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PROPPING AND TUNNELING

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ABSTRACT

In countries with weak legal systems, there is a great deal of tunnelling by the entrepreneurs who control publicly traded firms. However, under some conditions entrepreneurs prop up their firms, i.e., they use their private funds to benefit minority shareholders. We provide evidence and a model that explains propping. In particular, we suggest that issuing debt can credibly commit an entrepreneur to propping, even though creditors can never take possession of any underlying collateral. This helps to explain why emerging markets with weak institutions sometimes grow rapidly and why they are also subject to frequent economic and financial crises.

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1. Introduction

In countries with weak legal protection for investors, strong evidence indicates that entrepreneurs often tunnel resources out of firms, i.e., expropriate funds that rightfully belong to minority shareholders (Johnson, La Porta, Lopez-de-Silanes, and Shleifer 2000, Glaeser, Johnson, and Shleifer 2001). However, the anecdotal evidence also suggests that sometimes entrepreneurs in these countries transfer private resources into firms that have minority shareholders. Propping is often clandestine, but several examples came to light in the aftermath of the Asian financial crisis of 1997 and 1998. Lee Kun Hee, chairman of Samsung Electronics and head of the family that controls Samsung Group, donated some of his personal wealth to pay off the debts of Samsung Motors Inc, which was a subsidiary on the verge of bankruptcy in summer 1999 (Wall Street Journal, July 1, 1999, p. A19).² The controlling shareholders in CP Group sold assets in Thailand and China apparently in order to inject cash into publicly listed Thai companies (Far Eastern Economic Review, 1998a.)³ The Salim group sold privately held assets in the Netherlands in order to bail out publicly listed operations in both the Philippines and Indonesia (Far Eastern Economic Review, 1998b); it also injected funds from a publicly listed Hong Kong company into a publicly listed Indonesian company (Asian Wall Street Journal, 1999).⁴ In many countries, the evidence suggests controlling shareholders use private funds to provide temporary support to a firm that is in trouble.⁵

This paper suggests that propping may be an important part of how firms operate in countries with weak legal environments. In particular, it helps to explain why many firms in these countries rely heavily on debt finance. A weak legal system would seem to make debt unappealing because creditors can never effectively take control of collateral.⁶

For example, most collapses of banks and firms in Russia after the devaluation of August 1998 were associated with complete looting so that creditors and minority shareholders got nothing while the firms went out of business (Troika Dialog 1999).⁷ The experience of creditors in Hong Kong who lent to firms doing business in Mainland China is similar.⁸ Bankruptcy in Thailand typically takes up to 10 years and anecdotal evidence indicates that creditors ultimately receive very little through either court settlement (Foley 1999) or private debt renegotiations.⁹ This paper suggests that the possibility of propping makes issuing debt attractive to entrepreneurs and investors, when courts cannot enforce contracts.

Our interpretation of the evidence suggests that large business groups exhibit a form of the soft budget constraint, which is usually associated with government-backed enterprises or bank-supported firms (Dewatripont and Maskin 1995). Because the funding source cannot commit not to bail out firms, it is tempted to bail them out *ex post*; hence, this expectation induces inefficient behavior (Roland 2000, p.215). In contrast, we suggest that budget constraints are soft for large conglomerates in developing countries because the legal and regulatory environment is weak. In this context, debt is a commitment by the entrepreneur to bail out a firm when there is a moderately bad shock. However, this debt also creates a potential cost in that it makes it more likely that the entrepreneur will abandon the firm, i.e., take the money and run when there is a very bad shock.

Our analysis has three parts. First, we establish that firms in developing countries with weaker corporate governance also have a higher ratio of debt to total assets. Firm-level corporate governance and debt appear to be substitutes. This relationship is most

robust for Asian emerging market countries. Second, we develop a simple model that explains this observation as propping. Entrepreneurs choose how much to expropriate, as in Jensen and Meckling (1976), but they can also inject private cash today in order to preserve their options to expropriate and to obtain a legitimate share of profits tomorrow.¹⁰ Both expropriation and propping cannot be monitored, prevented, or punished in countries with weak legal protection of investors.¹¹ If the legal system is weak, creditors cannot take possession of collateral but a firm that defaults on existing debts will not generally be able to borrow further. In this framework, the direct effect of debt is to increase the potential for propping and make it more likely that outside investors will participate in financing the firm.¹²

From our perspective, debt commits the entrepreneur to bailing out a project and effectively establishes a credible soft-budget constraint, which is usually associated with government bailouts (Kornai 1979). Soft-budget constraints in socialist countries and state-owned enterprises destroy incentives for good performance (Roland, 2000). However, in our model, the commitment to bail out a project may actually increase its value, because it reduces the incentive of an entrepreneur to expropriate investors when returns are temporarily low. This debt-induced softening of a particular firm's budget constraint may actually make it easier to attract outside investors. La Porta, Lopez-de-Silanes, and Shleifer (1999) show that groups of connected firms are observed more frequently than stand-alone firms in most countries. These groups typically control at least one company that is publicly traded or otherwise used to raise funds from outside investors, although with a number of other companies that are privately held without any outside investors. Some valuable assets are usually kept private. This type of

organization is particularly common in emerging markets in which the legal protection of minority shareholder rights and creditors is weaker (La Porta, Lopez-de-Silanes, Shleifer and Vishny, LLSV 1998 and 2002).

Third, the empirical evidence suggests that the propensity to tunnel is higher for groups of interconnected firms, particularly if they are organized in pyramids. We assume that the propensity to tunnel is correlated with the propensity to prop, i.e., that transfers in and out of firms are symmetric. Using this assumption, we test for the presence of propping and find that a higher propensity to prop is associated with more debt, and with less adverse effects of debt on stock price when there is an adverse macroeconomic shock.

We model tunnelling following LLSV (2002), Johnson, Boone, Breach and Friedman (2000), and Shleifer and Wolfenzon (2000) and introduce the possibility of propping, i.e., negative tunnelling. More generally, our model builds on the work of La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998, 2000, and 2002), who show that many countries do not protect investors adequately. Specifically, in countries with weak investor protection, entrepreneurs can tunnel resources out of their firms in ways that cannot be prevented by outside investors (Johnson, La Porta, Lopez-de-Silanes, and Shleifer 2000). Faccio, Lang, and Young (2001) show that firms in Asia that are lower down a pyramid, i.e., have a greater divergence between cash-flow and control rights, tend to have more leverage, but that this result does not hold in Europe. These authors use different variables for the risk of expropriation and offer a different interpretation of the phenomenon. Kim and Stone (1999) emphasize the importance of corporate debt in explaining the severity of the Asian financial crisis.

Section 2 establishes the correlation between corporate governance and debt in emerging markets. Section 3 presents a simple dynamic model for an entrepreneur who has issued debt in a firm with minority shareholders. Section 4 examines evidence from the Asian financial crisis to test the theory. Section 5 concludes with directions for future research.

2. Evidence on Debt and Corporate Governance

Theoretically, firms with stronger corporate governance may issue more or less debt. For example, firms with better corporate governance may find it easier to issue debt or firms with better investment prospects may improve their corporate governance contemporaneously with issuing more debt. Alternatively, firms may use the issue of debt as a substitute for improving corporate governance. In this section, we seek to establish some basic robust facts for developing countries.

We report firm-level regressions intended to measure the relationship between corporate governance and levels of debt. Specifically, we estimate the following equation:

$$\text{Debt ratio} = a + b_1(\text{Corporate Governance}) + b_2(\text{Size}) + b_3(\text{Profitability}) + b_4(\text{Growth}) + b_5(\text{Industry Dummies}) + b_6(\text{Country Dummies}) + e, \quad (1)$$

where the inclusion of size, profitability, and growth follows Lee, Lee, and Lee (2000).

This specification assumes that corporate governance at the firm level is an exogenous variable, e.g., it is given by the tastes of the entrepreneur. This characteristic is consistent with firm-level literature and is developed further below. Ideally, we would instrument for corporate governance but no suitable instrument is currently available. As

a result, these regressions may suffer from the usual problems of endogeneity, omitted variables, and measurement error. Although the basic results are suggestive, we are not confident that these regressions are properly identified.

{Insert Table 1 here}

Table 1 presents summary statistics for the firms. In subsequent tables, we match our primary data with other data sources; thus the number of firms and countries covered varies in each table. The primary data source is the September 1997 *Worldscope* disk. We chose this month because it appears to be the one that gives the most recent updates but also has no updates based on post-June 1997 data, i.e., the data are all pre-Asian crisis. The data could be based on financial statements as late as June 1997; however, because the most popular fiscal year-end is December, the majority of these data are from the end of 1996.

{Insert Table 2 here}

Table 2 reports coefficient estimates from regressions of debt ratios on corporate governance ratings for 447 firms that are actively traded by international investors and held partly by investors who are not controlling shareholders. Therefore these firms should be raising capital from outside investors. Credit Lyonnais Securities Asia (CLSA) compiles the ratings used in Table 2 for companies in 25 emerging markets, i.e., the set of developing countries that are open to capital flows.¹³ The selection bias is interesting because CLSA includes firms attractive to international investors. CLSA rates firms on 57 issues in seven areas of corporate governance. For our measure, we take the simple average of CLSA's ratings in the areas of transparency, independence, accountability, responsibility, and fairness. We omit two of CLSA's ratings, namely, the social-

awareness rating because it does not relate directly to minority shareholder protection and the discipline rating because limiting the use of debt is one of the factors in its calculation. The ratings are from 1 to 100, with a higher score indicating better corporate governance.¹⁴ These ratings are for 2001, so we match them with Worldscope data from the same year.

The dependent variable, debt ratio, is defined here as the book value of debt divided by the book value of total assets. Firm size is annual net sales in billions of \$U.S., profitability is return on sales, and firm growth is the one-year growth rate in total assets. We include dummy variables for 12 of the 13 industries, which are based on Campbell (1996) and correspond with the firm's primary SIC code. The number of observations declines when we control for firm growth due to missing data. We control for the basic determinants of debt established in the corporate finance literature, namely, firm size, profitability, and growth.

Table 2 considers nonfinancial firms as a separate category because differences in financial reporting make it misleading to compare nonfinancial and financial firms. We find some evidence that larger firms have higher debt ratios, as predicted by Titman and Wessels (1988), and little evidence that more profitable firms have lower debt ratios, as would be suggested by Myers (1977). Table 2, Column 1 shows a strong negative correlation between corporate governance ratings and debt ratios, which is not significantly affected when controls for size and profitability, industry dummies, industry and country dummies, and firm growth are included. This result holds when we include financial firms in column 6 and 7, but it is weakened when firm growth and country dummies are included in column 7. In results not reported, we find that firms in Asia

drive these results, which is one reason for our focus on Asia in the empirical analysis. The magnitude of the coefficient on the CLSA rating indicates that a 10-point improvement in a firm's corporate governance score is associated with a lower debt ratio of 2.3 percentage points.

{Insert Table 3 here}

Table 3 reports similar results from a much broader set of nonfinancial firms, using the Worldscope database and additional sources on cross-listings. For this set of firms we have a variety of indicators of corporate governance, following Mitton (2002). Cross-listed is an indicator set equal to one if the firm is listed on a major U.S. exchange, either directly or in depository receipt form; listing on such an exchange is considered to represent better corporate governance. Big Six auditor is an indicator set equal to one if a Big Six accounting firm audited the firm; having such an auditor was considered to represent better corporate governance, although we have not checked for an Arthur Andersen effect. Diversified is an indicator set equal to one if the firm operates in more than one two-digit SIC industry; a more diversified firm is considered to have weaker corporate governance. Ownership concentration is the percentage of shares held by the largest shareholder; higher concentration is considered to represent stronger corporate governance (if the large shareholder exerts power in the interest of minority shareholders).

We conduct the analysis separately for three distinct regions. Our data sources have over 3,000 firms for Asia, including Japan, and Western Europe but only about 300 firms for Latin America. Table 3 reports coefficient estimates from regressions of debt ratios on variables related to corporate governance. In our Asian subsample, columns (1)

through (3), weaker corporate governance is correlated with higher levels of debt. The number of observations declines due to missing data as we add additional variables, but the coefficients remain fairly consistent across specifications. The one exception is cross-listed, which increases greatly in magnitude and significance when size is added as a control. From column (2) of Table 3, being cross-listed is associated with an 8 percentage point lower debt ratio, having a Big Six auditor is associated with a 3.4 percentage point lower debt ratio, and being diversified is associated with a 2.5 percentage point higher debt ratio. From column (3), an increase in ownership concentration of 10 percentage points is associated with a 1.4 percentage point lower debt ratio. The results for Asia are similar if we exclude Japan from the sample, as columns 4 through 6 demonstrate.¹⁵ Although not reported, the coefficients are very similar if we include each corporate governance variable separately. The results are unchanged qualitatively if country and industry dummies are omitted, with the exception that the coefficient on the diversified dummy loses statistical significance although it retains its sign.

The correlation between governance and debt is much weaker for the Latin American subsample reported in columns 7 through 9, although this is probably because we have fewer firms. However, it is also strikingly weaker for the Western European subsample reported in columns 10 through 12 and the number of firms is now comparable to the Asian subsample. In Western Europe, being cross-listed is actually associated with having more debt. Ownership concentration is the only variable that has a similar effect in Western Europe, although the coefficient is much smaller in this subsample.

We present a simple model that incorporates the fact that debt is attractive when corporate governance is weak, either because the legal system is weak or because the firm chooses not to protect minority shareholders. Our objective is to develop our intuition about the nature of propping and to suggest some simple empirical tests.

3. A Simple Dynamic Model of Propping¹⁶

Consider an entrepreneur who controls one publicly traded firm and can steal any amount from this firm, including looting everything.¹⁷ However, the entrepreneur can also prop up the firm's performance with privately controlled funds. Although the entrepreneur controls the firm, it has a separate legal status. The entrepreneur owns a share equal to α of the firm and outsiders own the remaining share $\beta=1-\alpha$. Retained earnings are denoted by I . We assume that the capital structure is already in place and that the firm is operating. In period t , the entrepreneur steals S_t of retained earnings from the firm and obtains utility equal to S_t . The cost of stealing is $(S_t^2/2k)$. The parameter k , which we assume to be no greater than I , represents the strength of the legal system so that a higher value of k means that stealing is less costly.

Stealing is wasteful in the sense that it reduces the amount invested, i.e., there is an opportunity cost to diverting resources out of this firm. The entrepreneur invests what he does not steal in a project that earns a gross rate of return R_t in period t , from which he obtains a share equal to α . We assume that the entrepreneur can steal as much as he wants from the firm before investment takes place, but he cannot steal the proceeds of the investment, at least not until the next period. This assumption indicates that investors cannot observe investment and never know the per unit return, R , but they can see the

level of physical activity of the firm, e.g., the quantity produced or the number of customers so that they can obtain a reasonable estimate of revenues.¹⁸ To simplify the analysis, we assume that the support of R_t is contained on $[0, 1/\alpha]$.¹⁹ Also, we assume that the stochastic variable R_t is persistent so that $[R_{t+1}|R_t]$ dominates in a first order stochastic manner $[R_{t+1}|R_t']$ when $R_t > R_t'$. We assume that the entrepreneur observes R_t before choosing S_t and that outside investors never observe R_t .

The publicly traded firm needs to make a debt payment, D , each period, that does not vary over time and cannot be renegotiated.²⁰ For example, D can be considered as the regular payment due on a long-term bond. Therefore, the firm's profit in period t is:

$$F(S_t, R_t) = R_t(I - S_t) - D.$$

We assume that, if in any period the firm's profit including the debt payment is negative, bankruptcy is declared and the firm ceases to operate. Hence, no future profits or debt payments exist and no opportunities to steal these assets are now available. Intuitively, the entrepreneur equates the marginal cost and marginal benefit of stealing. Because the entrepreneur owns α of the firm, he has an incentive to invest at least some of the firm's assets rather than to steal them all. As α rises, the amount of stealing falls in equilibrium. As k rises, the amount of stealing rises in equilibrium.

We determine the entrepreneur's optimal behavior by solving the stochastic dynamic program.²¹ The entrepreneur's expected payoff in any period is:

$$\pi_g(S_t, R_t) = \alpha \max[0, F(S_t, R_t)] + S_t - S_t^2/2k,$$

which can be written as:

$$\pi_g(S_t, R_t) = \alpha F(S_t, R_t) * H(F(S_t, R_t)) + S_t - S_t^2/2k,$$

where $H(x) = 0$, if $x < 0$, and $H(x) = 1$, otherwise. Let δ denote the discount factor. The Bellman equation for the entrepreneur's expected discounted present and future earnings can be written as:

$$V(R_t) = \max_S \{ \pi_m(S_t, R_t) + \delta * E[V(R_t') | R] * H(F(S_t, R_t)) \};$$

thus, the entrepreneur's expected payoff is $V(R_0)$.

The value function $V(R_t)$ is strictly positive and non-decreasing in R as is its conditional expectation given by:

$$W(R_t) = E[V(R_t') | R_t],$$

due to the persistence assumption. Let $S_u(R_t) = \operatorname{argmax}_S \alpha F(S_t, R_t) + S_t - S_t^2/2k$.

Solving the first-order condition yields:

$$S_u(R_t) = k(1 - \alpha R_t),$$

which would be the solution for a static model without debt found in Johnson, Boone, Breach, and Friedman (2000).

First we consider the case in which $\delta = 0$ and future payoffs do not matter so that the entrepreneur's optimization problem deals only with a single-period. Hence, the problem can be written as:

$$S^*(R_t) = \operatorname{argmax}_S \alpha \max[0, F(S_t, R_t)] + S_t - S_t^2/2k.$$

The function to be maximized is continuous with at most two local maxima. Thus, we can show that the optimal policy is $S^*(R_t) = S_u(R_t)$ for $R_t \geq R_m$ and $S^*(R_t) = k$ for $R_t < R_m$, where R_m satisfies the following equation:

$$F(S_u(R_m), R_m) + \delta w + S_u(R_m) - S_u(R_m)^2/2k = k/2. \quad (1)$$

If $D = 0$, then $R_m = 0$ and we get the same result as in the model without debt in Johnson, Boone, Breach and Friedman (2000); however, if $D > 0$, $R_m > 0$. In fact, R_m is strictly

increasing in D . Thus, for $R_t < R_m$ the presence of debt causes the entrepreneur to loot if rates of return are too low, due to impending bankruptcy. This looting effect is similar to the debt overhang results in Myers (1977).

Returning to the case in which $\delta > 0$, but we assume, for simplicity, that $R(t)$ is an independent, identically distributed (i.i.d.) random variable. Hence, $W(R_t) > 0$ is independent of R so that we denote this value by w . In this case, the entrepreneur's optimization problem is written as:

$$S^*(R_t) = \operatorname{argmax}_{S_t} \alpha [F(S_t, R_t) + \delta w]^* H(F(S_t, R_t)) + S_t - S_t^2/2k. \quad (2)$$

The function to be maximized has two local maxima and a single downward discontinuity at $S_d(R_t) = I - D/R_t$. If $D = 0$, the firm never goes bankrupt and $S^*(R_t) = S_u(R_t)$. However, in general, the optimal decision policy, $S^*(R_t)$, can be of two forms depending on the relationship between R_m , which was defined in equation (1), and R_+ , which is determined as $R_+^* (I - S_u(R_+)) = D$. In other words, R_+ is the rate of return at which the firm can just make its debt payment given the amount that the entrepreneur wants to steal. If $R_+ < R_m$, the optimal policy is the same as in the case for $\delta = 0$. However, if $R_+ > R_m$, the optimal policy function becomes more interesting because three regions of behavior are possible.

In the first region, $R_t \geq R_+$ and $S^*(R_t) = S_u(R_t)$. In this case, the presence of debt does not alter the entrepreneur's behavior. In the second region, $S^*(R_t) = k$ for $R_t \leq R_-$, where R_- satisfies

$$F(S_d(R_-), R_-) + \delta w + S_u(R_-) - S_u(R_-)^2/2k = k/2.$$

Hence, the entrepreneur steals as much as possible, i.e., k from the firm, establishing the looting effect of debt. In the intermediate region, $R_- \leq R \leq R_+$ and $S^*(R_t) = S_d(R_t)$. Note that

$S_d(R_t)$ is increasing in R_t . In this region, $S_d(R_t) < S_u(R_t)$ so that the presence of debt actually reduces stealing because the entrepreneur is trying to protect his future earnings. We call this the propping effect of debt because debt induces better performance by the entrepreneur from the perspective of shareholders.

{insert Figure 1 here}

These three regions are illustrated in Figure 1 in which stealing $S(t)$ is represented on the y-axis and R_t is represented on the x-axis. The dark line corresponds to $S^*(R_t)$, which is the optimal amount of stealing given the value of R_t . The straight line from $(0, k)$ to $(1/\alpha, 0)$ is $S_u(R_t)$ which is the optimal policy if debt were equal to zero. As argued above, the presence of debt may reduce stealing by the entrepreneur in the intermediate region, $R_+ > R_t > R_-$, because the entrepreneur steals less so that the firm will remain solvent. In this region, debt strengthens the entrepreneur's incentives to act in the interest of shareholders, as suggested by Grossman and Hart (1982), Jensen and Meckling (1976), and Jensen (1986). In this intermediate region, the entrepreneur may even put some of his own money into the firm to prevent bankruptcy. The reason for this behavior is that earnings in the future, both from profit sharing and stealing, are valuable so that the entrepreneur wants to keep the firm in business for these opportunities.

In the region where R_t is small, the presence of debt increases the amount of stealing by the entrepreneur since the firm is going bankrupt so that there is no gain accrues from profits. Debt overhang causes the entrepreneurs to steal more at the expense of outside shareholders and bondholders as in Myers (1977). The qualitative aspects of this analysis are not changed if R_t is persistent but not necessarily i.i.d. In this case, w is replaced by $W(R_t)$ in equation (2). Since this function is nondecreasing, the

solution still has three types of regions, namely, the normal one in which debt has no effect, a looting region in which the debt increases stealing, and the propping situation in which debt causes the entrepreneur to steal less in order to protect the firm from bankruptcy. The major difference in the more general model is that the points at which the transition between regions occurs have to be derived by solving the complete stochastic dynamic program.

4. Testing for Propping

The anecdotal evidence discussed in the introduction suggests that propping occurs in some emerging markets. Tables 2 and 3 present further information that is consistent with the presence of propping. However, it is difficult to observe propping directly because it is relatively easy to hide transfers in and out of firms when investor protection is weak. Furthermore, in contrast to tunnelling, minority shareholders and debt holders do not protest if propping occurs so that no scandals arise and not much public information is available. However, if we think that investors discern the behavior of entrepreneurs, or if there is sufficient trading based on insider information, stock price performance may provide some useful information about propping situations.

According to our theory, propping occurs when there is a negative shock to the macroeconomy. This shock needs to be large enough to induce propping but not too large or otherwise looting occurs. If such shocks are rare, evidence of propping will be difficult to find by examining performance over long periods. These considerations lead us to construct a test using stock price performance at a time of an intense but short-lived economic crisis. The Asian financial crisis of 1997 and 1998 provides a quasi-natural

experiment that allows us to test the effect of debt and corporate governance on firm-level performance. This crisis was undoubtedly an unexpected shock to Asian firms so that most of them could not adjust either their corporate governance or their debt levels immediately. At the same time, relatively few firms collapsed or were looted outright. Therefore, we can infer how the stock market views different corporate finance arrangements during an economic crisis when, according to our theory, the incentive to prop should be strongest.

Basically, we are looking for a difference-in-difference effect. Within the set of publicly traded Asian firms, all of which experienced a stock price decrease due to the adverse macroeconomic shock, was this decrease larger or smaller for firms that could be expected to be propped by an entrepreneur? Hence, we search for a particular interaction effect, namely, a propping propensity that is relevant only when there is a shock. Critical to this analysis is a measure for the propensity to prop; to construct such a measure, we consult the literature on tunnelling. Tunnelling appears to be more likely if a firm is part of a family group of firms. If firms are organized in pyramids so that one firm is controlled by another firm, which may in turn be controlled by another firm, tunnelling is facilitated as La Porta, Lopez-de-Silanes, and Shleifer (1999) and Bertrand, Mullainathan, and Mehta (2002) argue. Our theory suggests that tunneling and propping are basically symmetric behaviors so that so pyramids should also make propping easier.²²

Table 4 reports coefficient estimates from regressions of debt ratios on a pyramidal ownership indicator. The data come from nine Asian countries, namely, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand,

and are compiled from the Worldscope database. The ownership data assembled by Claessens, Djankov, and Lang (2000) are used to define pyramids and group affiliations. Pyramid is an indicator set equal to one if the firm is controlled through a pyramid structure. Group affiliation is an indicator set equal to one if the firm is associated with a family business group. We control for group affiliation in this context because some pyramidal firms may have better access to capital by virtue of being associated with a family group.

Table 4 indicates a positive relationship between pyramidal control and debt ratios, even after controlling for size, profitability, and growth in column 2, and for group affiliation in column 3. This relationship is robust to the inclusion of financial firms in columns 4 through 6. The magnitude of the coefficients indicates that pyramid-controlled firms have higher debt ratios of about two percentage points on average. Taken together, tables 2, 3 and 4 taken together demonstrate that, at least for Asian companies, weaker corporate governance is correlated with higher levels of debt.²³ These results are consistent with the work of Faccio, Lang, and Young (2001), who find higher levels of debt among Asian corporations that are more vulnerable to expropriation measured by group affiliation and divergence between cash-flow and control rights.

Table 5 reports coefficient estimates from regressions of crisis-period stock returns on debt ratios. These data are from the five Asian countries that were most affected by the crisis, namely, Indonesia, Korea, Malaysia, the Philippines, and Thailand. They are compiled from the Worldscope database in combination with data on ownership structure of firms assembled by Claessens, Djankov, and Lang (2000). The crisis-period stock return is defined as the stock return in local currency over the period from July

1997 to August 1998.²⁴ The key independent variable is the debt ratio, defined as the book value of total debt over the book value of total capital. Financial firms and firms not included in the IFC global index are excluded, to ensure that the data are comparable and that stock prices are informative. The dependent variable is stock price performance during the crisis. Firms with more debt suffered larger falls in stock price, which is not surprising because leverage increases a firm's covariation with the market and highly levered firms could also be hurt by exchange rate movements if their debt is dollar-denominated. More interesting is the fact that this effect is considerably stronger for non-pyramid firms than for pyramidal firms.

As Table 5 indicates, when we split the sample into pyramid and non-pyramid firms, the coefficient on the debt ratio for pyramid firms is less than half the magnitude and only marginally significant when we control for firm size in column (6). The results are similar if we omit industry or country dummies, although the divergence between pyramid and non-pyramid firms is largest when we include both sets of controls. Alternatively, if we pool all firms and include debt, a dummy for pyramid, and a pyramid times debt interaction term, the coefficient on the interaction term is positive at 0.22, which is a little less than half the magnitude of the coefficient of -0.46 on debt, and significant with a t-statistic of 1.99. The coefficients on debt and pyramid are both negative and significant in this unreported regression.

These results suggest an interpretation of business groups as an organizational form. If groups develop, they may be an effective way to prop up firms, but they can also facilitate more effective tunnelling. However, both group and non-group firms can loot in the same way. Therefore, the comparison of group and stand-alone firms depends on

the relative importance of tunnelling compared with propping. Group firms have an advantage when propping is relatively valuable to investors. Under such conditions, group firms can raise capital more cheaply or undertake more projects than stand-alone firms.²⁵

5. Conclusions

There is strong empirical evidence that entrepreneurs tunnel resources out of firms in countries with weak investor protection. There is also anecdotal evidence that, under some circumstances, the same entrepreneurs may prop up firms using their own private resources. We developed a simple model in which it is optimal for entrepreneurs to prop when there is a moderate adverse shock, so that the firm stays in business. In this model, the entrepreneur can commit to prop by borrowing rather than issuing equity. However, if the negative shock is too large, the entrepreneur loots the firm and it collapses.

Evidence from the Asian financial crisis of 1997 and 1998 is broadly supportive of the idea that propping exists. Asian firms in pyramids are more prone to tunneling, presumably because it is less costly to transfer resources between firms with this ownership structure. We suggest that pyramid firms also find it easier to prop. Consistent with this idea, and the prediction of our model, we find that pyramid firms with more debt experienced smaller stock price declines during the crisis, controlling for other factors.

These results are suggestive but the ideas presented here need to be tested further. Direct evidence on the size and nature of propping would be helpful. The model fits the

fact that corporate governance and debt are substitutes in emerging markets, i.e., worse firm-level corporate governance is associated with higher levels of debt. However, we still need a more fully developed theoretical structure within which entrepreneurs choose an ownership structure and how they finance their activities, given that outside investors know both tunneling and propping are possible.

If our results hold up under further theoretical and empirical scrutiny, there are several interesting implications. The first is that even in countries with very weak legal protection for investors, it is possible for firms to attract money from outsiders. However, outside investment will tend to be in the form of debt rather than equity. High debt ratios mean that there is propping in some negative scenarios, but if a shock is sufficiently bad, then firms will simply shut down. This pattern of financing may help to explain why emerging markets with weak institutions can experience episodes of rapid growth, at the same time as remaining vulnerable to severe economic crises.

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² Mitton (2002) finds evidence of propping in diversified firms in Indonesia, the Philippines, Korea, Malaysia, and Thailand during the Asian crisis of 1997 to 1998. His results suggest that the misallocation of investment in diversified conglomerates may become worse when an economy experiences a crisis.

³ CP Group is a large complicated conglomerate and the precise nature of transactions involving privately held affiliates is difficult to discern. In China, “CP has sold its stakes

in Shanghai-Ek Chor Motorcycle and a brewery it set up with Heineken NV of the Netherlands... In Thailand, the group has sold its entire stake in Sunny Supermarkets, a 24-hour grocery store chain; 75% of Lotus Distribution, which runs a discount-store chain; and a small stake in CP 7-Eleven, which runs a 24-hour convenience store franchise” (Asian Wall Street Journal, March 3, 1998). At the same time, it supports its three companies that are listed on the Stock Exchange of Thailand, namely, TelecomAsia, Charoen Pokphand Feedmill PCL, and Charoen Pokphand Northeastern PCL (Asian Wall Street Journal, March 3, 1998 and June 10, 1999).

⁴ Some minority shareholders in the Hong Kong company have expressed concern that this transaction amounts to expropriating them in order to prop up the Indonesian company.

⁵ The strongest evidence of systematic propping comes from Japan, where Hoshi, Kashyap and Scharfstein (1991) find that banks provided capital to firms experiencing a liquidity shortfall, so long as the firms belonged to the same industrial group. In Japan the transfers are not from the private pocket of an entrepreneur to a public company, but rather between linked companies, both of which may be public. There is also evidence of tunnelling and propping in India (Bertrand, Mullainathan, and Mehta 2001) and Korea (Bae, Kang and Kim 2002, Joh 2003).

⁶ This violates a basic assumption of Hart and Moore (1998), who model environments in which a debts are noncontingent payment stream, creditors have the right to foreclose in the event of a default, and credit has priority in bankruptcy. In the environments considered in this paper, a creditor cannot foreclose or otherwise take control of assets in bankruptcy.

⁷ Asset stripping in bankruptcy happens in many countries. Akerlof and Romer (1993) analyze a related form of looting that they argue occurs in the US. In their model, the entrepreneur always intends to abscond with some assets and shift his debt onto the government.

⁸ One informed observer reports, “I have yet to hear of a single case where Hong Kong liquidators have gone to China and succeeded in recovering assets” (Wall Street Journal, August 25, 1999, p.A14.) More generally, very few debt defaults from the Asian crisis of 1997 to 1998 have resulted in investors receiving any liquidation value. *The Economist* reports “Despite the creation last year of a bankruptcy law in Indonesia where there had been none before, it is still virtually impossible to force a defaulted debtor into liquidation (the few creditors that have tried are still tangled up in legal appeals)” (30 January 1999).

⁹ In November 1999, Thailand Petrochemical Industries had still not reached a rescheduling agreement with its creditors more than two years after it suspended debt repayments (Financial Times, November 18, 1999.) Korean private sector debt renegotiations were proceeding so slowly that, in the summer of 1999, the Financial Supervisory Commission created an alternative procedure for debt rescheduling and put pressure on banks to reach agreements with debtors (Choi 1999).

¹⁰ Jensen (1986) suggests that high levels of debt can induce greater effort from managers. In our terminology, he is proposing the existence of a non-cash variety of propping.

¹¹ In contrast, in the United States, it is illegal to provide financial support to a publicly traded firm unless this behavior is disclosed fully. For example, a controlling shareholder

could not make a loan secretly or buy a product at inflated prices through another company that he controls. More generally, it is illegal to manage earnings so that a firm's financial performance looks better than it actually is.

¹² In addition, there is an indirect and less obvious effect of debt. For a given level of desired funding, an increased use of debt reduces reliance on outside equity, thus allowing the entrepreneur to retain more ownership. This reduces the moral hazard problem of the entrepreneur and, potentially, increases the value of the firm.

¹³ CLSA ranked firms in 25 countries. Of these, 21 of them had matches with Worldscope and are in our sample. They are identified in Table 1, in the next-to-last column. The other 4 countries that had no matches with Worldscope are the Czech Republic, Peru, Russia, and Venezuela. Durnev and Kim (2002) give more details about the CLSA rankings.

¹⁴ These CLSA measures are imperfect but they have some plausibility. Khanna, Kogan and Palepu (2002) report that Indian firms with a lower CLSA score are more likely to experience corporate governance scandals. Durnev and Kim (2002) and Klapper and Love (2002) have shown that firms with a better CLSA measure of corporate governance have higher valuations.

¹⁵ The exception is cross-listed which is no longer significant.

¹⁶ We use the basic structure of the entrepreneur's decision from LLSV (2002) and Shleifer and Wolfenzon (2000), although stealing takes place after the investment has been made in their models. A static version of this problem appears in Johnson, Boone, Breach and Friedman (2000) and a discrete time variant with debt is developed in

Friedman and Johnson (2000). The intuition of the basic agency problem is close to Jensen and Meckling (1976).

¹⁷ To avoid confusion, we divide expropriation into two parts. The first is routine stealing, which can take place every period without the firm going out of business. The second is looting, which consists of the entrepreneur grabbing all available assets so that the firm must shut down. None of the terms we use are intended to convey a normative judgment or to imply that a particular behavior is actually illegal.

¹⁸ Essentially, we are assuming that, if investors observe stealing, they will withdraw their support. The entrepreneur steals before investing either because this can be concealed easily or, in the case of looting, because returns are so low that it is not worth undertaking any investment.

¹⁹ No stealing occurs if αR is sufficiently high. Given that α is often high in emerging markets, an economic boom may make it optimal for the entrepreneur not to steal at all.

²⁰ We model the case where the firm has debt, but it could have equity with some debt-like characteristics, e.g., the firm is punished if it has below market expectations for earnings, so that there is some incentive for smooth performance. As long as both the entrepreneur and investors lose something when the firm goes bankrupt, the intuition behind our results holds.

²¹ Because there are no infinitely long-lived securities, no pathologies such as bubbles can arise in our model.

²² Wolfenzon (1999) develops a model in which entrepreneurial expropriation is consistent with the development of pyramidal ownership. Our approach is complementary to his.

²³ Alternative interpretations of these results are possible. For example, diversified firms may have higher levels of debt because their revenues are less volatile, not because their governance is weaker. However, taken as a group, these tables confirm this relationship between governance and debt for a broad sample of firms and for a variety of variables associated with corporate governance. This relationship appears to be particularly strong in Asia.

²⁴ More discussion of this variable can be found in Johnson, Boone, Breach, and Friedman (2000) and Mitton (2002).

²⁵ This interpretation may explain why groups have an advantage in countries with weak legal environments as Khanna and Palepu (1997) argue but it also recognizes that groups may themselves steal or loot (see also Kim 2003).

Table 1
Summary Statistics by Country

The table reports summary statistics for firms in the Worldscope database, using most recent financial statements from June 1997 or earlier (usually year-end 1996). Nonfinancial firms are those whose primary SIC code is not between 6000 and 6999. The Claessens sample refers to those firms matched with ownership data assembled by Claessens, Djankov, and Lang (2000). CLSA-rated means that the firms were given a corporate governance ranking by Credit Lyonnais Securities Asia.

	Number of Worldscope firms	Number of nonfinancial firms	Average debt ratio %	Average sales (\$bil)	Median profitability %	Median ownshp. conc. %	% Cross- listed	% Big 6 Audited	% Diversified	Firms in Claessens sample	% Group- affiliated	% Pyramid- controlled	CLSA-rated firms	Average CLSA rating
ARGENTINA	31	29	24.99	0.770	10.66	54.8	13.8	41.4	58.6	0	NA	NA	1	66.7
AUSTRALIA	255	190	22.50	1.001	4.87	19.2	4.7	87.4	63.7	0	NA	NA	0	NA
AUSTRIA	81	62	26.50	0.708	3.31	51.0	0.0	43.5	77.4	0	NA	NA	0	NA
BELGIUM	137	83	25.52	1.619	2.59	50.1	0.0	39.8	94.0	0	NA	NA	0	NA
BRAZIL	152	133	22.57	1.176	2.99	36.5	1.5	85.0	47.4	0	NA	NA	29	61.6
CANADA	438	376	27.30	0.977	4.28	50.2	11.4	90.7	55.9	0	NA	NA	0	NA
CHILE	77	62	22.37	0.357	11.35	43.4	14.5	80.6	64.5	0	NA	NA	13	65.9
CHINA	98	90	25.33	0.175	9.04	56.7	2.2	26.7	35.6	0	NA	NA	21	47.9
COLOMBIA	30	21	16.15	0.236	3.55	NA	0.0	33.3	38.1	0	NA	NA	1	52.7
CZECH REPUBLIC	17	17	18.89	0.239	6.31	20.4	0.0	64.7	94.1	0	NA	NA	0	NA
DENMARK	179	127	27.07	0.519	3.69	5.0	0.8	90.6	75.6	0	NA	NA	0	NA
FINLAND	104	85	31.63	1.390	3.53	25.1	2.4	68.2	74.1	0	NA	NA	0	NA
FRANCE	646	475	22.53	2.233	2.37	52.6	1.3	24.2	90.9	0	NA	NA	0	NA
GERMANY	582	479	17.85	2.926	1.56	59.4	0.6	41.1	83.3	0	NA	NA	0	NA
GREECE	125	97	25.93	0.102	5.83	50.1	0.0	4.1	76.3	0	NA	NA	2	59.5
HONG KONG	363	268	23.60	0.437	6.14	46.2	0.4	84.7	88.8	318	45.6	23.6	37	64.9
HUNGARY	13	12	14.47	0.091	5.26	45.9	0.0	83.3	66.7	0	NA	NA	2	54.9
INDIA	314	305	34.51	0.239	8.23	51.0	0.0	6.2	64.6	0	NA	NA	73	52.8
INDONESIA	127	100	31.94	0.295	9.96	50.5	2.0	2.0	62.0	106	67.9	58.5	17	38.9
IRELAND	64	52	22.79	0.524	6.26	16.1	9.6	88.5	63.5	0	NA	NA	0	NA
ISRAEL	42	32	21.03	0.442	5.32	50.0	15.6	6.3	65.6	0	NA	NA	0	NA
ITALY	228	149	24.93	2.655	2.21	56.0	4.0	93.3	93.3	0	NA	NA	0	NA
JAPAN	2,315	2,086	30.00	2.233	1.25	13.8	1.1	0.5	76.6	1,007	61.2	64.3	0	NA
KOREA (SOUTH)	258	210	48.03	1.976	1.13	13.5	1.4	0.0	60.0	236	50.8	33.1	22	46.6
LIECHTENSTEIN	4	1	21.66	1.650	9.23	NA	0.0	100.0	0.0	0	NA	NA	0	NA
LUXEMBOURG	16	6	23.12	1.540	4.52	48.4	0.0	50.0	66.7	0	NA	NA	0	NA
MALAYSIA	398	316	25.08	0.265	8.10	28.6	0.0	70.6	87.7	209	43.1	38.3	42	58.0
MEXICO	93	83	30.54	0.857	6.98	51.6	20.5	49.4	63.9	0	NA	NA	8	62.0
NETHERLANDS	196	164	23.16	2.438	3.09	18.7	5.5	93.3	81.1	0	NA	NA	0	NA
NEW ZEALAND	58	51	28.16	0.715	6.83	42.5	5.9	92.2	68.6	0	NA	NA	0	NA
NORWAY	107	87	32.02	0.845	5.30	30.0	4.6	90.8	66.7	0	NA	NA	0	NA
PAKISTAN	82	75	35.76	0.080	3.92	60.0	0.0	1.3	41.3	0	NA	NA	11	29.2
PERU	36	29	23.77	0.117	7.78	73.0	6.9	24.1	41.4	0	NA	NA	0	NA
PHILIPPINES	101	68	22.23	0.241	10.05	NA	1.5	7.4	48.5	98	65.3	30.6	20	39.9
POLAND	46	36	10.21	0.121	5.61	30.9	0.0	33.3	63.9	0	NA	NA	2	40.5
PORTUGAL	78	58	26.36	0.323	2.50	47.7	1.7	34.5	51.7	0	NA	NA	0	NA
SINGAPORE	216	172	22.33	0.279	5.35	35.1	0.6	87.8	86.0	193	18.1	65.8	39	67.9
SOUTH AFRICA	194	147	12.22	0.802	5.51	50.5	2.0	92.5	72.8	0	NA	NA	34	68.1
SPAIN	161	116	18.61	1.193	3.26	50.5	1.7	87.1	65.5	0	NA	NA	0	NA
SRI LANKA	18	12	22.46	0.036	4.63	38.9	0.0	83.3	50.0	0	NA	NA	0	NA
SWEDEN	175	141	23.01	1.543	4.08	26.9	2.8	78.0	77.3	0	NA	NA	0	NA
SWITZERLAND	175	132	30.26	1.935	3.16	38.1	1.5	70.5	77.3	0	NA	NA	0	NA
TAIWAN	218	193	23.68	0.340	7.58	8.5	0.5	54.4	48.2	101	15.8	48.5	41	52.6
THAILAND	261	195	41.53	0.187	5.87	30.4	0.0	36.4	40.5	129	44.2	10.9	20	57.6
TURKEY	54	40	13.06	0.590	8.94	37.7	0.0	0.0	27.5	0	NA	NA	12	38.3
UNITED KINGDOM	1,640	1,252	20.82	1.022	4.40	16.0	2.2	78.9	72.0	0	NA	NA	0	NA
UNITED STATES	3,565	2,862	25.33	1.882	4.49	13.3	NA	95.6	49.3	0	NA	NA	0	NA
VENEZUELA	15	12	22.24	2.782	9.45	NA	8.3	8.3	75.0	0	NA	NA	0	NA
ZIMBABWE	4	3	4.87	0.042	18.26	63.0	0.0	100.0	66.7	0	NA	NA	0	NA
Total	14,591	11,795								2,397			447	

Table 2
Debt Ratios and Firm-level Corporate Governance Ratings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Nonfinancial firms				All firms		
Corporate governance rating	-0.302 *** [-4.07]	-0.283 *** [-3.69]	-0.301 *** [-4.41]	-0.242 *** [-2.86]	-0.232 *** [-2.75]	-0.240 *** [-4.20]	-0.148 * [-1.93]
Firm size		0.655 *** [3.69]	0.485 ** [2.51]	0.315 [1.39]	0.214 [0.77]	0.378 *** [2.87]	0.267 ** [1.98]
Profitability		-0.028 [-0.58]	-0.054 [-1.14]	-0.032 [-0.74]	-0.032 [-0.72]	-0.057 [-1.33]	-0.029 [-0.70]
Firm growth					0.013 [0.61]		0.004 [0.44]
Industry dummies	No	No	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	Yes	Yes	No	Yes
Number of observations	372	370	370	370	356	447	416
R-squared	0.055	0.067	0.232	0.319	0.319	0.242	0.296

Notes

(i) The number of observations declines in some specifications due to missing data.

(ii) The numbers in brackets are heteroskedasticity-robust t-statistics.

(iii) Asterisks denote levels of significance with *** indicating significant at the 1% level, ** at the 5% level, and * at the 10% level.

Table 3
Debt ratios and Corporate Governance-related Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Asia		Asia (Japan excluded)			Latin America			Western Europe			
Cross-listed	-0.707 [-0.22]	-7.913 ** [-2.32]	-9.540 ** [-2.13]	-0.289 [-0.05]	-2.349 [-0.34]	-7.688 [-1.10]	3.491 [1.24]	3.283 [1.12]	0.506 [0.11]	4.767 * [1.85]	5.980 ** [2.18]	8.566 ** [2.10]
Big 6 auditor	-3.332 *** [-3.03]	-3.353 ** [-2.57]	-5.212 *** [-3.04]	-2.945 *** [-2.63]	-3.069 ** [-2.26]	-4.924 *** [-2.74]	4.262 ** [2.06]	4.081 * [1.72]	-5.221 * [-1.67]	-1.169 [-1.07]	-0.829 [-0.83]	-1.126 [-0.96]
Diversified	3.137 *** [4.09]	2.493 *** [3.03]	2.289 ** [2.29]	4.008 *** [3.74]	3.140 ** [2.53]	4.366 ** [2.55]	2.479 [1.39]	1.366 [0.70]	1.485 [0.48]	0.239 [0.22]	0.603 [0.62]	0.572 [0.51]
Ownership concentration			-0.141 *** [-6.12]			-0.123 *** [-3.58]			-0.138 ** [-2.44]			-0.049 *** [-3.11]
Firm size		0.313 *** [6.73]	0.359 *** [3.44]		0.260 [1.26]	0.119 [0.45]		-0.229 [-0.74]	-0.363 [-0.59]		-0.094 * [-1.69]	-0.140 * [-1.89]
Profitability		-0.002 [-0.79]	-0.001 [-0.42]		-0.001 [-0.62]	-0.001 [-0.38]		-0.021 * [-1.88]	-0.178 *** [-3.22]		0.000 [1.10]	0.000 [1.31]
Firm growth		0.022 * [1.71]	0.036 *** [2.69]		0.040 ** [2.54]	0.058 *** [3.80]		-0.002 *** [-4.89]	-0.011 * [-1.75]		0.001 [1.03]	0.000 [0.00]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	3698	3319	2509	1612	1238	861	369	324	94	3469	3430	2706
R-squared	0.111	0.128	0.135	0.238	0.278	0.300	0.106	0.127	0.592	0.045	0.053	0.054

Notes

(i) Coefficients for a constant term, industry dummy variables, and country dummy variables were estimated but are not reported.

(ii) The numbers in brackets are heteroskedasticity-robust t-statistics.

(iii) Asterisks denote levels of significance with *** indicating significant at the 1% level, ** at the 5% level, and * at the 10% level.

Table 4
Debt Ratios and Pyramidal Ownership Structure:

	(1)	(2)	(3)	(4)	(5)	(6)
	Nonfinancial firms			All firms		
Pyramid	1.876 ** [2.16]	2.209 ** [2.25]	1.832 * [1.80]	1.876 ** [2.16]	2.036 ** [2.23]	2.203 ** [2.35]
Firm size		0.298 *** [6.30]	0.295 *** [6.28]		0.291 ** [6.42]	0.293 ** [6.43]
Profitability		-0.087 *** [-2.66]	-0.086 *** [-2.65]		-0.034 [-1.64]	-0.034 [-1.65]
Firm growth		0.040 ** [2.16]	0.040 ** [2.18]		0.045 *** [2.91]	0.045 *** [2.88]
Group affiliation			0.950 [0.91]			-0.448 [-0.48]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1935	1737	1737	2397	2144	2144
R-squared	0.134	0.179	0.180	0.131	0.171	0.171

Notes

(i) Coefficients for a constant term, industry dummy variables, and country dummy variables were estimated but are not reported.

(ii) The numbers in brackets are heteroskedasticity-robust t-statistics.

(iii) Asterisks denote levels of significance with *** indicating significant at the 1% level, ** at the 5% level, and * at the 10% level.

Table 5
Crisis Outcomes, Pyramid Structures, and Debt

	(1)	(2)	(3)	(4)	(5)	(6)
	Nonfinancial firms		Non-pyramid firms only		Pyramid-controlled firms only	
Debt ratio	-0.346 *** [-4.98]	-0.414 *** [-5.79]	-0.371 *** [-4.50]	-0.440 *** [-4.88]	-0.172 [-1.49]	-0.188 * [-1.72]
Firm size		0.096 *** [3.12]		0.068 * [1.86]		0.170 *** [2.75]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	305	305	184	184	121	121
R-squared	0.196	0.223	0.308	0.320	0.163	0.248

Notes

(i) Coefficients for a constant term, industry dummy variables, and country dummy variables were estimated but are not reported.

(ii) The numbers in brackets are heteroskedasticity-robust t-statistics.

(iii) Asterisks denote levels of significance with *** indicating significant at the 1% level, ** at the 5% level, and * at the 10% level.

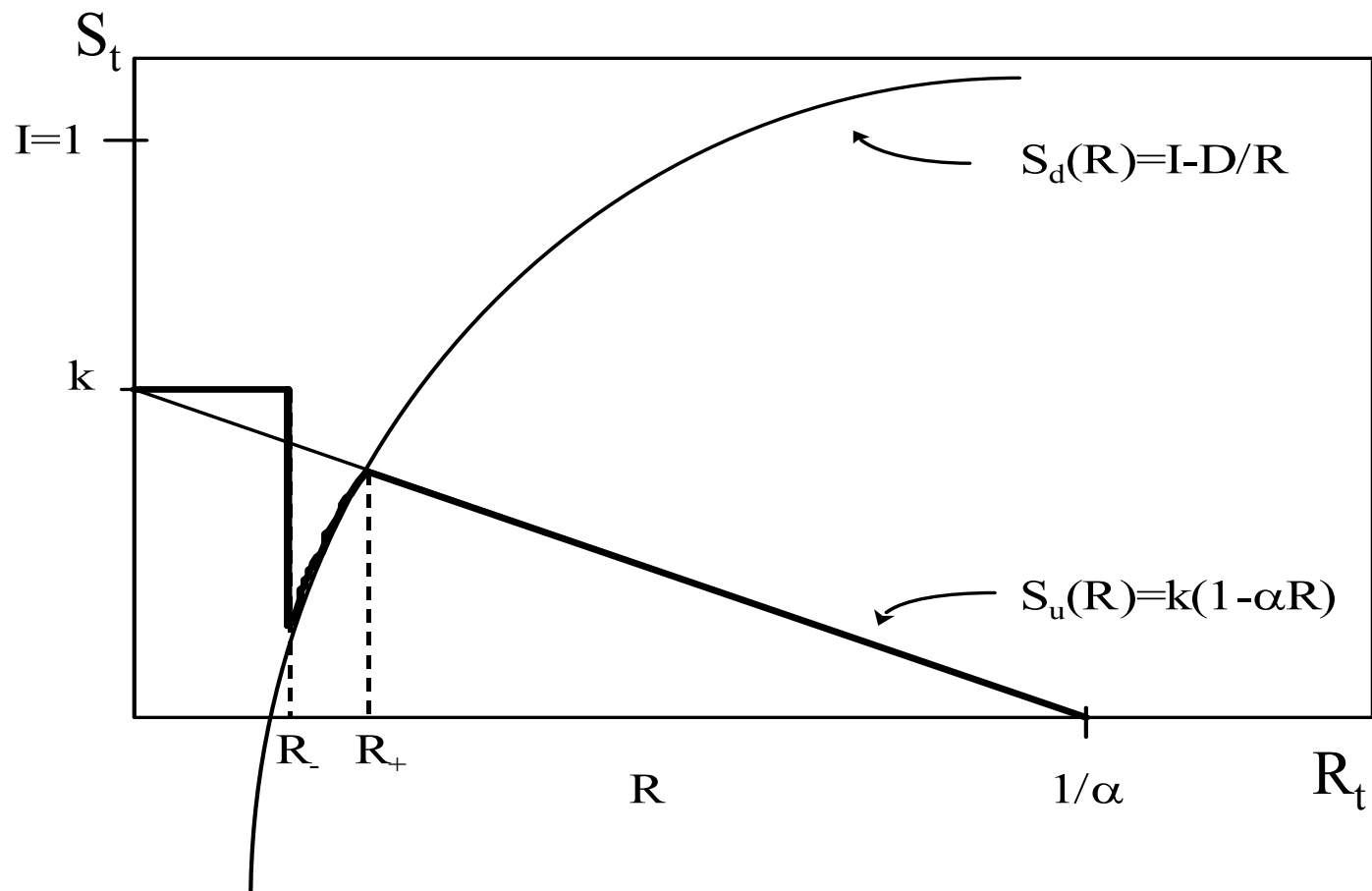


Figure 1