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***Market Discipline in Conglomerate Banks:
Is an Internal Allocation of Cost of Capital
Necessary as Incentive Device?***

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by

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Abstract

This paper analyzes the optimal conglomeration of bank activities. We show that the effectiveness of market discipline for stand-alone activities (divisions) is of crucial importance for the potential benefits of conglomeration. We find that effective market discipline reduces the potential benefits of conglomeration. With ineffective market discipline of stand-alone activities conglomeration would further undermine market discipline, but may nevertheless be beneficial. In particular, when rents are not too high the diversification *benefits* of conglomeration may dominate the negative incentive effects. A more competitive environment therefore may induce conglomeration. We also show that introducing internal cost of allocation schemes may create 'internal' market discipline that complements the weak external market discipline of the conglomerate. In this context we show that these schemes should respond to *actual* risk choices, rather than be limited to *anticipated* risk choices.

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MARKET DISCIPLINE IN CONGLOMERATE BANKS: IS AN INTERNAL ALLOCATION OF COST OF CAPITAL NECESSARY AS INCENTIVE DEVICE?

I. INTRODUCTION

Should banks diversify their activities? Although few would readily deny that some diversification is necessary, banks seem to engage in a broad variety of activities. The question that arises is what is the optimal conglomeration of bank activities?

In this paper we focus on internal incentive problems that may arise from interactions between different divisions in a conglomerate bank. Combining bank activities may reduce transparency and therefore diminish the effectiveness of market discipline. That is, outsiders may not be able to assess the performance of a conglomerate bank sufficiently and, more importantly, may have little control over the bank, whereas bank managers may have excessive discretion. The primary mechanism that we see for market discipline is its effect on the banks' cost of capital. Banks should face a cost of capital reflecting the riskiness of their activities. Conglomeration however obscures this process and invites cross-subsidization and free-riding between divisions, since each division does not fully internalize the consequences of its own actions. As a consequence, market discipline might become ineffective.

A recent example of free-riding (and cross-subsidization) was the Barings débâcle, where the costs of not inducing market discipline on the proprietary trading department turned out to be almost prohibitive. Some interpret this débâcle as a meltdown caused by a clash of cultures between proprietary trading activities and traditional relationship banking, and suggest better internal controls and external supervision as remedies. In this paper we argue that while internal controls and supervision may indeed *control* incentives, they do however not *align* incentives, but merely 'brute force' desired behavior. In the Barings case trading units, while undoubtedly ill supervised, faced little market discipline. Barings' (relationship oriented) corporate banking activities in the UK were effectively underwriting the risky proprietary trading activities in Singapore. Barings Singapore therefore faced an artificially low cost of capital and could free-ride on Barings UK. This interpretation highlights the potential divergent incentives of different organizational units when combined in one institution.

Our analysis goes far beyond the specifics of the Barings example. Modern commercial banking has slowly been transformed from a purely relationship-type business in one where a transaction-orientation - with proprietary trading as a prime example - has become more prevalent. Incentive problems as discussed in the context of Barings may therefore have become very important.

These internal incentive problems have implications for the optimal organizational structure and scope of a bank's activities. While the internal incentives that we have discussed so far emphasize the

cost of conglomeration, some distinct *benefits* exist as well. One argument in favor is that separate (market) financing of different activities may suffer from informational problems and adverse selection premiums elevating funding costs. Combining different divisions within a bank may lead to diversification benefits in funding effectively 'washing out' information asymmetries. Thus diversification could reduce adverse selection (lemon's) premiums in the funding costs¹. Another argument relates to the potentially distortive effects of limited liability. As is well known, limited liability of shareholders may invite risk taking behavior (Jensen and Meckling (1976)). Diversification through (implicit) co-insurance reduces these incentives. Our analysis primarily incorporates the latter effect.

We will emphasize that explicitly considering internal incentive problems and the potential mitigating effects of diversification has implications for the optimal organizational structure of a bank's activities. Our main insights are as follows. The effectiveness of market discipline for stand-alone activities (divisions) is of crucial importance for the potential benefits of conglomeration. We find that effective market discipline reduces the potential benefits of conglomeration. With ineffective market discipline of stand-alone activities conglomeration would further undermine market discipline, but may nevertheless be beneficial. In particular, when rents are not too high the diversification *benefits* of conglomeration may dominate the negative incentive effects. A more competitive environment therefore may induce conglomeration. We also show that introducing internal cost of allocation schemes may create 'internal' market discipline that complements the weak external market discipline of the conglomerate. In this context we show that these schemes should respond to *actual* risk choices, rather than be limited to *anticipated* risk choices.

The applicability of our analysis reaches further than banking and transcends to a long-standing issue in industrial economics concerning the determinants of the boundaries of firms, as discussed in for example Grossman and Hart (1986) and Holmström and Tirole (1991)². These contributions to industrial economics generally focus on synergies (i.e. complementarity or joint production). A related literature focuses - as we do - on the co-insurance benefits of conglomeration in absence of synergies. These papers show that the resulting lower variability of cash flows may increase the value of tax shields (Flannery, Houston and Venkataraman (1993)), increase the effectiveness of debt as a bonding device (Li and Li (1996)) or improve investment incentives (Kahn (1992)). While co-insurance is an

¹ Gorton and Penacchi (1990) rationalize security design (in particular the creation of deposits) on these grounds.

² See also Hart and Moore (1990) and the overview provided by Hart (1995).

important consideration in our analysis as well, our primary focus is on the interactions - free-riding incentives - between divisions³.

Our analysis of internal cost of capital allocation schemes is related to recent studies that analyze the allocation of internally and externally raised capital to investment projects within a firm in the presence of information and incentive problems. A growing empirical literature documents that diversification (i.e. conglomeration) appears to destroy value. Berger and Ofek (1995), Lamont (1997) and Shin and Stulz (1997) suggest that this diversification discount may arise from investment inefficiencies caused by (inefficient) cross-subsidies between divisions in a conglomerate firm. Furthermore, a number of theoretical contributions shed light on the capital allocation process within firms. Harris and Raviv (1996) provide an economic rationale for observed capital budgeting procedures like capital spending limits and relate these to firm and division characteristics in a one-divisional firm. Similarly, Stein (1997) examines the role of corporate headquarters in (re)allocating scarce resources to competing projects in an internal capital market. Rajan, Servaes and Zingales (1997) present a theory which rationalizes inefficient allocation of capital (i.e. cross-subsidizations) in order to improve divisional incentives and reduce investment distortions in a two-divisional firm. Gertner, Scharfstein and Stein (1994) focus primarily on the comparison between internal and external finance, and discuss the benefits of an internal capital market as compared to external financing by banks or the financial market. These papers are related to our analysis. However, they do not focus on incentive conflicts - free-riding - between divisions⁴, but are primarily concerned with the optimal allocation of funds over the divisions. We emphasize that internal cost of capital allocations are of eminent importance in banking once incentive problems and free-riding are considered.

The organization of the paper is as follows. In Section II we give an overview of the model and discuss the intuition of our analysis. Section III introduces the formal model, and contains the analysis. The internal capital allocation mechanism is introduced in Section IV. In Section V we link our insights to the Barings debacle and focus on the interactions between relationship banking and proprietary trading activities. Section VI contains the conclusions. All the proofs are in the Appendix.

II. GENERAL FRAMEWORK AND INTUITION

³ A related paper in this respect is Bagwell and Fulghieri (1995), which finds conditions under which *synergistic* mergers may improve divisional incentives and mitigate internal agency problems.

⁴ In Bagwell and Fulghieri (1995) interactions between divisional incentives crucially depend on the presence of synergistic gains. This is also the case in Rajan, Servaes and Zingales (1997), where interdependencies only arise if both divisions invest in synergistic projects.

We present a model in which external financing is potentially subjected to 'effective' market discipline. Market discipline is induced by introducing a direct link between (partially observable) risk choices and funding costs. The interest rate (i.e. funding cost) set by the market therefore does not only *anticipate* potentially more risky choices after contracting, but does also partially *respond* directly to risk choices⁵. This implies that a firm cannot costlessly increase risk ex post. It would then face an *extra* high interest rate. This 'market discipline' response makes a firm reluctant to increase risk. While we frame the incentive problem in terms of 'increasing risk', we consider a setting where monitoring effort can improve the return distribution of projects, and reduce risk.

The partial revelation of risk choices makes the analysis more dynamic than the standard moral hazard approach. In the standard moral hazard approach unobservable actions (e.g. risk and effort choices) are made after contract terms have been set. In that case the market will only anticipate the higher (than first best) risk choice and adjust contract terms accordingly. This however does not constrain moral hazard; to the contrary, moral hazard then may become even more severe. Unless the firm can somehow try to commit to safer choices to prevent these adverse contract terms, we seem always driven to the worst situation. We introduce *effective* market discipline by having the interest rate charged to the firm reflect *both* (partially observable) actual and anticipated risk choices. Since the firm now bears some of the additional costs from suboptimal risk taking it may be discouraged to do so.

A second feature of our model is the free-riding due to a 'moral hazard in teams' effect (Holmström (1982)). This is introduced by incorporating separate divisions in a multi-divisional bank. In the absence of an internal cost of capital allocation the funding cost of each division only partially reflects the risk choices made by that division. That is, the consequences of each division's decisions are shared by all, since the market only assesses the overall riskiness of the bank. As a consequence divisions can increase risks without being fully charged for the costs, even if external market discipline is perfect. Thus even for an arbitrarily high degree of market discipline, divisions may choose to free-ride on the bank at large.

The intuition developed in the paper is as follows. We consider two divisions, A and B, that need to be financed externally and may either operate as stand-alone firms or may be integrated in a two-divisional bank. Division A makes an only partially observable risk choice whereas in division B no

⁵ This formulation strikes a balance between the bad Nash outcome of 'standard' moral hazard (i.e. the financier anticipates the borrower to deviate from first best - e.g. assumes more risk - following the financier's announced fixed interest rate) and a full *direct* internalization of risky decisions by borrowers. Only the latter provides an effective deterrent. We model this (see Section III) by introducing a probability that risk choices are fully observable, and hence contractible. Alternatively, we could have modelled the bank's debt maturity structure. With short-term debt and (partially) irreversible risk choices, a bank's risk choice would directly affect its (future) funding cost (see Flannery (1994)).

incentive problems are present. The degree of market discipline imposed determines the sensitivity of division A's funding costs with respect to its risk taking behavior. Higher levels of market discipline may mitigate division A's incentive problems and drive its risk choices toward first best.

If the two divisions are integrated in one bank, the pooled funding cost reflects only partially the risk choices of each division; both divisions 'share' the consequences of their risk choices. Simultaneously, the divisions co-insure each other, i.e. the multi-divisional bank's returns are more predictable and *ceteris paribus* default is less likely. This has three effects on the risk choices of division A. First, the co-insurance lowers the pooled funding rate, and hence reduces risk-taking incentives induced by limited liability. We label this the *diversification effect of co-insurance*. This effect alone will improve division A's risk choices. Second, the default probability of the bank becomes partially immune to (excessive) risk taking by division A. This reduces the expected costs of financial distress, thus inducing risk taking (*negative incentive effect of co-insurance*). Third, since the (pooled) funding rate of the conglomerate is less sensitive to division A's risk choice than the funding rate of division A as a stand-alone entity (division B 'smooths'), division A now only partially internalizes the higher funding costs associated with risk taking. Thus market discipline has become less effective inducing inefficiencies (free-riding) in division A's decisions (*negative incentive effect of reduced market discipline*).

These considerations highlight the costs and benefits of conglomeration. On a positive note, diversification *ceteris paribus* reduces (nominal) funding rates and as such *improves* incentives. Observe that in the case of 'complete' (or perfect) market discipline of stand-alone activities conglomeration cannot improve incentives: the negative incentive effects of conglomeration dominate and risk choices are worsened. While risk choices are worse, conglomeration might sometimes still be value-maximizing. This is because diversification may reduce the default probability and thus preserve future rents more often.

The general result is that more market discipline favors a stand-alone organizational structure and reduces the benefits of conglomeration (if any). Imperfect market discipline *could* boost the case for conglomeration, notwithstanding that conglomeration *always* further reduces market discipline. Surprisingly therefore our analysis shows that conglomeration might have benefits that substitute for ineffective market discipline. Alternatively, however, conglomeration might make matters worse. Only when the expected benefits from diversification are strong enough could conglomeration dominate the stand-alone option. Here does the competitive environment enter as an important factor. Particularly when rents are not too high diversification is valuable. Thus in a competitive environment conglomeration can be optimal.

The benefits of conglomeration could be improved further by introducing an internal scheme for the allocation of costs of capital. This mechanism should be designed such that it enhances the sensitivity of the funding costs of each division, such that free-rider problems are mitigated.

III. THE MODEL: SETUP AND ANALYSIS

1. Specification

1.1 Production Possibilities for Divisions

Consider two divisions, division A and division B. Each needs \$1 for its investment opportunity. All funding is raised through debt contracts⁶. The riskless interest rate is assumed to be zero and there is universal risk neutrality. At $t=0$ the manager of division A undertakes the project and decides on the monitoring intensity m that affects the risk of the project. A higher monitoring level corresponds to lower risk. The (private) monitoring cost equals $V(m)$, with $V'(m)>0$ and $V''(m)>0$. A level of $m \in [0,1]$ results in a success probability $\theta + (1-\theta)m$, with $\theta \in [\frac{1}{2}, 1]$ ⁷. The parameter θ is publicly observable, m is only partially observable (see later). At $t=1$ project returns are realized. In case of success the project return is $X>1$, in case of failure the return equals zero. We assume that the objectives of the manager are perfectly aligned with those of the shareholders.

The future opportunities of division A are aggregated in the parameter F . F represents the capitalized future profits of division A, incorporating all expected future cash flows from the periods beyond $t=1$. In case of default division A is terminated and F will be lost⁸.

Division B generates an end-of-period ($t=1$) return of $Y>1$ with a (exogenous) probability $p \in (0,1)$ and 0 with probability $(1-p)$. Division A and B's returns have zero correlation.

1.2. Organizational Structure and Sequence of Events

We distinguish two organizational structures:

- (1) Division A and division B operate separately and independently (stand-alone option). Each is funded directly (and independently) in competitive credit markets.

⁶ The use of debt in our paper is rationalized on grounds of non-verifiability (and hence non-contractibility) of a firm's cash flows.

⁷ The condition $\theta \geq \frac{1}{2}$ guarantees the equivalence between monitoring and risk choices, i.e. given $\theta \geq \frac{1}{2}$ increasing monitoring effort is equivalent to reducing risk.

⁸ Note that this implies that F cannot be expropriated from division A or redistributed ex post without complete loss in value. F can be thought of as the future profits arising from investing in proprietary information or other division-specific investments. Alternatively, the loss of the value F could be interpreted as a bankruptcy cost, but this interpretation is less desirable. In Section V we let the division affect its value of capitalized future profits through its first period decisions.

- (2) Division A and division B are integrated in one firm, and funded as a conglomerate. Now both divisions co-insure each other.

We assume that the two-divisional firm will only default if the projects of *both* divisions fail. This incorporates co-insurance in the model⁹.

The sequence of events is as follows. Prior to $t=0$ the organizational structure of the firm is chosen. At $t=0$ the divisions' activities are funded, both divisions invest \$1. Subsequently, the manager of division A chooses its monitoring intensity. At $t=1$, cash flows are realized and repayments are made.

1.3. Determination of Interest Rates and Market Discipline

The funding costs are determined in a competitive capital market such that the lenders earn zero profits. Under full information the interest factors for the stand-alone divisions A and B are:

$$R_A(m) = \frac{1}{\theta + (1-\theta)m} \quad (1)$$

respectively

$$R_B = \frac{1}{p} \quad (2)$$

For the conglomerate we have:

$$R_C(m) = \frac{1}{\theta + (1-\theta)m + \{1 - [\theta + (1-\theta)m]\}p} = \frac{1}{1 - (1-\theta)(1-m)(1-p)} \quad (3)$$

Note that $R_C(m) < R_A(m)$ and $R_C(m) < R_B$, at any level of monitoring m . This reflects the diversification benefits of co-insurance.

We now introduce market discipline, and limited observability of m . Effective market discipline limits division A's ability to manipulate m . Let $\alpha \in [0,1]$ be the probability that the actual monitoring choice m is detected by the lender. Lenders will optimally condition the funding costs on their observation of m to reduce the agency costs. If m is not observed lenders only (rationally) anticipate the

⁹ This assumption implies that the cash flows realized by *each* division are sufficiently high to facilitate full debt repayments for the conglomerate, and thus survival of both divisions. In Section V we will relax these assumptions, and have the bank at large be subjected to default risk even if only one division fails.

firm's privately optimal monitoring choice. Note that $\alpha=0$ implies no market discipline and $\alpha=1$ implies perfect market discipline¹⁰. Firms face the following expected funding costs:

$$R_i(\alpha, m) = \alpha R_i(m) + (1-\alpha)R_i \quad (4)$$

with $i \in \{A, C\}$, where m is the actual monitoring choice and α the probability of detection. The monitoring choice affects $R_A(\alpha, m)$ and $R_C(\alpha, m)$ directly if detected (via its effect on $R_A(m)$ respectively $R_C(m)$). If undetected (with probability $(1-\alpha)$) lenders only rationally anticipate the risk choices¹¹. R_A and R_C therefore do not directly depend on m . In division B no moral hazard occurs, thus R_B is independent of the degree of market discipline and is as given in (2).

2. Analysis

Since the success probability of division B is independent of its manager's actions, the analysis will proceed from the perspective of division A. We start with division A's choice of risk (monitoring intensity).

2.1 Risk Choice in a Stand-Alone Firm

With self-financing stand-alone division A maximizes $[\theta+(1-\theta)m](X+F) - V(m)$. The first best level of monitoring intensity m^* chosen by the manager satisfies $(1-\theta)(X+F) = V'(m^*)$. With (complete) outside debt financing the manager of a stand-alone division A solves the following optimization problem:

$$\begin{aligned} \text{Max}_m \quad & [\theta+(1-\theta)m](X - R_A(\alpha, m) + F) - V(m) \\ \text{s. t.} \quad & R_A = \frac{1}{\theta+(1-\theta)m} \end{aligned} \quad (5)$$

Recall that R_A represents the interest factor if the division's monitoring choice is not detected, see (4). The constraint in (5) guarantees that the lenders rationally anticipate the monitoring choice of the division. The level m_A of monitoring chosen follows from the first order condition of (5), taking into account (4):

¹⁰ The degree of market discipline α may depend on the type (and specificity) of a division's assets. The degree of market discipline represents the degree of contractability/verifiability of monitoring levels chosen in the division and reflects the 'transparency' of a division's assets (or operations).

¹¹ Lenders anticipate the incentives faced by the firm's or divisional managers. So even with unobservable m they can solve the manager's optimization problem and set the interest rates accordingly.

$$(1-\theta)(X-R_A(\alpha, \tilde{m}_A)+F) - [\theta+(1-\theta)\tilde{m}_A]\alpha \frac{\partial R_A(\tilde{m}_A)}{\partial m} = V'(\tilde{m}_A) -$$

$$\theta+(1-\theta)\tilde{m}_A = \frac{(1-\theta)(1-\alpha)}{(1-\theta)(X+F)-V'(\tilde{m}_A)} \quad (6)$$

The following results can now be derived.

Lemma 1: The stand-alone division A chooses too much risk, i.e. underinvests in monitoring, $m_A < m^*$. The underinvestment is more severe at higher levels of the expected funding costs.

Lemma 2: The monitoring intensity m_A in the stand-alone division A strictly increases with the level of market discipline imposed and reaches the first best monitoring intensity m^* at $\alpha=1$.

Lemma 1 shows the discrepancy between the first best and the actual level of monitoring chosen. In absence of market discipline the financial market can only (passively) anticipate risk choices. This will aggravate moral hazard problems. Lemma 2 shows that market discipline mitigates moral hazard by creating a mechanism for ex post settling up, i.e. by directly confronting the divisional manager with an increase in interest rate following his (lower) choice of monitoring intensity. This will make the manager reluctant to reduce monitoring effort. With $\alpha=1$ the divisional manager fully internalizes the consequences of his monitoring decision and first best obtains.

2.2 Risk Choice in a Conglomerate

If division A and division B are integrated in a two-divisional firm, the manager of division A determines his monitoring choice by solving the following optimization problem¹²:

$$\underset{m}{\text{Max}} [\theta+(1-\theta)m](X-R_C(\alpha, m)) + \{[\theta+(1-\theta)m] + (1-[\theta+(1-\theta)m])p\}F - V(m)$$

$$\text{s.t. } R_C = \frac{1}{1-(1-\theta)(1-m)(1-p)} \quad (7)$$

¹² This specification incorporates co-insurance benefits, e.g. when division A fails and division B succeeds bankruptcy is averted and future rents F are preserved. Note that the specification in (7) does not include a subsidy from division A to division B in case the latter defaults. It is somewhat arbitrary whether or not the manager of division A would take such subsidy into account. We have assumed here that the manager cares about his own payoffs, and not about the subsequent reallocations of profits. Alternatively, we could have introduced such subsidies in (7). This would however not have affected our results qualitatively.

Observe that the future rents F are available even if division A fails, as long as division B is successful; i.e. the divisions A and B co-insure each other. Let m_C be division A's monitoring choice in a conglomerate. The first order condition for division A can be expressed as follows:

$$(1-\theta)(X-R_A(\alpha, \tilde{m}_C)+F) - [\theta+(1-\theta)\tilde{m}_C]\alpha \frac{\partial R_A(\tilde{m}_C)}{\partial m} + (1-\theta)[R_A(\alpha, \tilde{m}_C)-R_C(\alpha, \tilde{m}_C)] \\ - (1-\theta)pF - [\theta+(1-\theta)\tilde{m}_C]\alpha \left[\frac{\partial R_C(\tilde{m}_C)}{\partial m} - \frac{\partial R_A(\tilde{m}_C)}{\partial m} \right] = V'(\tilde{m}_C) \quad (8)$$

We have rearranged the terms in (8) to disentangle the various effects that differentiate the conglomerate from the stand-alone case. We first derive the following result.

Lemma 3: Since $\left| \frac{\partial R_C(\alpha, m)}{\partial m} \right| < \left| \frac{\partial R_A(\alpha, m)}{\partial m} \right| \quad \forall m \in [0,1]$, the impact of market discipline on division A as part of a conglomerate (two-divisional firm) is strictly less than the impact it has on a stand-alone division A.

The intuition is that in a multi-divisional firm the consequences of division A's moral hazard are shared by both divisions; division A's funding cost therefore only partially reflects its monitoring choice. In other words, the overall expected pooled funding cost $R_C(\alpha, m)$ reflects division A's risk choices less than $R_A(\alpha, m)$ does. As a consequence, market discipline will be less effective in a conglomerate, even if outsiders can detect the monitoring choices of each division as easily in the conglomerate as in the stand-alone case¹³.

We can now interpret equation (8). Comparing (6) to (8) identifies the three effects that distinguish the two-divisional firm from the stand-alone division. The first two terms on the left hand side (LHS) of equation (8) can also be found in (6) and specify the marginal return to monitoring effort of division A as a stand-alone firm. Conglomeration introduces three additional effects:

¹³ One could expect that a conglomerate obscures the decisions taken in individual divisions. This reduced transparency - effectively a reduction in α - would further undermine market discipline in a conglomerate. Note however that our results hold irrespective of whether α decreases in the case of a conglomerate or not.

- First, a *diversification effect of co-insurance*, represented in the third term on the LHS of equation (8). This diversification effect results from the lower funding costs $R_C(\alpha, m)$ of a two-divisional firm, and positively affects division A's choice of monitoring¹⁴.
- Second, an *incentive effect of co-insurance*, represented in the fourth term on the LHS of (8). The co-insurance effect guarantees that division A may capture its future rents F even if it fails. This occurs whenever division B is successful. Division A therefore can free-ride on division B in a two-divisional firm. This effect could make more risk (less monitoring) acceptable to division A;
- Third, an *incentive effect due to a reduction in the impact of external market discipline*, represented in the fifth term on the LHS of equation (8). This induces additional free-riding and adds to the negative incentive effect from co-insurance; it may adversely affect division A's choice of monitoring.

We now have the following two results.

Proposition 1: (i) For a given level of α there may exist a cutoff level $\underline{F} > 0$ of F such that for $F \leq \underline{F}$ the monitoring intensity chosen by division A is higher (=lower risk) in a conglomerate than as a stand-

alone firm. If $F > \underline{F}$ the reverse is true. Furthermore $\frac{\partial \underline{F}}{\partial \alpha} < 0$ 10. (ii) For a given level of F there may exist a cutoff level $\underline{\alpha} \in [0, 1]$ of α such that for $\alpha \leq \underline{\alpha}$ division A chooses a higher monitoring intensity in a

conglomerate; the reverse holds for $\alpha > \underline{\alpha}$. Furthermore $\frac{\partial \underline{\alpha}}{\partial F} < 0$ 11.

The first part of the proposition can be explained as follows. The choice of monitoring intensity made by division A results from a trade-off between the positive diversification effect and the negative incentive effects. If the level of capitalized future profits is high (F large) the negative incentive effects are dominant and division A's monitoring intensity is reduced relative to the stand-alone case. For smaller values of F the diversification effect is dominant, resulting in lower risk (higher monitoring intensity) in a conglomerate. The intuition is that high values of F induce substantial monitoring in the

¹⁴ From equation (3) it is clear that $R_C(\alpha, m) < R_A(\alpha, m)$ for a given $m \in [0, 1]$, due to the diversification benefits from co-insurance. However, division A may choose a different effort level m_C in a conglomerate firm from the level m_A selected in the stand-alone case. The inequality $R_C(\alpha, m_C) < R_A(\alpha, m_A)$ continues to hold if and only if $m_C > (m_A - p)/(1 - p)$, i.e. if the effort level chosen in a conglomerate firm is still sufficiently high (although it may be lower than in a stand-alone firm). If $m_C < (m_A - p)/(1 - p)$ the negative incentive effects in a conglomerate firm dominate the diversification effect from co-insurance (Note that since $m_C \in [0, 1]$ the latter case will not occur if $m_A < p$). This will be discussed in more detail below (see also the proof of Proposition 2).

stand-alone case aimed at preserving F. In a conglomerate F is less at risk and lower monitoring becomes privately optimal. For low values of F, limited liability induces low monitoring in the stand-alone case. Conglomeration may then mitigate this and becomes more attractive. The comparative

statics result $\frac{\partial F}{\partial \alpha} < 0$ 12 shows that with more market discipline the stand-alone option becomes optimal for even lower values of F. In the limit we have:

Corollary 1 (Perfect or Complete Market Discipline): With perfect (or complete) market discipline ($\alpha=1$) a stand-alone division attains first best monitoring choices and therefore always chooses lower risk than in a conglomerate.

The intuition is straightforward. Near perfect market discipline does not leave much value to conglomeration. That is, in the extreme - with perfect market discipline - incentives are fully aligned and conglomeration only worsens risk choices. At the other extreme, with no market discipline, the prospects for conglomeration are best, resulting in a large interval of values of F for which conglomeration improves incentives.

The intuition for the second part of Proposition 1 is analogous. If the stand-alone division A is subject to little market discipline (low α) conglomeration may improve division A's monitoring intensity. Although the effectiveness of market discipline is further reduced in case of conglomeration (see the last term of the LHS of equation (8)) the diversification benefits from co-insurance may dominate. For higher market discipline of the stand-alone activities (higher α) the impact of the reduced effectiveness of market discipline in a conglomerate becomes larger and may finally more than compensate for the positive diversification effect of co-insurance. This results in a lower monitoring intensity in division A in a conglomerate relative to the stand-alone option. For higher levels of capitalized future profits (higher F) the interval of values of $\alpha \leq \underline{\alpha}$ for which risk choices are improved in a conglomerate becomes smaller. The negative incentive effect from co-insurance then becomes relatively more important vis-a-vis the diversification benefits and adds to the reduced effectiveness of

market discipline. This explains the comparative statics result $\frac{\partial \alpha}{\partial F} < 0$ 13.

2.3 Choice of Organizational Structure

Prior to the monitoring decision at $t=0$ (the shareholders of) both divisions decide on an organizational structure. Division A and division B choose the organizational structure that maximizes the total expected net surplus generated by their respective investments. Conglomeration then is optimal

if it generates the highest total expected net surplus. In this case an optimal sharing rule between the divisions can always be found such that both divisions prefer to be integrated in a conglomerate firm.

The choice of organizational structure is not fully determined by the comparison of risk choices. Conglomeration - *ignoring* incentive effects - reduces the probability that future rents F are lost due to default. This favors the case for conglomeration. Therefore, conglomeration is preferred when the risk choice in a conglomerate is better, but also sometimes when it is not. The following result can be derived.

Proposition 2: (i) For *low* levels of α conglomeration is preferred if $F \leq \underline{F}$, otherwise the stand-alone option is optimal. For *high* levels of α conglomeration may be preferred for $F_0 \leq F \leq \bar{F}$, whereas the stand-alone option is preferred for $0 < F < F_0$ and $F > \bar{F}$ ¹⁵. (ii) For a given level of F conglomeration is preferred if $\alpha \leq \underline{\alpha}$, otherwise the stand-alone option is optimal. \bar{F} , F_0 and $\underline{\alpha}$ are defined in the Appendix. All exceed the respective cut-offs \underline{F} and $\underline{\alpha}$ as defined in Proposition 1.

The intuition largely follows that of Proposition 1. The stand-alone division A would benefit from committing to a higher monitoring intensity (observe that $m_A < m^*$, see Lemma 1). Conglomeration may improve matters if division A benefits sufficiently from the diversification effect of co-insurance in a conglomerate. From Proposition 1 we know that this holds for low levels of α and relatively low values of capitalized future profits F ; if F is relatively high ($F > \underline{F}$) the negative incentive effect from co-insurance dominates and division A chooses more risk in a conglomerate (Proposition 1). Conglomeration then initially is still optimal since the expected value arising from the preservation of future rents is sufficiently high, i.e. the additional rents preserved due to diversification benefits exceed the loss due to distorted risk choices. This is the case for $F \leq \bar{F}$. Thus the cut-off \bar{F} in Proposition 2 exceeds the cut-off \underline{F} in Proposition 1. For higher values of F ($F > \bar{F}$) the negative incentive effects from co-insurance are dominant and the stand-alone option becomes optimal. For high levels of α we start out with lower incentives in a conglomerate. Conglomeration then may become optimal if the rents at stake are sufficiently large ($F > F_0$). However, if F becomes too large ($F > \bar{F}$) the stand-alone option again becomes optimal, since the probability of capturing these higher future rents in a conglomerate

¹⁵ This formulation captures the most general case for high α (see also Table 2). There may be parametric conditions for which F_0 and/or \bar{F} do not exist, i.e. for which the set $(F_0, \bar{F}]$ is \emptyset . In this case the stand-alone option is always optimal, and the graph in Figure 1 would not intersect the F -axis. For more details see the proof of Proposition 2.

deteriorates too much. The subset of values of F for which conglomeration is optimal therefore is wider than the subset for which division A's risk choices are improved in a conglomerate.

A similar intuition holds for the market discipline cut-off \bar{F} . In *Figure 1* we illustrate how the extra surplus generated by conglomeration (vis-a-vis stand-alone) depends on the level of rents F . In the figure Δ represents the net surplus generated by conglomeration minus the surplus available in the stand-alone case.

[Insert Figure 1]

Low α



High α

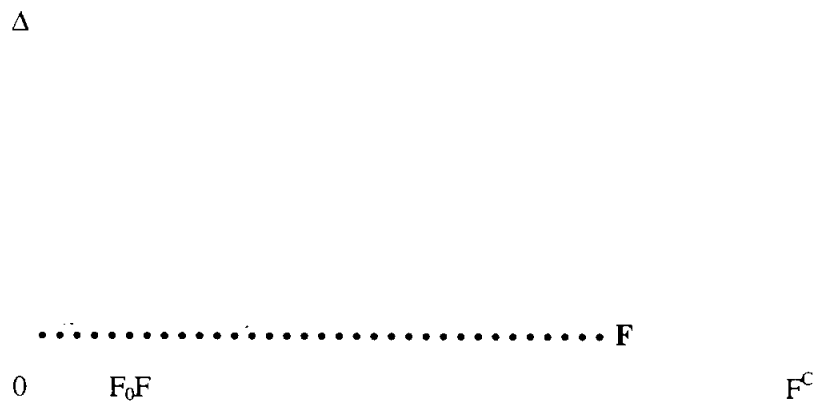


Figure 1: The Difference in Total Expected Net Surplus between Conglomeration and the Stand-Alone Option as a Function of F .

We observe from the figure that for large values of F ($F > F^C$) conglomeration and the stand-alone organizational structure converge. Such a high value of F induces a maximum feasible monitoring choice. This is formalized in Corollary 2.

Corollary 2 (Corner Solution): If F becomes large (i.e. for $F > F^C$) both divisions are indifferent between the stand alone option and conglomeration. In both organizational structures division A then chooses maximum monitoring intensity.

3. Numerical Example

In this section we will illustrate our main results so far in a numerical example based on the following parameters: $\theta = 1/2$, $p = 1/2$, $X = 2.75$, $Y = 4$ and $V(m) = 4m^2$. The results of our numerical analysis are summarized in *Table 1*. Panel A presents the differences in the equilibrium risk choices $m_C - m_A$ in division A as a function of the degree of market discipline $\alpha \in [0, 1]$ and the level of capitalized future profits $F \geq 0$. Panel B focuses on the optimal organizational structure of the respective divisions' activities and incorporates the differences in expected net surplus generated by their investments for the different levels of α and F .

[Insert Table 1]

The results confirm the characterization in Propositions 1 and 2. High rents F make the stand-alone option optimal: both better monitoring incentives $m_C - m_A < 0$ and a higher surplus of stand-alone vis-a-vis conglomeration, see the negative numbers in Panel B. Low market discipline improves monitoring choices in a conglomerate vis-a-vis stand-alone. Generally, conglomeration is suboptimal for high levels of α except for intermediate values of F .

Panel A: Difference in Monitoring Incentives in Division A ($m_C - m_A$) as Function of α and F								
F α	0.00	0.25	0.50	1.00	2.00	4.00	8.00	∞
0.00	0.0377	0.0282	0.0188	0.0000	-0.0369	-0.1086	-0.2462	0.0000
0.10	0.0276	0.0183	0.0091	-0.0092	-0.0452	-0.1155	-0.2514	0.0000
0.20	0.0177	0.0086	-0.0004	-0.0182	-0.0534	-0.1224	-0.2564	0.0000
0.30	0.0081	-0.0007	-0.0095	-0.0270	-0.0614	-0.1291	-0.2614	0.0000
0.40	-0.0012	-0.0098	-0.0183	-0.0354	-0.0692	-0.1357	-0.2662	0.0000
0.50	-0.0102	-0.0186	-0.0269	-0.0436	-0.0767	-0.1422	-0.2710	0.0000
0.60	-0.0189	-0.0271	-0.0353	-0.0515	-0.0840	-0.1485	-0.2757	0.0000
0.70	-0.0273	-0.0353	-0.0434	-0.0593	-0.0912	-0.1546	-0.2804	0.0000
0.80	-0.0356	-0.0434	-0.0513	-0.0669	-0.0982	-0.1606	-0.2849	0.0000
0.90	-0.0435	-0.0512	-0.0590	-0.0743	-0.1051	-0.1665	-0.2894	0.0000
1.00	-0.0514	-0.0589	-0.0664	-0.0816	-0.1118	-0.1724	-0.2938	0.0000
Panel B: Difference in Expected Surplus in a Conglomerate vis-a-vis the Stand Alone Option								
F α	0.00	0.25	0.50	1.00	2.00	4.00	8.00	∞
0.00	0.0519	0.0987	0.1421	0.2192	0.3347	0.4143	-0.0179	0.0000
0.10	0.0379	0.0835	0.1260	0.2012	0.3135	0.3879	-0.0517	0.0000
0.20	0.0243	0.0688	0.1102	0.1836	0.2926	0.3617	-0.0850	0.0000
0.30	0.0111	0.0547	0.0951	0.1664	0.2721	0.3359	-0.1177	0.0000
0.40	-0.0016	0.0409	0.0804	0.1499	0.2521	0.3106	-0.1500	0.0000
0.50	-0.0140	0.0276	0.0660	0.1338	0.2328	0.2858	-0.1819	0.0000
0.60	-0.0259	0.0146	0.0521	0.1182	0.2139	0.2615	-0.2134	0.0000
0.70	-0.0376	0.0020	0.0386	0.1028	0.1954	0.2378	-0.2446	0.0000
0.80	-0.0489	-0.0103	0.0254	0.0878	0.1772	0.2145	-0.2753	0.0000
0.90	-0.0599	-0.0222	0.0125	0.0732	0.1593	0.1915	-0.3055	0.0000
1.00	-0.0706	-0.0339	-0.0001	0.0588	0.1420	0.1685	-0.3354	0.0000

Table 1: Overview of Results of Numerical Example

4. Discussion

The general insights from the Propositions 1 and 2 are summarized in *Table 2*.

α	F	Low	Medium	High	$F > F^C$
Low		Conglomerate	Conglomerate	Stand-Alone	Indifferent
High		Conglomerate or Stand-Alone	Conglomerate or Stand-Alone	Stand-Alone	Indifferent
Limit $\alpha \rightarrow 1$		Stand-Alone	Conglomerate or Stand-Alone	Stand-Alone	Indifferent

Table 2: Optimal Organizational Structure as Function of Competitive Environment (F) and Market Discipline/Transparency (α).

We observe from Table 2 that medium rents may favor conglomeration; risk choices however are generally worse (compare Panel A and Panel B in Table 2). This discrepancy between optimal risk choices and the choice of organizational structure occurs because conglomeration better preserves the rents F (ceteris paribus, default is less likely). For very high levels of F ($F > F^C$) this is not important because the risk choices in a stand-alone structure and the conglomerate are conservative and default is (nearly) ruled out. Observe also from Table 2 that with sufficiently low rents with perfect market discipline ($\alpha \rightarrow 1$) the stand-alone option is preferred. While this limiting case is of interest in itself¹⁶, combinations of low and medium/high levels of market discipline and rents may best characterize most real-world industries. A general implication from Table 2 is that conglomeration could be an optimal response to a more competitive environment *unless* transparency (or market discipline) becomes near perfect¹⁷.

On a more fundamental level firms may differ in asset-specificity and operate in different competitive environments. Asset-specificity may well be linked to transparency. High asset-

¹⁶ As is the other extreme case $F > F^C$; observe from Corollary 2 that then the choice of organizational structure is a matter of indifference.

¹⁷ As a qualifier we should realize that managerial interests in our analysis are perfectly aligned with those of shareholders. Managerial agency-problems may potentially be more severe in a conglomerate.

specificity may give rise to proprietary information and lack of transparency, and hence little market discipline. This could favor a conglomerate type of organization for such type of activity¹⁸.

On a different note, the characterization in Table 2 could also lead to insights on the heterogeneity of activities that are combined in a conglomerate. Our insights suggest that activities with low and high asset-specificity should not be mixed together. Low asset-specificity assets may benefit most from a stand-alone organization exploiting the considerable amount of market discipline that then obtains. High asset-specificity activities can then only be combined with other high asset-specificity activities and would jointly benefit from the positive incentive effects of diversification¹⁹.

Note that these observations are tentative. Often cross-sectional differences in asset-specificity may go hand in hand with differences in the competitive environment. For example, a high degree of asset-specificity (with low α) may sometimes go together with a non-competitive environment (high rents F). As can be seen from Table 2, high rents could mitigate the conglomeration benefits of low α activities and still make the stand-alone option optimal. It is therefore important to consider both dimensions (α and F) in classifying the desired organizational structure of activities.

IV. INTERNAL ALLOCATION OF COST OF CAPITAL

From Section III it is clear that integrating separate divisions in a conglomerate firm is desirable if this results in better monitoring choices in the divisions. If this is not the case free-riding (implying high risk) may dominate and division A and division B may prefer to operate as a stand-alone entity. Potentially valuable diversification benefits then remain unexploited. The source of this inefficiency is the reduction in market discipline following conglomeration that outweighs the potential diversification benefits. An increase in the impact of market discipline in a conglomerate firm therefore could reduce free-riding and facilitate socially desirable integration.

In this section we show that an internal cost of capital allocation mechanism could create *internal* discipline that complements (external) market discipline. Such a well-functioning (internal) cost of capital allocation mechanism could align incentives and allow division A to optimally benefit from the diversification benefit of integration.

¹⁸ A slightly different perspective appears in Myers and Rajan (1997). In their work liquid assets (i.e. low asset-specificity) are most difficult to monitor for reasons of excessive managerial discretion (e.g. managers could easily run away with these assets). We do not focus on these managerial agency-problems.

¹⁹ See the numerical example in the Appendix for an illustration of this intuition.

The impact of a given level α of market discipline on division A's choice of monitoring intensity can be increased by an internal allocation of (the cost of) capital to the respective divisions by a CEO. For our qualitative results it does not matter whether the CEO is better informed with respect to the incentive problems in division A than outsiders, or does not have better information but could just undo the diluted market discipline in a conglomerate²⁰. It is assumed that the CEO acts in the interest of the shareholders of the conglomerate firm.

We will proceed as follows. Note that in Section III the same interest rate factor $R_C(\alpha, m)$ was charged to each division; this is now going to change. The internal allocation of cost of capital is introduced in the following way. The CEO first allocates a *differential charge* to the respective divisions to reflect *intrinsic* differences in riskiness. Thus the CEO does not charge a pooled rate to both divisions but differentiates the cost of capital charged between division A and division B. This is analogous to charging the cost of capital which would be charged by the market if division A and division B would be operated and funded as separate entities. Simultaneously, the CEO could restore market discipline by increasing the *sensitivity parameter* in the cost of capital charged to division A with respect to m . That is, he internally 'leverages' the now diluted external market discipline parameter α . It is assumed that the CEO assigns a sensitivity parameter β to the cost of capital charged to division A. The total degree of (market) discipline that division A is subjected to then

equals $(1-\beta)+\beta^{21}$, where α is defined as $\frac{\partial R_C(m)/\partial m}{\partial R_A(m)/\partial m}$ 14. If the sensitivity parameter β equals zero, each division is only subjected to external market discipline of the diluted degree ($<\alpha$). If the CEO makes each division fully accountable for its risk choice by assigning $\beta=1$ then discipline is perfect and first best attains. For intermediate values of the sensitivity parameter β the total degree of (market) discipline lies between α and 1. The expected cost of capital charged to division A can now be denoted by

²⁰ It is thus *not* necessary that the CEO is better informed than outsiders. If he were equally informed, and could only undo the diluted impact of market discipline on division A by using an internal cost of capital allocation, things would improve as well. In this case the total degree of (market) discipline that division A can be subjected to in a

conglomerate firm has a maximum of $\alpha \frac{\partial R_A(m)}{\partial m}$ **Error! Main Document Only..** If the CEO has better information than outsiders the total (market) discipline could become even larger. This is (implicitly) the case in Stein (1997) where the CEO engages in 'winner-picking' and can reallocate (scarce) resources between competing projects in a conglomerate.

²¹ This specification shows that internal and external (market) discipline are complements; a higher α and/or β increases discipline. The parameters α and β are expressed as sensitivity parameters vis-a-vis the interest rate charged to the division in a conglomerate firm. Note that α (instead of β) measures the sensitivity vis-a-vis the funding cost of the division as a stand-alone entity.

$R_A((1-\beta)+\beta,m)$, with $\frac{\partial R_A(\alpha(1-\beta)+\beta,m)}{\partial m} = [\alpha(1-\beta)+\beta] \frac{\partial R_A(m)}{\partial m}$ 15 and $\frac{\partial R_A(m)}{\partial m} < 0$ 16
 (see (1) and (4)). Similarly, the funding cost of the conglomerate firm in competitive markets is $R_C((1-\beta)+\beta,m)$.

Note that the differential charge removes the diversification benefit from the (nominal) funding costs. Each division will now be charged for its default risk. This implies that both divisions will face a higher (nominal) funding cost than before. The following result can be derived.

Lemma 4: A differential charge reflecting intrinsic differences in riskiness will elevate the (nominal) funding cost faced by both divisions. This will worsen division A's incentives.

The intuition for this lemma is that *passively* increasing capital charges worsens incentives. It highlights the adverse outcomes that occur with 'standard' moral hazard. An internal cost of capital allocation can only be effective if sufficient discipline is imposed as well. Here the sensitivity factor $(1-\beta)+\beta$, as defined above, becomes important. We now have Proposition 3.

Proposition 3: Internal discipline ($\beta>0$) strictly improves division A's incentives in a conglomerate, enlarging the range of values of F for which conglomeration improves incentives and/or is optimal:

$$\frac{\partial F}{\partial \beta} > 0 \quad 17.$$

that is (see Proposition 1),

The result in Proposition 3 shows the potential effectiveness of internal discipline. Effectiveness requires a dynamic mechanism that responds to actual risk choices. This discipline adds to the optimality of conglomeration, and reduces the funding costs of the conglomerate bank.

Corollary 3: With full internal discipline ($\beta=1$) market discipline α is redundant, and first best attains; division A chooses its first best monitoring intensity (risk level).

Corollary 4 shows that internal discipline β complements and ultimately may replace market discipline α . In the limit, when β is one, internal discipline is perfect and market discipline α becomes redundant. The analysis above suggests that free-riding behavior on the part of division A can be reduced by a well functioning internal cost of capital allocation mechanism which may promote socially desirable conglomeration.

V. PROPRIETARY TRADING VERSUS RELATIONSHIP BANKING

1. Introduction

In this section we adapt our analysis to the specific features of the Barings débâcle and more generally the potential conflict between transaction- and relationship-oriented banking as briefly discussed in the Introduction. In this extension we address the issue of the optimal organizational structure of proprietary trading activities in banking and how these may undermine other activities.

We will argue that the proprietary trading activity may free-ride on the bank at large. This, we will show, implies that a proprietary trading unit does not sufficiently internalize risk and other (mainly relationship-oriented) activities of banks may suffer. The implication might be that bankers mistakenly believe that proprietary trading is profitable, while simultaneously undermining their relationship-oriented activities.

Note that much of the banking activities are relationship-oriented. Proprietary trading activities however are different and involve arbitrage between different markets and/or different financial products. These trading activities involve substantial risk, thus establishing the fair risk-adjusted cost of funds is important. This cost might, given the specific nature of the trading activities, differ substantially from the cost of funds of the bank as a whole. Moreover, relationship-oriented banking by definition has a longer-term scope; the bank may need to heavily invest in relationships at the outset (a 'set-up' cost), in order to benefit in the longer term. An interaction therefore can be expected between relationship-specific effort exerted now and the possibility to benefit from this in a later period. The activities in the trading division are more short-term oriented and do not depend on relationship-specific effort. In a multi-divisional bank however the risk choices of the trading division may have an impact on the relationship-banking division, by affecting the risk - and survival probability - of the bank as a whole.

Compared to our model setup so far we now activate division B as proprietary trading division, and we interpret division A as the relationship-banking division. Our *primary* focus is on how the choices of trading division B may undermine, or negatively affect the choices made by relationship-banking division A.

2. Specification and Analysis

As before, division A (the relationship-banking activity) chooses monitoring intensity m generating a payoff X with probability $\theta+(1-\theta)m$, and zero otherwise. Division A is subject to external market discipline of a degree $\alpha_A \in [0,1]$. The capitalized value of future profits is now $F(m)$, with $F'(m) > 0$ and $F''(m) < 0$. The dependence of F on m captures some of the future benefits of relationship-specific investments and generalizes the exogenous value of F as used before.

Our primary focus is on division B (the proprietary trading activity). This division generates an end-of-period return $Y(p)$ with probability p , where p can now be chosen (was fixed before). We let $Y'(p) < 0$ and $Y''(p) > 0$, such that $pY(p)$ has an interior maximum. The degree of external market discipline division B is subject to equals $\alpha_B \in [0, 1]$.

Analogous to the main analysis in Section III two different organizational structures can be distinguished; either stand-alone or conglomerate. The funding costs are as specified in (1) through (3). Note that the pooling rate is now $R_C(\alpha, m, p)$ per dollar invested and depends on the (risk) choices in *both* divisions (m respectively p). In case of conglomeration the incentives in both divisions are determined simultaneously.

If division B operates as a stand-alone firm it maximizes $p[Y(p) - R_B(\alpha, p)]$, and in a conglomerate $p[Y(p) - R_C(\alpha, m_C, p)]$. Define p_B and p_C as division B's (privately) optimal risk choices if it operates stand-alone and in a conglomerate respectively. We can now derive the following result.

Proposition 4 : Given division A's optimal monitoring choice in a conglomerate there may exist a level of market discipline $\underline{\alpha}_B \in [0, 1]$ such that for $\alpha_B > \underline{\alpha}_B$ the proprietary trading division B chooses strictly more risk in a conglomerate than as a stand alone activity, i.e. $p_C < p_B$. For $\alpha_B \leq \underline{\alpha}_B$ division B chooses less risk in a conglomerate bank; $\underline{\alpha}_B$ is defined in the Appendix.

The proposition shows that effective market discipline (of stand-alone activities) discourages conglomeration. However, whenever we start out with little market discipline of stand-alone activities (low α_B), the beneficial effects of diversification dominate, and the risk choices in division B are better in a conglomerate. Proposition 4 is in the spirit of our earlier results.

In the determination of the optimal organizational structure similar issues play a role as before. Both divisions again choose the organizational structure of their operations at $t=0$, anticipating their incentives and the funding costs conditional on each organizational structure. Several cases can be distinguished. We will focus on the most stringent case when B chooses more risk in a conglomerate than as a stand-alone division ($\underline{\alpha}_B < \alpha_B < 1$). We can show:

Proposition 5 (Active Trading Division B): Excessive (vis-a-vis stand-alone) risk taking in the trading division B makes conglomeration less attractive. The relationship banking division A then may only benefit from conglomeration if it faces sufficiently low market discipline. Otherwise the stand-alone option is optimal.

This proposition generalizes Proposition 1. The proposition can be illustrated with a simple numerical example²². Assume as before that $\theta=1/2$, $X=2.75$, $Y=4$ and $V(m)=4m^2$. Furthermore, let $F(m)=0.5\sqrt{m}$ 18 and $Y(p)=3(p-2)^2$. Then it can be shown that division B chooses excessive risk in a conglomerate if α_B is larger than 0.37. This worsens incentives in division A. Division A now chooses lower monitoring incentives in case of conglomeration if $\alpha_A>0.49$. Note that these lower incentives furthermore reduce the benefits from relationship banking activities. Conglomeration therefore becomes less attractive. Only if the expected benefits from diversification are still sufficiently high conglomeration is the optimal organizational structure.

Our example furthermore suggests that the stronger the effect of m on the future rents F the lower the benefits of conglomeration. With $F'(m)=6\sqrt{m}$ 19, for example, conglomeration always worsens risk choices in division A and is never optimal. These results show how relationship-specific activities may suffer from the proprietary trading activity, and further motivate the necessity of an internal allocation of cost of capital.

Note that Proposition 4 and 5 may underestimate the consequences of risk taking in the proprietary trading division B. This is because we have assumed that division A defaults less often as part of a conglomerate bank than as a stand-alone entity. We next allow the proprietary trading division B to *increase* the default probability of the bank as a whole.

Consider the following simple alteration of the model. Let δ be the dilution factor in the success probability of the relationship lending division A. We assume that default in the proprietary trading division reduces the success probability of the relationship lending division from $\theta+(1-\theta)m$ to $[\theta+(1-\theta)m](1-\delta)$, with $\delta\in(0,1]$ ²³. The survival probability of the conglomerate bank now becomes equal to $p+[\theta+(1-\theta)m](1-p)(1-\delta)$. With $\delta=0.50$ in our numerical example it can be seen that the incentives for (excessive) risk taking in both divisions of the conglomerate bank increase. Division A now always reduces its monitoring incentives, whereas B increase its risk for $\alpha_B>0.33$. This induces division A to prefer the stand-alone option more often.

²² For a summary of all the possible combinations of risk choices and choices of organizational structure see the proof of Proposition 5 and the numerical example in the Appendix.

²³ Note that here we focus on a *one-sided* impact of division B's risk taking incentives on the success probability of division A. This is done for reasons of (economic) interpretation and simplicity. Introducing a two-sided impact would not qualitatively change our results. Note furthermore that there may be different ways to model the impact of excessive risk taking by proprietary trading on the relationship banking division, e.g. by decreasing the capitalized value of future rents $F(m)$ with some factor. The difference between this option and our choice lies in the extent to which the relationship lending department will be able to capture the current cash flow X . Still another way of incorporating a dilution factor would be to multiply the survival probability of the conglomerate bank by a factor $\varepsilon\in(0,1)$. Again this approach would not qualitatively change our results.

The intuition is that the possible dissipative impact of default in division B on the survival probability of the overall bank will increase the pooled funding costs $R_C(\alpha, m, p)$ of the conglomerate bank. This effect becomes stronger if δ increases. Free-riding by the proprietary trading department then undermines relationship banking activities (i.e. reduces monitoring intensity in division A) even more and further reduces the benefits of conglomeration to division A²⁴.

Proposition 4 and 5 and the numerical example give us some key implications of the Barings débâcle. Proprietary trading within a conglomerate bank may suffer from a lack of market discipline, and as a result, excessive risk taking may occur that undermines the relationship-specific activities. The latter effect is the key insight that this section adds to our general analysis in Section III.

VI. CONCLUSION

We have focused on the incentives for risk taking in a multi-divisional ('conglomerate') bank. Incentive problems sometimes dictate integration of activities, but with perfect market discipline favor stand-alone activities. Conglomeration might have benefits that compensate for ineffective market discipline. In particular, diversification benefits may effectively relax the limited liability constraint such that adverse - risk taking - incentives are mitigated. However, conglomeration also undermines market discipline and invites free-riding. An effective internal capital cost allocation mechanism might then be indispensable to mitigate these effects.

In Section III.4 we have extracted some insights that may help explain the (sub)optimality of conglomeration in different industries. Here we would like to point at some recent developments that might be of direct importance for our analysis. First, in the recent decennia we have observed substantial advances in information technology. This may have improved transparency, and hence facilitated better market discipline. Together with our finding that more market discipline pushes us in the direction of stand-alone activities, conglomeration should suffer. Simultaneously, the environment for banks has generally become more competitive. Our findings show that this (a lower F in our analysis) actually favors conglomeration, unless market discipline becomes near perfect. These developments therefore do not unambiguously point at more conglomeration or separation of activities. However, we do show that *ultimately* market discipline is a decisive factor (favoring separation).

²⁴ This is caused by the fact that the stronger negative incentive effects in case of conglomeration can no longer be compensated for by the (declining) benefits of diversification.

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APPENDIX

Proof of Lemma 1: With complete selffinancing division A's optimal risk choice m^* follows from:

$$(1-\theta)(X+F) = V'(m^*) \quad (\text{A.1})$$

where $m^* \equiv m^*(\theta, X, F)$ with $\frac{\partial m^*}{\partial \theta} < 0$ ²¹, $\frac{\partial m^*}{\partial X} > 0$ ²² and $\frac{\partial m^*}{\partial F} > 0$ ²³ since $V''(m) > 0 \forall m \in [0, 1]$. In the case of outside financing at the funding rate $R_A(\alpha, m)$ division A's optimal monitoring choicem m_A satisfies the first order condition (6), which can be written as:

$$(1-\theta)(X+F) = V'(m) + (1-\theta)(1-\alpha)R_A \quad (\text{A.2})$$

and the necessary second order condition $V''(m_A) > 0$. Note that $R_A = R_A(\alpha, m_A)$ in equilibrium (see equation (5)). The second term on the RHS of (A.2) is larger than zero $\forall m \in [0, 1]$. Due to the convexity of $V(m)$ then it can easily be seen that $V'(m_A) < V'(m^*)$ implies that $m_A < m^*$. Furthermore,

since $\frac{\partial [V'(m^*) - V'(m_A)]}{\partial R_A} = (1-\theta)(1-\alpha) > 0$ ²⁵ it is clear that $(m^* - m_A)$ increases with R_A . □

Proof of Lemma 2: This result follows readily from equation (A.2). Note that $m_A \equiv m_A(\alpha, \theta, X, F)$. Since the second term on the RHS of (A.2) decreases monotonically with α and $V''(m) > 0$, it can be

seen that $\frac{\partial \tilde{m}_A}{\partial \alpha} > 0$ ²⁶. For $\alpha=1$ the first order condition equals (A.1), and the optimal risk choice equals m^* . Alternatively, this result can be derived from totally differentiating equation (6) with

respect to α . For completeness, note furthermore that $\frac{\partial \tilde{m}_A}{\partial X} > 0$ ²⁷, $\frac{\partial \tilde{m}_A}{\partial F} > 0$ ²⁸ and $\frac{\partial \tilde{m}_A}{\partial \theta} < 0$ ²⁹ if

$V'(m)$ is sufficiently high, i.e. if $V'(m) > \frac{(1-\theta)^2(1-m)(1-\alpha)}{[\theta+(1-\theta)m]^2}$ ³⁰. □

Proof of Lemma 3: This result follows from differentiating $R_A(\alpha, m)$ and $R_C(\alpha, m)$ with respect to m . Since $p \in [0, 1]$ it can be seen that $\forall m \in [0, 1]$:

$$\left| \frac{\partial R_C(\alpha, m)}{\partial m} \right| = \frac{\alpha(1-\theta)(1-p)}{\{\theta+(1-\theta)m+(1-[\theta+(1-\theta)m])p\}^2} < \frac{\alpha(1-\theta)}{[\theta+(1-\theta)m]^2} = \left| \frac{\partial R_A(\alpha, m)}{\partial m} \right| \quad 31 \quad \square$$

Proof of Proposition 1: Recall m_A and m_C as the solutions to division A's optimization problem if it operates as a stand-alone firm and as part of a conglomerate firm respectively. Then for the stand-alone case equation (6) and the second order condition are given by:

$$(1-\theta)(X+F) - (1-\theta)R_A(\alpha, m) - [\theta+(1-\theta)m] \frac{\partial R_A(\alpha, m)}{\partial m} - V'(m) = 0 \quad (A.3)$$

and $V''(m_A) > 0$. Similarly, for the conglomerate case the first order condition and the second order condition are given by:

$$(1-\theta)(X+F) - (1-\theta)R_C(\alpha, m) - [\theta+(1-\theta)m] \frac{\partial R_C(\alpha, m)}{\partial m} - (1-\theta)pF - V'(m) = 0 \quad (A.4)$$

and $V''(\tilde{m}_C) > \frac{2\alpha(1-\theta)^2(1-p)p}{\{\tilde{\mu}_C + (1-\tilde{\mu}_C)p\}^3}$ $\equiv V_1$, with $\tilde{m}_i = \theta + (1-\theta)m_i$ for $i \in \{A, C\}$. For a given level of α let F^A and F^C be the minimum levels of F for which m_A respectively m_C equal 1. From Lemma 2 and (A.4) it can be seen that m_A and m_C increase monotonically in F on $F \in [0, F^A]$ and $[0, F^C]$ respectively. Furthermore let $V''(m_C) > V_2$, with $V_2 \equiv V_1 + (1-p)V''(m_A)$. From this it can be seen that $F^C > F^A$. Now first consider the case where $F \in [0, F^A]$. If $m_C(0) > m_A(0) \exists$ a unique $\underline{F} \in [0, F^A] \ni m_A(\underline{F}) = m_C(\underline{F})$. Since $m_C - m_A$ decreases monotonically with F on $F \in [0, F^A]$ it can be seen that $m_C(F) > m_A(F)$ for $F < \underline{F}$ whereas $m_C(F) < m_A(F)$ for $F > \underline{F}$. If $m_C(0) < m_A(0)$ then $m_C(F) < m_A(F) \forall F \in [0, F^A]$. For $F \in (F^A, F^C)$ it can easily be seen that $m_C(F) < m_A(F) = 1$ but the difference in incentives between the stand alone option and the conglomerate now decreases with F . For $F \geq F^C$ finally $m_C(F) = m_A(F) = 1$ (corner solution). The level of capitalized future profits \underline{F} for which division A would make the same risk choice in a conglomerate firm as in the stand-alone case satisfies:

$$\underline{F} = \frac{R_A(\alpha, \tilde{m}_A) - R_C(\alpha, \tilde{m}_A)}{p} - \frac{\theta + (1-\theta)\tilde{m}_A}{(1-\theta)p} \alpha \left[\frac{\partial R_C(\tilde{m}_A)}{\partial m} - \frac{\partial R_A(\tilde{m}_A)}{\partial m} \right] \quad 35 \text{By substituting}$$

$$\underline{F} = \frac{(1-\alpha)[p+(1-p)\tilde{\mu}_A(2-\tilde{\mu}_A)] - \tilde{\mu}_A}{\tilde{\mu}_A[p+(1-p)\tilde{\mu}_A]^2} \quad 36. \text{ Note that it can be shown}$$

from (1) and (3) \underline{F} rewrites to that there exist parameter values for θ , α , X and p such that $\underline{F} \in [0, F^A]$ (see also the numerical example in Section III.3). If $\underline{F} < 0$ $m_C < m_A \forall F \in [0, F^A]$. From taking the first order derivative of \underline{F} with respect to

$$\alpha \text{ and after some tedious algebra it can be shown that } \frac{\partial \underline{F}}{\partial \alpha} < 0 \quad 37. \text{ In terms of } \alpha \text{ the proof is}$$

analogous. For a given level of F define α^A and α^C as the minimum levels of α for which m_A and m_C respectively would equal 1. From Lemma 2 and (A.4) furthermore it can easily be shown that m_A

and m_C increase monotonically with α on $[0, \text{Min}\{\alpha^A, 1\}]$ and $[0, \text{Min}\{\alpha^C, 1\}]$ respectively. Now first consider the case where $\alpha \in [0, \text{Min}\{\alpha^A, 1\}]$. If $m_A(0) < m_C(0)$ and $\alpha^A \leq 1$ then \exists a unique $\underline{\alpha} \in [0, \alpha^A]$ $\exists m_A(\underline{\alpha}) = m_C(\underline{\alpha})$. Since $m_C - m_A$ decreases monotonically with α then $m_C(\alpha) > m_A(\alpha)$ for $\alpha \in [0, \underline{\alpha})$ whereas $m_C(\alpha) < m_A(\alpha)$ for $\alpha \in (\underline{\alpha}, \alpha^A]$. If $m_A(0) < m_C(0)$ and $\alpha^A > 1$ then \exists an $\underline{\alpha} \in [0, 1]$ $\exists m_A(\underline{\alpha}) = m_C(\underline{\alpha})$ if and only if $m_C(1) < m_A(1)$. Otherwise $m_C(\alpha) > m_A(\alpha) \forall \alpha \in [0, 1]$. If $m_C(0) < m_A(0)$ $m_C < m_A \forall \alpha \in [0, 1]$. If $\alpha \in [\alpha^A, \text{Min}\{\alpha^C, 1\}]$ it can easily be seen that $m_C(\alpha) < m_A(\alpha) = 1$. Finally, if $\alpha \in [\alpha^C, 1]$ $m_C(\alpha) = m_A(\alpha) = 1$ (corner solution). The degree of market discipline $\underline{\alpha}$ for which $m_C = m_A$ equals

38. From the numerical example in Section III.3 it can finally be seen that there exist parameter values for θ, X, p and F such that $\underline{\alpha} \in [0, \text{Min}\{\alpha^A, 1\}]$. If $\underline{\alpha} < 0$ $m_C < m_A$ for $\alpha \in [0, \text{Min}\{\alpha^A, 1\}]$. By taking the first order derivative of $\underline{\alpha}$ with respect to F and after some algebra it can furthermore be shown that

$$\frac{\partial \underline{\alpha}}{\partial F} < 0$$

39. That completes the proof. \square

Proof of Corollary 1: The first part of Corollary 1 has been derived in Lemma 2. For the second part it is sufficient to proof that (A.4) < (A.3) for $\alpha = 1$. This can easily be seen from substituting $\alpha = 1$. Since $m_A = m^*$ for $\alpha = 1$ the second order condition then dictates that $m_C < m^*$ (see Proposition 1). With conglomeration therefore the first best monitoring intensity m^* will never be attained, and the stand alone option may be optimal. This would be the case if $F > F^A \Rightarrow m^* = 1$. If $m^* < 1$ conglomeration may or may not be optimal (see Proposition 2). Alternatively, it can be shown that the cutoff value \underline{F} of F for which $m_C = m_A = m^*$ is smaller than zero for $\alpha = 1$. \square

Proof of Proposition 2: Conglomeration is the (socially) preferred organizational structure if the total expected net surplus generated by the respective divisions' investments is (weakly) higher in a conglomerate firm than in the stand-alone option. If division A and division B operate as stand-alone divisions the total expected net surplus equals $pY + m_A(X+F) - 2$. In case of conglomeration the total expected net surplus equals $pY + m_C(X+F) + (1-c)pF - 2$. Define $\Delta(\alpha, F)$ as the difference in total expected net surplus between the conglomerate and the stand alone option, divided by $(1-\theta)$, as a

$$\frac{\partial \Delta^2(\alpha, F)}{\partial F^2} < 0$$

function of α and F . Furthermore let \underline{F} on $F \in [0, F]$ with \underline{F} as defined below, i.e. let

$$\tilde{m}_C[X + (1-p)F] - \tilde{m}_A[X + F] + 2\tilde{m}_C(1-p) - 2\tilde{m}_A < 0 \quad 41 \text{ or}$$

$$V'''(\tilde{m}_C) > -\frac{3(1-\theta)(1-p)V_1}{M_C} + \frac{(1-\theta)V'''(\tilde{m}_A)}{[V''(\tilde{m}_A)]^3} \frac{[V''(\tilde{m}_C)-V_1]^3}{(1-\theta)(1-p)^2} \frac{X+F}{X+(1-p)F} +$$

$$\left[\frac{2(1-p)^2}{V''(\tilde{m}_C)-V_1} - \frac{2}{V''(\tilde{m}_A)} \right] \frac{[V''(\tilde{m}_C)-V_1]^3}{(1-\theta)(1-p)^2} \frac{1}{X+(1-p)F}$$

Conglomeration then is optimal if and only if $\Delta(\alpha, F) > 0$, i.e. if and only if

$$[\tilde{m}_C - \tilde{m}_A](X+F) + (1-\tilde{m}_C)pF > 0 \quad (A.5)$$

We first focus on the first part of Proposition 2. First consider the case where $m_C(0) > m_A(0)$. Since

$$\frac{\partial F}{\partial \alpha} < 0$$

from Proposition 1 it can be seen that 44, this case occurs if α is relatively low. Condition (A.5) then is always satisfied if $m_C \geq m_A$, i.e. if $0 \leq F \leq \underline{F}$. If $m_C < m_A$, i.e. for $F > \underline{F}$, conglomeration will only be optimal if the expected benefit from co-insurance (through F) exceeds the loss due to distorted incentives. For a given level of α let $F > \underline{F}$ be the level of F for which $(1-m_C)p = (m_A - m_C)$. Then for $F \geq F$ condition (A.5) will not be satisfied, and the stand-alone option is optimal. The intuition is that for $F \geq F$ the incentives in division A have been distorted so much that the diversification effect of co-insurance has completely been eliminated. No higher value of F can make conglomeration desirable anymore, since the probability of capturing these higher future rents has deteriorated too much. Therefore $\exists \alpha F \in (\underline{F}, F) \ni \Delta(\alpha, F) \geq 0$ if $F \leq F$ and $\Delta(\alpha, F) < 0$ if $F > F$. Next consider the case where $m_C(0) \leq m_A(0)$, i.e. where $\underline{F} < 0$. As can be seen from Proposition 1 this case is relevant

$$\frac{\partial \Delta(\alpha, 0)}{\partial F} < 0$$

for high levels of α . Then if 45 the stand alone option is always optimal. If

$$\frac{\partial \Delta(\alpha, 0)}{\partial F} \geq 0$$

46 there may exist at most two levels of capitalized future profits F on the interval $[0, F] \ni \Delta(\alpha, F) = 0$. Denote these values as F_0 and $F > F_0$. If this is the case conglomeration is optimal for $F \in [F_0, F]$. The intuition is that the level of F may first dominate the negative incentive effect stemming from co-insurance. For higher levels of F however the incentive effect becomes dominant and conglomeration becomes less optimal. Otherwise $\Delta(\alpha, F) < 0 \forall F$ and the stand-alone option is always optimal. That completes part (i). In terms of α Proposition 2 is derived in a similar way. For a given level of F consider first the case where $m_C(0) > m_A(0)$. If $m_C \geq m_A$, i.e. if $0 \leq \alpha \leq \text{Min}\{\underline{\alpha}, 1\}$, condition (A.5) is always satisfied. If $\alpha > \text{Min}\{\underline{\alpha}, 1\}$ $m_C < m_A$, the more so if α grows larger. For $\alpha > \text{Min}\{\underline{\alpha}, 1\}$ therefore conglomeration is optimal if and only if $\Delta(\alpha, F) > 0$. Even if conglomeration

reduces division A's monitoring intensity, it may still be preferred if m_C is still sufficiently high. i.e. if

$$\tilde{m}_C > \tilde{m}_A - \frac{(1 - \tilde{m}_A)pF}{X + (1-p)F}$$

47. Define $\alpha \in [0, 1]$ as the level of α for which $\Delta(\alpha, F) = 0$. Since $\Delta(\alpha, F)$ decreases monotonically in α then it can easily be seen that conglomeration is optimal if $\text{Min}\{\alpha, 1\} < \alpha \leq \text{Min}[1]$. Next consider the case where $m_C(0) < m_A(0)$. Since $\Delta(\alpha, F)$ is monotonically decreasing with α in this case the stand alone option is always optimal. That completes the proof of part (ii). \square

Proof of Corollary 2: From Proposition 1 it follows that $m_C = m_A = 1$ for $F \geq F^C$. This result then follows immediately from substituting this in the expected net surplus functions for the different organizational structures. \square

Proof of Lemma 4: The first order condition of division A's optimization problem in the presence of a passive internal allocation mechanism in a conglomerate is given by equation (A.7):

$$(1 - \theta)(X + F) - (1 - \theta)R_A(\hat{\alpha}, \tilde{m}_C) - [\theta + (1 - \theta)\tilde{m}_C]\hat{\alpha} \frac{\partial R_A(\tilde{m}_C)}{\partial m} - (1 - \theta)pF - V'(\tilde{m}_C) = 0 \quad (\text{A.7})$$

After comparing (A.7) with equation (A.4) and substituting $\hat{\alpha} = \alpha \frac{\partial R_C(m) / \partial m}{\partial R_A(m) / \partial m}$ 49 it can be seen that the market discipline terms cancel. Lemma 4 then results from the fact that $R_C(\alpha, m) < R_A(\alpha, m) \forall m \in [0, 1]$. \square

Proof of Proposition 3: The proof of this Proposition follows from Lemma 2 and Proposition 1. First we show that internal discipline ($\beta > 0$) would improve division A's incentives in a conglomerate in the absence of a differential charge. In this case the total degree of market discipline that division A

would be subject to vis-a-vis the conglomerate funding rate equals $\alpha + \beta \frac{\alpha(1 - \hat{\alpha})}{\hat{\alpha}} > \alpha$ 50 (see footnote 15). From totally differentiating the first order condition of division A's optimization problem in the presence of internal discipline and the second order condition it can be seen that

$\tilde{m}_C(F)|_{\alpha + \frac{\beta\alpha(1 - \hat{\alpha})}{\hat{\alpha}}} > \tilde{m}_C(F)|_{\alpha}$ 51 $\forall F \geq 0$ and that $\frac{\partial \tilde{m}_C}{\partial F}|_{\alpha + \frac{\beta\alpha(1 - \hat{\alpha})}{\hat{\alpha}}} > \frac{\partial \tilde{m}_C}{\partial F}|_{\alpha} > 0$ 52. The (negative) slope of $m_C(F) - m_A(F)$ therefore becomes less steep and \underline{F} increases, the more so if β grows larger, i.e.

$$\frac{\partial \underline{F}}{\partial \beta} > 0$$

53. Following a similar argument it can be shown that internal discipline would improve

division A's incentives in a conglomerate in the presence of a differential charge and $\frac{\partial \underline{F}}{\partial \beta} > 0$ 54. Note that the presence of internal discipline ($\beta > 0$) improves division A's incentives irrespective of whether differential interest rates are charged to the divisions A and B or not. From comparing the cutoff levels \underline{F} of \underline{F} in the absence of an internal allocation mechanism (see Proposition 1) and in the presence of an internal allocation mechanism with $\beta > 0$ finally it can be shown that an internal allocation mechanism of cost of capital results in a higher \underline{F} if β is sufficiently high. \square

Proof of Corollary 3: With $\beta = 1$ the total degree of (market) discipline that division A is subject to equals 1. The result then follows readily from Lemma 2. \square

Proof of Proposition 4: Division B's optimization problem if it operates stand alone is given by:

$$\text{Max}_p [Y(p) - R_B(\alpha_B, p)]$$

$$\text{s.t. } R_B = \frac{1}{p} \tag{A.8}$$

The first best risk choice p^* , which occurs with complete selffinancing, satisfies $Y(p^*) + p^* Y'(p^*) = 0$ and the second order condition $2Y'(p^*) + p^* Y''(p^*) < 0$. With outside financing division B's optimal risk choice p_B if it operates as a stand-alone firm satisfies:

$$Y(p) + pY'(p) - (1 - \alpha_B)R_B = 0 \tag{A.9}$$

and the second order condition $2Y'(\tilde{p}_B) + \tilde{p}_B Y''(\tilde{p}_B) < 0$ 57, with $p_B < p^*$. Define p_C as division B's risk choice in case of conglomeration and let m_C be division A's optimal monitoring choice in case of conglomeration (as before). The first order condition of division B's optimization problem in case of conglomeration is given by (A.10):

$$Y(p) + pY'(p) - R_C(\alpha_B, \tilde{m}_C, p) - p \frac{\partial R_C(\alpha_B, \tilde{m}_C, p)}{\partial p} = 0 \tag{A.10}$$

$$2Y'(\tilde{p}_C) + \tilde{p}_C Y''(\tilde{p}_C) < - \frac{2\alpha_B(1-\tilde{\mu}_C)\tilde{\mu}_C}{[\tilde{\mu}_C + (1-\tilde{\mu}_C)\tilde{p}_C]^3} \equiv Y_1$$

The second order condition is

59. Note that p_B

and p_C are both monotonically increasing in α . Given division A's equilibrium strategy p_C division B

$$\alpha_B = \underline{\alpha}_B \equiv \frac{\tilde{\mu}_C(1-\tilde{p}_B)[\tilde{\mu}_C + (1-\tilde{\mu}_C)\tilde{p}_B]}{[\tilde{\mu}_C + (1-\tilde{\mu}_C)\tilde{p}_B]^2 - (1-\tilde{\mu}_C)\tilde{p}_B^2} \quad 60.$$

chooses $p_C = p_B$ in a conglomerate if and only if

Define Y_1 as $2Y'(p_i) + p_i Y''(p_i)$ for $i \in \{B, C\}$ and let M_C be equal to $p_C + (1-p_C)p_C$. Furthermore let $Y_C < Y_2$

$$Y_1 + \frac{\tilde{p}_B \tilde{p}_C (1-\tilde{\mu}_C) Y_B}{M_C^2} < Y_1$$

where Y_2 equals

61. Then it can easily be seen that $p_C < p_B$ if $\alpha_B > \underline{\alpha}_B$ and $p_C \geq p_B$ if and only if $\alpha_B \leq \underline{\alpha}_B$. Since $p_C = p_B$ increases monotonically with α furthermore it can be seen that

$\underline{\alpha}_B \in (0, 1)$ if $p_C(0) > p_B(0)$ and $p_C(1) < p_B(1)$. That completes the proof. \square

Proof of Proposition 5: The first order condition of division A's optimization problem if it operates as a stand-alone firm in the presence of outside financing is given by:

$$(1-\theta)X + (1-\theta)F(m) + [\theta + (1-\theta)m]F'(m) - (1-\theta)(1-\alpha_A)R_A - V'(m) = 0 \quad (A.11)$$

In case of conglomeration the first order condition of division A's optimization problem is:

$$(1-\theta)X + (1-\theta)(1-\tilde{p}_C)F(m) + [1 - (1-\theta)(1-\tilde{p}_C)(1-m)]F'(m) - (1-\theta)R_C(\alpha_A, \tilde{p}_C, m) - [\theta + (1-\theta)m] \frac{\partial R_C(\alpha_A, \tilde{p}_C, m)}{\partial m} - V'(m) = 0 \quad (A.12)$$

Let V_A be equal to $V''(m_A) - 2(1-\theta)F'(m_A) - \alpha_A F''(m_A)$ and define V_C as $V''(m_C) - 2(1-\theta)(1-p_C)F'(m_C) -$

$$V_C > V_1 + \frac{(1-\tilde{p}_C)\tilde{\mu}_C\tilde{\mu}_A V_A}{M_C^2}$$

$M_C F''(m_C)$. Furthermore, let

64. Then it can easily be shown that given

division B's optimal strategy p_C in a conglomerate division A improves its monitoring intensity in case of conglomeration if and only if:

$$\alpha_A \leq \underline{\alpha}_A \equiv \frac{(1-\tilde{\mu}_A)\tilde{p}_C[\tilde{\mu}_A + (1-\tilde{\mu}_A)\tilde{p}_C] - \tilde{p}_C[F(\tilde{m}_A) - (1-\tilde{m}_A)F'(\tilde{m}_A)]\tilde{\mu}_A[\tilde{\mu}_A + (1-\tilde{\mu}_A)\tilde{p}_C]^2}{[\tilde{\mu}_A + (1-\tilde{\mu}_A)\tilde{p}_C]^2 - (1-\tilde{p}_C)\tilde{\mu}_A^2} \quad 65.$$

If $\alpha_A > \underline{\alpha}_A$ division A chooses higher risk in case of conglomeration. In case of conglomeration the equilibrium incentives in both divisions are determined simultaneously. Conglomeration then is the preferred organizational structure if the total expected net surplus in case of conglomeration is higher than in the stand alone option, i.e. if

$$\tilde{\mu}_C X + [\tilde{\mu}_C + (1 - \tilde{\mu}_C) \tilde{p}_C] F(\tilde{m}_C) + \tilde{p}_C Y(\tilde{p}_C) > \tilde{\mu}_A X + \tilde{\mu}_A F(\tilde{m}_A) + \tilde{p}_B Y(\tilde{p}_B) \quad (\text{A.13})$$

The following equilibria now can occur: (i) $m_C \geq m_A$ and $p_C \geq p_B$, i.e. the incentives in both divisions are improved with conglomeration. In this equilibrium $\alpha_A \leq \underline{\alpha}_A$ and $\alpha_B \leq \underline{\alpha}_B$ and conglomeration is the optimal organizational structure; (ii) $m_C \geq m_A$ and $p_C < p_B$, i.e. division B free-rides on division A. In this case $\alpha_A \leq \underline{\alpha}_A$ and $\alpha_B > \underline{\alpha}_B$ and conglomeration may or may not be optimal; (iii) $m_C < m_A$ and $p_C \geq p_B$, i.e. division A free-rides on division B and $\alpha_A > \underline{\alpha}_A$ and $\alpha_B \leq \underline{\alpha}_B$. Conglomeration then may or may not be optimal; (iv) $m_C < m_A$ and $p_C < p_B$, i.e. the incentives in both divisions are distorted in case of conglomeration and $\alpha_A > \underline{\alpha}_A$ and $\alpha_B > \underline{\alpha}_B$. In this equilibrium the free-riding by division B induces excessive risk taking in division A and vice versa. This is the equilibrium we focus on in Section V.2. Conglomeration then will only result in a higher expected net surplus if the benefits from co-insurance are sufficiently high, otherwise the stand alone option will be optimal. From expression (A.13) it can be seen that irrespective of division A's risk choice m_C in a conglomerate, conglomeration becomes less attractive if $p_C < p_B$. Conglomeration then only is still optimal if the distortions in division A's risk choices are not too high. This is the case if α_A is not too high. That completes the proof. The following numerical example illustrates all possible equilibria. Assume that $X=2.75$, $\theta=0.50$, $V(m)=4m^2$, $F(m)=0.5m^{0.5}$ and $Y(p)=3(p-2)^2$. *Table A-1* and *Table A-2* summarize the results. Panel A of *Table A-1* represents the difference ($m_C - m_A$) in monitoring intensity in division A as a function of α_A and α_B . Panel B shows the difference ($p_C - p_B$) in risk choices as a function of α_A and α_B . *Table A-2* finally incorporates the difference in total expected net surplus between the conglomerate and the stand alone option. \square

Panel A: Differences in Incentives in Division A ($m_C - m_A$) as a Function of α_A and α_B											
α_B α_A	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.0	0.0429	0.0430	0.0432	0.0433	0.0434	0.0436	0.0437	0.0438	0.0442	0.0443	0.0444
0.1	0.0340	0.0341	0.0343	0.0344	0.0345	0.0346	0.0347	0.0349	0.0351	0.0352	0.0353
0.2	0.0251	0.0252	0.0253	0.0254	0.0255	0.0256	0.0257	0.0258	0.0260	0.0261	0.0262
0.3	0.0163	0.0164	0.0165	0.0165	0.0166	0.0167	0.0168	0.0169	0.0170	0.0171	0.0171
0.4	0.0076	0.0077	0.0077	0.0078	0.0078	0.0079	0.0080	0.0080	0.0081	0.0081	0.0082
0.5	-0.0010	-0.0009	-0.0009	-0.0008	-0.0008	-0.0007	-0.0007	-0.0006	-0.0007	-0.0006	-0.0006
0.6	-0.0094	-0.0094	-0.0093	-0.0093	-0.0093	-0.0093	-0.0092	-0.0092	-0.0093	-0.0093	-0.0092
0.7	-0.0177	-0.0177	-0.0177	-0.0177	-0.0177	-0.0177	-0.0177	-0.0176	-0.0178	-0.0178	-0.0178
0.8	-0.0259	-0.0259	-0.0259	-0.0259	-0.0259	-0.0260	-0.0260	-0.0260	-0.0262	-0.0262	-0.0262
0.9	-0.0340	-0.0340	-0.0340	-0.0341	-0.0341	-0.0342	-0.0342	-0.0342	-0.0345	-0.0345	-0.0345
1.0	-0.0418	-0.0419	-0.0419	-0.0420	-0.0421	-0.0421	-0.0422	-0.0422	-0.0425	-0.0426	-0.0426
Panel B: Differences in Incentives in Division B ($p_C - p_B$) as a Function of α_A and α_B											
α_B α_A	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.0	0.0488	0.0348	0.0215	0.0088	-0.0033	-0.0149	-0.0260	-0.0367	-0.0470	-0.0570	-0.0668
0.1	0.0489	0.0348	0.0215	0.0088	-0.0033	-0.0149	-0.0260	-0.0367	-0.0470	-0.0571	-0.0668
0.2	0.0489	0.0349	0.0215	0.0088	-0.0033	-0.0149	-0.0260	-0.0367	-0.0471	-0.0571	-0.0668
0.3	0.0490	0.0349	0.0216	0.0089	-0.0033	-0.0149	-0.0260	-0.0367	-0.0471	-0.0571	-0.0669
0.4	0.0490	0.0350	0.0216	0.0089	-0.0033	-0.0149	-0.0260	-0.0368	-0.0471	-0.0572	-0.0669
0.5	0.0491	0.0350	0.0216	0.0089	-0.0033	-0.0149	-0.0261	-0.0368	-0.0472	-0.0572	-0.0670
0.6	0.0491	0.0350	0.0216	0.0089	-0.0033	-0.0149	-0.0261	-0.0368	-0.0472	-0.0573	-0.0670
0.7	0.0492	0.0351	0.0217	0.0089	-0.0032	-0.0149	-0.0261	-0.0368	-0.0472	-0.0573	-0.0671
0.8	0.0492	0.0351	0.0217	0.0089	-0.0032	-0.0149	-0.0261	-0.0368	-0.0472	-0.0573	-0.0671
0.9	0.0493	0.0352	0.0217	0.0090	-0.0032	-0.0149	-0.0261	-0.0369	-0.0473	-0.0573	-0.0671
1.0	0.0493	0.0352	0.0218	0.0090	-0.0032	-0.0149	-0.0261	-0.0369	-0.0473	-0.0574	-0.0672

Table A-1: Differences in Incentives in Divisions A and B between the Conglomerate and the Stand-Alone Option

α_B α_A	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.0	0.2038	0.1777	0.1564	0.1394	0.1262	0.1163	0.1094	0.1050	0.1034	0.1035	0.1055
0.1	0.1875	0.1614	0.1400	0.1230	0.1098	0.0998	0.0928	0.0884	0.0866	0.0867	0.0887
0.2	0.1713	0.1451	0.1237	0.1066	0.0933	0.0834	0.0763	0.0719	0.0699	0.0699	0.0719
0.3	0.1552	0.1289	0.1075	0.0904	0.0771	0.0670	0.0599	0.0555	0.0533	0.0533	0.0553
0.4	0.1394	0.1131	0.0916	0.0745	0.0611	0.0510	0.0439	0.0394	0.0371	0.0370	0.0389
0.5	0.1240	0.0976	0.0761	0.0589	0.0454	0.0353	0.0281	0.0236	0.0212	0.0211	0.0229
0.6	0.1088	0.0824	0.0608	0.0436	0.0301	0.0199	0.0127	0.0081	0.0055	0.0054	0.0072
0.7	0.0939	0.0674	0.0458	0.0285	0.0150	0.0047	-0.0025	-0.0072	-0.0098	-0.0100	-0.0082
0.8	0.0792	0.0527	0.0310	0.0137	0.0001	-0.0102	-0.0175	-0.0223	-0.0249	-0.0252	-0.0234
0.9	0.0648	0.0382	0.0164	-0.0010	-0.0146	-0.0249	-0.0323	-0.0371	-0.0399	-0.0401	-0.0384
1.0	0.0507	0.0241	0.0023	-0.0152	-0.0289	-0.0392	-0.0467	-0.0515	-0.0543	-0.0546	-0.0530

Table A-2: Difference in Total Expected Net Surplus between the Conglomerate and the Stand-Alone Option