreed fixed payments. Our analysis exploits this well-evidenced trade-off [e.g., Bolton and Freixas (2000)] and examines the causal relationship between this trade-off and the state of the economy to determine the equilibrium mode of financing along the path of economic development.[4]

The main implication of our analysis is that an economy may find its financial market in any of three distinct types of equilibria depending on the level of economic development. In a low-development regime, the financial market is characterized by a unique equilibrium that is associated with a high incidence of debt financing. At the other extreme, at a very high level of economic development, there exists a unique equilibrium that is associated with a high incidence of equity financing. Significantly, between these two extremes, the outcome is not unique and either debt or equity, or a combination of the two, could prevail as an equilibrium mode of financing. These results are the derivative of the well-evidenced economic development–finance nexus and represent a relationship between financial structure and economic development that is consistent with the evidence.

The remainder of the paper is organized as follows. In Section 2 we present a description of the economic environment, with the description of the credit market in Section 3. In Section 4 we study the optimal financing choice in a partial equilibrium setting. Joint determination of equilibria in the financial market and the state of the economy is addressed in Section 5. In Section 6, we offer some concluding remarks.

2. THE ECONOMY

We consider an economy that consists of an infinite sequence of two-period-lived overlapping generations. Agents are broadly divided into three groups of market participants—households (depositors), capital-producing firms (borrowers), and final-goods-producing firms. We normalize the size of each group to mass 1. All agents are risk-neutral and wish to consume only at the end of the second period. We proceed with our formal description with reference to circumstances facing each type of agent of generation t.

2.1. Households (Depositors)

Each young household is endowed with one unit of labor, which is supplied inelastically to the final goods producers at the prevailing wage rate, w_t. At time t, a young household decides whether to deposit its wage earnings with financial intermediaries in return for capital in $t+1$. We assume that as an alternative, a young household is able to convert its wage earnings, w_t, directly into w_t units of $t+1$ capital. In either case, each household becomes the potential owner of capital during adulthood in $t+1$, which is then sold to final-goods-producing firms in exchange for output to finance old age consumption.

2.2. Final-Goods-Producing Firms

Final-goods-producing firms are active only during adulthood (period $t+1$), when they gain access to a final-goods-production technology. The final goods are produced by renting capital (from the concurrent generation) and hiring labor (from the young households) at competitively determined rates. In particular, an adult final-goods-producing firm employing l_{t+1} units of labor and k_{t+1} units of capital is able to produce y_{t+1} units of final goods according to

$$y_{t+1} = Ak_{t+1}^{\alpha} l_{t+1}^{1-\alpha}, \quad A > 0; \alpha \in (0,1). \tag{1}$$

In the presence of complete factor mobility, all final-goods-producing firms employ equal amounts of l_{t+1} and k_{t+1} in equilibrium. Because there are an equal number of households and final-goods-producing firms, we have $l_{t+1} = 1$. Accordingly, the competitively determined wage rate, w_{t+1}, and the rental rate of capital, ρ_{t+1}, facing each producer of final good are given by

$$w_{t+1} = A(1-\alpha)k_{t+1}^{\alpha} \tag{2}$$

and

$$\rho_{t+1} = A\alpha k_{t+1}^{\alpha-1}. \tag{3}$$

2.3. Capital-Producing Firms (Borrowers)

Each capital-producing firm begins life with zero resources, except for access to a risky investment project from which capital is produced. In order to operate the investment project, a firm must acquire external financing from financial intermediaries during the first period. We assume that firms differ in terms of their intrinsic characteristics. To be specific, we divide the pool of firms into two types—type H and type M—indicating high-quality and mixed-quality firms. For both types, the yield from an investment project at time t is jointly determined by two elements: the realization of a project-specific shock, θ_{it}, and the type of borrower who is operating the project. A firm does not have any control over the realization of θ_{it}. Further, unless the project is undertaken, a firm is unable to observe the realization of θ_{it} and knows only its probability distribution, which is identical and independent across the projects. This distribution is given by $\theta_{it} = \theta_1$ (indicating a good state) with given probability p and $\theta_{it} = \theta_2$ (indicating a bad state) with probability $(1-p)$.

We assume that before undertaking the project, a type-H firm is aware of its own type with certainty and is able to convert one unit of time-t wage earnings into $Q > 1$ units of time-$(t+1)$ capital in a good state. In contrast, unless the project is undertaken, a type-M firm is unable to discern whether it is as productive as a type-H firm or if it is a firm of an inferior quality. Specifically, given $(\theta_{it} = \theta_1)$, a type-M firm faces an ex ante distribution in which its project yield is identical to that of a type-H firm only with a probability π, and with a probability $(1-\pi)$, its project yields a lesser amount, $q < 1 < Q$, of $t+1$ capital per input. In the bad state, when $\theta_{it} = \theta_2$, an investment project fails and yields nothing, irrespective of whether a firm is type H or type M. Finally, we assume that a given fraction, $0 < v < 1$, of borrowers are of type H, and that the distribution of borrower types and the distribution of the project-specific random shock are common knowledge.

2.4. Financial Intermediaries and the Structure of Information

The deposits of the households are intermediated through financial intermediaries that operate in a competitive environment where free entry and exit from the industry ensure that each financial intermediary earns zero profit in equilibrium. We assume that an intermediary is unable to distinguish ex ante between a type-H and a type-M firm because a firm's type is private information. This informational asymmetry is crucial in shaping the financial contract between firms and financial intermediaries—an issue that we discuss in detail in the following section.

3. THE CREDIT MARKET

The precise functioning of the credit market is as follows. At the beginning of a period, each financial intermediary posts a loan contract whose terms are observed by all firms. If an intermediary's contract is not dominated by others, it is approached by firms. Thus, financial intermediaries compete for borrowers. Without any loss of generality, we also assume that, at equilibrium, the financial intermediaries divide the loanable deposits and borrowers (firms) equally among themselves. If the equilibrium in the credit market supports n financial intermediaries, then each financial intermediary receives a deposit of the amount w_t/n, which is then divided equally among $1/n$ firms. Accordingly, each firm receives a loan amount of w_t from a financial intermediary. To keep our exposition transparent, we determine the terms of period-t financial contracts by taking the capital stock, k_t, the wage rate, w_t, and the rental rate of capital for period $t+1$, ρ_{t+1}, as given. The joint determination of these state variables and the financial contracts is discussed in Section 5 of this paper.

To begin with, consider a generic problem where a profit-maximizing financial intermediary is required to divide (expected) capital, V, from an investment project between three types of participants—borrowers (capital-producing firms), depositors (households), and financial intermediaries. We denote the shares of these participants by V_B, V_D, and V_I, respectively, where $V = V_B + V_D + V_I$. To induce participation, the financial intermediary is required to pay a minimum of ζ_B and ζ_D to a borrower and to a depositor, respectively. Thus, the problem facing the financial intermediary is simply to maximize its share $V_I = V - V_B - V_D$ subject to $V_B \geq \zeta_B$, $V_D \geq \zeta_D$, and the usual non-negativity constraints. In our case, the financial intermediary operates in a competitive framework where, at equilibrium, free entry and exit ensure that $V_I = V - V_B - V_D = 0$, or equivalently, $V_B = V - V_D$. Further, recall that a financial intermediary faces competition from others in attracting potential borrowers (firms). As a result, any arrangement for which $V_D - \zeta_D > 0$ is not sustainable in equilibrium. This is simply because a financial intermediary can offer more competitive terms of lending by transferring the entire depositor's surplus, $V_D - \zeta_D$, to the borrowers. Thus, $V_D = \zeta_D$ must also hold at equilibrium. This, together with the condition $V_B = V - V_D$, then implies that the credit market equilibrium must satisfy the benchmark condition

$V_B = V - \zeta_D$. In the following, we combine this condition with other features of the credit market to pin down the precise nature of the financial contracts.

Recall that depositors in our economy have access to an alternative rate of return. To reflect this, we have assumed that a depositor (i.e., a household) is able to convert its wage, w_t, directly into capital on a one-to-one basis. Therefore, to attract deposits, financial intermediaries must offer a gross deposit rate equal to 1, implying that $\zeta_D = w_t$.

Next, we assume that the terms of a loan contract can take one of two possible forms: a debt (bond) issue or an equity issue. The debt issue specifies a fixed repayment, R, to financial intermediaries at a specified date if the project is successful and the project output—which is not subject to costly state verification—is greater than or equal to R. In the event that firms are unable to honor the payment obligations, bankruptcy is declared, the projects are liquidated, and the financial intermediary appropriates the liquidated value of the projects as the residual claimant. We assume that the liquidation process is costly, and that a financial intermediary is able to recover only a fraction ϵ of the project output. Bankruptcy is also costly for firms, and bankruptcy costs are important in a firm's decision to raise funds through the issue of debt [e.g., Bolton and Freixas (2000)].[5] In practice, a significant part of this cost may be legal costs and/or can take the form of an adverse effect on a firm's reputation, reducing the firm's ability to raise funds in the market. Here, our scope to model the exact nature and size of these costs and the manner in which a firm pays them is limited because firms are active only for one period. As an alternative, we simply assume here that in the event of bankruptcy, a firm incurs a utility loss arising either from cumbersome legal proceedings associated with bankruptcy or from a worsening of its position in the market. Further, we assume that this loss is proportional to the scale of the firm's operation as measured by the size of the received project loan. In particular, a firm operating a project with loan size w_t incurs a loss σw_t in the event of a default, where $0 < \sigma < 1$. In contrast, an equity issue does not involve any such losses, as it specifies a share, $\delta \in [0,1]$, of the produced capital to which outside shareholders are entitled.

Now, consider a financial intermediary lending out w_t funds to a firm under an equity contract.[6] Also, recall that a fraction $v + \pi(1 - v)$ of the total pool of firms are of type H or have yields equivalent to that for a type-H firm. With probability p, each firm faces the prospect of encountering a good state ($\theta_{it} = \theta_1$). Thus, the expected yield of a project from the point of view of a financial intermediary is given by $V \equiv \hat{V} = p\{vQ + (1-v)\pi Q + (1-v)(1-\pi)q\}w_t$. Because the equity contract specifies a share $\delta \in [0,1]$ of the produced capital to which a financial intermediary is entitled, the borrower retains $V_B = (1-\delta)\hat{V}$. The benchmark condition, $V_B = \hat{V} - \zeta_D$, together with $\zeta_D = w_t$, then implies that $\delta\hat{V} = w_t$, or $\delta p\{vQ + (1-v)\pi Q + (1-v)(1-\pi)q\}w_t = w_t$. This, in turn, yields[7]

$$\delta = \frac{1}{p\{vQ + (1-v)\pi Q + (1-v)(1-\pi)q\}}. \tag{4}$$

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Next, consider a financial intermediary lending out w_t funds using a debt contract where a firm is required to make a fixed repayment, R. Under this arrangement, some firms will default. This will transpire when (irrespective of types) a firm encounters a bad state ($\theta_{it} = \theta_2$) and also when a fraction $(1-\pi)$ of type-M firms find themselves as low-quality firms capable of producing only $qw_t < w_t$ capital even when $\theta_{it} = \theta_1$. In such a state, a financial intermediary would be able to recover only a fraction ϵ of the project output produced by low-quality type-M firms. Accordingly, the expected yield of a project from the point of view of a financial intermediary is given by $V \equiv \tilde{V} = p\{vQ + (1-v)\pi Q + (1-v)(1-\pi)\epsilon q\} w_t$. Under the debt contract, because the borrowers are able to make payments only in the nondefault states, we have $V_B = pv(Qw_t - R) + p(1-v)\pi(Qw_t - R)$. As before, the benchmark condition $V_B = \tilde{V} - \zeta_D$ implies $p\{vR + (1-v)\pi R\} + p\{(1-v)(1-\pi)\epsilon q\} w_t = w_t$, or

$$R = \frac{w_t - p(1-v)(1-\pi)\epsilon q w_t}{p\{v + (1-v)\pi\}}. \tag{5}$$

Equations (4) and (5) outline the lending terms under the equity and debt contracts, respectively. Because financial intermediaries compete for borrowers, it is reasonable to assume that firms' preferences shape the choice between the two contracting regimes.[8] However, the market is populated by two types of firms, and therefore which type's preferences are at play remains in question. Notice that a fraction$(1-\pi)$ of type-M firms are able to produce only $q < 1 < Q$ units of time-$(t+1)$ capital for each unit of input even when a good state (i.e., $\theta_{it} = \theta_1$) has occurred. Accordingly, this group of firms will default with certainty at a lending rate greater than or equal to 1. Knowing this, financial intermediaries naturally will have a bias against lending to type-M firms under full information. However, because financial intermediaries are unable to distinguish ex ante between a type-M and a type-H firm, this bias can only be executed if financial intermediaries are able to differentiate between the two types based on additional information. One possible way this information could materialize is if a type-M firm reveals its preference for a contract that is different from what is preferred by a type-H firm. Therefore, to avoid being identified, it may be in the interest of a type-M firm to mimic the preference revealed by a type-H firm. If so, then the mode of raising funds in this market will be shaped by preferences revealed by type-H firms. At the end of this section, we describe in detail the circumstances in which it is optimal for the type-M firms to mimic the type-H firms.

We pin down a type-H firm's preferred mode of financing with the help of the following lemma and proposition.

LEMMA 1. *Let W_E and W_D denote the amounts of capital that a type-H firm is able to retain from the project in a good state under an equity contract and a debt contract, respectively. $W_D > W_E$ when $\epsilon > \delta$.*

Proof. The amounts a type-H firm is able to retain under an equity contract and under a debt contract are given by $W_E = Qw_t(1-\delta)$ and $W_D = (Qw_t - R)$, respectively. After the expressions for δ and R from equations (4) and (5) are substituted, a little algebraic manipulation yields that $W_D > W_E \Leftrightarrow \epsilon > \frac{1}{p[Q\{v+(1-v)\pi\}+(1-v)(1-\pi)q]} \equiv \delta$. ■

The intuition underlying this result is easy to obtain. When firms are pooled together, financial intermediaries face a positive probability of lending to low-quality type-M firms. Under a debt contract, this group of firms will default with certainty and financial intermediaries, being the residual claimants, are able to appropriate $\epsilon q w_t$ capital in the event of the good state. In contrast, under the equity contract, financial intermediaries are able to obtain a fraction δ of the produced output, qw_t, from these firms. Thus, when $\epsilon > \delta$, the equity contract gets more diluted than the debt contract. Accordingly, financial intermediaries would require more repayments from firms under the equity contract to satisfy their own zero-profit constraint. This leads to $W_D > W_E$. Also, note from equation (4) that δ is decreasing in Q. Therefore, the relation $\epsilon > \delta$ is true for a sufficiently high value of Q, which we assume to hold for the remainder of the analysis.

This result implies that in the absence of any other costs, a type-H firm would always prefer to raise funds through the issue of debt if it knew that it was in a good state. In practice, however, a type-H firm will encounter a bad state ($\theta_{it} = \theta_2$) with probability $(1-p)$ and will be compelled to declare bankruptcy and incur a loss, σw_t. In the following, we take this information into account and determine the optimal financing choice of a representative type-H firm.

PROPOSITION 1. *Define X_1 and X_2 such that $W_E = X_1 w_t$ and $W_D = X_2 w_t$. A type-H firm would prefer to raise funds through an equity (debt) contract if* $\Omega \equiv (1-\mathrm{p})\sigma/\mathrm{p}(\mathrm{X}_2 - \mathrm{X}_1) > (<)\rho_{\mathrm{t+1}}$.

Proof. In the preceding, X_1 and X_2 are constellations of parameters whose expressions can easily be obtained by substituting δ and R [from equations (4) and (5)] into the expressions for W_E and W_D, respectively. Further, because $W_D > W_E, X_2 > X_1$. Now, consider a type-H firm raising funds through an equity contract at time t. Because p is the probability of encountering a good state (i.e., $\theta_{it} = \theta_1$), the firm's expected return from the project is $pW_E(= pX_1 w_t)$ capital, which it plans to sell to final-goods producers during $t+1$ at a competitively determined rental rate ρ_{t+1}. Therefore, the expected lifetime utility of a type-H firm under an equity contract is given by $U_E = p\rho_{t+1}X_1 w_t$. An equivalent expression under a debt contract is given by $pW_D(= pX_2 w_t)$. However, in contrast to the case of an equity contract, there is an expected loss of an amount $(1-p)\sigma w_t$ associated with the event of bankruptcy. Therefore, the lifetime expected utility of a type-H firm borrower under a debt contract is given by $U_D = p\rho_{t+1}X_2 w_t - (1-p)\sigma w_t$. A straightforward comparison of U_E and U_D establishes the result. ■

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Recall that, unless the project is undertaken, a type-M firm is unable to discern whether or not it is as productive as a type-H firm, which occurs with probability π. In all other events, a type-M firm turns out to be noncreditworthy. Naturally, the condition (as outlined in Proposition 1) dictating a type-H borrower's preference may not apply in the case of a type-M borrower. To obtain a clear picture, let $\tilde{U}_E = p\rho_{t+1}w_t\left[\pi Q + (1-\pi)q\right](1-\delta)$ and $\tilde{U}_D = p\pi\rho_{t+1}\left[Qw_t - R\right] - (1 - \pi p)\sigma w_t$ denote the utilities accruing to a type-M borrower under the equity and the debt contract, respectively. After the values of δ and R from equations (4) and (5) are substituted, straightforward algebra yields that $\tilde{U}_E > \tilde{U}_D \Leftrightarrow \tilde{\Omega} \equiv \frac{(1-\pi p)\sigma}{\pi p X_2 - p X_1[\pi + (1-\pi)\tilde{q}]} > \rho_{t+1}$, where X_1 and X_2 are defined in Proposition 1 and $\tilde{q} = q/Q < 1$. Given that $X_2 > X_1$, it is easy to verify that $\tilde{\Omega} > \Omega$. Now, consider the case where the value of ρ_{t+1} is large enough for the relation $\rho_{t+1} > \tilde{\Omega} > \Omega$ to hold. In this case both groups of firms would prefer to raise funds through debt. Similarly, equity would be the preferred mode of financing for both groups when $\tilde{\Omega} > \Omega > \rho_{t+1}$. The preference of the two groups will differ when $\tilde{\Omega} > \rho_{t+1} > \Omega$: a type-M firm would enjoy higher utility from the equity contract, whereas the debt contract would be the preferred mode of financing for a type-H firm. This, however, does not mean that it is optimal for a type-M firm to reveal its preference for equity to the lenders. By doing so, a type-M firm would reveal its true type to the lenders and be denied financing. In contrast, by mimicking a type-H borrower, a type-M borrower will be able to maintain its anonymity and enjoy strictly positive expected utility from the debt contract. Thus, Proposition 1 draws a connection between the state variable ρ_{t+1} and the time t financing choice for the entire pool of firms. In the following section we demonstrate how the future state of the economy, in turn, is influenced by firms' time t choice of financing. This two-way causal relationship between the behavior in the financial market and the state of the economy lies at the core of our analysis that we discuss in Section 5.

4. FINANCING CHOICE AND CAPITAL DYNAMICS

The main goal of this section is to evaluate what effect a particular form of financing will have on the capital dynamics and the price of capital. First, consider a situation in which equity financing is the preferred mode of raising funds at time t. Under this circumstance, capital that enters the time-$(t+1)$ final-goods production originates from firms that have experienced $\theta_{it} = \theta_1$. These firms belong to three groups: the type-H firms, a fraction of the type-M firms that find themselves to be the same as the type-H firms after the project is undertaken, and a fraction of the type-M firms that end up as low-quality firms. By exploiting the law of large numbers and by recalling that there is unity measure of final-goods-producing firms, we express the time-$(t+1)$ capital stock per final-goods-producing firm as $k^E_{t+1} = p\left[vQ + \pi(1-v)Q + (1-\pi)(1-v)q\right]w_t \equiv \phi_E w_t$. Further, by using

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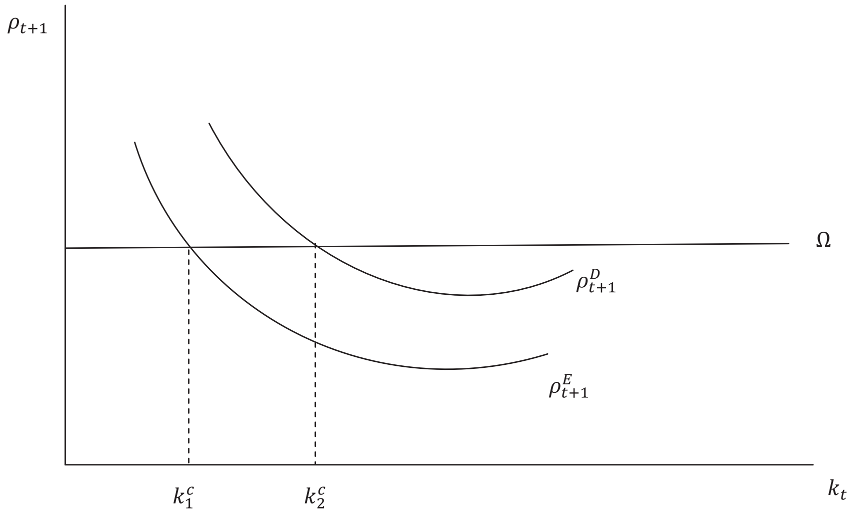

FIGURE 2. Cost of capital.

equations (2) and (3), we obtain the time-$(t+1)$ price of capital as

$$\rho^E_{t+1} = \frac{A\alpha}{\left[\phi_E A(1-\alpha)k^\alpha_t\right]^{(1-\alpha)}}. \tag{6}$$

At the other extreme, consider the case where debt financing is the preferred choice for raising funds at time t. As before, the time-$(t+1)$ capital originates from the same three groups of firms. However, the difference here is that, under the debt contract, low-quality type-M firms default even in a good state and contribute only $\epsilon q w_t$ to the $t+1$ capital stock. Accordingly, the time-$(t+1)$ capital stock per firm is given by $k^D_{t+1} = p[vQ + \pi(1-v)Q + (1-\pi)(1-v)\epsilon q]w_t \equiv \phi_D w_t$, and the corresponding price of capital is given by

$$\rho^D_{t+1} = \frac{A\alpha}{\left[\phi_D A(1-\alpha)k^\alpha_t\right]^{(1-\alpha)}}. \tag{7}$$

Because $0 < \epsilon < 1$, $\phi_E > \phi_D$. Accordingly, $\rho^D_{t+1} > \rho^E_{t+1}$ for all values of k_t (see Figure 2).[9]

5. JOINT DETERMINATION OF FINANCING CHOICE AND CAPITAL DYNAMICS

The preceding analysis demonstrates that the time-$(t+1)$ capital stock, and its price, ρ_{t+1}, are influenced by the time-t financing choice. Together with the results obtained in Section 3, this implies a relationship between the financing choice and

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the state of the economy that is fundamentally two-way causal. The primary goal of this section is to take this interdependence into account and draw a connection between the stages of economic development and financing choice. We do this with the help of the following results.

LEMMA 2. *Consider* Ω *as defined by Proposition 1. Let* k_1^c *and* k_2^c *denote the values of* k_t *for which* $\rho_{t+1}^E = \Omega$ *and* $\rho_{t+1}^D = \Omega$, *respectively.* $k_2^c > k_1^c$.

Proof. Given that $\rho_{t+1}^E = \frac{A\alpha}{[\phi_E A(1-\alpha)k_t^\alpha]^{(1-\alpha)}}$ and $\rho_{t+1}^D = \frac{A\alpha}{[\phi_D A(1-\alpha)k_t^\alpha]^{(1-\alpha)}}$, we obtain

$$k_1^c = \left[\frac{A\alpha}{\Omega}\right]^{\frac{1}{\alpha(1-\alpha)}} \left[\frac{1}{A(1-\alpha)\phi_E}\right]^{\frac{1}{\alpha}} \text{ and } k_2^c = \left[\frac{A\alpha}{\Omega}\right]^{\frac{1}{\alpha(1-\alpha)}} \left[\frac{1}{A(1-\alpha)\phi_D}\right]^{\frac{1}{\alpha}}.$$

Because $\phi_E > \phi_D$, we have $k_2^c > k_1^c$. ■

Figure 2 provides a diagrammatic representation of Ω and the price of capital under debt or equity.

We are now in a position to determine the contracting form and the state of the economy jointly and to show how the time-t equilibrium financing choice is determined by the relation of k_t to the values of k_1^c and k_2^c. We summarize the main result in the following proposition.

PROPOSITION 2. *If* $k_t < k_1^c < k_2^c$, *then there exists a unique equilibrium at time t where all type-H firms raise funds through debt financing. Conversely, if* $k_1^c < k_2^c < k_t$, *then there exists a unique equilibrium at time t where all type-H firms raise funds through equity financing.*

Proof. Suppose $k_t < k_1^c < k_2^c$. Consider a behavior profile where all type-H borrowers are raising funds using the debt contract. As a result, $k_{t+1} = k_{t+1}^D$ and $\rho_{t+1} = \rho_{t+1}^D$. Because

$$k_t < k_1^c = \left[\frac{A\alpha}{\Omega}\right]^{\frac{1}{\alpha(1-\alpha)}} \left[\frac{1}{A(1-\alpha)\phi_E}\right]^{\frac{1}{\alpha}},$$

we have $\Omega < \rho_{t+1}^E$. Also note that $\rho_{t+1}^E < \rho_{t+1}^D$ for all values of k_t. These together imply that $\Omega < \rho_{t+1} = \rho_{t+1}^D$. Therefore, following Proposition 1, there will not exist any incentive for a type-H firm to deviate from this behavior profile and raise funds through an equity contract when all other type-H borrowers are raising funds through debt contracts. Debt financing is therefore an equilibrium financing choice in the market.

To see that this is a unique equilibrium, consider another behavior profile where all type-H firms are raising funds through equity. As a result, $\rho_{t+1} = \rho_{t+1}^E$. Because $\Omega < \rho_{t+1}^E = \rho_{t+1}$, it is optimal for a type-H firm to deviate from this profile and raise funds through a debt contract. Therefore, equity financing cannot exist as an equilibrium financing choice. By a similar line of argument, it is easy to see that the relation $\Omega > \rho^D_{t+1} > \rho^E_{t+1}$ emerges when $k^c_1 < k^c_2 < k_t$, and equity finance emerges as a unique equilibrium behavior for the type-H firms. ■

COROLLARY 1. *If $k^c_1 < k_t < k^c_2$ holds for an intermediate value of the capital stock, then equity and debt are equally likely candidates for the equilibrium mode of financing in time period t. In addition, there may also exist a mixed equilibrium where a fraction of funds is raised through debt contracts and the rest is raised through equity contracts.*

Proof. $k^c_1 < k_t < k^c_2$ implies that the relation $\rho^D_{t+1} > \Omega > \rho^E_{t+1}$ is true. By making use of arguments similar to those used in the proof of Proposition 2, it is easy to see that no type-H firm will have an incentive to deviate from a behavior profile where all other type-H firms are raising funds through debt contracts. Similarly, no type-H firm will deviate from a profile where funds are raised exclusively through equity. Therefore both the debt and the equity modes of financing could emerge as equilibrium contracts for the market. To see the possibility of a mixed equilibrium, let $\tilde{k}_{t+1}$ denote the time-$(t+1)$ capital stock per firm when a fraction $\mu_t \in (0,1)$ of type-H firms raise funds through equity financing and the rest, $(1-\mu_t)$, through debt financing at time t. It is easy to verify that $\tilde{k}_{t+1} = \tilde{\phi}A(1-\alpha)k^{\alpha}_t$ and $\tilde{\rho}_{t+1} = A\alpha\tilde{k}^{\alpha-1}_{t+1}$, where $\phi_E > \tilde{\phi}(\mu_t) > \phi_D$. In such a circumstance, any μ_t for which $\rho_{t+1}(\mu_t) = \Omega$ holds then supports an equilibrium in which a fraction $\mu_t \in (0,1)$ of type-H firms utilize equity and the remaining utilize debt as a means of raising funds.[10] ■

The intuition underlying Proposition 2 and Corollary 1 is straightforward. Each firm chooses equity or debt as the preferred mode of financing according to whether $\Omega > \rho_{t+1}$ or $\Omega < \rho_{t+1}$. Which of these conditions holds depends on the level of capital stock, k_t, and the aggregate behavior of firms: the lower (higher) the value of k_t, the higher (lower) is the value of ρ_{t+1}, whereas the greater the fraction of firms choosing the equity (debt) contract, the lower (higher) is the value of ρ_{t+1}. The interplay between the effects of capital stock and aggregate firm behavior is crucial in determining the outcomes. For example, in the region $k_t < k^c_1$, the low value of capital stock pushes ρ_{t+1} so high that the relation $\Omega < \rho_{t+1}$ continues to hold even when all firms choose equity as their preferred mode of financing. Consequently, the only behavior profile from which defection will not occur is one in which all firms choose debt financing. Conversely, in the region $k_t > k^c_2$, the capital stock is so high that the relation $\Omega > \rho_{t+1}$ continues to hold even when all firms opt for debt financing. Consequently, all firms deviate from debt financing and equity finance emerges as the equilibrium behavior. In the intermediate region, $k^c_1 < k_t < k^c_2$, the capital stock is neither too large nor too small to completely offset the opposing effect on ρ_{t+1} that could arise from aggregate behavior. This creates room for the frequency-dependent equilibrium to emerge in which an individual firm's decision is shaped by the behavior of the other firms. For example, for an individual firm, equity financing becomes an optimal decision when ρ_{t+1} falls sufficiently so that $\Omega > \rho_{t+1}$ holds as a result of other firms choosing equity financing.

By recalling that the type-M firms mimic the financing choice of the type-H firms in order to avoid detection, the proposition and its corollary draw a link between k_t and the time-t financing choice for the entire pool of firms, which, in turn, leads us to distinguish between three types of development regimes, as illustrated in Figure 2. The first—a low-development regime—is one in which the capital stock is low (below the threshold level k_1^c), the price of capital is high, and debt financing is the dominant mode of raising funds. The second—a high-development regime—is one in which the capital stock exceeds the upper threshold level k_2^c, the price of capital is low, and firms rely exclusively on equity financing to raise funds. The transition from a low- to a high-development regime outlines a process in which market-based finance gains prominence.

Interestingly, however, we also identify an intermediate regime with $k_1^c < k_t < k_2^c$ in which there is no unique relation between the levels of capital stock and the preferred method of raising funds. For a given level of the capital stock, the market equilibrium could be one where either debt or equity or a combination of the two could emerge as a preferred mode of financing. Together, these results provide a theory of joint determination of real and financial activities with the ability to elucidate the well-evidenced pattern in the diversity of financial structure. Here our explanation does not rely on the variations in factors such as institutional and regulatory qualities. Instead, we appeal to a fundamental two-way causal relationship between financial and real activities to explain both the trend and the diversity in financial structure across a wide spectrum of countries in terms of their level of prosperity.

6. DISCUSSION AND CONCLUSIONS

There is general consensus about the tendency of financial markets to be more bank-based in poor countries and more market-based in rich countries. Yet the association between the market-based financial structure and real development has remained low for the entire sample of countries, because of notable diversity in the mode of financing among middle-income countries. Our paper seeks to provide an explanation for this pattern. Importantly, our goal here is neither to engage in the bank-based versus market-based debate in the context of economic development nor to emphasize how institutions and governance shape the financial structure. Instead, we appeal to a well-founded financial–real sector nexus to generate theoretical predictions that are consistent with the observed pattern in the diversity of financial structures.

Our model may prove to be useful in explaining some side issues. First, there is ample evidence in the existing literature to suggest that financial structure matters for innovation and productivity growth. Some argue in favor of the market-based structure [e.g., Rajan (1992); Saint-Paul (1992); Bencivenga et al. (1995)], whereas others argue that bank-based systems are more effective in fostering innovation and productivity growth [Bhattacharya and Chiesa (1995); Yosha (1995); Stulz (2000)]. In contrast, researchers have paid relatively less attention to the possible effects running from technological progress to financial structure. In most cases, either the discussion has revolved around firms' financing choice of R&D expenditures or R&D activities are taken as one of many controls in explaining firms' capital structure [e.g., Titman and Wessels (1988)]. Because technology is exogenous in our model, an explicit analysis of joint evolution of technology and financial structure is beyond our scope. Still, our theory holds some promise in linking cross-country variations in technological progress to financial structure. For example, it is easy to verify that both critical levels of capital stocks, k_1^c and k_2^c, are decreasing in the values of the technology parameters (e.g., Q and q) and the project's success probability, p. Thus any technological progress leading to an improvement in the expected output of the investment project is likely to advance the prospect of a market-oriented financial structure.

Second, a number of studies have explored the effects of the liberalization of capital controls on the development of equity markets in developing and middle-income countries. In general, these effects are mixed. For example, Levine and Zervos (1998a) identify 14 countries that significantly reduced barriers to international capital and dividend flows in the 1980s. Among these, only five countries experienced an increase in the size of their stock markets following liberalization. Others [e.g., Chinn and Ito (2006)] have reported that a higher level of financial openness contributes to the development of equity markets only when a threshold level of general legal systems and institutions are already in place and/or liberalization in cross-border goods transactions precedes capital account liberalization. Our framework points to another explanation, which is based on the movements of the price (or cost) of capital. The prediction of our model is that indeterminacy of equilibrium and diversity in the mode of financing are likely to transpire when the price of capital falls below a threshold level and its value enters an intermediate range. There is a large body of evidence to suggest that with capital market liberalization, developing and emerging countries have experienced a reduction in the price of capital [Kim and Singal (2000); Henry (2003, 2007); Martell and Stulz (2003)]. This stylized fact, together with our theory, points to an informed conjecture suggesting that a decline in the price of capital could have guided countries to an intermediate regime where it is possible for a variety of financing choices to co-exist as equilibrium outcomes. Naturally, in such circumstances, a clear effect of capital market liberalization on stock market development is unlikely to show up in the data.

NOTES

1. This measure can readily be constructed from the World Bank financial structure database. See, for example, Demirgüç-Kunt and Levine (2001) and Demirgüç-Kunt et al. (2011).

2. According to the World Bank classification, 9 of these countries are low-income countries, 27 are lower-middle-income countries, 26 are upper-middle-income countries, and 44 are high-income countries.

3. Capitalization vs. Bank is defined as the size of domestic stock market capitalization relative to the domestic assets of deposit money banks. Trading vs. Bank Credit is defined as the ratio of the total value of stock transactions on domestic exchanges to the value of private credit by deposit money banks. Trading vs. Overhead Costs equals stock market total value traded relative to GDP multiplied by overhead costs, where higher values of overhead costs indicate a less efficient banking sector.

4. Our approach here is strikingly different from what is on offer in the existing literature. For example, in Boyd and Smith (1996, 1998) and in Khan (2001), the trade-off depends on the costs of state verification, where the debt contract is subject to a standard costly state verification problem. In Chakraborty and Ray (2006), the trade-off depends jointly on the cost of monitoring and the entrepreneur's initial wealth when the lending to firms is fraught with moral hazard problems. In contrast, in Chakraborty and Ray (2007), the trade-off is shaped by the type of investment technology and the nature of legal and financial institutions.

5. See Altman (1984) for estimates of the size and importance of bankruptcy costs.

6. As in Bolton and Freixas (2000), we do not consider the possibility of a separating equilibrium where Type-H borrowers could partially reveal themselves using a menu of contracts.

7. Our analysis is not meant to imply that δ remains fixed throughout the course of development. The expression for δ depends on a variety of exogenous technological parameters and the composition of borrowers, which we consider to be exogenous for the purposes of the present analysis. In practice, however, these factors do change, both in the short run and over the course of development, leaving room for δ to change as well.

8. For a similar treatment where firms' preferences dictate the nature of the financial contract, please refer to Azariadis and Smith (1993) and Bencivenga and Smith (1993), among others.

9. A side implication of this result is that a higher capital accumulation path is associated with higher equity market activity. This result is congruent with the stylized facts that there exists a significant positive association between initial level of stock market liquidity and current and future rates of capital accumulation and productivity growth [Levine (1991); Bencivenga et al. (1995); Levine and Zervos (1998b)].

10. It is possible to draw a mapping from the capital stock in the intermediate range to the value of μ with an implication that the mixed equilibrium biases toward the debt contract. To see this, note that ρ_{t+1} is decreasing in both μ_t and k_t. Because the mixed equilibrium requires $\rho_{t+1}(\mu_t, k_t) = \Omega$, an increase in k_t in the intermediate region must require μ_t to go down. This does not, however, imply any systematic variation of financial structure among the middle-income countries. The intermediate region still remains characterized by multiple equilibria with possibilities of diverse outcomes.

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