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Explaining the Trend and the Diversity in the Evolution of the Stock Market[♣]

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Abstract:

In an overlapping generations economy, 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 only debt, only equity, or a mix of the two. The equilibrium choice of contract depends on the state of the economy, which in turn depends on the contracting regime. Based on this analysis, the paper provides a theory of the joint determination of real and financial development. The paper is able to explain both the endogenous emergence of the stock market along the path of economic development and the diversity in the mode of financing that is commonly observed in the intermediate stage of development.

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1. Introduction

It has been widely recognised for some time among development experts that financial development is a multi-faceted process that takes place through various distinct stages – from the emergence and expansion of bank-intermediated debt finance to the materialisation 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, and Goldsmith, 1969). In recent years, a substantial volume of empirical research has been directed towards understanding the events that lead an economy to undergo transition from a financial system based wholly or predominantly on the issue of debt to one involving a much greater reliance on the issue of equity. These investigations have yielded a number of important findings that strongly suggest that the development of equity markets is a systematic process that influences and is influenced by the development of the real sector. For example, using data on 47 countries from 1976 through 1993, Levine and Zervos (1998b) conclude that the value of stock trading relative to the size of the financial market and relative to the size of the economy are positively and significantly correlated with current and future rates of economic growth.[1] Extending their analysis using a data set on a cross-section of up to 150 countries, Demirguc-Kunt and Levine (1999) find strong evidence supporting a positive and robust correlation between the levels of GDP per capita and the size, the level of activity, and the efficiency of the stock market.[2] Motivated by these findings, we examine the evolution of equity markets with a model that allows for mutual interdependence between the real and financial sectors.

Despite the strong suggestion from the empirical literature, modelling the process of transition from one stage of financial development to another has eluded the attention of most researchers. Exceptions include the notable contributions by Boyd and Smith (1996, 1998) that propose a framework in which producers of capital choose between two different technologies that are financed in two different ways. The output arising from the first type of technology is publicly observable and is financed by

[1] Antje and Jovanovic (1993) obtain a similar result.
[2] According to their analysis, the correlation between GDP per capita and both the total value traded as a share of GDP and the market turnover ratio are about 0.4 and are significant at the 0.01 level. The correlation between GDP per capita and market capitalisation is almost 0.3 and is significant at the 0.05 level.

means of equity at no expense. The output of the second type of technology is not directly observable by lenders and is financed by means of debt due to the standard costly verification problem (e.g. Townsend, 1979; Diamond, 1984). Assuming plausible parameter values, it is shown that there is a critical level of per capita income below which only a debt market exists. As capital accumulation takes place, however, the cost of state verification increases due to a fall in the relative price of capital. Eventually (i.e., once the critical level of income is reached), a stock market emerges as firms begin to make more use of the observable technology and less use of the unobservable technology, implying an increase in the amount of equity finance relative to debt finance.

The above empirical and theoretical research view the development of the equity market as being largely driven by the development of the real sector. Such hypothesis, however, has not gone unchallenged. Researchers have raised doubts based on a nontrivial number of cases where countries with comparable levels of economic development differ significantly in terms of the size and the liquidity of their equity markets (Pagano, 1993).[3] Closer inspection of the data further reveals that the majority of such cases are confined to countries in the intermediate stages of development. To highlight this point, we list the variances of the ratios of market capitalisation to GDP and the total value traded to GDP across different income groups in Table 1.[4] In general, both the size of equity markets and the level of equity market activity (as measured by the above ratios, respectively) are increasing as we move from the lowest income countries to the highest income countries. This general finding, however, masks the greater variation found among the middle- and high-income groups. The picture that emerges is one of wide diversity in the size of equity markets and in the level of equity market activity for those countries at an intermediate stage of development. Focusing first on market capitalisation to GDP, consider the differences in the variances across the income groups. The variance for the lower high-income

[3] For example, in the UK, the ratio of stock market value to GDP is five times larger than in Germany, France, Denmark, and Finland, and six times larger than in Italy and Norway.

[4] In the construction of Table 1, we employ the same set of countries and data as in Demirguc-Kunt and Levine (1999). Countries are first classified according to their 1995 GNP per capita as defined in the 1997 World Development Indicators. Low income is $765 or less; lower middle income is $766-$3035; upper middle income is $3036-$9385; high income is $9,386 or more. We then classify the high-income countries into upper high income and lower high income according to (average 1990-95) GDP per capita.

group is 4.2 times that of the highest income group. The variance for the upper middle-income group is 9.5 times that of the lower middle-income group and 67.8 times that of the lowest income group. Similar differences emerge when comparing the variances using total value traded to GDP.[5] In fact, the diversity among these measures is greater for the upper middle-income and the lower high-income countries than for any other income group.

Why do some countries face such decidedly different paths of equity market development along similar paths of economic development? In answering this question, the existing literature has focused primarily on differences in institutional and regulatory arrangements across countries. For example, La Porta et al. (1998) explain how countries with different legal origins develop distinct laws governing debt and equity contracts. In turn, these country-specific contracting regimes then influence the evolution of banks and security markets. Similarly, differences in accounting standards and in the level of corruption have been viewed as responsible for the differences in equity market development among otherwise similar countries (Demirguc-Kunt and Levine, 1999). Despite being valuable in their own right, these explanations are based on factors or events whose analysis lies beyond the domain of traditional economics. Furthermore, such institution and regulation based explanations are inadequate in explaining why the diversity in the mode of financing is more commonly observed in the intermediate stages than in any other stage of development. In this paper, we contend that the diversity in the mode of financing among similar countries can still be explained by appealing to the two-way interaction between the development of the financial sector and the real sector, which has been well evidenced in the recent empirical literature.

The analysis that we present here is based on a simple growth model in which an informational asymmetry exists between borrowers and lenders. In making a choice between debt financing and equity financing, a representative borrower evaluates the trade-off between two types of costs – bankruptcy costs and dilution costs (e.g., Bolton and Freixas, 2000) – that arise in conjunction with the informational asymmetry.

[5] The variance in the total value traded for the lower high-income group is approximately double that of the highest income group. The variance for the upper middle-income group is almost 8 times that of the lower middle-income group and 135 times that of the lowest income group.

Bankruptcy cost is the loss that a borrower incurs in his current and/or future profit when he is unable to honour a mutually agreed fixed payment that is associated with debt issue. By contrast, an informational dilution cost is the cost incurred by good quality firms that are pooled together with inferior quality firms such that the offered contract falls short of the first best contract (e.g., Myers and Majluf, 1984). In the absence of any pre-committed payment arrangements, there is no bankruptcy cost associated with equity financing. There may be higher dilution costs, however, for a good firm offering equity. This is due to the fact that under the equity contract, the cash flows that a lender receives depend entirely on the type of a borrower. Thus, pooling high quality and inferior quality firms dilutes the optimal contract. By contrast, under debt financing, the dilution costs are lower since the borrower makes fixed payments. However, a firm may be forced into bankruptcy and liquidation when it is unable to honour its commitments, facing higher bankruptcy costs even in the face of lower dilution costs. Our analysis suggests that the trade-off between the two types of costs depends on the level of capital accumulation in the economy. Accordingly, a borrower's choice between debt financing and equity financing relies crucially on the state of the economy. In turn, the economy's rate of return to capital depends on the prevailing mode of financing. Given this mutual dependency, we jointly determine the equilibrium mode of financing along the path of economic development.

The main implication of our analysis is that an economy may find its financial market in any of three distinct types of equilibria contingent upon the level of capital accumulation in the economy. In a low development regime, the financial market is characterised by a unique equilibrium that is associated with a high incidence of debt financing. At the other extreme, at a very high level of the capital stock, there exists a unique equilibrium that is associated with a high incidence of equity financing. Significantly, between these two extremes, the equilibrium mode of financing is not unique and a high incidence of either debt or equity financing may prevail. This account of events is useful in understanding not only the well-evidenced link between the level of real activity and the financing choice of firms, but also the wide diversity in the choice of financing that is more commonly observed among countries that are at an intermediate stage of economic development.

The remainder of the paper is organised as follows. In Section 2 we present a description of the economic environment. In Section 3 we study an economy's optimal

choice of financing in a partial equilibrium setting. Section 4 analyses equilibria in the financial market that are associated with different levels of economic prosperity. In Section 5, 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 divided into three groups of market participants – households (lenders), capital-producing firms (borrowers), and output-producing firms. We normalise 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 (Lenders)

Each young lender is endowed with one unit of labour, which is supplied inelastically to the output producers at the ruling wage rate, w_t. At time t, a young lender decides whether to lend his wage earnings to capital-producing firms in return for capital in $t+1$. Alternatively, we assume that a lender is able to convert his wage earning, w_t, directly into w_t units of $t+1$ capital. In either case, each lender becomes the potential owner of capital during adulthood (in $t+1$). This capital is then sold to output-producing firms in exchange for output to finance old age consumption.

2.2 Output-Producing Firms

These firms are active only during adulthood (period $t+1$) when they gain access to an output production technology. The output is produced by renting capital (from the current generation) and hiring labour (from the young generation) at competitively determined rates. In particular, an adult output-producing firm employing l_{t+1} units of labour and k_{t+1} units of capital, is able to produce y_{t+1} units of output according to $y_{t+1} = Ak_{t+1}^{\alpha} l_{t+1}^{1-\alpha}$, $A > 0; \alpha \in (0,1)$. (1)

In the presence of complete factor mobility, all output-producing firms employ equal amounts of l_{t+1} and k_{t+1} in equilibrium. Since there are an equal number of households and output-producing firms, we obtain a unitary amount of labour per firm, i.e.,

$l_{t+1} = 1$. Accordingly, the competitively-determined wage rate, w_{t+1}, and the rental rate of capital, ρ_{t+1}, facing each producer of output 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 a risky investment project from which capital is produced. To exploit such opportunity, a firm must acquire external financing from lenders during the first period. We assume that borrowers differ in terms of their intrinsic characteristics and that the output from the investment project is influenced by such characteristics. To illustrate, we assume that a borrower can be either of two types: type 1 or type 2. The output of an i^{th} investment project at time *t* is jointly determined by the realisation of a project specific shock, θ_{it}, and the type of borrower who is operating the project. A borrower does not have any control over the realisation of θ_{it}. In addition, unless the project is commenced, a borrower is unable to observe the realisation of θ_{it} and knows only its probability distribution, which we assume to be identical and independent across the projects. This probability distribution is given by $\theta_{it} = \theta_1$ (indicating a good state) with prior probability p and $\theta_{it} = \theta_2$ (indicating a bad state) with prior probability $(1-p)$. In the good state, when $\theta_{it} = \theta_1$, a type-1 borrower operating an i^{th} investment project is able to convert 1 unit of time t wage earnings into $Q > 1$ units of time $t+1$ capital. By contrast, under the same circumstances, a type-2 borrower is able to produce only $q < 1 < Q$ units of time $t+1$ capital. To ensure that loan transactions take place between borrowers and lenders, we assume Q to be sufficiently large. In the bad state, when $\theta_{it} = \theta_2$, an investment project fails and yields nothing irrespective of the borrower's type. Finally, we assume that a given fraction, $0 < v < 1$, of borrowers are of type 1, and that the distribution of borrower types and the distribution of the project specific random shock are common knowledge.

To further differentiate the two types of borrowers, we assume that the type-1 borrower also has the ability to acquire skills whenever he operates an investment

project. Specifically, a young type-1 borrower is able to acquire valuable experience that enables him to develop entrepreneurial skills that can be used productively during adulthood. In practice, such entrepreneurial skills are rewarded in the market and the extent of the reward is determined, among other things, by the state of the economy. To keep our model tractable, we do not explicitly include this entrepreneurial input into the production function. Instead, we capture the flavour by assuming that each adult type-1 borrower is endowed with s_{t+1} units of skilled labour, which entitles him to $B(k_{t+1})s_{t+1}$ units of additional consumption in $t+1$. The function B denotes the rate of return of the borrower's skilled labour endowment, which depends on the time $t+1$ capital stock per firm, k_{t+1}.

While the type-2 borrower does not gain the entrepreneurial skills of the type-1 borrower, during the second period, each type-2 borrower is endowed with a home production technology that is capable of converting capital into output. The productivity of capital in the home production technology is relatively inferior to the mainstream output production technology outlined in equation (1). In particular, we assume that by employing this home production technology, a type-2 borrower is able to convert 1 unit of capital into $\varepsilon\rho_{t+1}$ amount of output, where $\varepsilon < 1$ and ρ_{t+1} is as given in equation (3).[6]

2.4 The Structure of Information

While the distribution of borrower types is common knowledge, we assume that a lender is unable to distinguish *ex-ante* between a type-1 and a type-2 borrower because a borrower's type is private information. This informational asymmetry is

[6] The differences in the acquisition of entrepreneurial skills can be justified by underlying differences in human capital. For the type-1 borrower, his initial level of human capital makes it easier for him to gain additional skills as he operates the investment project. Thus the higher level of human capital for the type-1 borrower makes it more likely that he will receive a good economic shock and gives him greater ability to utilize the realized shock to add to human capital by acquiring entrepreneurial skills. The type-2 borrower, on the other hand, begins with a different level or type of human capital that does not permit acquisition of entrepreneurial skills as he operates the investment project. Thus, borrower type is determined partially by the economic shock and partially by inherent differences in human capital. See Murphy, Shleifer, and Vishny (1991) for a similar argument that more able agents can earn more than proportionately to their ability from operating the same technology as less able agents. Among others, Romer (1990), Iyigun and Owen (1998), and Aghion and Howitt (1998, section 9.1.1) utilize human capital differences in explaining economic growth.

crucial in shaping the financial contract between borrowers and lenders – 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 each period, young households and young capital-producing firms are united in randomly matched pairs.[7] To keep our exposition transparent, in this section we assume that, at the beginning of period t, the terms of the financial contracts are determined while taking the capital stock, k_t, wage rate, w_t, and the rental rate of capital for period $t+1$, ρ_{t+1}, as given. Subsequently, in Section 4, we demonstrate how the optimal financial contract is influenced by the evolution of these state variables along the growth path. We assume that the terms of contracts offered in the market are public knowledge and can take one of two possible forms: a bond (debt) issue or an equity issue. The debt issue specifies a fixed repayment, R, to bondholders at a specified date. By contrast, an equity issue specifies a share, $\delta \in [0,1]$, of the produced capital to which outside shareholders are entitled.

Before proceeding further, it is instructive to elucidate a few assumptions and to make a few observations that are important in the determination of the optimal contracting form. We assume that the lenders operate in a competitive framework. Accordingly, any contract that makes extra economic profit for the lenders is not sustainable since the lenders compete with each other to win borrowers by offering any extra economic profits to the borrowers. This amounts to saying that competition drives the lenders to maximize the utility of the borrowers subject to their own zero profit constraint. Hence, in practice, the borrowers' preferences determine the optimal contracting form.[8] Further, the outside opportunities of the lenders entail that the expected rate of return from lending must be greater than or equal to zero. Then, given

[7] The assumption of one-to-one matching between borrowers and lenders is not uncommon in the literature (e.g., Bencivenga and Smith, 1993; Bose and Cothren, 1996) and is made in the present context largely to save on notation. As will become apparent, if a lender were to be approached by more than one borrower (each of whom is identical *ex ante*), the lender would either divide her loanable funds equally between borrowers, or lend only to a single borrower. Given that there are equal numbers of lenders and borrowers, the equilibrium outcome in each case would be equivalent to one-to-one matching.

[8] This approach is common in the existing literature. Examples include Bencivenga and Smith (1991, 1993) and Azariadis and Smith (1993), among others.

$q < 1$, a type-2 borrower faces bankruptcy and obtains no profit from the investment project even when the good state ($\theta_{it} = \theta_1$) has occurred. Thus, in the present state of the model, there exists no incentive for a type-2 borrower to participate in the market when a debt contract is issued and when the lenders are the residual claimants. This is not true, however, in the case of a type-1 borrower. Given $Q > 1$, in the good state of the economy, a type-1 borrower is able to repay the lenders and earn positive profit. Accordingly, the problem associated with the informational asymmetry can be resolved trivially by making use of only debt contracts, so that type-2 borrowers do not enter the market. To avoid such triviality, we assume that the type-2 borrowers are endowed with an opportunity to sever ties with the lenders and appropriate a fraction, $(1-\hat{\delta})$, of the produced capital that can then be used in home production. Such opportunity provides sufficient incentive to the type-2 borrowers to participate in the market when funds are exchanged through the issue of debt contracts. Below, we pin down the optimal contracting form by making use of a set of lemmas and propositions.

Lemma 1:

(i) Given $\hat{\delta} < 1$, a type-2 borrower always severs ties with the lenders under a debt contract.

(ii) If $\hat{\delta} > \delta$, a type-2 borrower meets his payment commitments under an equity contract (that specifies a share, $\delta \in [0,1]$, of the produced capital to which outside shareholders are entitled).

Proof: (i) Under the debt contract, a type-2 borrower faces bankruptcy with certainty and receives zero payoff. If, instead, a type-2 borrower severs ties with the lender, he is able to retain $(1-\hat{\delta})qw_t$ amount of capital which, when invested in home production, yields $(1-\hat{\delta})qw_t\varepsilon\rho_{t+1}$ amount of output. This payoff being strictly greater than zero is sufficient to motivate the type-2 borrower to sever ties with the lenders.

(ii) Under the equity contract, in a bad state ($\theta_{it} = \theta_2$), a type-2 borrower owes nothing to the lenders. In a good state ($\theta_{it} = \theta_1$), a type-2 borrower pays δqw_t amount of capital to the lenders and is able to retain $(1-\delta)qw_t$ amount of capital as profit. In turn, this entitles him to $(1-\delta)\rho_{t+1}qw_t$ amount of output at the end of the second period

through the mainstream technology. Given $\varepsilon < 1$, a straightforward comparison of the payoffs ensures that a type-2 borrower meets his payment commitments under an equity contract if $\hat{\delta} > \delta$.

To obtain funding, a type–2 borrower must always mimic any preferences revealed by a type-1 borrower.[9] As a result, we determine the optimal contracting form by exclusively focussing on the preferences revealed by the type-1 borrower. Let W_E and W_D denote the expected amount of capital that a type-1 borrower is able to retain from the project under the equity and debt contracts, respectively.

Proposition 1: $W_D > W_E$ *when* $\hat{\delta} > \delta$.

Proof: An equity contract specifies a share $\delta \in [0,1]$ to which the lenders are entitled. Since competition drives lenders' profits to zero, the value of δ must be consistent with the zero profit constraint of the lender. For a given amount of loanable wage earnings, w_t, the zero profit constraint of the lender is given by $w_t = \delta p[vQ + (1-v)q]w_t$. This, in turn, implies $\delta = \dfrac{1}{p[vQ + (1-v)q]}$. When offering a debt contract, a borrower promises a fixed repayment, R, that must also satisfy the zero profit constraint of the lender, i.e., $vpR + (1-v)pq\hat{\delta}w_t = w_t$. Accordingly, $R_t = \dfrac{w_t - (1-v)pq\hat{\delta}w_t}{vp}$. Given these observations, we obtain

$$W_E = pQw_t(1-\delta) = \left[pQ\frac{p[vQ + (1-v)q] - 1}{p[vQ + (1-v)q]} \right] w_t \equiv \mathrm{X}_1 w_t \qquad (4)$$

and

$$W_D = p[Qw_t - R_t] = \left[\frac{Qvp - 1 + (1-v)pq\hat{\delta}}{v} \right] w_t \equiv \mathrm{X}_2 w_t . \qquad (5)$$

[9] As in Bolton and Freixas (2000), we do not consider the possibility where type-1 borrowers could attempt to partially reveal themselves by offering a menu of contracts. Such a separating equilibrium can only be supported by ad-hoc beliefs.

A straightforward comparison of equations (4) and (5) indicates that $W_D > W_E$ when the relation $\hat{\delta} > \delta$ holds. In turn, the relation $\hat{\delta} > \delta$ is true for a sufficiently large value of Q, which we assume holds for the remainder of our analysis.

Intuition underlying the above proposition is easy to obtain. Consider a scenario in which a debt contract has been offered. If $\theta_{it} = \theta_1$ and the borrower is a type-2 borrower, then, with certainty, the borrower severs ties with the lender, leaving the lender with $\hat{\delta} q w_t$ amount of capital. Under an equity contract, however, the lender is only able to obtain a fraction δ of the capital, qw_t, produced by a type-2 borrower. Accordingly, when $\hat{\delta} > \delta$, and when a lender offers a contract by pooling the two types of borrowers, an equity contract gets more diluted (i.e., falls short of the first best contract) than a debt contract, causing $W_D > W_E$.

The result obtained in Proposition 1 implies that in the absence of any other costs, a type-1 borrower would always prefer to raise funds through an issue of debt, thus minimizing the dilution costs. In reality, however, a firm's decision to raise funds through the issue of debt is significantly influenced by the consideration of bankruptcy costs – the loss that a borrower typically incurs in his current and/or future profit when he is unable to honour a mutually agreed fixed payment (e.g. Bolton and Freixas, 1998, 2000).[10] In our case, a type-1 borrower encounters this possibility when $\theta_{it} = \theta_2$ and the project yields nothing. We assume that under such circumstance, a type-1 borrower is compelled to declare bankruptcy and incurs a bankruptcy cost that is a fraction, σ, of his second period labour earnings.[11] Thus, under debt financing, while the dilution costs are lower, a firm may be forced into bankruptcy and incur the costs associated with bankruptcy. By contrast, in the absence of any pre-committed payment arrangements, there is no bankruptcy cost associated with equity financing. However, there may be higher dilution costs for a type-1 firm offering equity. Below, we exploit

[10] See Altman (1984) for estimates of the size and importance of bankruptcy costs.

[11] Highlighting once again the difference between the two agents, note that a type-2 borrower does not face the bankruptcy cost because he instead severs ties with the lender under a debt contract. In a multi-period setting, there may be a reputational effect that precludes the type-1 agent from severing ties with the lender. While not modeling this reputational effect directly, we appeal to the intuition and assume that the type-1 borrower does not abscond with funds and thus faces the bankruptcy cost.

this trade-off between the two costs in determining the optimal financing choice for the economy.

Proposition 2: An equity (debt) contract is the preferred mode of financing from the point of view of a type-1 borrower when $\frac{(1-p)\sigma s B(k_{t+1})}{(W_D - W_E)} \equiv \Omega(k_{t+1}) > (<)\rho_{t+1}$.

Proof: During adulthood, a type-1 borrower rents out any capital at his disposal at a competitively determined rental rate ρ_{t+1}. At the same time, when operating under an equity contract, a type-1 borrower is able to earn $B(k_{t+1})s_{t+1}$ amount of adult income from his skilled labour endowment in the absence of any bankruptcy costs. Accordingly, we write the expression for the expected life-time utility of a borrower under an equity contract as

$$U_E = \rho_{t+1} W_E + B(k_{t+1})s_{t+1} \tag{6}$$

where W_E is given by equation (4). In a similar vein, we express the life-time expected utility of a type-1 borrower under a debt contract as

$$U_D = \rho_{t+1} W_D + pB(k_{t+1})s_{t+1} + (1-p)(1-\sigma)B(k_{t+1})s_{t+1}, \tag{7}$$

where W_D is given by equation (5). The first term represents a type-1 borrower's expected project earnings (in terms of output) under a debt contract. The second and third terms together represent a type-1 borrower's expected earnings from his skilled labour endowment during the second period in the presence of a probable bankruptcy. A straightforward comparison of equations (6) and (7) establishes the result.

The above proposition shows that the equilibrium mode of financing at period t depends not only on the current state variable, w_t (through W_D and W_E), but is also influenced by the variables k_{t+1} and ρ_{t+1} that characterise the future state of the economy. As we demonstrate in the following section, this relationship is instrumental in explaining why countries with similar economic environments often differ in their use of debt and equity financing.

4. Capital Dynamics and the Financing Choice

The foregoing analysis (Proposition 2) sets out the condition based upon which a type-1 borrower makes a decision about whether to use debt or equity as the preferred mode of raising funds. The analysis reveals that the debt-equity decision depends upon economy-wide variables. We begin our discussion in this section by considering how these economy-wide variables, in turn, are affected by the mode of raising funds in the financial market. This two-way causal relationship between the behaviour in the financial market and the state of the economy lies at the core of our analysis that is to follow.

First, consider a situation in which $\Omega(k_{t+1}) > \rho_{t+1}$ holds (from Proposition 2) and equity financing is the preferred means of raising funds at time *t*. Under such circumstance, type-2 borrowers have no incentive to sever ties with the lenders. The ownership of the capital that enters the time $t+1$ output production is distributed among three groups of individuals – the households, the type-1 borrowers, and the type-2 borrowers. By exploiting the law of large numbers and by recalling that there is unity measure of output-producing firms, we express the time $t+1$ capital stock per firm as

$$k_{t+1}^{E} = p[vQ + (1-v)q]w_t = A(1-\alpha)\,p[vQ + (1-v)q]k_t^{\alpha}. \qquad (8)$$

At the other extreme, consider the case where debt financing is the preferred choice of raising funds at time t. In such a case, each type-2 borrower severs ties with the lenders and appropriates $(1-\hat{\delta})$ fraction of the capital that he produces. Hence, the ownership of the capital that enters the time $t+1$ output production is distributed among the lenders and the type-1 borrowers. Accordingly, the time $t+1$ capital stock per firm is given by

$$k_{t+1}^{D} = p[vQ + (1-v)\hat{\delta}q]w_t = A(1-\alpha)\,p[vQ + (1-v)\hat{\delta}q]k_t^{\alpha}. \qquad (9)$$

In Diagram 1, we denote these two capital accumulation paths by Path E and Path D and their corresponding steady states by k_{ss}^{E} and k_{ss}^{D}, respectively. Given $\hat{\delta} < 1$, Path E lies above Path D and $k_{ss}^{E} > k_{ss}^{D}$. In this way, we ensure that the existence of a stock market, should it ever emerge, is conducive to real economic development, as suggested by the empirical evidence. For example, among the references cited earlier, Levine and Zervos (1998b) report significant positive correlations between

various indicators of stock market activity and the current and future rates of capital accumulation and productivity growth.

At this stage, it is imperative to specify a functional form for $B(k_{t+1})$ – the rate of return to the type-1 borrower's skilled labour endowment. We assume that $B(.) = bk_{t+1}, \quad b > 0$, implying that the return to entrepreneurial skills is proportional to the level of prosperity of the economy as measured by the capital stock per firm. Making use of Proposition 2, we define two variables $\Omega^E \equiv \Omega(k_{t+1}^E)$ and $\Omega^D \equiv \Omega(k_{t+1}^D)$ in accordance with the fact that k_{t+1} takes values k_{t+1}^E and k_{t+1}^D respectively in the cases of equity and debt financing. Substituting the expressions for W_E, W_D, k_{t+1}^E and k_{t+1}^D from equations (4), (5), (8) and (9) respectively, we obtain

$$\Omega^E = \frac{p[vQ + (1-v)q](1-p)\sigma bs}{(X_2 - X_1)} \tag{10}$$

and

$$\Omega^D = \frac{p[vQ + (1-v)\hat{\delta}q](1-p)\sigma bs}{(X_2 - X_1)}. \tag{11}$$

Since $\hat{\delta} < 1$, casual inspection reveals that $\Omega^E > \Omega^D$.

Similary, we define ρ_{t+1}^D and ρ_{t+1}^E as the time $t+1$ rates of return to capital when debt and equity contracts respectively prevail in the financial market at time t.

Lemma 2: ρ_{t+1}^D *and* ρ_{t+1}^E *are decreasing in* k_t *and* $\rho_{t+1}^D > \rho_{t+1}^E$.

Proof: Since $\hat{\delta} < 1$, equations (8) and (9) imply $k_{t+1}^E > k_{t+1}^D$. This, together with equation (3), readily establishes the claim.

Lemma 3: Let k_1^c *and* k_2^c *represent the time* t *capital stock per firm at which* $\Omega^E = \rho_{t+1}^E$ *and* $\Omega^D = \rho_{t+1}^D$, *respectively. Then* $k_2^c > k_1^c$.

Proof: Lemma 2, together with the fact that $\Omega^E > \Omega^D$, establishes the claim. For convenience, we illustrate the scenario in Diagram 2.

The foregoing analysis demonstrates that the time $t+1$ state variables are influenced by the time t financing choice. This, together with the results obtained in

Section 3, then predicts a relationship between the financing choice and the state of the economy that is fundamentally two-way causal. The following propositions show that in such an environment, the time t equilibrium financing choice is determined by the relation of k_t with respect to the values of k_1^c and k_2^c.

Proposition 3: If $k_t < k_1^c < k_2^c$ holds for a low value of k_t then there exists a unique equilibrium at time t where debt financing is used to raise funds in the credit market. If $k_1^c < k_2^c < k_t$ holds for a high value of k_t then the time t credit market is uniquely characterized by equity financing.

Proof: Suppose $k_t < k_1^c < k_2^c$ and all funds are raised by debt contracts at time t so that $\Omega = \Omega^D$, $k_{t+1} = k_{t+1}^D$ and $\rho_{t+1} = \rho_{t+1}^D$. Given that ρ_{t+1}^D is decreasing in k_t, $k_t < k_2^c \Leftrightarrow \rho_{t+1}^D > \Omega^D$. Accordingly, (by use of Proposition 2) no borrower has an incentive to deviate and raise funds through an equity contract when all other borrowers are raising funds through debt contracts. Debt financing is therefore the equilibrium financing choice in the market. To see that this is a unique equilibrium in such an environment, suppose that all funds are raised through equity financing. As a result, $\Omega = \Omega^E$, $k_{t+1} = k_{t+1}^E$, and $\rho_{t+1} = \rho_{t+1}^E$. Since $k_t < k_1^c$ implies $\rho_{t+1}^E > \Omega^E$, the optimal behaviour of an individual borrower is to deviate 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 equity finance is the unique equilibrium choice of borrowers when $k_1^c < k_2^c < k_t$.

Corollary 1: If $k_1^c < k_t < k_2^c$ holds for an intermediate value of capital stock per firm, then equity and debt are equally likely candidates for the equilibrium mode of financing at time period t.

Proof: $k_1^c < k_t < k_2^c$ implies that the relations $\rho_{t+1}^D > \Omega^D$ and $\rho_{t+1}^E < \Omega^E$ hold at the same time (see Diagram 2). The use of Proposition 3 then readily proves the above claim.

Based on the foregoing analysis, we are led to distinguish between three types of development regimes for an economy as illustrated in Diagram 1. The first – a low development regime – is one in which debt financing is the dominant mode of raising funds in the credit market for any given level of capital stock below the threshold level k_1^c. In this case, the capital stock accumulates along Path D, which is consistent with debt financing. The second – an intermediate development regime – is one in which the market equilibrium is characterized by a situation where either debt or equity could emerge as a preferred mode of financing for a capital stock between the two thresholds k_1^c and k_2^c. Therefore, in the interval $k_t \in (k_1^c, k_2^c)$ two countries with a similar level of development may experience very different levels of equity market development. Finally, the third – a high development regime – is one in which firms primarily rely on equity financing to raise funds in the market for any given level of capital stock per firm above the upper threshold level k_2^c.[12]

This chain of events accords well with the empirical observations highlighted earlier. On the one hand, the model outlines a process of transition from low to high economic development in which the stock market becomes an increasingly important source of funding for borrowers. On the other hand, by way of exploiting the two-way causality between the real sector and the financial sector, our analysis is able to explain the diversity in the mode of financing among countries with similar levels of economic development and why such diversity is more commonly observed among the upper middle-income and lower high-income countries as in Table 1. We conclude this section by noting the possibility that the transition from one development regime to another may not occur in a smooth fashion as depicted in Diagram 1. For example, an economy may remain trapped in a low steady state with an underdeveloped equity

[12] In addition to these pure equilibria, there may also exist equilibria in mixed strategy in the intermediate development regime. Denote $\tilde{k}_{t+1}$ as the time $t+1$ capital stock per firm when $\mu_t \in (0,1)$ fraction of borrowers offer equity financing and the rest, $(1-\mu_t)$, offer debt financing. As before, we define $\tilde{\Omega} = \Omega(\tilde{k}_{t+1})$ and $\tilde{\rho}_{t+1} = \rho(\tilde{k}_{t+1})$. It is easy to verify that $k_{t+1}^E > \tilde{k}_{t+1} > k_{t+1}^D$. Accordingly, $\rho_{t+1}^D > \tilde{\rho} > \rho_{t+1}^E$ and $\Omega_{t+1}^E > \tilde{\Omega} > \Omega_{t+1}^D$. In such a circumstance, any μ_t for which $\tilde{\Omega} = \tilde{\rho}$ holds then supports an equilibrium in which $\mu_t \in (0,1)$ fraction of borrowers utilize equity financing and the remaining $(1-\mu_t)$ fraction of borrowers utilize debt financing.

market if the relation $k_1^c > k_{ss}^D$ holds for a set of parameter values. Given the specific objective of the paper – explaining the financing choice of an economy along the course of economic development – we have chosen not to discuss such cases in greater detail.

5. Discussion and Conclusions

In recent years, a number of cross-country studies have suggested that strong equity market activity is typically associated with high levels of economic development. This view has been challenged based on the observation that there exists notable diversity in the mode of financing among countries that belong to the same income group – implying that the sizes of the economies are insufficient in explaining the differences in the levels of equity market activity. Against this backdrop, our paper provides a theory of joint determination of real and financial development with the ability to explain both the emergence of the stock market along the path of economic development and the striking diversity in the mode of financing that is often observed among countries with similar levels of economic development.

The linchpin of our analysis is the trade-off between bankruptcy costs, associated with debt issues, and information dilution costs, associated with equity issues, that agents must resolve in deciding the optimal contracting form. Significantly, our analysis shows that the relationship between the optimal financing choice and the economy-wide state variables is two-way causal. Given this mutual dependency, we jointly determine the equilibrium mode of financing along the path of development. Our analysis produces results that are consistent with the stylized facts. In particular we show that a transition from low to high economic development is associated with more reliance on equity financing. During an intermediate stage of development, however, the equilibrium mode of financing could be characterized by either debt financing, or equity financing, or a mixture of the two. Thus, the present paper exploits the well-evidenced financial development–economic development nexus in explaining why countries with similar levels of economic development often experience remarkably different levels of equity market activity and why such diversity is more common among countries in the intermediate stages of development.

The model that we develop here may prove to be useful in explaining some of the other stylized facts that relate to the development of equity markets. In recent years, a number of studies (e.g. Levine and Zervos, 1998a, 1998b; Demirguc-Kunt and Levine, 1996; Chinn and Ito, 2002) have explored the effects of liberalization of capital controls on the development and functioning of equity markets in developing and middle-income countries. Evidence strongly suggests that, in most cases, liberalization of capital controls has given rise to increases in the liquidity (as measured by the value of the trades of domestic shares on domestic exchanges divided by GDP) and volatility of stock markets. The effect of capital control liberalization on the size (as measured by the value of listed domestic shares on domestic exchanges divided by GDP) of stock markets, however, is 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 have experienced an increase in the size of their stock markets following liberalization. Our model may prove to be helpful in explaining these mixed effects. Suppose, as a result of capital inflows, the rental rate to capital falls. In our model, this can be seen as a decline in ρ. Consequently, the economy's position in Diagram 2 is changed. For instance, as a result of capital inflows, a country may make a transition from a low development regime to an intermediate development regime. As elucidated in our model, due to the presence of multiple equilibria, such a transition is likely to produce a mixed rather than a unidirectional effect on the size of the stock market for a pool of countries as some countries rely more predominately on equity while others rely more predominately on debt financing.

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Table 1 Equity Market Development and GDP

	GDP per capita (1990-95)	Market capitalisation/GDP	Total value traded/GDP
Total (63 countries)			
average	6546.68	0.3897	0.17
variance		0.1948	0.0610
min	194.31	0.01	0
max	20134.81	2.01	1.14
Upper High Income (12 countries)			
average	17432.68	0.4758	0.2675
variance		0.0741	0.0495
min	14481.78	0.11	0.01
max	20134.81	0.98	0.76
Lower High Income (13 countries)			
average	10016.84	0.6177	0.3415
variance		0.3099	0.0894
min	3908.74	0.12	0.05
max	14313.95	1.96	1.08
Upper Middle Income (13 countries)			
average	3532.62	0.4577	0.1292
variance		0.4204	0.0945
min	2124.69	0.01	0
max	6588.45	2.01	1.14
Lower Middle Income (14 countries)			
average	1515.03	0.2443	0.0829
variance		0.0443	0.0119
min	609.76	0.02	0
max	2951.55	0.65	0.4
Low Income (11 countries)			
average	535.91	0.1309	0.02
variance		0.0062	0.0007
min	194.31	0.04	0
max	1042.35	0.28	0.08

We use the same set of countries and data as in Demirguc-Kunt and Levine (1999). Market capitalisation to GDP is a measure of market size, defined as the ratio of the value of domestic equities (traded on domestic exchanges) to GDP. Total value traded to GDP is a measure of market activity, defined as the value of trades of domestic equities on domestic exchanges divided by GDP.

Countries are initially classified according to their 1995 GNP per capita as defined in the 1997 World Development Indicators. Low income is $765 or less; lower middle income is $766-$3035; upper middle income is $3036-$9385; high income is $9,386 or more. We then classify the high-income countries into upper high income and lower high income according to GDP per capita (1990-95).

Diagram 1

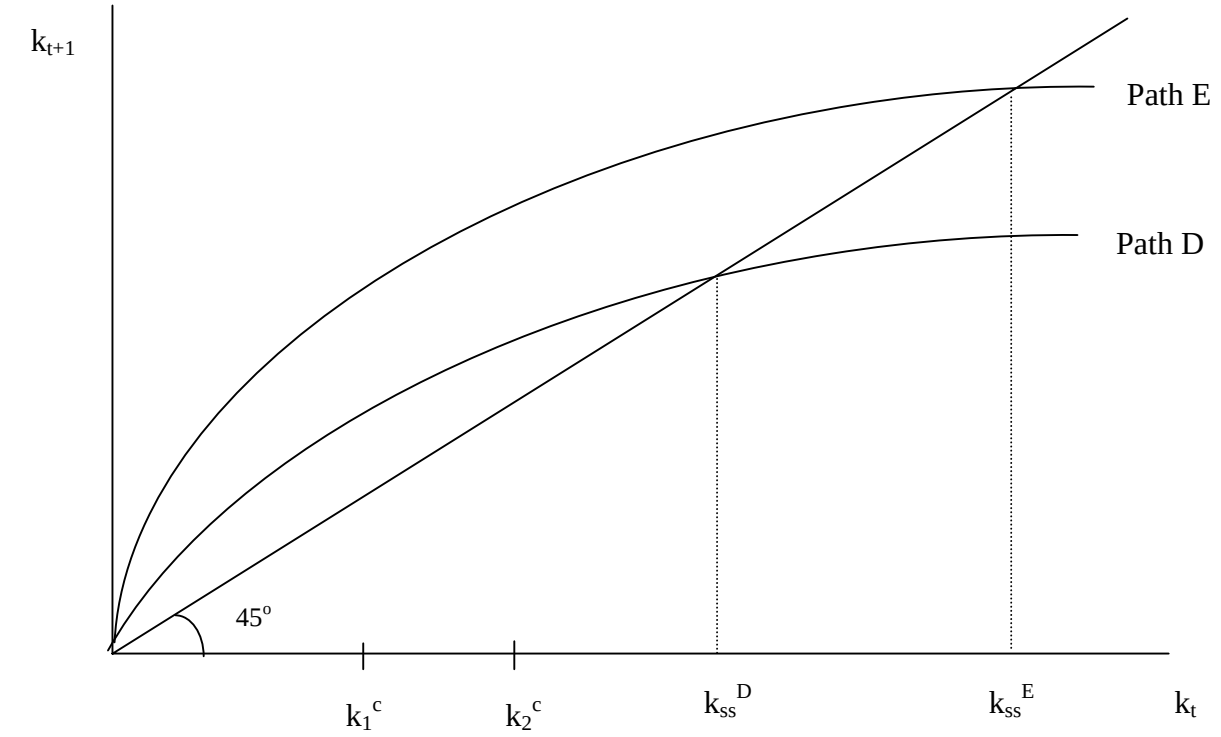
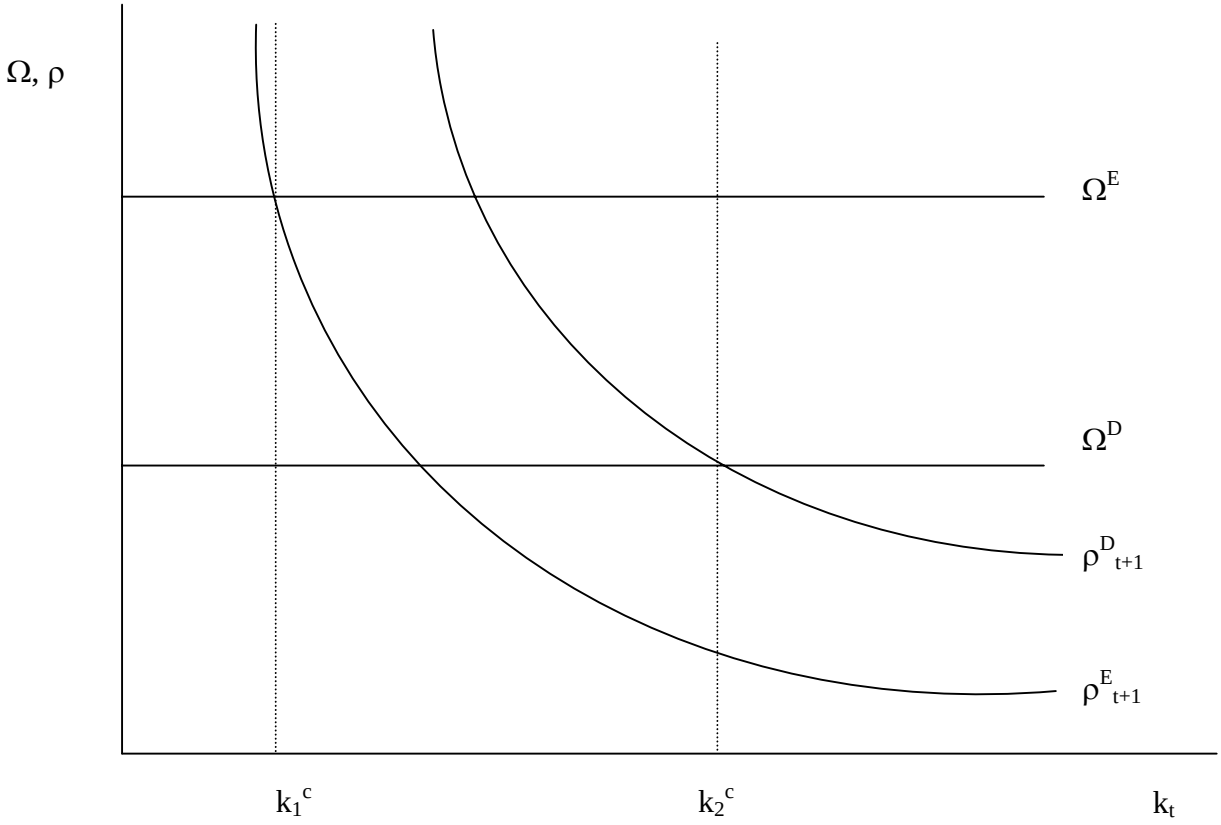


Diagram 2



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