Internal Capital Markets: The Insurance-Contagion Trade-off

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Abstract

This paper shows that the pooling of financial resources in an internal capital market may magnify financial distress situations. This effect, which is closely related to the well-known debt overhang phenomenon, arises when there is a illiquidity in one part of the conglomerate, which then spills over to other divisions. This effect is the flip side of the coinsurance function of conglomerates, the leading rationale for internal capital markets. We show that contagion will prevail for very volatile firms, whereas coinsurance is likely to dominate for more stable firms. Taking into account that conglomeration is likely to exacerbate incentive problems in the firm, a non-monotonic relationship between the severity of risk and the preference for conglomeration emerges, where the best and the worst firms prefer to incorporate as stand-alone firms.

Our model can accounts for the empirical observation that the conglomerate discount tends to increase as financial market conditions worsen. For conglomerates with considerable contagion risks, the discount will actually deepen as the divisions become more closely related, in line with empirical studies.

1. Introduction

Many firms maintain diversified activities, or even expand the scope of their operations through acquisitions and other forms of investment, in apparent defiance to the disdain that corporate strategists and equity markets have long reserved for conglomerates. Ever since Lang and Stulz (1994), Berger and Ofek (1995) and Servaes (1996) documented that diversified firms trade at a considerable discount to a comparable portfolio of stand-alone firms, two questions notably about conglomerates have captivated: What explains the finding of a conglomerate discount? And why would firms choose to diversify, when this organizational choice is apparently so little appreciated by the stock markets?

On the first question, the controversy whether the conglomerate discount is a hard fact or is largely explained by selection bias has been revived by a number of recent critical studies. They present multi-faceted evidence that conglomerate divisions have, on average, significantly different characteristics than comparable stand-alone firms.[1] The conclusion is that conglomerates are not discounted because internal capital markets destroy value, but because poorer performing firms are much more likely to be acquired by a conglomerate than better performing one.

In answering the second question, the most important benefit of conglomerates is widely seen in the *coinsurance* function of internal capital markets: firms can channel the internally generated funds to the most worthy projects; and by combining the divisional cash flows into a smooth aggregate cash flow, firms can raise their debt capacity and enjoy tax benefits.[2] In other words, divisions provide insurance for their cash flow risks, which should be particularly valuable in the presence of imperfect capital markets.

The question is then whether conglomerates will make efficient use of the opportunity to pool the financial resources, or whether they will squander it. There is some support for the idea that conglomerates will be able to perform "winner-picking" among their divisions and thus create value.[3] But overwhelm-

1. See Maksimovic and Phillips (2000), Campa and Kedia (2001), Hyland (2001), Graham et.al. (2001), and Chevalier (2000).
2. Apart from the debt tax shield, the tax advantage of a stable profit flow arises as governments tax positive income, but do not pay subsidies for negative income. Carryforwards/carrybackwards reduce, but do not entirely eliminate, this distortion (Majd and Myers (1987)).
3. Gertner et.al. (1994), Stein (1997), Fluck and Lynch (1999), Gautier and Heider (2001) and Inderst and Mueller (2001) argue *for this claim*.

ingly, hierarchical decision-making and increased conflicts are seen as major impediments to an efficient allocation of funds; divisions with negative value will be cross-subsidized and be able to secure disproportionate funds, and infighting between headquarters and divisions and across divisions will lead to losses, and increase the misalignment of managerial incentives.[4]

Thus, the large majority of the contributions in the academic discussion seems to agree on the following insurance-agency trade-off: the internal capital market offers in principle a valuable coinsurance facility, but conglomerates are exposed to more rent-seeking, conflicts of interest and other forms of agency costs than comparable focused firms. Substantial controversy subsists as to the relative importance of the two sides of the trade-off, i.e. whether internal capital markets should be regarded as principally an inefficient or a rather benign affair.

But the insurance-agency trade-off theories lead to the following puzzle. They suggest that the relative value of conglomeration should increase as financial conditions worsen. This prediction should be supported by both sides of the trade-off: First, on the agency side, if less financial resources are available relative to investment opportunities or liquidity needs, then there is less discretion and resources for squandering, rent-seeking or inefficient cross-subsidies. Second, on the insurance side, the more financially constrained a firm is, the more valuable should be the internal capital market, since the firm is more severely restricted to raising funds externally. The problem is that this clear implication appears to be contradicted by recent empirical evidence: Lins and Servaes (2000) show that the conglomerate discount is actually steeper in poorly developed emerging markets. And Claessens et.al. (1999b) find that during the 1998 Asian financial crisis, the conglomerate discount in the Asian markets rose, rather than showing signs of a decrease.

Our paper argues that the coinsurance function of internal capital markets in itself can provide for an alternative explanation of the downside of conglomeration. Namely, an internal capital market will indeed create positive spillovers, by pooling and channeling liquidity to high-q divisions with insufficient internally generated funds. This is just the upside emphasized by the insurance-agency trade-off theories. But at the same time, liquidity pooling is likely to be ex-

4. See Meyer et.al. (1982), Rajan et.al. (2000), Scharfstein and Stein (2000), Inderst and Mueller (2001). These predictions seem to be borne out by empirical work by Lamont (1997) and Shin and Stulz (2000) who show that conglomerates capital expenditure is less sensitive to their q than that of stand-alone firms, and by Rajan et.al. (2000) who show that conglomerates with more heterogeneity across divisions are more heavily discounted.

posed to a negative externality of illiquidity: if one division is hit by a severe shortfall of funds, it is likely to drain away resources from high-q divisions. These healthy high-q divisions would be perfectly insulated from the illiquidity event, and could self-finance their good projects, if only they had stayed independent. In a conglomerate, divisions are exposed to financial contagion from anywhere within the wide confines of the diversified firm, as the narrow financial firewalls around each division have been dismantled.

To provide more insight into how our trade-off works, suppose two divisions of a conglomerate are independently exposed to the risk of a liquidity shortage at an intermediate period. If this liquidity shortage is mild, it can be overcome by using the free financial resources earned elsewhere in the conglomerate. Cross-subsidization is likely to be benign. But suppose the shortage is severe, and exceeds the free liquidity resources. The conglomerate still needs to provide the money, or else its creditors may threaten to foreclose and liquidate the entire company. Additional cash resources are needed, which are likely to squeeze on worthy investments elsewhere. Then, the liquidity shortfall becomes contagious.[5]

Our insurance-contagion model makes two contributions to the analysis of internal capital markets. First, on a theoretical level, this model suggests that in order to understand the costs associated with internal capital markets, one needs to look no further than the financial spillovers of the liquidity insurance motive itself. No detour to increased agency costs or exacerbated rent-seeking activities is needed. Second, on an empirical level, our model predicts that as liquidity conditions worsen, conglomerates are likely to do worse than stand-alone firms, and not better, as the insurance-agency models imply.

Our basic result is, therefore, that firms will only benefit from conglomeration if the positive spillover of efficient liquidity cross-subsidies outweighs the negative spillover of contagious illiquidity. A deterioration of the financial conditions of a firm or, equivalently, of the financial environment of the firm, say due to a financial crisis or credit crunch, is likely to mean that contagion scenarios become more important relative to insurance scenarios. As a result of such a deterioration, the value of a conglomerate would go down, and not up, in line with empirical findings by Claessens et.al. (1999a,b) and Lins and Ser-

5. Even if the distressed division is a separately incorporated firm, it will not be possible in many cases to shut it down or spin it off without a financial fallout to headquarters in excess of the pure equity loss in the division; frequently enough, liquidation or asset sale of the ailing division will take time, time during which creditors to the conglomerate will exert extreme caution in taking on new financial commitments.

vaes (2000). Taking the insurance-agency trade-off into account, the choice of conglomeration exhibits a fundamental non-monotonicity: firms at the top end and the bottom-end of a performance spectrum will choose to stay independent, whereas firms in the middle range will merge into conglomerates, as they are the most likely to benefit from the positive coinsurance effect.

We consider two extensions. First, how is the trade-off affected as we move from totally diversified conglomerates (very different industries, independent markets) to conglomerates with more correlation in their activities? We find that an increase in correlation will diminish the positive insurance effect of conglomeration. But, rather surprisingly, more correlated divisions will also mean that the contagion risk is reduced. This is because the unconditional probability of states of nature where divisions have asymmetric interim cash flows decreases as their correlation increases.

Second, we investigate the optimal scope of a conglomerate. As more divisions are added, it is more likely that the portfolio of divisions has a mixed interim result, with good and bad performers. Whether the conglomerate benefits from an increase in scope, depends on whether the most probable of these mixed scenarios comes down on the "good side" (insurance still possible) or "bad side" (contagion starts to spread) of the trade-off, which is ultimately a question of the quality of the firm portfolio that the conglomerate holds.

Our paper is closely related to earlier theory literature on internal capital markets and themes visited there., emphasizing both the insurance motive and the agency costs. In particular, our paper belongs to a recent strand of literature where the conglomeration discount is not explained by an internal capital market destroying resources, but because poorly performing firms will prefer to become part of a conglomerate organization. Also, coinsurance against liquidity risks as the main benefit of internal capital markets has been investigated earlier. With regard to these two points, we are close notably to Inderst and Mueller (2001) and to Fluck and Lynch (1999). A number of proposals have been made how conglomerates increase agency costs, where Gautier and Heider (2001) propose an intriguing model. The contribution of our paper to this literature is the contagion risk as the flip side of liquidity coinsurance.

We believe our paper to be of particular relevance to conglomerates in emerging markets, where the fear of sudden shocks on the liquidity provision by external markets are much more common and important, and thus internal capital markets play a particular role in providing insurance in these moments of crisis.

Four recent papers report evidence on conglomerates and business groups in emerging markets: Khanna and Yafeh (2000), while finding only scant evidence on profit transfers in conglomerates in a sample of fifteen countries, report a significant activity of liquidity smoothing for the one market where they have sufficient data, India. The two papers by Claessens et.al. (1999a,b) show, for eight South Asian markets and Japan, a smaller diversification discount for emerging markets, but a larger discount for the least developed markets, and analyze the impact of the Asian crisis. Finally, Lins and Servaes (2000) measure the conglomerate discount for a comparable sample of Asian economies, find a larger discount for economies with severe capital market imperfections.

The paper is organized as follows. A simple example is developed in Section 2.. The model is laid out in Section 3.. In Section 4., the basic analysis is performed and the non-monotonicity of the conglomeration decision is discussed. Section 5. looks at extensions. In Section 6., empirical implications are derived. Section 7. concludes.

2. A Numerical Example

The following simple numerical example may be helpful to understand the mechanics of the insurance-contagion trade-off. We have deliberately constructed this example to differ from some model assumptions below, to emphasize that the contagion effect does not hinge on the specific incomplete contracts set-up explored below. In particular, in this example, all cash flows are assumed to be verifiable, including the payoffs at the end of the game. Also, the example omits a number of important elements of our model, like effort taking.

Suppose there are two identical divisions A and B. Each earns R_1 in t_1, where R_1 is 0 with probability 1/2 or 50 euros with probability 1/2, and R_1 is i.i.d. distributed. Each division also has the opportunity to make another gain of $R_2 = 30$ euros in t_2, but only if it invests $I = 15$ euros in t_1.

Initially, each division has a debt of $D = 50$ due in t_1.

If organized as a stand-alone firm, each division can raise 30 euros in t_1 by pledging the gain R_2. Now if $R_1 = 50$, then the firm has up to $50 + 30 = 80$ euros at its disposal in t_1, including the new credit raised against R_2. This is enough to pay back D and finance the investment. If $R_1 = 0$ on the other hand, then the firm has only $0 + 30 = 30$ at its disposal in t_1, which is not enough even to pay back D. So the firm is bankrupt in t_1. Its expected equity value is $\frac{1}{2}(50 + 30 - 50 - 15) + \frac{1}{2}0 = 7.5$.

If the firms are part of a conglomerate, then if both divisions earn $R_1 = 0$ or both earn $R_1 = 50$, the outcome is as before. But if one earns the high return $R_1 = 50$ while the other has the poor return $R_1 = 0$, then their combined financing capacity in t_1 is $50 + 0 + 30 + 30 = 110$. After paying for the debt of $2D = 100$, this is not enough to finance even a single project. The investment is thus only made when both firm have the high t_1-return. The expected return per division is thus $\frac{1}{4}15 + \frac{1}{2}\frac{110-100}{2} + \frac{1}{4}0 = 6.25$. If t_1-returns are asymmetric, then the division with the high t_1-return is trapped in a *debt overhang* situation: the debt of the other division spills over, and drains so much of the resources that in the end neither is able to invest. If the divisions had been organized as stand-alone firms, the division with the low t_1-return would end up in bankruptcy, but the division with the high t_1-return would have been insulated from the shock. Conglomeration means that debt overhang can become *contagious* within the wider firm. It is this spreading of debt overhang that we have in mind with the term contagion.

Now assume the initial debt is lower, at only $D = 40$. As a stand-alone firm, each division can still only invest if $R_1 = 50$, and its expected equity value is $\frac{1}{2}(50 + 30 - 40 - 15) + \frac{1}{2}0 = 12.5$. If the firms are part of a conglomerate, then the outcome is the same as before if both divisions earn the same return in t_1. But with asymmetric t_1-realizations, a combined financing capacity in t_1 which is unchanged at 110, means that the conglomerate has, after paying for the debt of $2D = 80$, is just enough to finance both projects and earn another $30 - 15 = 15$ euros per division. The investment is thus made if only one firm shows the high t_1-return. The expected return per division is thus $\frac{1}{4}15 + \frac{1}{2}\left(\frac{110-80}{2} + 15\right) + \frac{1}{4}0 = 18.75$. If t_1-returns are asymmetric, then the division with the low t_1-return benefits from the classical insurance mechanism, and can invest nonetheless, thanks to efficient cross-subsidization.

3. The Model

There are two firms, firm A and firm B, which are identical except for the fact that their returns are independently distributed. Each firm has a single owner or entrepreneur with zero wealth endowment. The game has three time periods, t_0, t_1 and t_2. Each firm has an investment opportunity that requires an investment of I in period t_0, and earns an uncertain cash flow R^1 in t_1 and another cash flow in t_2. The uncertain cash flow R^1 is high, $R^1 = R^H$, with probability $q > \frac{1}{2}$, or low, $R^1 = R^L \leq R^H$, with probability $1 - q$. The probability q is exogenous.

We interpret the possibility of a low return $R^1 = R^L$ in t_1 as the risk of an uncertain liquidity shock hitting the firm. To capture the uncertain nature of this liquidity shortfall, we will later assume that R^L is a random variable. For the moment, we take R^L to be a known realization somewhere on the interval $R^L \in [0, R^H]$. Below we will extensively discuss the impact of the severity of liquidity events by considering variations of R^L.

The magnitude of the cash flow received in t_2 depends on some unobservable effort that the entrepreneur provides between periods t_0 and t_1. If the entrepreneur provides low effort, then is equal to its standard level, which we denote by R^2. There is no cost of effort in this case. If the owner expends high effort, at a non-pecuniary disutility of b, then a fixed amount of M is added to the t_2-cash flow, which will then be $R^2 + M$.

The uncertain return R^1 of firm A and of firm B is independently distributed (relaxed in Section 5.1.). We denote the net firm value to the entrepreneur, net of her effort costs, by V^S,

$$V^S = \begin{cases} qR^H + (1-q)R^L + R^2 + M - I - b \ , & \text{for high effort} \\ qR^H + (1-q)R^L + R^2 - I \ , & \text{for low effort} \end{cases} .$$

The superscript S denotes a *s*tand-alone firm, and the value is the same for firm A and B. We assume that $R^2 \geq R^H$. This assumption captures the idea that R^2 represents the entire continuation payoff of the project after the point has passed where the project could be credibly stopped (in t_1). It assures that the entrepreneur will always prefer continuation over reneging.

We assume that

$$\frac{M}{2} < b \leq qM \ , \tag{1}$$

making the provision of effort socially desirable. We also make the assumption that

$$V = qR^H + (1-q)R^L + R^2 - I > 0 \ .$$

If this benchmark condition is satisfied, the project is worthwhile undertaking, provided there is no threat of liquidation, even if no effort is exerted.

At the beginning of t_0, before writing financial contracts, the two entrepreneurs have the option to merge their operations into a single diversified firm, which we also call a *conglomerate*, rather than remain two separate stand-alone firms. In a conglomerate, each entrepreneur remains in charge of her unit and her effort alone decides on her division's performance, but economically the two units are combined and the entrepreneurs split resources and proceeds. Invoking standard assumptions in bargaining theory, we assume that the shareholders of the two firms will reach an efficient and equitable decision: They organize as a conglomerate whenever the value of the conglomerate V^C exceeds the sum of the values of the stand-alone firms, $V^A + V^B$, and stay independent if this is in their joint interest, i.e. if $V^A + V^B > V^C$. When the two owners merge, they will in each period agree on an equitable split of their joint surplus (cash flow after debt service).[6] We assume that if the two firms merge, each entrepreneur still remains in charge of his respective division, and his individual effort only determines the high realization of R^1 of his division, say because of inalienable control skills.

Financing for the investment I can be obtained from outside investors operating on a competitive capital market,[7] where expected profits are squeezed to zero. Our model is in fact an adapted version of Bolton-Scharfstein (1990); like their model[8], our model is set up to emphasize the difficulty to make the entrepreneur disgorge a sufficient reimbursement to investors. We assume that cash flows are observable, but not verifiable, so the entrepreneur could in principle keep the entire cash flow.

As in Bolton-Scharfstein (1996), however, if a firm defaults on its payment obligations, the investors can force it into liquidation in t_1. We assume that liquidation is a court-supervised procedure. In this procedure, all of the firm's assets are sold off for a verifiable and known fixed liquidation value of $L < I$. The liquidation proceeds L will be disbursed to investors until all of their claims are paid off, with the remainder being paid to the entrepreneur. If liquidated in t_1, all of the firm's operations are ceased and the second period return R^2 is lost. Only the court can liquidate, and the court will always liquidate the entire firm. The entrepreneur cannot self-liquidate the firm.[9] The liquidation value in t_2 is

6. This assumption implies that the joint surplus $V^C - (V^A + V^B)$ will be split equally between the two shareholders, since $V^A = V^B$ in our symmetric model. Note that the level of the joint surplus is determined as the Nash equilibrium outcome in our simple game of effort decisions.
7. Since we will refer to a single investor below, we note that there would be no difference if we allowed funding by several investors, as long as those investors would renegotiate efficiently.
8. Similarly the model by Bolton and Scharfstein (1996) and others. For example, this could be the case because the entrepreneur has the discretion to report that no cash flow was earned and if no court of law can enforce any contractual repayment higher than the reported cash flow.
9. We assume this on the grounds that liquidation typically takes time, which makes self-liquidation ineffective in our setting as a tool to enforce that cash is disgorgea to investors. More precisely, self-liquidation is meaningless if the following is assumed: first, suppose

equal to zero, implying that it is impossible to enforce any contractual payment to investors in t_2.

Therefore, financial contracts financing I are only possible if a sufficient repayment to investors can be guaranteed out of t_1-returns. The threat of liquidation in t_1 is a means to entice voluntary repayment in t_1 and to enable funding in the first place, but it comes at a considerable cost since the project is ended prematurely. In our setting, the only feasible financial contracts are debt contracts since repayment cannot depend on the realization of R^1 or R^2. The optimal debt contract, on which our analysis below is built, will carry out as little actual liquidation as needed, just as in Bolton-Scharfstein (1990, 1996). We choose this contractual setting since it allows for a simple representation of the debt overhang problem: investors will be reluctant to reduce claims in the short-term where enforcement is easy if they know that enforcement in the long-term will be impossible.

Prior to carrying out a liquidation threat, renegotiation is possible. We make the simple assumption that the investor can make a take-it-or-leave-it offer to alter the initial contract, and the entrepreneur then accepts or rejects the offer. Likewise, if the firms form a conglomerate, then the two entrepreneurs first agree on their response according to the simple bargaining formula laid out above, and then communicate their agreement as an acceptance/rejection of the investor's proposal. This assumption implies that the investor has all the bargaining power when renegotiating. This extreme distribution of the bargaining power simplifies the analysis, but is not needed for our results.

The timing of the game is summarized in *Figure 1.*

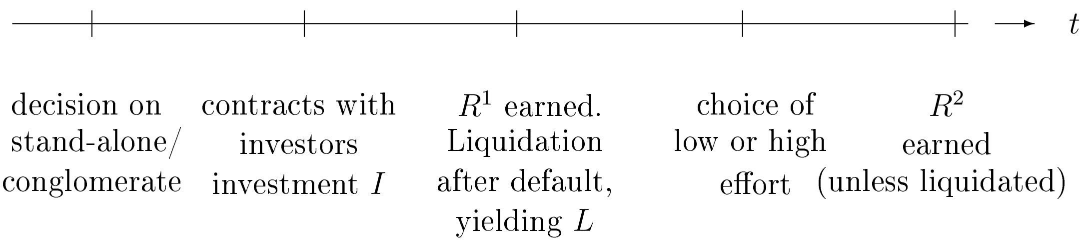

Figure 1: Time Line

that even if liquidation starts in t_1, L is only earned in t_2. Second, it is not verifiable whether the entrepreneur actually proceeds with liquidation or not. No contract relying on self-liquidation of the entrepreneur can then see liquidation proceeds transferred to the investor before t_2, at a time when the entrepreneur has no incentives to make any payment to the investor since it is now too late to trigger liquidation as an effective punishment.

4. Analysis

In this Section, we analyze the equilibrium of the model with the aim to compare the outcome for the firms as stand-alone entities and as a conglomerate. We find that this comparison depends essentially on the depth or severity of the liquidity shock in t_1. For this reason, we proceed as follows: we will investigate successively the three cases for R^L that give rise to markedly differently outcomes, which we call low, substantial, and severe liquidity risks. With these building blocks in place, we will introduce uncertainty about R^L and look at the ex ante choice of firm organization.

4.1. BENCHMARK: PROJECTS WITH LOW LIQUIDITY RISKS

Here, we consider projects where the risk of a liquidity shock is so small that there is no role for a liquidity insurance function. This is the case, as we will argue, when $R^L > L$, and we call this the *low liquidity risk case.*

We first look at the scenario where the two firms remain incorporated as stand-alone firms. We begin the analysis with an even simpler case: if $R^L > I$, then the firm is rich enough to pay back a sufficient amount to the investor in all contingencies, even after a liquidity shock. In this case, the following *debt contract* guarantees a riskfree zero return for the investor: the investor has a fixed claim worth $D = I$ payable in t_1. This debt contract is also the optimal contract, since repayments can only be enticed in t_1, and since the repayment cannot depend on R^1. This contract implies that the investor has the right to trigger liquidation in t_1 in the event of default.

We first verify that in this case, the entrepreneur will voluntarily repay the full claim $D = I$, which is always possible since the t_1- proceeds exceed the debt claim I. When repaying in full, the entrepreneur keeps $R^1 - I + R^2$ (respectively $R^1 - I + R^2 + M$, if high effort has been taken), where $R^1 \in \{R^H, R^L\}$. When the entrepreneur defaults, the investor will always trigger liquidation: the liquidation proceeds L are then paid to the investor until she has received full compensation, R^2 is lost and the entrepreneur gets only R^1 in total. Thus, voluntary repayment is preferable since $I < R^H < R^2$. Renegotiation after default would only avoid liquidation if the entrepreneur pays at least $D = I$ to the investor, but the investor, endowed with all the bargaining power, would extract even more than that. So the entrepreneur has every reason to avoid default.

The entrepreneur's incentive to take effort is easily checked. The incentive condition for the owner to choose the high effort is then, using $D = I$:

$$q(R^H - I) + (1-q)(R^L - I) + R^2 + M - b > q(R^H - I) + (1-q)(R^L - I) + R^2 \ ,$$

which can be rewritten as $b < M$ and is satisfied by our assumption (1) that $b < qM$. Next, we turn to the case of a slightly stronger liquidity shock, i.e. where $L < R^L < I$. In this case, the cash flow R^L is insufficient to guarantee a sufficient return to the investor. If R^L is realized, then the non-verifiability of returns R^1 and R^2, however, implies that the only hope to get any return higher than zero resides in the liquidation right of the outside investors in the event of default. If liquidated, the investor receives L, and the owner gets a t_1-return of R^L. The investor, however, will make a renegotiation offer (take-it-or-leave-it offer): since she has all bargaining power, she will propose to lower her debt claim to $R^L < D$. The entrepreneur will accept: she will keep only R^L when she declines (she is then in default, and the investor will prefer liquidating and receiving L to not liquidating and receiving nothing) but get $R^2 > R^L$ when accepting the offer. Thus, liquidation will be avoided.

Now debt is no longer riskfree, and the face value of debt $D \geq I$ paid in the good state must be such that the investor expects to break even, $qD + (1-q)R^L = I$, hence $D = (I - (1-q)R^L)/q$. The effort decision of the owner is determined by the incentive condition

$$q(R^H - D) + R^2 + M - b > q(R^H - D) + R^2 \ ,$$

which is again identical to $b < M$ (and satisfied by condition (1)). Entrepreneurial effort is thus always ensured when the liquidity risk is low. The entrepreneur receives then a net value equal to the first-best value,

$$V_l^S = qR^H + (1-q)R^L + R^2 + M - I - b \ ,$$

where the subscript l refers to *l*ow liquidity risk.

We now consider that both firms have decided to merge, and A and B become divisions of a joint firm, the *conglomerate.* We investigate the case where $R^L > L$, i.e. we consider both regions of a mild liquidity shock in one step. In this case, each of the divisions, as a stand-alone firm, was perfectly capable of overcoming the liquidity shock. Clearly, the conglomerate would add nothing in this respect, as its advantage lies in the possibility to insure liquidity shocks for which a stand-alone firm lacks the resources.

There is an important difference, however, concerning effort incentives. In a stand-alone firm, each owner was reaping the full benefit of her effort decision, whereas in the conglomerate the benefits are shared, for the parties bargain ex post on the splitting of the unverifiable revenues on which no ex-ante contract can be written. Since the entrepreneurs now share their surplus ex post, the payoff depends on their joint effort choices. Testing for a high effort (Nash) equilibrium in effort choices, suppose that the entrepreneur controlling the other division chooses high effort. An entrepreneur would then expect the following payoff:

$$q^2\left(R^H - D\right) + 2q(1-q)\ \max\left(\frac{R^H + R^L}{2} - D,\ 0\right) + (1-q)^2 \max\left(R^L - D,\ 0\right) + R^2 + M - b \tag{2}$$

As in a stand-alone firm, if $R^L < I$ then $R^L < D$, i.e. debt is risky. But the debt level is smaller than for a stand-alone firm since the investor benefits from the coinsurance as well and can lower the risk-premium $D - I$. By comparing to the corresponding payoff when the entrepreneur takes low effort, we determine the incentive condition for high effort as $b \leq \frac{M}{2}$,[10] which is in contradiction to assumption (1). So firms cannot be induced to take the high effort level, and the only Nash equilibrium is where both opt for the low effort level. This is very intuitive: the conglomerate combines the return of both projects into a single cash flow which is split equally ex post, introducing a kind of "corporate socialism" and weakening individual effort incentives. As a result, the effort cost can only be half as high as in the case of stand-alone firms.[11]

We use the superscript V^C to denote the net value of the conglomerate, which is always taken to be in a low-effort equilibrium. Let V_l^C denote the value when liquidity risks are low. The overall value of one of the partner's 50% stake in

10. The entrepreneur's payoff, when deviating to low effort, is

$$q^2\left(R^H - D\right) + 2q(1-q)\ \max\left(\frac{R^H + R^L}{2} - D,\ 0\right) + (1-q)^2 \max\left(R^L - D,\ 0\right) + R^2 + \frac{M}{2} \tag{3}$$

The incentive condition for high effort can then be simplified as $b \leq \frac{M}{2}$.

11. This effect does not depend on the specific assumption of our model, but would come out of any model where merging means that individual performance can only imperfectly be tracked within the overall performance of the conglomerate. But clearly, the effect is rather strong here since the partners can only negotiate ex post how to split their joint revenue.

the conglomerate is:

$$\frac{V_l^C}{2} = qR^H + (1-q)\,R^L + R^2 - I$$

Our assumption $b > \frac{M}{2}$ implies that $\frac{V_l^C}{2} < V_l^S$, so firms prefer to be separate. Thus we have shown that:

If the liquidity risk is low, $R^L > L$, then the entrepreneurs are better off to incorporate as stand-alone firms.

Merging creates only a cost in form of weakened effort incentives, but no benefit since the liquidity insurance function of the conglomerate is not needed. This is true at least as long as our assumption concerning disutility of effort holds; if this condition was violated, the entrepreneurs would be indifferent, but never strictly prefer a conglomerate.

4.2. INSURABLE LIQUIDITY RISKS

We now turn to situations where the liquidity shortfall is potentially severe enough to trigger liquidation. As we will show, this is the case if $R^L < L$. More precisely, we analyze liquidity shocks in a range of $2L - R^H < R^L < L$. We refer to this range of R^L as *substantial* liquidity shocks.

Consider again a stand-alone firm. First, note that if the liquidity shock arrives, then the cash flow R^L is insufficient to repay the debt claim D. Thus must be the case, as the investor's participation constraint requires that $D \geq I$, but by assumption, $I > L > R^L$. If liquidated, the investor receives $L > R^L$, and the owner keeps R^L. A renegotiation offer is not possible in this case: for this, the investor would have to ask for at least L, but the owner disposes only of R^L. Since the owner cannot pledge any of her t_2-return, liquidation is unavoidable.

But even if the arrival of a liquidity shock will trigger liquidation, the entrepreneur's incentives to take the high effort are as before, as:

$$q(R^H - D) + q(R^2 + M) + (1-q)R^L - b > q(R^H - D) + qR^2 \ + (1-q)R^L,$$

which always holds by assumption (1). Thus, the entrepreneur always exercises high effort. As for the net firm value, we know that with probability q, R^H is earned in t_1 and the firm is continued, adding $R^2 + M$ in t_2. With probability $1-q$, R^L is earned and the firm is liquidated, for an additional liquidation value of L. Of these cash flows, the investor receives a slice with an initial value of I. Thus,

$$V_i^S = q\left(R^H + R^2 + M\right) + (1-q)\left(R^L + L\right) - I - b\ , \tag{4}$$

where the subscript i refers to $i$nsurable liquidity shocks.

Next, we consider a conglomerate for the case of $2L - R^H < R^L < L$. We need to distinguish between two subcases depending on the size of t_1-cash flows if only one of the projects is hit by a poor performance. In this case, if a one-sided liquidity shock arrives, the sum of the two projects' intermediate cash flows are larger than what the investor receive if he liquidates the firm. If $D < \frac{R^H+R^L}{2}$, then the conglomerate can pay off the investor without renegotiation. If $D > \frac{R^H+R^L}{2}$, the investor will make a renegotiation offer, offering to lower the debt claim to $R^H + R^L$ if the entrepreneurs turn over all their cash. This offer is preferable to both sides compared to liquidation. Thus, the conglomerate indeed allows to insure against a one-sided liquidity shock. On the other hand, if both firms experience a liquidity shock, then no renegotiation is possible since $R^L < L$ means that the investor can only receive a repayment of L if liquidation is carried out, and no renegotiation offer is as attractive for her.

We test again for a high effort equilibrium. The entrepreneur's payoff in case high effort is provided is (assuming that the other entrepreneur also takes high effort):

$$q^2\left(R^H - D\right) + 2q(1-q)\ \max\left(\frac{R^H+R^L}{2} - D,\ 0\right) + [1-(1-q)^2](R^2+M) + (1-q)^2 R^L - b\ . \tag{5}$$

The conglomerate will escape liquidation in t_1 only if at least one firm has a return of R^H. This condition is taken into account, in the last term on both sides. When we compare (5) to the payoff if the entrepreneurs reverts to low effort,[12] we see that the condition for effort-taking is the same, $b \leq [1-(1-q)^2]\frac{M}{2}$, which is always violated by assumption (1). The only Nash equilibrium will be with low efforts, and the value of a conglomerate exposed to a substantial liquidity shock is:

$$\frac{V_i^C}{2} = qR^H + (1-q)R^L + [1-(1-q)^2]R^2 + (1-q)^2 L - I\ . \tag{6}$$

12. This payoff is:

$$q^2\left(R^H - D\right) + 2q(1-q)\ \max\left(\frac{R^H+R^L}{2} - D,\ 0\right) + [1-(1-q)^2]\left(R^2 + \frac{M}{2}\right) + (1-q)^2 R^L\ .$$

Comparing $\frac{V_i^C}{2}$ to V_i^S, what is the preferred firm organization? The following trade-off emerges: On the one hand, the insurance function of a conglomerate implies that the illiquidity risk can be reduced to $(1-q)^2$, compared to a probability of $1-q$ for stand-alone firms. On the other hand, effort incentives are weakened because only the merged surplus can be divided; thus, given our sustained assumption about the level of b, conglomerate firms can only implement the low effort, while stand-alone firms take the high effort option. A genuine incentives-insurance trade-off emerges, which is the trade-off emphasized in our paper.

We note first that if the condition $b \leq [1-(1-q)^2]\frac{M}{2}$ did hold and the high effort levels were feasible, then the conglomerate solution would be strictly preferred as it offers an insurance advantage: the only difference is with respect to the probability to continue into t_2. This probability is strictly lower for a conglomerate, which will only face liquidation when both divisions simultaneously realize R^L.

A comparison of $\frac{V_i^C}{2}$ and V_i^S shows that:

If the liquidity risk is substantial, $2L - R^H < R^L < L$, then the owners are always better off by forming a conglomerate if $q(1-q)(R^2 - L) > qM - b$.

The condition when conglomerates would be preferred is straightforward. The benefit of conglomeration is the difference between continuation value and liquidation value, $R^2 - L$, times the increment in the continuation probability that a conglomerate offers, $q(1-q)$. This benefit must be larger than the value loss from the lacking effort, $qM - b$, to make conglomeration an attractive decision.

4.3. UNINSURABLE LIQUIDITY RISKS

We finally consider the case where $R^L < 2L - R^H$. We will call this a *severe* liquidity shock.

Consider again a stand-alone firm. It turns out that the outcome will be the same as in the case of a substantial liquidity shock. Albeit the loss of a liquidity shock is steeper, the firm will be liquidated, guaranteeing the investor a return of L. The steeper liquidity risk will be entirely born by the entrepreneur. The debt claim $D > I$ and effort incentives are the same as before, and the firm value V_u^S is the same as V_i^S in (4).

Consider then a conglomerate. In this case, if a one-sided liquidity shock arrives, the two projects' intermediate cash flow is smaller than what the investor receives if she liquidates the firm. Thus, there is no room for renegotiation, and the firm will always be liquidated if only one or both of them experiences a liquidity shock.

The conglomerate will escape liquidation in t_1 only if both firms produce the high return R^H. The ex ante probability for continuation is thus q^2. A stand-alone firm, by comparison, stands a better chance of survival, as it will always be able to continue if its own return is high, which happens with probability q. This comparison reveals the working of the *debt overhang effect*: a conglomerate firm experiences a negative spillover from the liquidity shock of the other firm. Creditors have now claims in their hands which allow them to liquidate both firms, the one which has a liquidity shortfall as well as the other one which would be perfectly healthy if being alone. Since liquidation guarantees to the creditors a higher payoff than they would get under any continuation, there is no room for renegotiation.[13] As a result of this negative spillover, the probability of liquidation is higher for conglomerates $(1-q^2)$ than for stand-alone firms $(1-q)$.

The entrepreneur's effort incentive constraint can be written as before, and only low effort can be attained in a Nash equilibrium. The value of a conglomerate exposed to a substantial liquidity shock is:

$$\frac{V_u^C}{2} = qR^H + (1-q)R^L + q^2R^2 + (1-q^2)L - I \tag{7}$$

The subscript u refers to uninsurable liquidity shocks. We find that $\frac{V_u^C}{2} < V_u^S$ in this case, and so for two reasons: First, liquidation in t_1 happens more frequently in a conglomerate, with probability $1-q^2$ compared to $1-q^2$ for stand-alone firms. Second, the by now familiar reduction in effort incentives within a conglomerate is an additional source of value loss in a combined firm. Thus,

13. Renegotiation is not possible as the conglomerate firm can only be liquidated as a whole (no self-liquidation). Thus, without liquidation, $R^H + R^L$ is the highest possible payout to investors, below the $2L$ that they get under liquidation.

If, contrary to our assumptions, the entrepreneur could commit to self-liquidate in t_1 and to credibly turn over the liquidation proceeds to investors, then the investor could make the following renegotiation propoal: the face value of debt is reduced to $R^H + R^L + L$; then, if the entrepreneurs liquidate a single firm and pay out all their cash to the investor, the debt is settled and the investor cannot trigger liquidation. But this requires that L is indeed received in t_1; if the liquidation proceed is only collected and payable in t_2, no payment larger than $R^H + R^L$ will reach the investor without liquidating the conglomerate.

in this region of projects with a risk of being hit by the most severe liquidity shocks, stand-alone firms will be able to provide better effort incentives. Taking the incentive and the liquidity effect together shows that both favor stand-alone organization. We have shown:

If the liquidity shocks are severe, $R^L < 2L - R^H$, then firms will prefer to organize as stand-alone firms.

The intuition is that liquidity shocks now are exposed to contagion: even if only one division is concerned originally, the other will be affected indirectly, via debt overhang. Both divisions will have to be shut down, and they would be better off by keeping their insulating shell and staying separate.

4.4. UNCERTAINTY, FIRM ORGANIZATION AND THE DIVERSIFICATION DISCOUNT

We begin by summarizing our findings so far, concerning the comparison between stand-alone firms and conglomerates, for liquidity shocks of fixed size. Overall, we find the following non-monotonic relationship:

Proposition 1.

As a function of the payoff in a liquidity shock, the preferred firm organization is:

(i) For low liquidity shocks, $R^L \geq L$, incorporation as stand-alone firms is preferred.

(ii) For substantial liquidity shocks, $2L - R^H \leq R^L < L$, firms prefer to organize as conglomerates, provided that $q(1-q)(R^2 - L) > qM - b$.

(iii) For severe liquidity shocks, $R^L < 2L - R^H$, incorporation as stand-alone firms is preferred.

From this starting point, we now consider how firms will initially choose between these two organizational forms, given their expectation of the possible liquidity risks they will face.

For a more realistic comparison, we need to take into account that firms cannot fully anticipate the size of liquidity events at the time they need to decide on their organizational structure. Therefore, we introduce initial uncertainty about the size of R^L that firms will be exposed to. We assume that R^L is a random variable distributed over the entire interval $(0, R^H)$, with p.d.f. $f(R^L)$ and c.d.f. $F(R^L)$. We assume that while liquidity are independently distributed, the size realization of the stochastic liquidity shock is the same for both firms, for example, because the size of the shock is macroeconomic in its nature.

The value of a stand alone firm can then conveniently be written as the probability-weighted sum of the expected value in the three cases in Proposition 1,

$$\bar{V}^S(f) = \int_0^{2L-R^H} V_u^S(R^L)f(R^L)dR^L + \int_{2L-R^H}^{L} V_i^S(R^L)f(R^L)dR^L + \int_L^{\infty} V_l^S(R^L)f(R^L)dR^L \ .$$

Likewise, the value of a conglomerate is the expectation over its the expected value of the same three cases, or

$$\bar{V}^C(f) = \int_0^{2L-R^H} V_u^C(R^L)f(R^L)dR^L + \int_{2L-R^H}^{L} V_i^C(R^L)f(R^L)dR^L + \int_L^{\infty} V_l^C(R^L)f(R^L)dR^L \ .$$

The entrepreneurs will then decide to incorporate as stand-alone firms as long as

$$\bar{V}^S(f) > \frac{\bar{V}^C(f)}{2} \ ,$$

and in light of Proposition 1, the decision obviously depends on how the distribution function is allocated over the three regions studied earlier: if enough probability mass is in the region of substantial liquidity shocks where conglomerates are the preferred choice, and if the condition of Proposition 1 holds, then the entrepreneurs will opt for conglomeration.

We will next discuss how this informal analysis translates into observable measures, namely firm valuations and conglomerate discounts. We consider for this discussion the comparative statics of the probability density function with respect to the optimal choice of firm organization and the effect on firm value.

To fix ideas, imagine a sequence $f^1(R^L)$, $f^2(R^L)$, ..., $f^k(R^L), ..., f^N(R^L)$ of probability density functions where each element $f^k(R^L)$ is second-order stochastically dominated by its successor $f^{k+1}(R^L)$ along the sequence. Moreover, assume that for $f^1(R^L)$, $F^1(L) = 1$, and that for $f^N(R^L)$, $F^N(2L-R^H) = 0$. That is, the first element in this sequence has all its probability mass in the region of uninsurable liquidity shocks, the last has all its probability mass in the zone of low liquidity shocks, and along the sequence, probability mass is gradually shifted towards worse outcomes R^L. At some point, there is enough probability allocated in the middle region to make conglomerates preferable. We make the following straightforward observation, which directly translates into testable predictions about the favorite object of study in the internal capital markets literature, the conglomerate discount:

Proposition 2.

Consider a sequence of probability density functions $f^1(R^L)$, $f^2(R^L)$, ..., $f^N(R^L)$ such that $F^1(L) = 1$, $F^N(2L - R^H) = 0$ and $f^k(R^L)$ is second-order stochastically dominated by $f^{k+1}(R^L)$ for all $k \in \{1, .., N-1\}$. Then along this sequence, the firm value is strictly decreasing.

Proof: See the Appendix.

In fact, within each region and organizational regime, the firm value is strictly increasing in R^L. As R^L extends over the limit $R^L = 2L - R^H$, the firm value of conglomerates experiences a discontinuous jumps reflecting the gain in insurability. As it extends beyond $R^L = L$, the value of stand-alone firms experiences a much larger jump. The discrepancy between these two jumps explains the non-monotonicity.

From an empirical point of view, this comparative statics captures cross-sectional as well as longitudinal aspects: cross-sectionally, we consider a deterioration of the quality of divisions as we move across conglomerates. In the time series dimension, a deterioration in the p.d.f. of R^L is tantamount to a worsening of liquidity supply conditions on external capital markets.

The contribution of our paper to the analysis of conglomerates is to show that the liquidity insurance function very naturally has a flip side: debt overhang may threaten to affect affiliated divisions which otherwise would be perfectly healthy. This explains a non-monotonicity in the choice of organizational form, making the poorest firms prefer to incorporate as stand-alone plays to insulate against this spillover.

At the other end, our analysis provides an explanation for the diversification discount: Only the best firms are secure enough that they can do without the insurance function of internal capital markets, and they can focus on the optimal incentives as the determinant of firm size instead. For less solid firms, the insurance function becomes relevant, and is likely to dominate the loss in incentives. Conglomerates are discounted because only medium-quality firms organize as conglomerates.

5. Extensions

The basic structure of the model can be suitably extended and made sufficiently complex to analyze a range of further and related issues. We discuss *(i)* what happens when there is a correlation between liquidity shocks, and *(ii)* the scope of the conglomerate.

5.1. SYSTEMATIC LIQUIDITY SHOCKS

Liquidity shocks take the special form of uncorrelated shocks in our study. This enabled us to focus on the central trade-off, that between diversification and contagious spread of liquidity risks, in a simple fashion. Systematic liquidity shocks, i.e. correlation among individual liquidity risks, are an important concern, as they will change the scope of coinsurance among divisions. The effect is not trivial, though: As firms become more exposed to systematic liquidity risks, the scope for mutual insurance dwindles; but at the same time, the risk of contagion will also diminish, since liquidity shortages are less likely to occur in one firm but not in the other firms within the conglomerate.

A simple modification of our model with two symmetric firms allows to introduce correlated liquidity shocks. We continue to assume that each firm's unconditional probability of receiving R^H is q. Conditional on one firm's cash flow being R^H, the probability of the other firm earning R^H as well is $p > q$. Conversely, conditional on one firm earning R^L, the probability of the other firm earning R^L is $r < q$, where, from Bayes' rule, $r = \frac{(1-p)q}{1-q}$. This implies that the joint probabilities over the four possible outcomes of the t_1-cash flows profiles are, respectively, pq for (R^H, R^H), $q(1-p)$ for (R^H, R^L) and (R^L, R^H), and $1-q-q(1-p)$ for (R^L, R^L) (compared to the probabilities of q^2, $q(1-q)$ and $(1-q)^2$, respectively, for uncorrelated cash flows). As before, the support of the random variable R^L is always the same for both firms. The correlation coefficient of $\rho > 0$ can be calculated as $\rho = \frac{p-q}{1-q}$, where $\rho = 0$ if $p = q$ and $\rho = 1$ if $p = 1$.

Thus, we can conveniently use ρ as a measure of correlation, and directly proceed to a comparative statics analysis in terms of ρ. The three regions of R^L identified earlier remain the same as before. In each region, the effort incentives for the two entrepreneurs are the same as in the uncorrelated case, as the incentive conditions are unchanged. In fact, given the two t_1-cash flows, the outcome of renegotiation and hence whether there will be continuation or liquidation is the same. Moreover, we know that for stand-alone firms, the analysis and the attainable firm values are the same as in the uncorrelated case, since the firms' marginal probabilities of achieving R^H or R^L do not depend on ρ.

All we need to investigate then is the impact, in conglomerates, of an increase in ρ on the ex ante probabilities for the four possible realizations of $t_1$cash flows. An increase in ρ will increase the joint probability for (R^H, R^H) and (R^L, R^L) and reduce the joint probability for (R^H, R^L) and (R^L, R^H).

Consider then a conglomerate exposed to substantial liquidity shocks, $2L - R^H \leq R^L < L$. Its value is:

$$\frac{V_l^C(p)}{2} = qR^H + (1-q)R^L + (2q - pq)R^2 + (1 - 2q + pq)\, L - I \tag{8}$$

Compare this to expression (6) to see that $V_l^C(\rho)$ is always *smaller* than the conglomerate value if liquidity shocks are uncorrelated, since $2q - pq < 1 - (1-q)^2 = 2q - q^2$. Inspection shows that $V_l^C(p)$ is also strictly *decreasing* in p.

Next, consider a conglomerate exposed to severe liquidity shocks, $R^L < 2L - R^H$. Its value is:

$$\frac{V_u^C(p)}{2} = qR^H + (1-q)R^L + pqR^2 + (1-pq)L - I \tag{9}$$

Comparison with (7) shows that is always *larger* than the conglomerate value if liquidity shocks are uncorrelated, as $pq > q^2$. $V_u^C(p)$ is also strictly *increasing* in p.

Reconsidering the analysis of Section 4. with the modified probability structure, we have shown that:

Proposition 3.

Consider two firms with correlation ρ between their uncertain cash flow distributions. The optimal organizational choice is as follows:

(i) For low liquidity shocks, $R^L \geq L$, firms will prefer to incorporate as stand-alone organization, and their values do not depend on ρ.

(ii) If the possible liquidity shock is substantial, $2L - R^H \leq R^L < L$, and if firms prefer to organize as a conglomerate, then the value difference between stand-alone and conglomerate is larger than in the case of uncorrelated division, and increasing in ρ.

(iii) For severe liquidity shocks, $R^L < 2L - R^H$, firms will prefer to organize as stand-alone firms, but the value difference to conglomerates is smaller than in the case of uncorrelated divisions, and decreasing in ρ.

As correlation among firm-specific liquidity risks increases, both the insurance effect, but also the contagion effect is diminishing, and their impact on the trade-off between these two effects is not immediately obvious. Our finding is, however, quite intuitive: increasing correlation means symmetric situations $\{R^L, R^L\}$ and $\{R^H, R^H\}$ become more likely. This is good news when only the situation $\{R^H, R^H\}$ allows conglomerates to stay afloat (severe liquidity shocks). But it is bad news if the conglomerate can offer insurance, and $\{R^L, R^L\}$ is the only situation where insurance breaks down.

5.2. CONGLOMERATE SCOPE

We have so far considered the most basic conglomerate, which consisted of two identical divisions. Nothing stands in principle in the way of involving more firms or more heterogenous firms, in size or quality. We consider only one particular extension of the conglomerate, that of a three-division conglomerate.

Suppose there is a finite number of firms, labelled A, B, C, etc., all being identical and having independently distributed cash flows as described earlier. For each firm, investment, financing and cash flow are as these have been described before. The firms can either organize as stand-alone firms, in two-division conglomerates or in three-division conglomerates (we do not consider larger unions for simplicity).

Effort incentives are obviously even weaker in a three-division conglomerate than in a two-division conglomerate, so low effort will be the outcome for large and for small conglomerates alike. The efficient choice between two-division conglomerate and three-division conglomerate, therefore, comes down to a comparison of the ex ante probabilities that the firm can continue into t_2 in both cases. The logic of the analysis remains the same as before, but we need to employ a different set of thresholds. For in a three-division conglomerate, it may be possible to collectively insure one, two or three, simultaneously arriving, liquidity shocks. The ex ante probabilities in a three-division conglomerate are: q^3 for no liquidity shock hitting any of the firms, $3q^2(1-q)$ for exactly one shock, $3q(1-q)^2$ for two shocks and for three shocks it is $(1-q)^3$.

If $\frac{3}{2}L - \frac{1}{2}R^H \leq R^L < L$ (where the first inequality is identical to $R^H + 2R^L \geq 3L$) then a three-division conglomerate can insure one or two shocks. Thus, it allows continuation with probability $1-(1-q)^3$. By contrast, a two-division conglomerate will only be able to continue with probability $1-(1-q)^2$ (one shock insurable at most). The larger conglomerate is thus preferable, since there is an additional coinsurance gain from adding another division.

If $3L - 2R^H \leq R^L < \frac{3}{2}L - \frac{1}{2}R^H$, then only a single shock can be insured in a three-firm conglomerate. Thus, it allows continuation with probability $1 - 3q(1-q)^2 - (1-q)^3 = 3q^2 - 2q^3$. By contrast, if $R^L > 2L - R^H$, a two-firm conglomerate will still be able to continue with probability $1-(1-q)^2 = 2q - q^2$. It is immediate to verify that the former probability is smaller. The smaller conglomerate becomes more attractive as debt overhang starts to become more important.

Finally, if $R^L < 2L - R^H$, two-firm conglomerates are dominated by stand-alone incorporation, as shown earlier. But stand-alone firms guarantee high effort, whereas a three-firm conglomerate still offers some insurance, albeit in a rather limited way, since only a single liquidity shock can be insured, as long as $2R^H + R^L > 3L$. The insurance-effort trade-off that we encountered earlier emerges again. The value of a three-division conglomerate V^C_{u3} if only one shock can be insured, is

$$\frac{V_u^C(3)}{3} = qR^H + (1-q)R^L + (3q^2 - 2q^3)R^2 + (1 - 3q^2 - 2q^3)L - I\,. \qquad (10)$$

Comparison of (10) to the stand-alone value V_u^S in (4) gives the condition that the former will be preferred if:

$$q(3q - 2q^2 - 1)(R^2 - L) > qM - b\,.$$

This means that three-firm conglomerates may well lead to a higher value, even if only one shock among the three divisions can be insured. But the conditions are fairly restrictive: q must be high, but not too high, and $R^2 - L$ must be many times larger than M. Stand-alone firms appears to be more plausible in this region. We can summarize our results as:

Proposition 4.

Consider identical firms with i.i.d. cash flow distributions considering the choice between stand-alone, two-division and three-division conglomerates. Then the optimal organizational choice will be as follows:

(i) For low liquidity shocks, $R^L \geq L$, firms will prefer to organize as stand-alone firms.

(ii) In the lower region of substantial liquidity shocks, $\frac{3}{2}L - \frac{1}{2}R^H \leq R^L < L$, firms will prefer to organize as three-firm conglomerates, provided that $q(1-q)(R^2 - L) > qM - b$.

(iii) In the upper region of substantial liquidity shocks, $2L - R^H \leq R^L < \frac{3}{2}L - \frac{1}{2}R^H$, firms will prefer to organize as two-firm conglomerates, provided that $q(1-q)(R^2 - L) > qM - b$.

(iv) For severe liquidity shocks, $R^L < 2L - R^H$, firms will only prefer a three-firm conglomerate if $R^L > 3L - 2R^H$ and if $q(3q - 2q^2 - 1)(R^2 - L) > qM - b$. Otherwise, they will prefer to incorporate as stand-alone firms.

In simple words, an increasing severity of liquidity shocks means that the conglomerate size is decreasing at some point, as expected liquidity shortfalls are becoming more serious. In a sense, the choice has become finer, it not only involves the choice between stand-alone or conglomerate, but also between different conglomerate sizes. This naturally extends the non-monotonicity result (Proposition 1) described earlier. As liquidity conditions worsen, firms gradually decreases the optimal scope of their conglomerate. As long as liquidity events are relatively benign, the insurance effect largely dominates, and conglomerates will generally be large. When liquidity events become more threatening, the contagion effect becomes more important, and it is worth to build tighter firewalls around divisions to protect them against negative spillovers.

6. Empirical Implications

In this Section, we collect testable predictions of our analysis and confront them to the extant empirical evidence on conglomerates, with particular emphasis on conglomerates in emerging markets.

Implication 1: The diversification discount is caused by poor performers being more likely to join conglomerates than good performers, and not because conglomeration makes the firms' performance deteriorate. Conglomerate divisions have a higher incidence of liquidity shortfalls than comparable stand-alone firms.

This prediction, which is closely related to similar arguments by Mueller-Inderst (2000) and Fluck and Lynch (1999), points to a simple test whether poor performance is the cause or consequence of conglomeration. Conglomerate divisions should have, prior to conglomeration, a markedly different profile as to financial performance and stability. This is consistent with the recent empirical literature emphasizing that conglomerate divisions are indeed poorer performers than matching stand-alone firms, as documented by Campa and Kedia (2000), Graham et.al. (2000) and Maksimovic and Phillips (2001), among others.

Implication 2: With regard to the degree of financial development, we expect the average conglomerate discount to be relatively large in the most developed *markets, to be lower in less developed markets, and stronger again in the least developed markets. Similarly, within a given market, we predict that the best and the poorest performers are incorporated as stand-alone firms, while intermediate firms are organized as conglomerates.*

The idea behind the first prediction is that the degree of financial development is strongly correlated with the magnitude of expected liquidity shocks. In the most developed markets, there is only a small role for the insurance effect, in intermediate markets, the insurance effect is important, while in the least developed markets, sudden liquidity needs are more likely to be of a severity that leads to contagion. Our non-monotonicity result then implies that business groups will initially be positively correlated with financial development, and then negatively related.

Consistent with this prediction, Lins-Servaes (2000), Claessens et.al. (1999b), and Fauver et.al. (1999) report that the diversification discount in emerging markets is significant, but on average smaller than for developed markets.[14] But Lins-Servaes (2000) and Claessens et.al. (1999b) report also that the least developed markets exhibit much larger diversification discounts again. Khanna-Yafeh (2000) also discuss evidence that conglomerates may become more popular as financial markets develop, which in our model could be interpreted as a transition from the contagion region to the coinsurance region.

One testable implication of the non-monotonicity prediction is that stand-alone firms have a larger variance of valuation (compared to the usual sales or asset multiples) than conglomerates, since conglomerates are sandwiched between high-quality stand-alone firms and low-quality stand-alone firms. We are not aware of a directly comparable test of this hypothesis. It seems to be true, however, that a large number of stand-alone firms have a lower valuation than many conglomerates (discussed in Rajan et.al. (2000)). Also, the outliers of firms with very high Tobin's q are predominantly stand-alone firms and not conglomerates (Lang and Stulz (1994), which seems consistent with our hypothesis.

Implication 3: Our model predicts that conglomerate discounts should be time varying. Periods of low discounts and a trend towards conglomeration are also periods of tight financial constraints on the capital markets, and periods of high discounts and a trend towards refocusing go together with loose financial markets conditions. In the onset of a serious financial crisis, the conglomerate discount is likely to become more severe for discounted conglomerates (prevalence of the

14. Roughly, 8-10% conpared to 15% or more for developed markets.

contagion effect), but it will fall less for conglomerates without a discount (prevalence of the coinsurance effect).

Servaes (1996) was the first to document that conglomerate discounts are exposed to cyclical movements, with very small discounts and a strong conglomerate merger activity in the 70s and the opposite ever since.[15] Consistent with our model, Claessens et.al. (1999b) show that during the Asian financial crisis 1998, the conglomerate discount was rising for the least developed markets.

Implication 4: As for conglomerate scope, our model predicts that large groups (as measured by the number of divisions), will have a smaller discount than smaller conglomerates, since they are constituted of better performing divisions.

There is only very little and very indirect empirical evidence that could be held against this prediction. Lang and Stulz (1994) report a strong drop in value as one moves from stand-alone firms to two-firm conglomerate. They find no drop in value when moving from two-division conglomerates to three-firm conglomerates. This is at least consistent with our prediction. Even more convincingly, some of their reported results seem to be consistent with the interpretation that the value for larger conglomerates is actually larger. Any satisfactory study of this issue should control for the degree of diversity within a conglomerate, and also for the size of divisions.

Implication 5: With respect to the correlation or degree of diversity between divisions, we predict that in a sample of strongly performing conglomerates (e.g. those trading at a premium),[16] the conglomerate discount should widen as the degree of correlation between divisions becomes larger. The conglomerate discount should be mitigated in a sample of poorly performing conglomerates.

Consistent with the first part of our prediction, Rajan et.al. (2000) find that "the greater the diversity, the lower the diversified firm's value relative to a portfolio of single-segment firms." (p. 39) Consistent with the second part of our prediction, Claessens et.al. (1999b) find for less developed markets, namely eight large Asian markets during the Asian financial crisis, evidence that more diversified firms were doing worse in the crisis, so positive correlation was a positive factor, in line with our prediction.

15. The structural break roughly coincides with the stock market's turn from a long bearish into a long bullish market.
16. Conglomerates trading at a premium constitute around 40% of a typical conglomerate sample, see Rajan et.al. (2000).

7. Conclusion

In this paper we have argued that the a conglomerate's pooling of financial resources with all its possible benefits also contains the explanation of an important downside of internal capital markets, namely that there are no financial firewalls between divisions and that financial distress potentially spills over from one division to others. For relatively mild events of financial distress, the positive or insurance side of pooling, the possibility to channel funds to the most promising divisions, is likely to be more important, but for severe liquidity shocks, the negative or contagion side of pooling becomes more threatening.

This explanation can notably account for some puzzling findings in the empirical literature, namely why conglomerates would not appear in a better light on financial markets in the advent of a financial crisis, why the conglomerate discount is worse in poorly developed financial markets, and why the tightening of financial conditions may more adversely affect conglomerates with widely diversified operations than conglomerates with a stronger correlation across division.

In deriving our results, we made a number of assumptions, and it might be interesting to look at their impact in further work. Notably, we considered only firms of equal size and quality to merge into conglomerates. Obviously, the two sides of the pooling of financial resources point to the possibility of finer modes of arbitrage. For example, stable firms with low risk of illiquidity can naturally offer insurance to poorer performing firms. But a condition for this is that the sheer size of the low-quality divisions is not in turn menacing the high-quality branch. This should frequently mean that the poorer divisions are also smaller in size. There is some evidence for this to happen in practice, as Maksimovic and Phillips (2000) show that the largest divisions tend to be the most productive ones, and as Graham et.al. (2000) show that acquired firms, and not acquirers (who naturally tend to be larger) exhibit substandard valuations.

Appendix

Proof of Proposition 2.

First, inspection shows that for a given regime $j \in \{l, i, u\}$, the value functions $V_j^C(R^L)$ and $V_j^S(R^L)$ are strictly increasing in R^L. To finish the proof, we need to show that as R^L passes over the thresholds $R^L = 2L - R^H$ and $R^L = L$, the value functions remain monotonic.

Consider first a stand-alone firm. Evaluated from below at $R^L = 2L - R^H$, its value is

$$V_u^S(R^L) = q\left(R^H + R^2 + M\right) + (1-q)\left(R^L + L\right) - I - b = V_i^S(R^L) \; , \tag{11}$$

which shows that this function is smooth and monotonic in R^L. Next, considering the stand alone firm value $V_i^S(R^L)$ at $R^L = L$, we find from below the same value as in (11). Evaluated from above, $V_l^S(R^L)$ gives

$$V_l^S(R^L) = qR^H + (1-q)R^L + R^2 + M - I - b \; ,$$

which is clearly monotonic in R^L, and also shows that $V_l^S(R^L) > V_i^S(R^L)$.

Consider next a conglomerate firm. Evaluated from below at $R^L = 2L - R^H$, its value is

$$\frac{V_u^C(R^L)}{2} = qR^H + (1-q)R^L + q^2R^2 + (1-q^2)L - I \quad , \tag{12}$$

Evaluating at the same point from above,

$$\frac{V_i^C(R^L)}{2} = qR^H + (1-q)R^L + [1-(1-q)^2]R^2 + (1-q)^2L - I \; , \tag{13}$$

which is strictly larger. Moving to the threshold , we find when evaluating from above:

$$\frac{V_l^C(R^L)}{2} = qR^H + (1-q)\,R^L + R^2 - I \; ,$$

which is strictly larger than (13) since $R^2 > I > L$ by assumption. *QED.*

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