On the Efficiency Gains from Financial Conglomeration

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Abstract

This paper studies the effects of financial conglomeration driven by cost-efficiency gains in monitoring credit and insurance customers. The analysis shows that conglomeration is conducive to intensified competition in the credit market and increases the profit on insurance. The aggregate profit in the financial sector might not increase, because there are circumstances where the conglomerates pass the cost-efficiency gains on to the borrowers in full. Increased competition in banking also reduces the aggregate risk in the financial markets, indicating that capital requirements in banking should be lower in the presence of financial conglomerates.

JEL classification: G21, G22, G38, L40
Keywords: Financial conglomerates, banking, insurance, capital regulation.

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1 Introduction

Many countries have been reforming their financial systems over the past few decades. The reforms have involved a removal of limitations on the activities of financial institutes, which has led to the emergence of the so-called financial conglomerates combining several financial services in one organization. Advocates of financial conglomeration have claimed that the new organizational arrangements will generate significant benefits on both sides of the markets. Included among these are cost-efficiency gains and higher profitability resulting from the economies of scale and scope; increased market efficiency which makes the market less vulnerable to costly failures; and greater convenience on the customer side of the market in the form of "one-stop shopping" benefits and information advantages generated in long-term business relationships.

One incentive for the banks to expand their product lines is the ability to serve new customers and sell additional products to the existing ones. For instance, an institute combining several services under one roof can improve its cost-efficiency by using the same distribution channels and customer databases. Provided that these cost-efficiency gains will be, at least partially, passed on to the customers, financial conglomeration may well improve the efficiency of the financial markets. This is a straightforward presumption the regulators have used to justify the removal of restrictions concerning the scope of activities of the financial institutes. The question, whether financial conglomeration leads to more efficient markets, however, depends essentially on the market environment which provides the incentives for prudential and competitive behavior.

There are few papers analyzing the efficiency implications of financial conglomeration. Mälkönen (2004) and Morrison (2003) entail a general discussion on the risks and regulatory aspects associated with financial conglomerates. Boot and Schmeits (2000) examine the incentive problems associated with financial conglomeration. Their analysis shows that conglomeration might mitigate risk-taking of banks, especially when the market discipline is ineffective. The analysis, however, also points out that conglomeration weakens market discipline and might induce free-riding between the divisions within a conglomerate. Freixas et al (2005) show that for a given risk portfolio financial conglomerates are less likely to become insolvent than stand alone institutes. With endogenous risk portfolios, the risk of failure depends essentially on the organizational form of the conglomerate and on the market discipline in the markets where the branches operate. One of their main argument is that financial conglomeration might increase the efficiency in banking, because decentralized financial conglomerates can engage in regulatory arbitrage by shifting risky assets from banking to a division with higher market discipline and lower capital requirements. This mitigates the distortions in the banks' investments generated by deposit insurance and increases the availability of finance as lower capital requirements reduce the cost the banks incur in their operations.

Unlike Freixas et al (2005) and Boot and Schmeits (2000) this paper considers the competitive implications of allowing more financial activities to occur in a financial institute and examines the circumstances where it will improve the market efficiency in terms of pricing and the management of risks. To this end, we develop a model of a financial conglomerate providing banking and insurance services. The model combines features from the literature on industrial organization and financial intermediation. Specifically, we consider markets for financial contracts in the presence of moral hazard. In modeling the financial contracting, we assume the institutes have an access to an interim monitoring technology which can be used to observe hidden action. Following Almazan (2002) we consider financial institutes specialized in monitoring different clients as the monitoring costs are determined by the specific types of the clients. The difference in costs thus determines the conditions under which the banks can feasibly act as delegated monitors to investors (Diamond 1984) and whether the degree of competition on the markets affects the allocation of risk within the economy.

In modeling financial conglomeration, the key assumption is that financial conglomerates have an informational advantage in monitoring clients who have an established credit relationship with the institute. This gives the institute a certain degree of local monopoly power over these clients when they shop for an insurance contract to secure their future income. The immediate consequence of this effect is that the credit market becomes more competitive, because the financial institutes engage in intensified competition for long-term business relationships. Increased competition imposes downward pressure on interest rates in banking and, in equilibrium, the conglomerates pass the cost-efficiency gains realized in insurance on to the banking customers, indicating that financial conglomeration may not increase the aggregate profit in the financial industry.

The model might be useful in understanding the anecdotal evidence that financial conglomerates are experiencing difficulties achieving the expected benefits of combining financial services. For instance, five big international banks - J.P Morgan Chase, Citigroup, Credit Suisse, Deutche Bank, and UBS - have been primarily unsuccessful in pursuing to capitalize on the synergies.[1] Laeven and Levine (2005) support these claims providing empirical evidence that financial institutes combining banking and non-lending activities suffer from a diversification discount in that these institutes have a lower market value than if they were broken into stand alone financial intermediaries. Although they find it difficult to establish a causal factor explaining the results, they suggest that there are intensified agency problems inherent to financial conglomerates. The results reported in this study provide an additional reason for the diversification discount by showing that although the institutes expect significant gains associated with conglomeration, the attempts to capitalize on the clients' downstream business lead to a market outcome where the anticipated revenues will not be realized ex-post.

From a welfare point of view, the model illustrates that conglomeration enhances the efficiency in the financial markets both in terms of pricing the services and risk management. First, in equilibrium the financial conglomerates pass the cost-efficiency gains in insurance on to the banking customers in full. Second, financial conglomeration reduces the share of riskier loans in the market, because the institutes' have increased incentives to monitor the borrowers as it gives them a competitive advantage in the insurance market. Finally, increased market efficiency makes the capital adequacy regulation in banking more effective in the case of financial conglomerates than stand-alone institutes. This, however, requires that the organizational structure of the conglomerates is such that the regulator can require the insurance branch of the institute to finance the banking branch in financial distress.

The remainder of the paper is organized as follows. The next section describes the economic environment in banking and insurance business. The third and the fourth sections examine the insurance and credit market equilibria when the product lines of the institutes are limited to include only one service. Section five repeats these exercises in the presence financial conglomerates and compares the results. Section six concludes.

2 The model

We consider an economy consisting of agents who live for three periods and financial institutes providing credit and insurance services. At the beginning of period one, the agents are endowed with a technology which combined with capital yields a stochastic income that will be realized at the end of the first and the second period. The banks are the only source of finance. With the

[1] Empirical studies examining the cost-efficiency gains and one-stop shopping benefits also report mixed results about the profitability of financial conglomeration (e.g. Berger 2000 and Berger et al 1999).

help of bank credit, the borrowers can start a project and repay the debt at the end of the first period. Agents whose projects fail, leave the economy after the first period. Projects, which survive through the first period, will be terminated after the realization of the stochastic second period payoff. These agents move then to a third period labeled as a 'retirement' period, during which the agents consume their accumulated wealth. This implies that after the bank loan has been repaid, a borrower with a successful project has an incentive to purchase an insurance policy to secure the second period income. The insurance contracting thus takes place at the beginning of the second period.[2] The sequence of actions is illustrated in Figure 1.

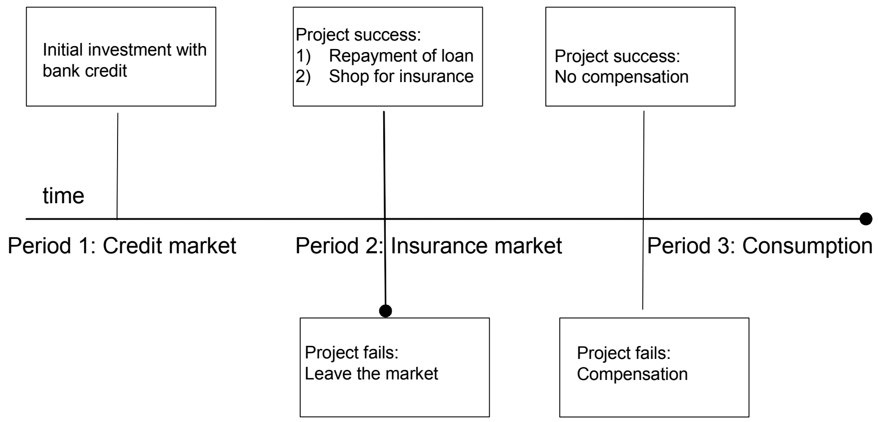

Figure 1: Timing of the model

Since the focus of the analysis is on the behavior of the financial institutes, we consider equilibria where the subsequent decisions of the borrowers and insurance customers are conditional on the outcome of the projects in earlier stages. This means that when signing a contract with a bank, the borrowers do not consider the implications of the loan contract in the insurance market. Other assumptions concerning the agents and the contracting environment are as follows.

2.1 Assumptions: Banking

Assets: Banks offer standard debt contracts to borrowers. The amount of capital required to start a project is normalized to unity and the borrowers' debt service obligation to bank i is denoted by r^i. There is a perfectly elastic supply of funds at deposit rate set to unity. The banks use deposits to finance the borrowers' projects. The projects yield a payoff ρ_r when successful. In the case of failure, the payoff is zero. The borrowers are protected by limited liability: the banks receive repayments only from borrowers with successful projects. In the case of failure the bank receives nothing.

Risks: The actual risk profiles of the projects are assumed identical in the first and second period. The outcome of a project depends on two stochastic components, which reflect the effort put into the project management and the overall conditions in the economy (the state of the world). Letting $\bar{\alpha}$ and $\underline{\alpha}$ denote the effort undertaken by the borrowers, we assume that with an effort $\bar{\alpha}$ the projects succeed idiosyncratically with probability $\pi(\bar{\alpha}) < 1$ in *any given state of the world.* The success probability of a project with a low effort, $\underline{\alpha}$, is lower. Specifically, with probability ω

[2] We could consider an alternative sequence of actions, where the agents could sign both insurance and loan contracts at the beginning of period one. This feature could give a raise to a moral hazard in teams problem, for both branches of the conglomerate would have diminished incentives to engage in monitoring. For information on moral hazard in teams, see Holmström (1982). Boot and Schmeits (2000) examine the problem in the case financial conglomerates.

the economy will be in a high-income state of the world, in which the low effort projects survive idiosyncratically with probability $\pi(\underline{\alpha}) \leq \pi(\bar{\alpha})$. A low-income state of the occurs with probability $(1-\omega)$. Under these circumstances, *all projects* with effort level $\underline{\alpha}$ succeed with zero probability. In what follows $\bar{\pi} = \pi(\bar{\alpha})$ and $\underline{\pi} = \pi(\underline{\alpha})\omega$ will be used as shorthand for the actual success probabilities of an individual project when an agent chooses an effort level $\bar{\alpha}$ and $\underline{\alpha}$, respectively.[3]

Risk preferences: To combine risk-averse agents and imperfectly competitive financial markets in a meaningful and tractable manner, we employ Yaari's (1987) dual theory of choice under risk. Essentially, the dual theory is a transformation in probabilities where bad outcomes are given a higher weight. This transformation satisfies the axiomatic properties of the expected utility theory, and therefore, it is a plausible approach to characterize risk aversion in a 'non-expected utility' framework. The advantage of using the dual theory of risk is that it assumes agents' utility linear in wealth, but concave in success probabilities (Yaari 1987).[4] We apply the general dual theory in our model by introducing *perceived probability measures* denoted by $\phi(\pi)$. This function satisfies $\phi(0) = 0$ and $\phi(1) = 1$; and $1 \geq \phi'(\pi) > 0$ for $\pi \in [\underline{\pi}, \bar{\pi}]$ and $\phi''(\pi) > 0$. The convexity characterizes risk aversion in that bad outcomes receive a higher weight: $1 - \phi(\bar{\pi}) > 1 - \bar{\pi}$ and $1 - \phi(\underline{\pi}) > 1 - \underline{\pi}$.[5] We should emphasize that the perceived risk measures do not constitute a distortion in the agents' observations about the actual probabilities, for they do not illustrate how the actual probabilities are processed into the perceived probabilities. The perceived probability measures instead reflect how the agents process the risks into their financial decisions.

In terms of actual success probabilities, $\bar{\pi}$ and $\underline{\pi}$, both the low and the high effort projects are economically viable. The borrowers and the depositors, however, perceive only high effort projects as viable. These assumptions can be formalized in the following manner

$$\underline{\pi}\rho_r > 1 \quad \textit{and} \quad \phi(\bar{\pi})\rho_r > 1 > \phi(\underline{\pi})\rho_r. \tag{1}$$

These properties imply that only risk neutral banks' have an incentive to finance the borrowers' projects, because risk aversion implies that the other agents invest directly into the projects only if they are ensured that that the project will be managed diligently.

Moral hazard: The role of the banks as financial intermediaries is due to their role as delegated monitors (Diamond 1984) and the property that they condition the financial decisions to the actual success probabilities of the projects. It is common knowledge that monitoring is required to reduce moral hazard which emerges as the borrowers enjoy a private benefit $B > 0$ from shirking (choosing $\underline{\alpha}$ rather than $\bar{\alpha}$).[6] The private benefit combined with a limited liability implies that for any given interest rate $r > 1$, the lender cannot induce effort $\bar{\alpha}$, unless he observes the borrowers'

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[3] The specification of risks can be interpreted as follows. Careful project management ($\bar{\alpha}$) means that the borrower takes necessary actions to make the project viable under adverse circumstances in the economy. The idiosyncratic risk component reflects the fact that each project may fail for reasons unrelated to management.

[4] The dual approach has become a useful tool in insurance economics (e.g. Doherty and Eeckhoudt 1995), because the traditional expected-utility approach does not fully explain some risk attitudes (see Rabin 2000 and Rabin and Thaler 2001).

[5] The property $1 \geq \phi'(\bar{\pi})$ is not affect the results of this study, but simplifies their derivation. For a similar approach, see De Donder and Hindricks (2003).

[6] The private benefit can be interpreted as shirking or, alternatively, as an opportunity cost from careful project management. This benefit cannot be transferred between individuals or stored to finance the consumption in the retirement period. See, for instance, Holmström and Tirole (1997).

hidden action.[7] The moral hazard problem can thus be formalized as

$$\phi(\underline{\pi})(\rho_r - r) + B \geq \phi(\bar{\pi})(\rho_r - r). \tag{2}$$

The assumptions (1) and (2) indicate that since the depositors do not have the access to the monitoring technology and they are risk averse, the borrowers have to rely on bank finance as the private investors will not invest in their project with a perceived risk profile $\phi(\underline{\pi})$.

Monitoring: We employ an information based model of an imperfectly competitive banking system, which builds on Diamond's (1984) model of delegated monitoring and Salop's (1979) model of spatial competition. The model considers banks that offer loan contracts to each client separately and then engage in monitoring of the clients. The banks are specialized in a sense that their monitoring costs depend on the type of the potential clients. Specifically, there is a continuum of borrowers and $N > 3$ banks uniformly distributed in a circle with a N - unit circumference. The distance between adjacent banks is thus normalized to unity. The monitoring technology is the following. Consider a borrower located between adjacent banks located at y_i and y_j. Furthermore, let x_i and $x_j = 1 - x_i$ denote the distance between the bank i and bank j and the borrower, respectively. The bank i incurs a monitoring cost equal to $x_i t^B$, where t^B denotes the cost parameter which is identical to all banks and $t^B x_i$ denotes the cost difference between the applicant's project and the one that the bank is fully specialized in monitoring (i.e. $x_i = 0$).[8] Reflecting the success probabilities of the projects, a contract is referred to as high risk and low risk contract when $\alpha = \underline{\alpha}$ and $\alpha = \bar{\alpha}$, respectively. A feasible low risk contract requires monitoring to mitigate moral hazard and by (2) it has to be provided at a sufficiently low rate. If these conditions are met (see Lemma 1 below), bank monitoring improves market efficiency.

The assumption that some banks have an advantage in monitoring certain clients captures the feature that both geographical and informational specialization are important aspects in small business lending. For instance, Nakamura (1994) suggests that small banks have an organizational structure which contributes to better ability to solve the informational asymmetries inherent in lending. Further, DeYoung et al (2004) argue that small banks survive the competition in the markets, because they have an advantage in the form of 'soft information' about their clients. Degryse and Ongena (2005) show that price discrimination in credit markets depends on geographical distance and on the associated travel costs of the lenders.

Capital regulation: A bank supervisor requires a bank to hold k units of capital per unit of deposits used for lending. We assume that the deposits are fully insured by the supervisor. The cost of holding excess capital is $\rho_r > \rho_k > 1$, illustrating the property that capital involves an opportunity cost for the bankers. We consider first fixed capital requirements, where k is identical to all loan contracts. In Section 3 we discuss the circumstances where risk-based capital regulation should be used instead.

[7] In this sense, we follow Holmström and Tirole (1997) and assume that the monitor can prevent the borrower from undertaking action $\underline{\alpha}$.

[8] Our approach in modeling the specialization in financial markets resembles e.g. Almazan (2002); Hauswald and Marquez (2002); and Kaas (2003). The monitoring technology can be interpreted in terms of geography in that the banks can establish relationships with clients at different locations and for this they incur a cost. A technological interpretation can be understood as a cost the financial analysts of the banks incur when specializing in particular industries.

2.2 Assumptions: Insurance

Insurance policies: At the beginning of period two, the market consists of borrowers whose project did not fail in the first period. These borrowers have repaid their debt and the project requires no additional capital, but since the future payoffs of the project are stochastic, the agents have an incentive to invest in an insurance policy to secure their third period consumption. To save on notation, we assume the actions and the risk profiles identical to those in the first period. Using the perceived probability measures this implies that uninsured agents have the following stochastic utility in the second period:

$$EU_2^N(\rho_r, \alpha) = \begin{cases} \phi(\bar{\pi})I_h + [1-\phi(\bar{\pi})]I_l & for \quad \alpha = \bar{\alpha} \\ \phi(\underline{\pi})I_h + [1-\phi(\underline{\pi})]I_l + B & for \quad \alpha = \underline{\alpha}, \end{cases} \tag{3}$$

where $I_h = 2\rho_r - r$ and $I_l = \rho_r - r$ denote the income the agents expect to have at the end of the period. This consists of the expected yield of the ongoing project in the second period and the net payoff from the first period invested in deposits with interest 1.

A full insurance policy from insurer j gives a policy-holder x_j the following utility

$$U_2^I(x_j, \alpha, p^j) = \begin{cases} I_h - p^j & for \quad \alpha = \bar{\alpha} \\ I_h - p^j + B & for \quad \alpha = \underline{\alpha}, \end{cases} \tag{4}$$

where p^j is the premium charged by insurer j. Using (3) we can derive the reservation premiums, for which the agents are just indifferent between purchasing the policy and remaining uninsured: $p_{\max}(\bar{\alpha}) = [1-\phi(\bar{\pi})]\rho_r$ and $p_{\max}(\underline{\alpha}) = [1-\phi(\bar{\pi})]\rho_r + B$.

Insurance contracts and monitoring: The insurer raises capital in the form of premiums collected from policy-holders and invests the capital in safe financial assets, which will be liquated at the end of the period to meet the policy holders' claims. In the same manner as banks, the insurer can monitor the policy holders to mitigate moral hazard. The monitoring technology is similar to the one in banking. That is, an insurer located at 0 incurs a monitoring cost equal to $t^I x$ ($t^I < t^B$) monitoring client x.

Cost advantage of financial conglomerates: Institutes combining insurance and banking have an absolute cost advantage in terms of monitoring existing clients. Specifically, a financial conglomerate incurs no cost of monitoring an insurance client who has already been monitored by the banking branch of the institute. This captures the property that when a bank or insurance company establishes a relationship with a client, it incurs costs in gathering information about the client. An institute combining the services can reduce these costs by using a common information system and reusing gathered information.[9]

Having described the assumptions of the model we can determine the condition where monitoring in credit and insurance markets is both socially efficient and feasible from the viewpoint of the financial institutes. This requires that the parameter B is such that both banks and insurers can feasibly provide incentive compatible services to their clients:

Lemma 1 *Monitoring is feasible and efficient in both insurance and credit markets if* $B \in \mathbf{I} \cap \mathbf{C}$, *where the set* $\mathbf{I} \cap \mathbf{C}$ *is non-empty.*

Proof. See the Appendix. ■

[9] For empirical evidence on the informational advantages, see Jappelli and Pagano (2002); Mester, Nakamura and Renault (2002) and Vander Vennet (2002).

Lemma 1 ensures the existence of the equilibrium in the relevant parameter range. In what follows we assume that Lemma 1 holds and move on to the analysis of the credit and insurance markets under different assumptions about the services the institutes can offer to their clients. At first, we examine the market outcomes when the institutes' scope of activities are limited to one service. Second, we examine the behavior of institutes combining the services. Finally, we compare the market outcomes and draw conclusions on the efficiency and regulatory implications of financial conglomeration.

3 Stand alone benchmark in insurance

This section characterizes the equilibria in a stand-alone insurance market, where the sequence of actions is the following. At first, the insurers set premiums separately in each location in the circle. After receiving the premium, the insurers invest the premiums in safe financial assets and decides whether to monitor the policy holder. Finally, the policy holders realize the final outcome of their project and the insurers pay to the policy holders entitled to compensation. A standard feature in the spatial models of imperfect competition is that the equilibrium can be fully characterized by investigating the competition between two adjacent producers. In the present model, this feature can be used to solve for the equilibrium in locations where monitoring is feasible. This means that the insurers' market power is limited to incentive compatible contracts in that low risk policies must be offered at a sufficiently low rate to compensate the private benefit B associated with a high risk policy.

The trade-off between monitoring cost and the reduction in expected costs in terms of compensations to policy holders determines whether the insurers have an incentive monitor the client after receiving the premium. Formally, the insurer i will monitor a client located at x_i if $C_i^I(\bar{\pi}, x_i) \leq C_i^I(\underline{\pi})$, where $C_i^I(\bar{\pi}, x_i) = (1-\bar{\pi})\rho_r + t^I x_i$ is the expected cost the insurer i incurs for managing a low risk contract of a customer located at x_i. The parameter $C_i^I(\underline{\pi}) = (1-\underline{\pi})\rho_r$ denotes the expected cost the insurer i incurs managing a high risk contract. These expressions imply that an individually rational contract for a profit maximizing insurer is such that the premium p^i the insurer i quotes to a customer located at x_i satisfies

$$\begin{array}{lll} \mathbf{a}) & p^i \geq C_i^I(\bar{\pi}, x_i) & if \quad C_i^I(\bar{\pi}, x_i) \leq C_i^I(\underline{\pi}), \\ \mathbf{b}) & p^i \geq C_i^I(\underline{\pi}) & if \quad C_i^I(\bar{\pi}, x_i) > C_i^I(\underline{\pi}). \end{array} \tag{5}$$

The constraint simply states that the lowest feasible premium is such that the insurer breaks even. When the expected cost of providing a low risk contract is lower than the cost of a high risk one, the break-even rate coincides with $C_i^I(\bar{\pi}, x_i)$. Otherwise, the premium must satisfy $p^i \geq C_i^I(\underline{\pi})$. Since the function $C_i^I(\underline{\pi})$ is identical to each insurer, we can use a standard Bertrand argument to argue that wherever a market for high risk contracts exists, a competitive bidding process drives the premiums down to this break-even rate $\underline{p} = C_i^I(\underline{\pi})$.

Taking the rate $\underline{p}$ as given, we can derive the incentive compatible premiums for low risk policies in the following manner. The customers form their assessments of the insurers' monitoring behavior on the basis of their location. The customer located at x_i observes that the insurer i will monitor the policy holder with probability 1 if $C_i^I(\bar{\pi}, x_i) \leq C_i^I(\underline{\pi})$. It is thus optimal for the customer at x_i to accept insurer i's offer, if the premium is low enough so that

$$U_2^I(x_i, \bar{\alpha}, p^i) \geq U_2^I(x_i, \underline{\alpha}, \underline{p}). \tag{6}$$

Solving for p^i, gives a an upper bound for the acceptable premiums of low risk policies in each location: $\bar{p} = \underline{p} - B$. Using the constraints (5) and (6) we can derive the locations where there is a market for low risk policies. These locations are close enough to the insurers so that they can internalize the monitoring cost and sell low risk policies with an incentive compatible premiums $p^i \leq \bar{p}$:

Lemma 2 *Insurer i can feasibly offer low risk contracts to customers located at $x_i \leq \bar{x}_i^I$, where $\bar{x}_i^I : C_i^I(\bar{\pi}, \bar{x}_i^I) = \bar{p}$. For insurer i, the market for low risk policies thus exists in locations $\bar{\mathbf{X}}_i^I \equiv [0, \bar{x}_i^I]$, where $\bar{\mathbf{X}}_i^I$ is a non-empty set.*

Proof. See the Appendix. ■

Lemma 2 can be understood intuitively in the following way. The monitoring cost is increasing in distance between the policy holders and the insurers. Thus, the insurers can feasibly monitor in locations sufficiently close to theirs. In locations where the monitoring cost is higher than the cut-off rate $\bar{p}$, the agents rather accept a high-risk contract offered by an insurer, which cannot monitor the contract at a cost below the break even rate $\underline{p}$.

Using Lemma 2 we can formalize the insurer i's constrained maximization problem as follows

$$\begin{array}{ll} & \max V^I(x_i) = p^i - C_i^I(\pi, x_i) \\ s.t. & C_i^I(\bar{\pi}, x_i) \leq p^i \leq \bar{p} \quad for \quad x_i \in \bar{\mathbf{X}}_i^B \\ & C_i^I(\underline{\pi}) \leq p^i \qquad\qquad for \quad x_i \notin \bar{\mathbf{X}}_i^B \end{array}$$

The problem can be solved using the constraints and the resulting equilibrium is the following:

Proposition 1 *The equilibrium outcomes in stand-alone insurance markets between adjacent insurers i and j can be characterized as follows:*

(**i**) *When $\bar{x}_i^I \geq 1/2$, the contracts will be monitored in each location, i.e. $\bar{\mathbf{X}}_i^I \cap \bar{\mathbf{X}}_j^I \equiv [1 - \bar{x}_i^I, \bar{x}_i^I]$. The equilibrium premiums of insurer i are such that*

$$p^i = \begin{cases} \bar{p} & for \quad x_i < 1 - \bar{x}_i^I \\ C_j^I(\bar{\pi}, 1 - x_i^I) & for \quad 1 - \bar{x}_i^I \leq x_i \leq 1/2. \end{cases}$$

(**ii**) *If $\bar{x}_i^I < 1/2$ then there is a segment of policy holders, who will not be subject to monitoring, i.e. $\bar{\mathbf{X}}_i^I \cap \bar{\mathbf{X}}_j^I = \varnothing$. In these locations, the equilibrium premiums coincide with $\underline{p}$. In locations $x_i \in \bar{\mathbf{X}}_i^I$ and $x_j \in \bar{\mathbf{X}}_j^I$ the policy holders will be charged a premium equal to $\bar{p}$.*

Proof. The proof follows the text. ■

This result resembles the outcome of a Bertrand bidding game, where the seller with the lowest costs can drive the rivals out of the market by cutting the prices just slightly below the one feasible for the others. This emerges as an equilibrium outcome in each location between adjacent insurers where the cost of monitoring is lower than the highest price for which the insurance customers are willing to accept a low risk policy. In these locations, the insurer located closer to the customer employs its cost advantage and prices the policy below the rival's lowest feasible premium. Since the outside option of the customer is increasing in the distance between the customer and the closest *rival institute*, the customers closest to the insurers tend to receive less competitive quotes. Hence, the policy holders' gains of trade are the lowest in locations closest to the insurers.

When $\bar{p}$ is sufficiently low so that neither of the adjacent insurers can internalize the monitoring cost in locations where monitoring is relatively costly, the market for low risk contracts collapses locally. The intuition for this result is simple: When the monitoring cost is high, there are insurance customers who cannot be feasibly monitored by any given insurer in the market, because these customers rather accept the high risk policy sold at a rate $\underline{p}$ than a low risk policy.[10] The pricing of the contracts implies that $U_2^I(x_i, \bar{\alpha}, \bar{p}) = U_2^I(x_i, \underline{\alpha}, \underline{p})$, which means that the gains from trade are the same for all policy holders, regardless of their location.

4 Stand alone banking

The sequence of actions in the credit market is the following. The borrowers enter the market without capital. The banks can price discriminate the borrowers on the basis of their locations setting the interest rates for each borrower separately. After signing a loan contract, the bank decides whether to monitor the borrower. At the end of the first period borrowers with a successful project repay their debt. The banks receive nothing from borrowers whose project failed.

The decision of the bank i to monitor a borrower is driven by the following constraints. Monitoring increases the probability of repayment. Given the interest rate r^i, the bank i will therefore monitor the borrower located at x_i if $C_i^B(k, x_i)/\bar{\pi} \leq C_i^B(k)/\underline{\pi}$, where $C_i^B(k, x_i) = k\rho_k + 1 + t^B x_i$ is the cost the bank i incurs for managing a low risk contract. Function $C_i^B(k) = k\rho_k + 1$ denotes the cost the bank incurs for having a high risk contract in its portfolio. Observe that the regulatory component, $k\rho_k$, is the cost the bank incurs for raising capital to meet the capital adequacy requirements. The second component in the cost function is the interest rate the banks must offer in the money market where they face a perfectly elastic supply of funds at a gross interest rate 1. The third component is specific to the contracts which involve monitoring, indicating that the cost of such contracts increasing in the distance between the bank and the borrower.

A feasible contract for the bank i involves an interest rate r^i which yields the bank a non-negative expected profit. Such rate depends on the distance between the bank and the borrower. Hence, the banks' strategy is subject to the following rationality constraint

$$\begin{array}{rll} r^i \geq \frac{1}{\bar{\pi}} C_i^B(k, x_i) & if & \frac{1}{\bar{\pi}} C_i^B(k, x_i) \leq \frac{1}{\underline{\pi}} C_i^B(k) \\ r^i \geq \frac{1}{\underline{\pi}} C_i^B(k) & if & \frac{1}{\bar{\pi}} C_i^B(k, x_i) > \frac{1}{\underline{\pi}} C_i^B(k). \end{array} \tag{7}$$

By similar lines of reasoning as in the case of the insurance markets we argue that, in equilibrium, the interest rates of high risk loans equal the break even rate $\underline{r} = C_i^B(k)/\underline{\pi}$.

Consider then the incentive constraints on the borrowers' side of the market. The borrowers form their assessments of monitoring effort of the banks on the basis of their locations. Specifically, a borrower x_i anticipates that she will be subject to monitoring by a bank i if $C_i^B(k, x_i)/\bar{\pi} \leq C_i^B(k)/\underline{\pi}$. Since monitoring reduces the borrower's payoff, an acceptable rate of a low risk loan must be low enough so that the borrower will be compensated for the loss of the private benefit. Otherwise, borrower x_i chooses a high risk loan with interest rate $\underline{r}$ from another bank located further away from the borrower. Plugging $\underline{r}$ into (2), we can infer that an incentive compatible rate of a low risk loan satisfies

$$\phi(\underline{\pi})(\rho_r - \underline{r}) + B \leq \phi(\bar{\pi})(\rho_r - r^i). \tag{8}$$

Solving for r^i, we obtain an upper bound for the interest rates of monitored loan contracts. That

[10] It is worth noting that the insurers located closer to these customers cannot compete with more distant ones, because the customers anticipate that they will be subject to monitoring if they are being offered a contract with premium $\bar{p} < p^i < \underline{p}$ by an insurer with $C_i^I(\underline{\pi}, x_i) < C_i^I(\underline{\pi})$. Accepting such contract would violate incentive constraint (6). From this it follows that the market for insurance contracts in these locations exists only for insurers who cannot feasibly monitor the policy holders.

is, the rate for which the borrowers are just indifferent between a high and a low risk contract:

$$\bar{r} \leq \frac{\phi(\underline{\pi})}{\phi(\bar{\pi})}\underline{r} + \frac{[\phi(\bar{\pi}) - \phi(\underline{\pi})]}{\phi(\bar{\pi})}\rho_r - \frac{B}{\phi(\bar{\pi})}.$$

Plugging $\underline{r}$ and $C_i^B(k, x_i)/\bar{\pi}$ into the above expression, we can derive the locations where banks can internalize the monitoring cost:

Lemma 3 *Bank i can feasibly offer loan contracts and monitor borrowers in locations $x_i \leq \bar{x}_i^B$, where $\bar{x}_i^B : C_i^B(k, \bar{x}_i^B)/\bar{\pi} = \bar{r}$. The market for low risk contracts thus exists in locations $\bar{\mathbf{X}}_i^B \equiv [0, \bar{x}_i^B]$, where $\bar{\mathbf{X}}_i^B$ is a non-empty set when $k = 0$.*

Proof. See the Appendix. ■

Lemma 3 indicates that the outcome in the market depends on the slope of the cost function and on the severity of the moral hazard problem illustrated by (2). If the slope of the monitoring costs is relatively steep in distance between the bank and the borrower, the banks are less likely to be able to internalize the monitoring costs, because the rate $\underline{r}$ is not sufficiently high to induce the borrowers accept the low risk offer. Therefore, the borrowers in locations $x_i > \bar{x}_i^B$ accept a high risk offer made by a more distant bank insofar as it is priced at the break even rate $\underline{r}$. Since we assume that the number of banks is $N > 3$, we can infer that in each location satisfying $x_i < \bar{x}_i^B < 1/2$ there are at least 2 banks willing to trade at a rate $\underline{r}$.

Using Lemma 3 we can define the bank i's problem as follows

$$\begin{array}{rll} & \max V^B(x_i) = r^i\bar{\pi} - C_i^B(k, x_i) & \\ s.t. & C_i^B(k, x_i)/\bar{\pi} \leq r^i \leq \bar{r} & for \quad x_i \in \bar{\mathbf{X}}_i^B \\ & C_i^B(k)/\underline{\pi} \leq r^i & for \quad x_i \notin \bar{\mathbf{X}}_i^B \end{array}$$

The bank solves this problem taking the rivals interest rates and constraints as given. The following proposition examines the resulting equilibrium:

Proposition 2 *The equilibrium outcomes in stand-alone credit markets between adjacent banks i and j can be characterized as follows:*

(**i**) *When $\bar{x}_i^B \geq 1/2$, the borrowers will be monitored in each location, i.e. $\bar{\mathbf{X}}_i^B \cap \bar{\mathbf{X}}_j^B \equiv [1 - \bar{x}_i^B, \bar{x}_i^B]$. The equilibrium interest rates are such that*

$$r^i = \begin{cases} \bar{r} & for \quad x_i \leq 1 - \bar{x}_i^B \\ C_j^B(k, 1 - x_i)/\bar{\pi} & for \quad 1 - \bar{x}_i^B \leq x_i \leq 1/2. \end{cases}$$

(**ii**) *If $\bar{x}_i^B < 1/2$ then there is a segment of borrowers, who will not be subject to monitoring, i.e. $\bar{\mathbf{X}}_i^B \cap \bar{\mathbf{X}}_j^B = \varnothing$. In these locations, the equilibrium interest rates coincide with $\underline{r}$. In locations $x_i \in \bar{\mathbf{X}}_i^B$ and $x_j \in \bar{\mathbf{X}}_j^B$, the borrowers will be charged $\bar{r} = C_i^B(k, \bar{x}_i^B)/\bar{\pi}$.*

(**iii**) *Absent capital regulation, stand-alone banks become insolvent in a low income state of the world if*

$$\bar{x}_i^B < \bar{x}_i^{B*} = \frac{\sqrt{1 + (2 - \frac{1}{\bar{\pi}})t^B/\bar{\pi}} - 1}{(2 - 1/\bar{\pi})t^B}$$

Proof. The proof of results (**i**) and (**ii**) follows the text. The proof of (**iii**) is the following. Consider the relevant market locations for bank i in the case of $N = 4$ banks. For bank i it is optimal to monitor borrowers in locations $x_i \leq \bar{x}_i^B$, because $C_i^B(k, x_i)/\bar{\pi} \leq \underline{r}$. Furthermore, the bank i wins the bidding for these clients, because $C_i^B(k, x_i)/\bar{\pi} \leq \bar{r}$. Symmetry thus implies that the number of low risk contracts in the portfolio of the bank i is $2\bar{x}_i^B$.

In the segment between locations $\bar{x}_i^B$ and $1 - \bar{x}_i^B$, neither of the adjacent banks i and j can feasibly offer loan contracts to the borrowers, who are being offered a high risk contract by $N - 2 > 1$ banks. From the borrowers' viewpoint, these loans are identical, thus, this market segment is split between $N-2$ banks with interest rate $\underline{r}$. Symmetry implies there are N locations where $C_i^B(k, \bar{x}_i^B)/\bar{\pi} \geq \bar{r}$ for all i, and in each of these locations there are $N-2$ banks splitting the market for high risk loans. Hence, the ratio of low and high risk contracts for bank i is $\frac{2\bar{x}_i^B}{1-2\bar{x}_i^B}$.

Consider then the market conditions where the banks are facing a risk of becoming insolvent. The bank i's profit in a low income state of the world where all borrowers with a high risk contract are unable to repay their debt, can be derived using Proposition 2 (**ii**). The bank i cannot repay its depositors if

$$V_i^B = 2\bar{\pi}\int_0^{\bar{x}_i^B}(t^B\bar{x}_i^B - t^B x_i)dx_i - 2(1-\bar{\pi})\int_0^{\bar{x}_i^B}(1 + t^B x_i)dx_i + \bar{x}_i^B k + (1 - 2\bar{x}_i^B)(k-1) < 0, \tag{9}$$

where the integrals denote profit the bank makes with low risk loans and $\bar{x}_i^B k + (1 - 2\bar{x}_i^B)k$ denotes the positive effect of capital adequacy requirements on banks solvency.

Obviously, capital requirements are sensible if $V_i^B < 0$ when $k = 0$. We thus assume $k = 0$ and integrating $V_i^B = 0$ to gives obtain a break even condition

$$(2\bar{\pi} - 1)t^B\bar{x}_i^{B2} - 1 + 2\bar{\pi}\bar{x}_i^B = 0.$$

Solving for $\bar{x}_i^B \geq 0$ determines the critical borrower who must receive a low risk contract so that the banks will not fail in any given state of the world:

$$\bar{x}_i^{B*} = \frac{\sqrt{1 + (2 - \frac{1}{\bar{\pi}})t^B/\bar{\pi}} - 1}{(2 - 1/\bar{\pi})t^B} > 0 \quad for \quad \bar{\pi} > 1/2$$

From this it follows that all banks become insolvent in a low income state of the world if $\bar{x}_i^B < \bar{x}_i^{B*}$.
■

Proposition 2 first derives a similar result as in Proposition 1. The first part of the result establishes that borrowers located further from the banks are more likely to receive loan offers with lower interest rates. This result resembles empirical evidence reported in Degryse and Ongena (2005), who show that the loan rates in banking are decreasing in the distance between the borrowers and the banks. The second part argues that this result, however, holds only in situations where the banks feasibly offer low risk loans to each borrower in the market. Specifically, this qualification shows that the allocation of high and low risk contracts depends on whether the banks can internalize the monitoring costs and provide loan contracts at an acceptable rate for the borrowers. When the cost of monitoring is high, the banks are less likely to accomplish this, for the borrowers located further from the banks rather accept high risk offers from banks which will not monitor these borrowers.[11]

The third result in Proposition 2 illustrates that the banks are facing a risk of insolvency due

[11] The prediction that projects closer to the bank's core business are more likely to be monitored is not implausible. For instance, Acharya et al (2004) report that lending expansion to new or competitive industries contributes to a higher level of risk in banks' loans.

to the perfect correlation of the outcomes of high risk contracts. This means that if the number of borrowers not subject to monitoring is sufficiently high, so that the profit made with low risk contracts is insufficient for covering the loan losses of the high risk contracts, the banks will not be able to repay the depositors in a low income state of the world. Capital regulation can be used to prevent the collapse of markets for low risk contracts. The effectiveness of regulation, however, depends on how the cost of capital requirements affects the pricing of the loans and how risk averse borrowers perceive the changes in interest rates affect their income. The following proposition illustrates these effects and the circumstances where capital regulation can be used to induce monitoring in banking.

Proposition 3 (**i**) *A fixed capital requirement increases monitoring in banking if the borrowers exhibit strong risk aversion in the region* $\pi \in [\underline{\pi}, \bar{\pi}]$ *and the success probabilities are relatively low. Formally, this requires* $\frac{\phi(\bar{\pi})}{\bar{\pi}} - \frac{\phi(\underline{\pi})}{\underline{\pi}} < 0$.

(**ii**) *Risk based capital requirement imposing a higher requirement on high risk loans, reduces the number of such loans in the market. The deadweight loss of the regulation is, however, not limited to high risk contracts, as it will increase the interest rates and the margins of all loans in the market.*

Proof. See the Appendix. ■

The intuition of this result is simple. Capital regulation is effective when a higher k increases the perceived cost of a high risk contract relative to that of low risk one. Proposition 3 argues first that with fixed capital requirements the regulator cannot accomplish this unless the borrowers exhibit strong risk aversion in a sense that the perceived success probability $\phi(\bar{\pi})$ is low relative to the actual probability $\bar{\pi}$. Since the case for fixed capital requirements seems rather weak, we also consider risk-based capital requirements. Risk-based capital requirements impose a higher cost for the banks providing loans for clients they will not monitor. This diminishes the competitive pressures on monitoring and helps the banks to internalize the costs, and consequently, mitigates the risk of bank insolvency. As a special case it can be shown that there is a capital requirement, which implements an equilibrium where the banks monitor each contract, so that the equilibrium outcome would be qualitatively the same as in Proposition 2 (**i**).

Capital regulation is obviously meaningful only in the circumstances illustrated in Proposition 2 (**ii**), where the rate of a low risk contract equals the critical rate $\bar{r}$. Since $\bar{r}$ is determined by the competitive rate of a high risk contract, $\underline{r}$, it follows that the increase in the interest rates of high risk contracts induced by higher k, are passed on to interest rates of low risk contracts in full. Thus, each borrower bears the deadweight loss of regulation, regardless of their location and the monitoring decisions of the banks.[12]

5 Financial conglomerates

In the present model, the key in understanding the effects of financial conglomeration on the efficiency of the financial markets boils down to the institutes' competitive behavior in both markets. In this section, we first examine whether the cost savings in insurance market affect the pricing of the insurance policies and interest rates. After solving for the equilibrium in both markets, we

[12] The presumption that the risk-based regulatory framework can be designed on the basis on the regulators' observations of the choices and the cost functions of the banks. It, however, coincides with the recent reforms of the Basel Capital Accord. In fact, the so-called second pillar of the New Capital Accord calls for a careful evaluation of the banks' risk management systems on behalf of the regulator.

compare the outcomes with the ones derived in the stand alone markets. Finally, we investigate the implications of financial conglomeration on the agents' welfare, the fragility of the financial markets and the effectiveness of capital adequacy regulation.

Before moving on to the analysis we should note that we do not analyze the underlying reasons for the emergence of financial conglomerates. Rather, we consider the market outcomes after conglomeration has taken place in the form of mergers or acquisitions. This means that the number of active financial institutes in each market is the same as in the stand-alone case. In the concluding section, we discuss business strategies which might explain financial conglomeration.

5.1 Equilibrium in the insurance market

We derive the equilibrium in the insurance market in the presence of financial conglomerates in a similar manner as in the case of stand alone insurers. Essentially, we are interested in how the cost efficiency gains in monitoring affect the incentive constraints (5) and (6), which determine the equilibrium outcomes in terms of pricing and monitoring in the market. Conglomeration affects the constraints on the supply side of the market, but does not affect the incentive constraint of the policy holders. Therefore, the policy holders' incentive constraint coincides with (6).

Consider a financial conglomerate that has a set of clients with an established relationship with the banking branch of the institute. To formalize the cost advantage associated with conglomeration, we define the set of borrowers that were monitored by the banking branch of conglomerate i as $\bar{\mathbf{X}}_i^{CB} \equiv [0, ..., \bar{x}_i^{CB}]$, where $\bar{x}_i^{CB} \leq 1/2$. Furthermore, let $\delta(x_i)$ denote a dummy variable taking values $\delta(x_i) = 0$ and $\delta(x_i) = 1$ for $x_i \in \bar{\mathbf{X}}_i^{CB}$ and $x_i \notin \bar{\mathbf{X}}_i^{CB}$, respectively. Plugging these variables into $C_i^I(\bar{\pi}, x_i)$ gives the following constraints for the insurance branch of the financial conglomerate i :

$$\begin{array}{llll} p^i \geq C_i^I[\bar{\pi}, \delta(x_i)x_i] & if & C_i^I[\bar{\pi}, \delta(x_i)x_i] \leq C_i^I(\underline{\pi}) \\ p^i \geq C_i^I(\underline{\pi}) & if & C_i^I[\bar{\pi}, \delta(x_i)x_i] > C_i^I(\underline{\pi}), \end{array} \tag{10}$$

where $C_i^I[\bar{\pi}, \delta(x_i)x_i] = C_i^I(\bar{\pi}, 0)$ for $x_i \in \bar{\mathbf{X}}_i^{CB}$. The property that $C_i^I(\bar{\pi}, 0) < C_i^I(\underline{\pi})$ readily implies that a financial conglomerate i will always monitor policy holders who have been subject to monitoring in the previous period. Thus, the lower bound of the feasible premiums for these policies equals $C_i^I(\bar{\pi}, 0)$. In the case of market segment $x_i \notin \bar{\mathbf{X}}_i^B$, the constraint coincides with that of the stand alone insurers (5).

Since the upper bound for acceptable premiums is independent of the monitoring costs, we can derive the equilibrium in the insurance market using constraints (6) and (10):

Proposition 4 *Suppose that the banking equilibrium is symmetric between adjacent conglomerates i and j, so that $\bar{x}_i^{CB} = 1 - \bar{x}_j^{CB}$. The insurance equilibrium can be characterized as follows*

(**i**) *When $\bar{x}_i^I > \bar{x}_i^{CB}$ the equilibrium coincides with Proposition 1.*

(**ii**) *If $\bar{x}_i^I < \bar{x}_i^{CB} \leq 1/2$, financial conglomeration increases the market efficiency in insurance, because each policy holder $x_i \in \bar{\mathbf{X}}_i^{CB}$ and $x_j \in \bar{\mathbf{X}}_j^{CB}$ will be subject to monitoring. As opposed to the stand alone case, policy holders located at $\bar{x}_i^I < x_i \leq \bar{x}_i^{CB}$ will also be monitored and charged a lower premium $\bar{p} < \underline{p}$.*

The increase in the profit in insurance equals the cost efficiency gains generated by conglomeration. The policy holders' welfare is unaffected by conglomeration.

Proof. The feature that conglomeration does not affect the equilibrium premiums in the insurance market follows from that pricing of the contracts between the insurer and the policy holder is based on the cost functions of the rivals. Thus, if the conglomerate i has an established credit relationship with a policy holder x_i, it can feasibly outbid the rivals and monitor the client.

The optimal premium and the monitoring behavior of the insurer must therefore coincide with the one derived in Proposition 1 in any given location insofar as $\bar{x}_i^I \geq \bar{x}_i^{CB}$.

When $\bar{x}_i^I < \bar{x}_i^{CB} \leq 1/2$ the number of monitored insurance contracts increases due to conglomeration, because the cost advantage allows the insurer monitor more distant policy holders than a stand alone institute. Thus, it is optimal for the conglomerate to set the premium marginally below the rate $\bar{p}$ for which the customer is just indifferent between buying a low risk policy from conglomerate i and a high risk policy from one of the more distant insurers.

In all cases, the policy holders' welfare is the same as in the stand-alone equilibrium derived in Proposition 1. This follows from the property that conglomeration does not affect the pricing of the contracts in the case (**i**). In case (**ii**), conglomeration reduces the premiums in the market segment $x_i = [\bar{x}_i^I, \bar{x}_i^{CB}]$. This does not, however, affect the welfare of the policy holders, because they are charged a rate $\bar{p}$ in locations $x_i = [0, \bar{x}_i^{CB}]$ and $x_j = [0, \bar{x}_j^{CB}]$ and $\underline{p}$ in other locations. These premiums satisfy $U_2^I(x_i, \bar{\alpha}, \bar{p}) = U_2^I(x_i, \underline{\alpha}, \underline{p})$ for $\forall x_i$. Conglomeration thus improves market efficiency since more policy holders will be subject to monitoring and the insurer makes higher profit, without affecting the policy holders' welfare. ■

The result is driven by the property that in equilibrium the premiums set by the insurer i are determined by the rivals' costs of managing the contract and the policy holders' incentive constraint (6). Since these constraints are unaffected by financial conglomeration, the cost advantages will pass directly in to insurers' mark-up and does not influence the risk allocation in the insurance market in the case (**i**). In the stand alone benchmark, the insurers could not internalize the monitoring cost in more distant locations. This contributed to a higher number of high risk policies. In the case (**ii**), conglomeration increases the market segment where the insurers' can feasibly offer low risk contracts, because of the cost advantage generated by established credit relationships. This constitutes an efficiency gain in terms of risk allocation and increases the insurers' surplus. The policy holders, however, will be unaffected by conglomeration.

5.2 Banking equilibrium

The banking branches of financial conglomerates first set the interest rates for the loans and then decide whether to monitor the borrower. The conglomerates observe that monitoring increases the probability of repayment and yields an additional profit in the insurance markets as illustrated in Proposition 4. Since the cost savings in insurance make monitoring more valuable, conglomerate banks have higher powered incentives to internalize the monitoring cost than stand-alone banks.

Formally, the effect of financial conglomeration can be derived by modifying the individual rationality constraint (7) of stand-alone banks. Letting $\bar{\pi} V_i^{IC}(x_i)$ denote the expected payoff the conglomerate receives in the insurance market when the borrower x_i accepts the loan offer from bank i, the incentive constraint (7) can be rewritten as

$$\begin{array}{llll} r^i \geq \frac{1}{\bar{\pi}} C_i^B(k, x_i) - V_i^{IC}(x_i) & if & \frac{1}{\bar{\pi}}[C_i^B(k, x_i) - V_i^{IC}(x_i)] \leq \frac{1}{\underline{\pi}} C_i^B(k), \\ r^i \geq \frac{1}{\underline{\pi}} C_i^B(k) & if & \frac{1}{\bar{\pi}}[C_i^B(k, x_i) - V_i^{IC}(x_i)] > \frac{1}{\underline{\pi}} C_i^B(k), \end{array} \tag{11}$$

These constraints obviously imply that a conglomerate bank has higher powered incentives to monitor in any given location x_i than a stand alone bank, because monitoring gives the insurance branch a competitive advantage which it can employ to increase profits.

The conglomerate maximizes its expected payoff subject to constraints (11) and (6). The borrower chooses the bank on the basis of the interest rate quotes and the perception on whether she will be subject to monitoring by the bank. Proposition 4 indicates that the profit the conglomerate makes in the insurance market depends on the parameter $\bar{x}_i^{CB}$. In a similar manner as in Lemma

3, we can derive this parameter through the incentive constraints of the banks and the borrowers:

Lemma 4 *Conglomerate bank i can feasibly offer loan contracts and monitor borrowers in locations* $x_i \leq \bar{x}_i^{CB}$, *where* $\bar{x}_i^{CB} : C_i^B(k, \bar{x}_i^{CB})/\bar{\pi} - V_i^{IC}(x_i) = \bar{r}$. *The market for low risk contracts thus exists in locations* $\bar{\mathbf{X}}_i^{CB} \equiv [0, \bar{x}_i^{CB}]$, *where* $\bar{x}_i^{CB} \geq \bar{x}_i^B$.

Proof. The proof is similar to that of Lemma 3 and therefore omitted. ■

Using Lemma 4 the problem of the financial conglomerate i can be written as

$$\begin{aligned} &\max_{r^i} V^{CB}(x_i) = r^i \bar{\pi} - C_i^B(k, x_i) + \bar{\pi} V_i^{IC}(x_i) \\ s.t. \quad &C_i^B(k, x_i)/\bar{\pi} - V_i^{IC}(x_i) \leq r^i \leq \bar{r} \quad for \quad x_i \in \bar{\mathbf{X}}_i^{CB} \\ &C_i^B(k)/\underline{\pi} \leq r^i \qquad for \quad x_i \notin \bar{\mathbf{X}}_i^{CB} \end{aligned}$$

The constraints readily imply that the lowest rate the conglomerate can quote is increasing in the cost the bank incurs for managing the low risk contract of the borrower and decreasing in the profit the conglomerate expects to make in the insurance market. The following proposition further examines how conglomeration influences the market outcomes derived in Proposition 2:

Proposition 5 *Financial conglomeration increases the market efficiency in banking. Specifically:*

(i) *If* $\bar{x}_i^B < 1/2$, *conglomeration increases the market segment where the banks monitor borrowers.*

(ii) *If* $\bar{x}_i^{CB} > 1/2$, *conglomeration increases borrowers' welfare through lower interest rates, because the cost efficiency gains in insurance will be passed onto the interest rates.*

(iii) *Conglomeration might increase the risk of bank failures, if the insurance profit cannot be used to refinance insolvent banks.*

Proof. See the Appendix. ■

The result implies that stand-alone banks are less likely to able to monitor the borrowers when the monitoring cost is high. This results in a collapse of the market for monitored loans in market segments with higher distance to the banks. Since the financial conglomerates have a higher powered incentives to internalize the monitoring cost, the market segment where the banks monitor borrowers is larger after conglomeration. In equilibrium, a higher number of borrowers will be subject to monitoring. However, the banking branch of the conglomerate incurs a negative profit when monitoring the borrowers located further from the banking branch.

The second result illustrates that the anticipated gains of conglomeration might not materialize *ex post*, because the long-run profits associated with financial conglomeration will, at least partially, be offset by intensified competition in banking. When the stand-alone banks can internalize the monitoring costs in the credit market, financial conglomeration does not influence the risk profiles of the banks, but reduces the interest rates. This is because both institutes have an incentive to cross subsidize their operations in the insurance market in the form of lower interest rates. The upper bound for interest rates the conglomerate i can set for low risk contracts thus reduces, because the conglomerate j is induced to quote lower interest rates than the ones feasible for a stand alone bank. Since the insurance profit for conglomerate j equals the conglomerate i's cost of monitoring policy holder $x_i = 1 - x_j$, we can show that reduction in equilibrium interest rates equals the cost savings in insurance.[13] Conglomeration therefore increases the welfare of borrowers.

[13] In locations where the bank j cannot compete with the more distant banks (locations $x_j > \bar{x}_j^{CB}$), conglomeration does not affect the market outcomes, because the upper bound for rates bank i can quote is determined by the rate $\bar{r}$.

While financial conglomeration increases monitoring in financial markets, the question whether the credit markets become more fragile, requires a closer examination of the structure of the conglomerates. Proposition 5 states that since the banking branches of the conglomerates have lower margins, the risk of insolvency could also be higher, because the losses generated by increased monitoring could make the banks unable to repay the depositors' at the end of the first period. This is, however, a short-term problem, if the insurance profit could be used to bail out the failing bank. Otherwise, conglomeration might increase the risk of bank insolvency in a low income state of the world.

In terms of banking regulation, the results just derived provide a new perspective on financial conglomeration. Specifically, conglomeration driven increase in monitoring implies that the capital adequacy requirements targeted to implement a certain level of risk in the banks' loan portfolio should be lower, insofar as the revenues in the insurance market can be used to finance loan losses in banking. The following proposition examines this result in the case risk based capital requirement in more detail:

Proposition 6 *After financial conglomeration, the banks increase monitoring. Hence, a risk based capital adequacy requirement aimed to implement equilibrium with a specific allocation of risks should be lower than in the case of stand-alone institutes. This, however, requires that the insurance branch of the conglomerate bails out the bank in the case of financial distress.*

Proof. The first part of the Proposition follows immediately from the property that for any given $\bar{r}$ the equilibrium satisfies $\bar{x}_i^B < \bar{x}_i^{CB}$. Since $\frac{\partial \bar{r}}{\partial k^{\pi}} > 0$ we can infer that under conglomerate structure, the regulator can use lower capital requirements to implement an equilibrium where the allocation of risks is identical to that in stand alone equilibrium. The second part follows from the proof of Proposition 5 (**iii**), which shows that if the insurance profit cannot be used to compensate for the loan losses in banking, the banking branch of the conglomerate becomes insolvent in situations where a stand-alone bank would break even. ■

This result claims that in the presence of financial conglomerates the credit market is less fragile, and therefore, the regulator can lower capital requirements to implement an equilibrium where the risk exposures are identical to those in stand-alone markets. The reason is that the conglomerates have a greater incentive to monitor than stand-alone institutes, because the conglomerates perceive the monitoring effort more valuable. The policy implication of the improved market efficiency is straightforward. If the regulator has an idea of an 'optimal' allocation of high and low risk contracts in stand-alone markets, increased monitoring allows the regulator to implement this allocation with lower capital adequacy requirements. This, in turn, diminishes the deadweight loss of regulation by reducing the costs of producing loan contracts and thereby interest rates in the credit market.

These results are arguably sensitive to the assumption that the insurance branch will bail out the banking branch subject to substantial loan losses. An interesting extension to the analysis would examine whether this assumption is valid. On one hand there are a number of potential agency problems between the branches and it is quite likely that the cross-subsidization effect could be stronger due to the usual moral hazard problem associated with deposit insurance. In such cases, financial conglomeration might become a source of financial contagion as noted by Freixas et al (2005). On the other hand, since the profit of conglomeration is generated on a rather long time span, it is more likely that in a fully dynamic model the institutes would have to consider their 'charter value' which might provide an additional incentive for the conglomerate to bail out one of its failing branches.[14]

[14]See Hellman et al (2000) and Repullo (2003).

6 Conclusion

The aim of this paper was to examine the implications of the emergence of institutes combining credit and insurance services in financial markets. To this end, we developed a model providing an example of the industrial organization aspects of financial conglomeration. This model was then employed to investigate the implications of financial conglomeration on market efficiency in terms of allocation of risk and pricing of financial services.

Since we were interested in the performance of two different organizational arrangements in financial markets, we first analyzed a stand-alone benchmark where institutes' operations were limited to a single service and compared the equilibrium outcomes of a model where the institutes combine different services. In addition to solving for the market equilibria in both cases, we showed how capital adequacy requirements can be used to influence the allocation of risks in the credit markets. The stand-alone equilibrium exhibited the following properties. First, specialization in monitoring certain types of clients allows the banks and the insurers to employ a local monopoly power over a subset of customers. Higher monopoly rents, however, induce the rival institutes to offer riskier contracts. The supply of such contracts reduces the number of projects with a higher success probability. The regulator can mitigate risk taking in banking by imposing minimum capital requirements which increase the expected cost of contracts which will not be monitored.

Induced by the expected profit on the downstream insurance market, financial conglomerates have a greater incentive monitor the borrowers. This effect shows up in tougher competition for clients in the credit market. The borrowers benefit from the improved market efficiency, because the lower cost of bank financing increases the borrowers' income and allows the regulator to implement the desired allocation of risk with lower capital adequacy requirements than in the case of stand-alone institutes.

From the viewpoint of the financial institutes, the gains associated with conglomeration might be markedly high *ex-ante*, indicating that in a game where the financial institutes design their organizational structure, a stand-alone structure would be a strictly dominated strategy. However, the unintended consequence of financial conglomeration is that the institutes might not be able to capitalize on the economies of scope *ex-post*. This is because when trying to establish long term relationships with borrowers, the competition becomes more intense diminishing the profit of the institutes in the credit market. The example in this paper illustrates this feature by showing that the aggregate profit in the financial sector might be the same regardless of the organizational forms of the institutes. Hence, it is not implausible to think that the long-term profit of a financial conglomerate is lower than the combined profit of two separate financial institutes, especially when there are costs involved with the re-organization of the institutes, agency problems or other frictions in combining the services.

It is also worth pointing out that this result is not limited to the situations where banks extend their business lines into insurance through mergers and acquisitions. On the contrary, the pro-competitive effect would become stronger, if both the insurers and the banks extended their product lines, because the number of active institutes in the markets would increase. This is one direction to which the present study could be extended. In particular, the model does not consider the structural design aspects of financial conglomeration and assumed that the customers of the financial institutes are myopic in that they do not recognize the consequences of the initial financial contract on the contracting environment in the downstream insurance markets.

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Appendix

Proof of Lemma 1. This proof shows that there is a market for low risk contracts so that the banks and the insurers will at least break when monitoring a client with a zero distance to the institute. To this end, we derive a break even rates $\bar{r}$ and $\bar{p}$ which are incentive compatible in that the borrowers and policy holders rather accept a low risk contract than a high risk one offered by another bank with a corresponding break even rate.

The lowest rate for which a bank can offer *a high risk contract* is $1/\underline{\pi}$. Plugging this into (2), we can derive $\bar{r}$, which satisfies $\phi(\underline{\pi})(\rho_r - \frac{1}{\underline{\pi}}) + B < \phi(\bar{\pi})(\rho_r - \bar{r})$. The break even condition for *a low risk* contract with $x_i = 0$ is $1/\bar{\pi}$. Setting $\bar{r} = 1/\bar{\pi}$ into the above expression characterizing the Moral Hazard problem and evaluating at $\rho_r = 1/\underline{\pi}$ gives

$$B < \frac{\phi(\bar{\pi})}{\underline{\pi}} - \frac{\phi(\bar{\pi})}{\bar{\pi}}, \tag{12}$$

where the RHS is the upper bound for B.[15] The lower bound for B determines the region where monitoring is required to implement effort $\bar{\alpha}$. To derive the lower substitute $\frac{1}{\bar{\pi}}$ for r in (2) and

[15] Observe that higher values of ρ_r imply that monitoring is feasible under higher B.

evaluate at $\rho_r = 1/\underline{\pi}$ to obtain

$$\frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\underline{\pi}} - \frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\bar{\pi}} < B. \tag{13}$$

(12) and (13) imply that monitoring is feasible and increases efficiency when

$$B \in \left(\frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\underline{\pi}} - \frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\bar{\pi}}, \frac{\phi(\bar{\pi})}{\underline{\pi}} - \frac{\phi(\bar{\pi})}{\bar{\pi}} \right) \equiv \mathbf{C},$$

which is a non-empty set.

In the case of insurance, observe first that choosing an effort level $\bar{a}$ is individually rational for uninsured agents if $EU_2^N(\rho_r, \underline{\alpha}) < EU_2^N(\rho_r, \bar{\alpha})$. This property (i.e. the agents choose action $\bar{\alpha}$ when uninsured) must hold so that we can use $EU_2^N(\rho_r, \bar{\alpha})$ to calculate the reservation premium for the insurance policy as $p_{\max}(\bar{\alpha}) = [1 - \phi(\bar{\pi})]\rho_r$. Setting $\rho_r = 1/\underline{\pi}$, parameter B must thus satisfy $B < \frac{\phi(\bar{\pi})-\phi(\underline{\pi})}{\underline{\pi}}$. This is the upper bound for B for which choosing action $\bar{\alpha}$ is optimal for uninsured agents. If B is higher, it is socially optimal to choose $\underline{\alpha}$.

The insurer's break even premium of a high and low risk contract is $\underline{p} = (1 - \underline{\pi})\rho_r$ and $\bar{p} = (1 - \bar{\pi})\rho_r$. Hence, the existence of the market for low risk policies thus requires $U_2^I(x_j, \alpha, \bar{p}) > U_2^I(x_j, \alpha, \underline{p})$. For $\rho_r = 1/\underline{\pi}$ this gives $B < \frac{\bar{\pi}-\underline{\pi}}{\underline{\pi}}$. Since $\phi'(\bar{\pi}) \leq 1$ we can infer that $\frac{\phi(\bar{\pi})-\phi(\underline{\pi})}{\underline{\pi}} < \frac{\bar{\pi}-\underline{\pi}}{\underline{\pi}}$, and thus, the existence of insurance market where monitoring is welfare increasing and feasible requires that $B \in \left(0, \frac{\phi(\bar{\pi})-\phi(\underline{\pi})}{\underline{\pi}}\right) \equiv \mathbf{I}$.

The insurance markets and credit markets coexist if the parameters of the model satisfy $B \in \mathbf{I} \cap \mathbf{C}$. This is a non-empty set because

$$\frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\underline{\pi}} > \frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\underline{\pi}} - \frac{\phi(\bar{\pi}) - \phi(\underline{\pi})}{\bar{\pi}}$$

■

Proof of Lemma 2. The set $\bar{\mathbf{X}}_i^I$ can be readily derived from (6). To show that $\bar{\mathbf{X}}_i^I$ is a non-empty set plug $\bar{p} = C_i^I(\bar{\pi}, \bar{x}_i^I)$ and $\underline{p} = C_i^I(\underline{\pi})$ into (6) and rearrange to obtain $B = (\bar{\pi} - \underline{\pi})\rho_r + t^I \bar{x}_i^I$. This implies that $\bar{\mathbf{X}}_i^I$ is non-empty if $\exists x_i < \bar{x}_i^I$ such that $B < (\bar{\pi} - \underline{\pi})\rho_r + t^I x_i$. Letting $x_i \to 0$ and using Lemma 1 we can infer that $\mathbf{X}_i^I$ is non-empty insofar as $\rho_r \geq 1/\underline{\pi}$. ■

Proof of Lemma 3. Substituting $\bar{r} = C_i^B(k, \bar{x}_i^B)/\bar{\pi}$ and $\underline{r} = C_i^B(k)/\underline{\pi}$ into (8), the condition for the existence of markets for low risk contracts becomes:

$$\phi(\bar{\pi})C_i^B(k, x_i)/\bar{\pi} \leq \phi(\underline{\pi})C_i^B(k)/\underline{\pi} + [\phi(\bar{\pi}) - \phi(\underline{\pi})]\rho_r - B$$

To show that the market exists, we evaluate the expression at $\rho_r = 1/\underline{\pi}$. Substituting this and $C_i^B(k, \bar{x}_i^B)$ and $C_i^B(k)$ into the above expression and rearranging gives

$$\left[\frac{\phi(\bar{\pi})}{\bar{\pi}} - \frac{\phi(\underline{\pi})}{\underline{\pi}}\right][k\rho_k + 1] + \frac{\phi(\bar{\pi})}{\bar{\pi}} t^B x_i \leq \frac{\phi(\bar{\pi})}{\underline{\pi}} - \frac{\phi(\underline{\pi})}{\underline{\pi}} - B.$$

Thus $\exists x_i \geq 0$ for which the inequality holds insofar as Lemma 1 holds. ■

Proof of Proposition 3. (**i**) Consider first a fixed requirement k which is the amount of capital the banks must put up when issuing a loan, regardless of their monitoring activity. The amount of high risk loans is implicitly determined by the set $x_i \in (\bar{x}_i^B, 1 - \bar{x}_i^B)$, where $\bar{x}_i^B$ satisfies

$$\phi(\underline{\pi})(\rho_r - \underline{r}) + B = \phi(\bar{\pi})[\rho_r - C_i^B(\bar{\pi}, k, \bar{x}_i^B)/\bar{\pi}].$$

i.e. $\bar{x}_i^B$ $(1-\bar{x}_i^B)$ is the highest distance from bank i (bank j) where the borrower accepts a low risk contract. Differentiate the above expression with respect to $\bar{x}_i^B$ and k gives

$$\frac{d\bar{x}_i^B}{dk} = \left[\frac{\overline{\pi}}{\phi(\overline{\pi})}\frac{\phi(\underline{\pi})}{\underline{\pi}} - 1\right]\frac{\rho_k}{t}$$

Higher k thus increases monitoring if:

$$\frac{\phi(\overline{\pi})}{\overline{\pi}} - \frac{\phi(\underline{\pi})}{\underline{\pi}} < 0.$$

(**ii**) Define risk-based capital requirements so that for $k=0$ each loan satisfying $\frac{1}{\overline{\pi}}C_i^B(0,x_i) > \frac{1}{\underline{\pi}}C_i^B(0)$ will be subject to a capital adequacy requirement $k^{\underline{\pi}}$. The critical borrower $\bar{x}_i^B$ satisfies $\frac{1}{\overline{\pi}}C_i^B(0,\bar{x}_i^B) = \frac{1}{\underline{\pi}}C_i^B(0)$. Differentiating this expression gives:

$$\frac{d\bar{x}_i^B}{dk^{\underline{\pi}}} = \left[\frac{\overline{\pi}}{\phi(\overline{\pi})}\frac{\phi(\underline{\pi})}{\underline{\pi}}\right]\frac{\rho_k}{t} > 0$$

From this it follows that higher $k^{\underline{\pi}}$ unambiguously increases the banks' ability to repay the depositors in low income state of the world.

The reason why the deadweight loss of the regulation passes on to all interest rates is that in a situation where capital regulation is meaningful (i.e. case (**ii**) in Proposition 3) the interest rates of low risk loans equals $\bar{r}$. The effect of higher $k^{\underline{\pi}}$ on $\bar{r}$ is given by

$$\frac{d\bar{r}}{dk^{\underline{\pi}}} = \frac{\phi(\underline{\pi})}{\phi(\overline{\pi})}\frac{1}{\underline{\pi}}$$

This means that the utility of the borrower with a low risk loan will decrease by $\phi(\overline{\pi}) * \frac{\phi(\underline{\pi})}{\phi(\overline{\pi})}\frac{1}{\underline{\pi}} = \frac{\phi(\underline{\pi})}{\underline{\pi}}$.
■

Proof of Proposition 5. (**i**) Observe first that $V_i^{IC}(x_i) \geq 0$ for any given x_i. Thus, we can infer that $\bar{x}_i^{CB} \geq \bar{x}_i^B$. This implies that if it was optimal for a stand alone bank to monitor borrower x_i then a conglomerate bank will also engage in monitoring in the same location. From this it follows that when $\bar{x}_i^B > 1/2$ the banks monitor each borrower regardless of their organizational form. To show that $\bar{x}_i^B < \bar{x}_i^{CB}$, consider the market segment $x_i \in [\bar{x}_i^B, 1-\bar{x}_j^B]$. Since $V_i^{IC}(x_i) \geq 0$ for all $x_i > 0$, the property $\bar{x}_i^B \geq 0$ implies that $V_i^{IC}(\bar{x}_i^B) > 0$. Letting $r^i(x_i)$ denote the break even rate for a conglomerate bank i, we can infer that

$$r^i(\bar{x}_i^B) = \frac{1}{\overline{\pi}}C_i^B(k,\bar{x}_i^B) - V_i^{IC}(\bar{x}_i^B) < \bar{r}.$$

Hence, it is optimal for the bank i to extend its offer $r^i(x_i) = \bar{r}$ to locations $\bar{x}_i^B < x_i \leq \bar{x}_i^{CB}$, where $\bar{x}_i^{CB}$ satisfies $r^i(\bar{x}_i^{CB}) = \bar{r}$.

(**ii**) By a standard Bertrand-type argument, the optimal interest rate for a conglomerate bank is just marginally below the break even rate of the rival. This means that when $\bar{x}_i^{BC} \geq 1/2$ the bank i will set the rate equal to $r^j(1-x_i) = \frac{1}{\overline{\pi}}C_j^B(k,1-x_i) - V_j^{IC}(x_j)$ in locations $1-\bar{x}_j^{BC} < x_i \leq 1/2$. Since the location $\bar{x}_j^{BC}$ is the one where $r^j(1-x_i) = \bar{r}$, the optimal rate for bank i in locations $x_i \leq 1-\bar{x}_j^{BC}$ is a flat rate equal to $\bar{r}$. In the case $\bar{x}_i^{BC} < 1/2$, the highest rate the bank can charge is the one for which the borrowers are just indifferent between being monitored and receiving the private benefit. Thus, the optimal rate for the bank is $r(\bar{x}_i^{BC}) = \frac{1}{\overline{\pi}}C_i^B(k,x_i) - V_i^{IC}(x_i)$ for $x_i \leq \bar{x}_i^{CB}$.

This rate is the highest rate to the bank and acceptable for the borrowers.

To show that the conglomerates pass the cost efficiency gains in insurance on to the borrowers, we substitute the equilibrium premiums derived in Proposition 3 into $V_i^{IC}(x_i)$ to derive the insurance profit the conglomerate makes in the case of $x_i \in \bar{\mathbf{X}}_i^{CB}$:

$$\begin{array}{ll} V_j^{IC}(x_j) = \bar{p} - C_i^{IC}(\bar{\pi}, 0) = t^I(1 - \bar{x}_i^I) & for \quad x_i < 1 - \bar{x}_i^I \\ V_j^{IC}(x_j) = C_j^{IC}(\bar{\pi}, x_j) - C_i^{IC}(\bar{\pi}, 0) = t^I(1 - x_i) & for \quad x_i \geq 1 - \bar{x}_i^I. \end{array}$$

Above we showed that when $\bar{x}_i^{CB} > 1/2$ all borrowers located $1 - \bar{x}_j^{BC} < x_i \leq 1/2$ will be charged $r^i(x_i) = \frac{1}{\bar{\pi}} C_j^B(k, x_j) - V_j^{IC}(x_j)$, where $V_j^{IC}(x_j) = t^I x_i$. Thus, the decrease in interest rates equals the cost savings in insurance. When $\bar{x}_i^{CB} < 1/2$ all borrowers will be charged either $\bar{r}$ or $\underline{r}$. Since $\bar{r}$ is derived from the incentive constraint (8) we can infer that conglomeration does not affect the welfare of the borrowers.

Part (**iii**) of Proposition 2 derived a critical borrower x^*, which determined the risk portfolio of the banks so that when $\bar{x}_i^B < x^*$, the banks will face insolvency in a low income state of the world. To fix ideas, suppose that $\bar{x}_i^B = x^*$. Since $\bar{x}_i^B$ is a break-even rate for a stand alone bank, $\bar{x}_i^{CB} > \bar{x}_i^B$ implies that a conglomerate bank engages in cross-subsidization by making a short term loss in banking so as to capture the borrowers' insurance business. The insurance profit, however, will be realized at the end of the second period. Hence, in a low income state of the world, the bank will be unable repay the depositors at the end of period 1. This occurs if

$$V_i^{CB} = 2\bar{\pi} \int_0^{\bar{x}_i^{CB}} (t^B \bar{x}_i^B - t^B x_i) dx_i - 2(1 - \bar{\pi}) \int_0^{\bar{x}_i^{CB}} (t^B x_i) dx_i - (1 - 2\bar{x}_i^B) < 0,$$

which can be rewritten as

$$V_i^{CB} = V_i^B + 2\bar{\pi} \int_{\bar{x}_i^B}^{\bar{x}_i^{CB}} (t^B \bar{x}_i^B - t^B x_i) dx_i - 2(1 - \bar{\pi}) \int_{\bar{x}_i^B}^{\bar{x}_i^{CB}} (1 + t^B x_i) dx_i - 1 + 2(\bar{x}_i^{CB} - \bar{x}_i^B)] < 0$$

For $\bar{x}_i^B = \bar{x}_i^{B*}$ we have $V_i^B = 0$, thus, the properties $2\bar{\pi} \int_{\bar{x}_i^B}^{\bar{x}_i^{CB}} (t^B \bar{x}_i^B - t^B x_i) dx_i < 0$ and $\bar{x}_i^{CB} < 1/2$ imply that $V_i^{CB} < 0$. This means that when the conglomerates cannot use the profit in insurance to cover the short-term losses in banking, the banks are more likely to become insolvent in a low income state of the world. ■