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The political contest for Basel III

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JEL Classification: D72, G21, G28

Keywords: All-pay auction, Capital Regulation, Lobbying

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1 Introduction

The story of regulation is always a story of lobbyism. Whenever a regulator directly intervenes in the market conditions of an industry, he implicitly generates quasi-rents for different market-participants. Creating rents and thereby winners and losers, those groups who are concerned by regulation may exercise pressure on the political level, for example by supplying politicians with one-sided information supporting their position. Thus, each regulated group may adopt tactics to gain the support of the regulator and a competition between interest groups arises constituting a market for regulation in this sector.[3] When regulatory stabilization occurs, it coincides with a political consolidation and one market group becomes dominant while the politically weaker group bears a larger burden.

The banking sector is one of the most regulated sectors. In most countries its regulation dates back to well before the 19th century and over time more elaborated regulatory instruments have emerged. This development culminated in the establishment of an international standard issued by the Basel Committee on Banking Supervision (Basel), forcing banks to hold specific risk-weighted minimum capital requirements. The recent October 2010 proposal of the Basel Committee on Banking Supervision raises the Core Tier 1 capital ratio of 4.5% from 2% which were required under Basel II. Unfortunately, political and academic discussions have so far focused mainly on the effects of the implemented rules on capital regulation, but have not taken into account the economic and political driving factors determining the implemented regulation policy. However, we assume that the source for any stabilized regulation is a political equilibrium between competing market players. Although capital regulation à la Basel affects all banks more or less in the same way, it privileges a subset of banks. Therefore in our paper we focus on the competitive effects of capital regulation and will show how the regulator is involved in rent-creating activity via the arrangement of minimum capital requirements as the traditional regulatory instrument in the banking sector. Our main result is that a decrease of capital requirements increases the low capitalized bank's margins inducing them to shift their portfolio choice, while high capitalized banks suffer on a larger extend from higher refinancing costs. Thus, lax capital regulation acts as a subsidy for low capitalized banks and creates quasi-rents. These expected rents form the origin for lobbying activity and the power for the political contest for regulation. A model will be developed to show to which degree some other banks may favour stricter regulation.

The structure of the paper is as follows: Section 1 motivates our study and gives a brief literature survey on lobbying in the banking sector. We also provide some empirical evidence on the increased lobbying expenditures by the financial sector over the last decade and in particular during the current financial crisis. In Section 2, we derive the competitive effects of capital regulation on the banking sector as the key element for regulatory density. Section 3 presents our basic two-stage lobbying model where capital regulation à la Basel is modelled as the outcome of a political game between competing banks in the banking sector. The risk-neutral banks compete for the political price that arises due to a policy choice of the captured regulator. Section 4 discusses the results and 5 concludes.

1.1 Motivation and related Literature

Before we outline our theoretical model that will help us understand the political relationship between banks and regulation we first want to motivate our idea and present some basic empirical evidence. Our paper is related to two strands of literature: first, to the literature on the influence of interest groups; and second, to the literature on the effects of lobbyism on the banking sector.

Lobbying can be defined as an activity aiming at changing existing policies to receive individual benefits. According to Grossman and Helpman (2001) there are two main channels by interest groups to promote

[3] see for example Becker (1983) or Alesina and Drazen (1991).

their political objective: the dissemination of information and campaign contributions. On the one hand, lobby groups inform and persuade policy makers of the wisdom of their position, on the other hand the pressure group can provide resources to political parties thereby buying access and influence via campaign contributions. In a seminal paper Stigler (1971) examines the battle for influence between competing lobby groups. He argues that the regulator changes the economic status of economic groups, thereby creating a demand for regulation since interest groups try to receive regulators in order to modify regulations in favour of their interests. Building upon the private interest theories of regulation (Stigler 1971), Laffont (1999) provides a deeper analysis of the supply of regulation showing that regulatory capture is more probable when regulation is technically complex and asymmetric information plays a major role.[4] Moreover his findings underline that highly concentrated and organized groups have more power than dispersed interest groups. In the literature there are many ways to model the interaction in which interest groups expend effort in trying to get ahead of their rivals and capture the regulator. The theory of political contests and tournaments is a dynamic and complex field.[5] To keep things simple, we will follow the approach of Hillman and Riley (1989) who model the battle for influence in a rent-seeking game where the interest group with the highest effort can determine the regulatory rule with a probability of 1 (first-price all-pay auction).

We adapt the setting of Epstein and Nitzan (2002) where one interest group (the "challenger") is interested in the approval of a proposed policy and a second interest group (the "defender") promotes the status quo and thus lobbies for the rejection of the proposed policy. The interest groups are engaged in lobbying in order to increase their probability of winning the public-policy contest. The regulator is aware of his potential benefit from lobbying effort *e.g.*by expected campaign contributions or by expected support of the voters whose welfare depends on the policy of the regulator, and thus approves or rejects the proposed policy.

The second strand of literature concerns the relationship between lobbyism and banking regulation. In general, regulators consult with the industry before modifying regulations and thereby are in close contact with banks. Because of the complexity and high degree of opaqueness of financial institutions and products, to some extend they need the cooperation with the industry in order to get access to the new operations and products. This interaction offers room for lobbyism.[6]But surprisingly, a relative small number of studies reveal evidence that lobby groups also influence the financial sector. Recently, Coates and Wilson (2010) analyzed the role of banking sector groups in banking crises. Their preliminary findings suggest that the probability of a banking crisis and the fiscal costs of crises increases with the number of banking sector special interest groups.[7]

Certain past regulatory debates can be seen in the light of the consequence of bank failures as a result of a financial crises. For example rules on restrictions on inter-regional branching were dominated by conflicts between the interests of different sorts of banks. Between 1931 and 1935 after the Great Depression a shift in the US institutional arrangement for regulating the structure of the banking industry can be observed. Abrams and Settle (1993) showed in a model of pressure-group behavior that the relative high rate of bank failures tipped the political balance toward pro-branching forces in many states. Kroszner and Strahan (1999) argue in the same way that special interest factors explain the timing of bank branching deregulation in U.S. states since the 1970s. Thus, these studies support evidence that the market structure and the political balance between the competitors within the banking industry matters for banking regulation. Apart

[4] Regulatory capture occurs when a state regulatory agency created to act in the public interest instead acts in favor of the commercial or special interests that dominate in the industry it is charged with regulating.

[5] A survey about the analysis of the complete information all-pay auction has been made by Nitzan (1993) or Konrad (2007).

[6] Recently three of the leading economists in banking regulation, Dewatripont, Rochet and Tirole (2010), argued that lobbyism is the main driving force for banking reforms by saying that "one can interpret the recent modification of the Basel capital adequacy rules (Basel II) as an outcome of lobbying by these banks".

[7] In Europe (in contrast to the US) systematic data on lobby group activity is not available. Despite the EU Interest Group Population Dataset 2007-2008 can be seen as a first step to measure the influence of pressure groups, the data set only lists lobby groups without providing any information about the number of lobbyists or lobbying expenses. Hence most of the empirical evidence of lobbyism is based on US data.

from plenty of anecdotal evidence[8] in favour of the growing importance of lobbying by banks to influence the political decision on the regulatory issues being made, there is now an increasing body of empirical evidence available supporting this claim. Concerning the financial crisis of 2008, Igan, Mishra and Tressel (2009) found that financial institutions lobbying on mortgage lending and securitization issues adopted riskier lending strategies and thereby contributed directly to the financial crisis. Lenders lobbying more intensively on issues related to mortgage lending had faster growing loan portfolios, but ex-post were faced with higher delinquency rates. That's why these instititions went bankrupt with a higher probability - a fact that can be interpreted as an exogenous shock to the regulation equilibrium.

Keeping this in mind and concerning the financial crisis of 2008, Igan, Mishra and Tressel (2009) found that financial institutions lobbying on mortgage lending and securitization issues adopted riskier lending strategies. Lenders lobbying more intensively on issues related to mortgage lending had faster growing loan portfolios, but ex-post were faced with higher delinquency rates. That's why these instititions went bankrupt with a higher probability - a fact that can be interpreted as an exogenous shock to the regulation equilibrium.

We contribute to this literature the competitive effects of capital regulation in a static framework and its impact on the equilibrium regulation policy. We will show that the regulator implicitly creates a regulatory rent by defining minimum capital requirements. This expected rent is the driving motor for lobbying activity. In particular, we follow the approach of Hardy (2006) who analyzes capital regulation as a reflex of the interest of a majority coalition in the banking sector. However, in a similar setting we examine (1) whether capital regulation offers rents to a subgroup of banks and (2) how the political contest leads to an equilibrium regulation policy. To our knowledge, there exists no other paper that explicitly models competitive effects of capital adequacy rules in a static model in the context of a domestic banking system with heterogeneous banks. We will argue that with size of banks comes political influence. And this influence over the regulator allows big banks to gain a competitive advantage over their peers, or more precisely over smaller banks. We highlight one such mechanism through which banks can lobby for their preferred regulation in our paper.

2 Competitive effects of capital regulation

In our basic model we first consider the investment decision of banks in absence of any regulatory constraint. Banks finance themselves through deposits (D) and equity capital (K). As we will see, because depositors cannot observe the risk taken on by an individual bank, banks have an incentive to take on too much risk from a social planner's perspective. Thus, there is room for regulation. The regulatory instrument will be a capital-adequacy ratio which we will denote with χ. In other words, banks will be required to have at least $K/L \geq \chi$. This section will analyze the competitive effects of such a capital-adequacy ratio and the induced incentives for the banks to lobby.

We aim to describe three essential features of the banking sector that are relevant for the analysis of regulatory capture in banking.

First, there is heterogeneity among banks' equity capital. In practice, some banks are willing to hold capital in excess of regulatory minimum independently of regulatory changes. Flannery and Rangan (2002) showed that none of the largest 100 banks were constrained by *de jure* capital standards in the period 1982-2000 and Gropp and Heider (2010) found no evidence that changes in banks capital structure were related to changes in regulation. In the literature (Taylor, Goodhart, 2006) there are several reasons why capital levels of some banks may be greater than the level of their competitors: Higher equity capital levels can be motivated by the bank manager's desire to retain capital for future acquisitions or to reflect the risk of loss of franchise of the bank. Moreover, investors in a bank may think that the regulatory capital requirement is insufficient

[8] see e.g. Simon Johnson, The Quiet Coup, 2009.

to compensate them for the risk they bear. Thus banks hold additional capital to offset the impact of this on their funding costs (market discipline). The margin between equity capital and regulatory capital may arise in order to be able to cover any losses arising from unaticipated negative shocks.[9] As a result, due to their historical development and specific investor environment some banks have higher capital levels while other banks - operating on a local level - have not. In our model we will assume that the voluntary equity endowment of an individual banks is exogenous and independently of regulatory minimums. It ranges over $\left[\underline{K}, \overline{K}\right]$and is distributed according to $g\left[K\right]$.

Second, banks are opaque. Thus outsiders like depositors or even the regulator cannot monitor the banks' risk *ex ante*. Bank's risk is assumed to be private, unobservable information. Despite every bank pretend to have a low-risk strategy, depositors will not believe the signaling and the market for deposits is characterized by a lemon market à la Akerlof. In our setting depositors set the default premia before banks choose their portfolio and their target returns. This means that depositors cannot exert any market discipline because they cannot react to the actual risk-taking of banks, which is revealed after depositors have set the default premia[10]The only observable information depositors have is the market volume of risky assets and the endowment of equity (according to capital requirements) bailing them out. Consequently the risky loan market volume works like a signal for depositors.

Third, banks can differ in their investment strategy. Each bank is assumed to operate in a monopolistically competitive market in its loan market for risky investments (i.e. we assume some kind of relationship lending). There are two investment strategies for a bank, investing in safe assets (B) or investing in risky assets (L). To make this case even more concrete, we assume the simplest case of risky return distribution $f(r_L)$, namely that of the return of the risky loans r_L taking either value 0 with probability $1-p$ or R with probability p.

$$r_L = \begin{cases} R & \text{p} \\ 0 & 1-p \end{cases}$$

Note that the risky strategy cannot be distinguished from the safe strategy in case of success of the investmentby depositors, but $E(r_L) > s > r_D$. Again, the investment strategy is known by the banks themselves, but due to banks' opaqueness it is not observable by outsiders *ex ante*.[11] Depositors cannot distinguish between banks and their risk-taking, thus they only know the degree of risk taken on by all banks collectively and accordingly demand the appropriate deposit rate $r_D\left[\overline{L}\right]$. Moreover, capital is assumed to be more expensive than deposits.

2.1 The risk-taking decision of a bank in a laissez-faire world

As a reference point, we first describe the first-best risk allocation for banks without any regulatory constraints. To simplify the analysis even further we first consider on one bank, holding the behavior of the competitor banks constant. Let $L_i(K+D)$ denote the banks's loan supply function, keeping the competitors' loan supply fixed. First, we analyze the bank's choice of loan for a given deposit rate r_D.

However, there is limited liability, so that if the risky investment fails, only available funds are paid out to the depositors. Limited liability protects the banks from incuring a loss, which ensures a minimum payoff of zero to the bank in case of failure. With $B = D + K - L$ the expected profits for bank i become:

[9] Often the best investment opportunities arise during recessions, and those banks that have been sufficiently clever in the management of their equity capital are able to benefit from these opportunities.

[10] Thus, in our setting with intransparent risk behavior by banks, there is a commitment problem since banks cannot credibly commit to a specific risk strategy. This time structure generates a moral hazard problem between depositors and banks, known as risk-shifting in the banking literature (see Allen, Gale 2004).

[11] All banks are independent, meaning that information about one bank does not reveal information about any other banks.

$$E(\pi_i) = \begin{cases} p(R \cdot L_i + s(D_i + K_i - L_i) - r_D[L_i, L_{-i}] \cdot D_i) & \text{if} s(D_i + K_i - L_i) < r_D[L_i, L_{-i}] \cdot D_i \\ p(R \cdot L_i) + s(D_i + K_i - L_i) - r_D[L_i, L_{-i}] \cdot D_i) & \text{if} s(D_i + K_i - L_i) > r_D[L_i, L_{-i}] \cdot D_i \end{cases}$$

where returns to bank i are $R \cdot L_i$ from its risky investments, plus $s(D_i + K_i - L_i)$ from its investments in the safe asset. Depositors are paid out $r_D\left[L_i, L_{-i}\right] \cdot D_i$. The optimality condition for the optimum amount of loans invested in the risky asset by bank i for $s(D + K_i - L_i) < r_D\left[L_i, L_{-i}\right] \cdot D$ is thus easily seen as given by

$$p\left(R - s - r'_D\left[L_i\right] \frac{L_i}{\overline{L}} \cdot D_i\right) = 0, \tag{1}$$

where $\overline{L} = L_i + L_{-i}$. Of course, this condition equates marginal revenue and marginal cost. Intituitevly, the investment in the risky asset is increasing with the net return on risky lending $(R - s)$. But note that given our assumptions, the equilibrium is characterized by at least one type of inefficiency. Firstly, a rise in risky lending by one bank imposes a negative externality on other banks by increasing the refinancing costs in the market for deposits, since $\frac{\partial r_D}{\partial \overline{L}} > 0$.[12] An immediate consequence of this result is that small banks have an incentive to specialize in risky loans. For $\overline{L} \to +\infty$ the refinancing costs of a bank are unresponsive to individual portfolio choice. Thus (1) will always be positive, and the bank will fully invest in the risky asset with $L^* = D + K$. However, with market power of a bank, *i.e.* increasing balance sheet total $(K_i + D_i)$, the marginal costs of risky lending increase for a bank. The sensitivity of r_D to changes in $\overline{L}$ in the market for deposits depends on L_i, which is a proxy for intensity of competition ($L_i = \overline{L}$ may be interpreted as pure market dominance, whereas $\overline{L} = +\infty$ corresponds to perfect competition). The optimal loan-curve is a concave function of the balance sheet total. Big banks will internalize the negative externality.[13]

The second inefficiency is created by limited liability. The optimality condition for the optimum amount of loans for $s(D_i + K_i - L_i) > r_D\left[L_i, L_{-i}\right] \cdot D_i$ corresponds with the case of unlimited liability since the bank will fully compensate depositors in case of failure of risky lending. In this case the first order condition becomes

$$p \cdot R - s - r'_D\left[\overline{L}\right] \frac{L_i}{\overline{L}} \cdot D_i = 0. \tag{2}$$

Comparing this condition with (1) reveals an externality caused by limited liability. Since $p \leq 1$, risk-taking decisions of banks in a laissez-faire world are distorted: private marginal costs are below social marginal costs leading to an overinvestment in risky loans.

Proposition 1. *In equilibrium for $s(D_i + K_i - L_i) > r_D\left[L_i, L_{-i}\right] \cdot D_i$ (limited liability), all banks invest too much in risky loans. The optimal loan volume L_i^* decreases in the market share of a bank, i.e., $L'_i\left(\frac{L_i}{\overline{L}}\right) < 0$.*

Now we turn to the determination of r_D. Anticipating $\overline{L} = L_i + L_{-i}$, depositors set a default premium to obtain an expected return of $U\left(s^D\right)$. Depositors have a risk-averse utility function $U(\cdot)$, $U' > 0, U'' < 0$. We assume that each depositor can either invest entirely in bank deposits or entirely in a risk-free alternative investment that yields s^D. Capital market equilibrium is characterized by the equality of the expected utilities of the return on bank deposits and the return on the alternative. However, the depositor's information of the bank's investment strategy and risk decisions are limited. If bank lenders are unable to monitor the individual

[12] see equation (4) or Appendix A.

[13] From the profit equation it is also easily seen that big banks, *i.e.* those with a high capital or equity endowment, will necessarily make bigger profits than small banks.

bank's action *ex ante* and thus are unable to anticipate these investments with an appropriate interest rate, depositors cannot distinguish between banks and need to take expectations across both realizations of returns of risky investments. Therefore, the equilibrium condition for depositors is

$$U\left(s^D \cdot D\right) = \int_{\underline{K}}^{\overline{K}} \left(p \cdot U\left[r_D \cdot D\right] + (1-p)\, U\left[s\left(\overline{D} + \overline{K} - \overline{L}\right)\right]\right) g\left[K\right]. \tag{3}$$

By total differentiating we can solve for the optimal response of the interest rate to the aggregate amount of risky loans:

$$\frac{dr_D}{d\overline{L}} = \frac{s \cdot (1-p) - \int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D} + \overline{K} - \overline{L}\right)\right] \cdot g\left[K\right]}{p \cdot \int_{\underline{K}}^{\overline{K}} \overline{D} \cdot U'\left[r_D \cdot \overline{D}\right] \cdot g\left[K\right]} > 0. \tag{4}$$

With $\frac{\partial r_D}{\partial \overline{L}} > 0$ depositors demand higher compensation the more banks invest in risky projects. They completely anticipate moral hazard on the bank side.[14]

To sum up, market structure of the banking sector influence stability through the asset side of the balance sheet of a bank via the lemon market for deposits. In absence of any regulation, small banks will invest in risky assets exclusively. As a result of asymmetric information these banks will engage nothing in riskfree bonds inducing a high degree of instability in the economy. This externality increases with the variance of the equity capital in the economy $\left[\underline{K}, \overline{K}\right]$. Thus, competitive banking leads to excessive risk-taking because of moral hazard and risk-shifting incentives.[15] In our model risky behavior raises the cost of funding for all banks so that depositors are indifferent: higher risk is compensated by a higher interest rate on deposits. In market equilibrium depositors consequently demand adjusted interest rates depending on the degree of risk-aversion and the market composition: whereas small banks do not have any incentive to invest in the safe asset, big banks partially internalize increasing refinancing costs and are more prudent. That is why big banks may welcome regulation and aim to force their competitors to hold more equity (or have an incentive to create off-balance sheet vehicles to benefit from being "small"). Indeed, reducing the variance of equity endowment in the banking sector is profit-enhancing for big banks.

Apart from the desire for regulation by some banks, the failure of a bank as a result of risky investment leads to social costs. These costs include externalities in form of contagion effects and disruptions of the payments system. Moreover contractions in the amount of available credit due to banking crises have negative effects on economic growth. Therefore there is not only a private, but also a public interest to intervene. In this context, regulation of bank's equity hoarding can be welfare improving.

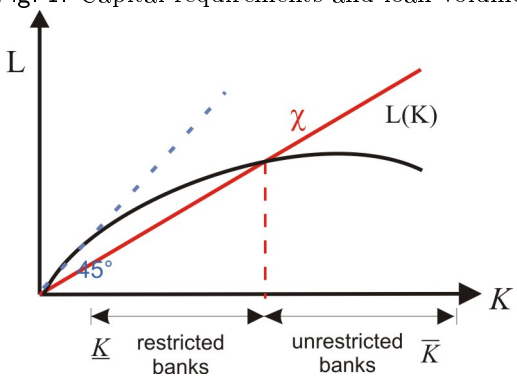
2.2 Introduction of capital requirements

Now we assume that a regulator imposes a minimum capital adequacy requirement in order to induce more stability in the banking sector. The simplest form of capital regulation is a lower bound to the ratio of capital to total assets - a leverage ratio restriction. In our model a leverage ratio restriction implies requiring a minimum amount of capital χ. In other words, banks will be required to have at least $K/L \geq \chi$.

As a result, for any given χ we can distinguish two groups of banks: those that are constrained by the capital requirement and those that can freely choose the level of lending because the χ is not binding for them. Of course, given our assumptions, an unconstrained bank will always fully invest according to her first best allocation (L^* that is characterized by equation 2) where marginal revenues equates marginal costs. However,

[14] The risk premium is higher, the more risk-averse the representative depositor.
[15] However in reality, due to frictions like switching costs, network effects and entry restrictions, perfect competition is not the norm in the banking sector.

Fig. 1: Capital requirements and loan volume



the constrained bank will invest under the regulatory constraint in the risky asset. Figure 1 illustrates this point: figure 1 plots the optimal function $L(K)$ that maximizes bank's expected profits. The concave $L(K)$-curve defines the optimal amount of loans invested in risky assets (regarding the volume of deposits D_i as fixed); so banks fare better if they invest according to this line.

The capital ratio introduced by a regulator now defines a fix relationship between risky assets L and equity capital K. Those banks which would optimally want to hold $K_i/L_i < \chi$ will be constrained and have to set $L_i = K_i/\chi$. The other banks with $K_i > K(\chi)$ *i.e.* the unconstrained banks, will set their capital-to-loans ratios optimally according to the $L(K)$-curve. But with $L_i = K_i/\chi$ the maximization problem for the constrained bank with superscript c is equal to:

$$E(\pi^c) = p\left(R \cdot \frac{K_i}{\chi} - r_D\left[\overline{L}, \chi\right] \cdot D_i\right) + s \cdot \left(D_i + K_i - \frac{K_i}{\chi}\right). \tag{5}$$

The low-capitalized banks with $K_i \leq \widetilde{K} = \chi \cdot L^*$ have to reduce its risky lending. With $E(r_L) > s$ an immediate consequence is that introducing a capital ratio χ acts as a capacity constraint for those banks diminishing expected returns. Since short term recapitalization is costly, capital requirements constrain bank's lending activity in our model. It is easy to see in figure 1 that capital requirements force low-capitalized banks to operate at a suboptimal scale and restrict the loan volume.[16]The direct effect of a contraction of bank $i's$ loan volume is a contraction of marginal return (MR) of the invested assets of a constrained bank, ceteris paribus. Thus, the new aggregate supply of lending is now given by $\overline{L} = \int_{\underline{K}}^{\widetilde{K}} \frac{K_i}{\chi} \cdot g[K] + \int_{\widetilde{K}}^{\overline{K}} (L^*) \cdot g[K]$.

Note that higher capital requirements are associated with less risky investments, since $\frac{\partial \bar{L}}{\partial \chi} < 0$ (see Apendix B). Keep in mind that this impact of χ on poorly capitalized banks has a feedback effect on the financing costs for all banks. If a poorly capitalized bank with $K \leq \widetilde{K}$ has to invest more in the safe asset, the equilibrium interest rate r_D that depositors demand will decrease. Consequently, an increase in the capital ratio acts as a disciplinary device inducing more stability in the banking sector by reducing the risky lending. This implies that the amount of the equity ratio that is favored by a bank i is strictly positive related to the endowment of equity capital.

Hence we can distinguish two effects of increasing capital ratios:

- An increase in capital ratio reduces the global banks' refinancing costs in the banking sector and increases its margins (positive refinancing effect), $\frac{\partial r_D}{\partial \chi} < 0$.
- A binding capital ratio forces some banks to reduce the investment volume of risky assets and therefore will diminish expected profits (negative restructuring effect), $\frac{\partial MR^c}{\partial \chi} < 0$.

[16] In theory, banks can respond to increased capital requirements via three ways: (1) asset liquidation, (2) recapitalization or (3) asset expansion. For simplicity and in accord with the literature we will assume the first case in our model.

If the bank i favors to be unconstrained, the most preferred capital ratio, denoted by χ, is equal to the capital ratio K_i/L_i the bank holds in status quo, since $\frac{\partial E[\pi_i]}{\partial \chi} > 0$. Here the restructuring effect is zero. However, there is the possibility that the positive refinancing effect still dominates the restructuring effect even if the later effect is positive. Then the costs resulting from the regulatory constraint on the lending volume are smaller than the gain of the sunken refinancing costs. Under this condition, the bank r_D prefers to be constrained by itself.

Proposition 2. *An increase of capital requirements leads to a reduction in the total supply of loans and a decrease of refinancing costs for all banks.*

The most notable results are those on competitive effects. Whereas the negative restructuring effect only affects poorly capitalized banks, the refinancing effect concerns all banks and reduces the negative externality. All banks benefit from lower refinancing costs as a result of a higher capital ratio, but only the constrained bank has to pay for it. Therefore, high capitalized banks will have an interest in raising the ratio while less capitalized banks on which the constraint is binding will press for a lower requirement. Less capitalized banks take into account that they will be punished for any capital ratio that is above their actual capital ratio. On the other hand, big banks with huge equity buffers suffer no costs as long as the ratio is not binding on them.[17]

Thus, defining any new capital ratio allocated by regulators has rent shifting effects between the two groups. The regulator implicitly either defines the rents and the beneficiary. Accordingly, those who are affected may try to influence the decision and have an incentive to lobby in order to set binding capital requirement in accordance to her *ex ante* level of K.

As a consequence, now the question does arise, which χ would a regulator implement. This is the issue of the next section.

2.3 Socially Optimal Regulation

As a reference point, before we focus on the lobbying-game between the two banking groups, we describe the capital ratio a social planner would implement. Keeping in mind that depositors are fully compensated by higher interest rates for higher risk, the only *ex ante* externality in this set-up exists between the banks on the refinancing market. If there were no asymmetries of information on the market for deposits and unlimited liability according to equation (2), each bank would pay an interest rate according to its risk behavior and there would be no externality. Accordingly a policy instrument that minimizes the variance of equity capital in the economy is welfare-improving.

However, for given $g[K]$, the capital ratio that would maximize profits of the average bank in the banking sector characterizes the efficient regulation policy, because here also no externality occurs.

$$G = \int_{\underline{K}}^{\widetilde{K}} \left(p \cdot \left(R \cdot \frac{K_i}{\chi} - r_D \left[\overline{L}\right] \cdot D_i \right) + s \cdot \left(D_i + K_i - \frac{K_i}{\chi} \right) \right) \cdot g[K] \tag{6}$$

$$+ \int_{\widetilde{K}}^{\overline{K}} \left(p \cdot (R \cdot L_i) + s \cdot (D_i + K_i - L_i) - r_D \left[\overline{L}\right] \cdot D_i \right) \cdot g[K].$$

[17] In the light of the financial crisis 2008 one may interpret low-capitalized financial institutions as investment banks, conduits and structured-investment vehicles (SIVs) that characteristically failed to have "free capital", i.e., capital in excess of regulatory requirements.

Since the organized banks contain few individuals, it ignores stakeholder rents, and thus has a utility function given by $V(\chi) \equiv G$ characterized in equation (6). The collective optimum is given by:

$$\chi^{Soz} = \left(- \frac{\int_{\underline{K}}^{\widetilde{K}} (p \cdot R - s) \cdot K_i \cdot g\left[K\right]}{\int_{\underline{K}}^{\widetilde{K}} \left(\frac{dr_D}{d\overline{L}} \cdot \frac{d\overline{L}}{d\chi} \right) \cdot D_i \cdot g\left[K\right]} \right)^{\frac{1}{2}} > 0. \tag{7}$$

In the optimum the negative marginal effect on the expected profit from the increased riskiness of the loan of the bank equals the positive marginal effect via a decrease in the refinancing interest rate. With respect to the current policy debate it is worth to mention that our result implies that a reduction of the total supply of loans is welfare-improving compared to a situation in a laissez faire world.

3 The Political Contest for Regulation

This section examines how lobbying affects the political equilibrium regulation scheme. As we have seen in the previous section regulation policy can be the source of rent transfers between market players. This rent transfer resulting from regulatory intervention may be contestable via the political allocation mechanism rather than purely designed by welfare-maximizing aspects discussed in section 2.3. Consequently, the regulated banks seeks to influence the outcome of the political decision process. In order to receive the favorable treatment of the regulator, the competitors spend money on marketing activities, lobbyists and other influence activities. We model the political contestable rent of capital regulation by contesting the capital ratio that will be implemented by the regulator.[18]

Specifically, suppose that the regulator's objective function $G\left(\sum_{i=1}^{N} E\left(\pi_i\right), \sum_{i=1}^{N} \lambda_i\right)$ depends on the banks' expected profits $E(\pi_i)$ and on the banks' lobbying efforts λ_i. If the regulator does not prefer to generate a contest and implements an optimal policy, then the value of the regulator's objective function is to maximize $\{G = V\}$ according to equation (6). It is plausible for the regulator to create a contest if and only if the existence of a contest increases the expected value of its objective function. That is,

$$G\left(\sum_{i=1}^{N} E\left(\pi_i\right), \sum_{i=1}^{N} \lambda_i\right) > \max\left\{G = V\right\}. \tag{8}$$

In the remainder of the paper we assume that this condition holds, *e.g.* a complete regulatory capture.

Now we introduce a first-price all-pay auction between banking groups, in which the competitor who expands the highest effort can determine the capital ratio with probability 1. In the initial situation there already exists a capital regulation policy in which some banks will be constrained by the capital ratio $\chi_0 = K_0/L_0$, whilst other banks will not. Since an increase in the capital ratio implies a regulatory rent for banks if $\chi \leq K_i/L_i$, these banks lobby for a policy change whereas low capitalized banks promote the regulatory status quo. Suppose that the chosen effort of both banks for influence-seeking activities translates deterministically into an unobservable variable.

3.1 Capital Regulation as first-price all-pay auction

Let the agents confront the opportunity of influencing the outcome of the political decision in determining the capital ratio. We model lobbying through a simple one-shot game, in which banks simultaneously donate some

[18] In our setting capital regulation is modelled as the outcome of the political game between the competitors in the banking sector. The risk-neutral banks compete for the political price that arises due to a policy choice of the regulator.

contributions λ_i to the regulator. Whether or not they are ultimately successful all players who participate in the political contest lose the resources which they spend in the attempt to influence the outcome of the contest in their favor. The regulator then chooses the policy that was demanded by the banking group which contributed the most. The other banks lose.

The timing of the game is as follows. In the first period, the banks offer the regulator a bribe schedule, λ. In the subsequent period, the regulator determines its policy, and collects the associated contributions. Finally, banks determine investments taking the regulation policy as given. We solve the model by backward induction.

Depositors are paid out r_D, and λ_i is the effort made by each bank of type i for influence-seeking activities. The optimality condition for the optimum amount of loans invested in the risky asset by bank i is thus easily seen as given by

$$p\left(R - s - r_D'\left[L_i\right]\frac{L_i}{\overline{L}} \cdot D_i - \lambda_i\right) = 0. \tag{9}$$

To solve for the Nash equilibrium in this lobbying game we have to determine the equilibrium effort for each bank.

3.2 Forming Lobby-Groups

Now, it is again helpful to classify different kinds of bank groups: (1) those banks that are constrained at the status quo (χ_0), (2) those who have equity buffers and (3) those that become constrained because of the increase of the capital requirements. Specifically, we now argue that the regulator faces the question whether he raises the capital ratio or not. Suppose that the regulator considers to implement a policy platform $\chi_1 > \chi_0$.[19] Now the contest between the banks involves a struggle between one group that defends the status quo and another group that challenges it by fighting for the new policy. The outcome of the contest depends on the stakes of the contestants and their expected efforts.

Obviously, those banks that are constrained in the status quo prefer no policy change and will spend effort ($\lambda_i \geq 0$) to promote the status quo. On the other side, it seems reasonable that those banks that are unconstrained in a scenario with the announced policy platform χ_1 will lobby for the policy switch. The most interesting group consists of those banks that are unconstrained in the status quo and become restricted with the new capital ratio. It is possible that some banks in this interval of $K_0 < K_i < K_1$ prefer to be constrained by themselves, namely if this obtains enough benefit in form of lower financing costs than the cost of restructuring, *e.g.* if the refinancing effect dominates the restructuring effect. To determine those banks that seek to change the current regulation, we can identify the marginal bank that is indifferent between the two policy platforms:

$$\underbrace{p \cdot (R \cdot L_i - (r_D[L, \chi_0] \cdot D_i))}_{\text{profit in case of} \chi_0} = \underbrace{p \cdot (R \cdot \hat{K}/\chi_1 - (r_D[L, \chi_1] \cdot D_i)) + s \cdot (D_i + \hat{K} - \hat{K}/\chi_1)}_{\text{profit in case of} \chi_1}. \tag{10}$$

The marginal restricted bank has an endowment of equity that is equal to

$$\hat{K} = \frac{p \cdot (R \cdot L_i - (r_D[L, \chi_0] \cdot D_i)) + p(r_D[L, \chi_1] \cdot D_i)) - s \cdot D_i}{p \cdot (R/\chi_1 + s - s/\chi_1)}. \tag{11}$$

[19] The regulator is not introduced as a player in the policy-determination game. The role of the regulator is analyzed in Epstein and Nitzan (2002) or Pastine and Pastine (2010).

As a result we can divide the banks with $K_0 < K_i < K_1$ into two groups. The former has a status quo preference ("defender"), the latter accept a higher capital ratio in exchange for cheaper refinancing ("challenger"). Thus, one obtains the following opponents in the political battle for influence: all banks with $K^D \leq \hat{K}$ support the status quo whereas all banks with $K^C > \hat{K}$ favor a policy switch. We label the number of all defending banks D and the number of challenging banks C.

3.3 Political Equilibrium

The value of each bank for or against a policy switch allocated in the contest υ_i is equal to the expected regulatory rent as a result of a policy change. In order to define banking group's i willingness to pay for lobbying activities we compare the aggregate sum of their member banks' profits of regulatory status quo with the profits in a situation with a capital ratio of χ_1. In other words, $\Upsilon_i = \sum_i^J |\pi_i(\chi_0) - \pi_i(\chi_1)|$. As mentioned above, the challengers would be the beneficiary of a policy switch, the defenders would loose. Thus all banks have a non-negative value to a policy switch allocated in the contest.

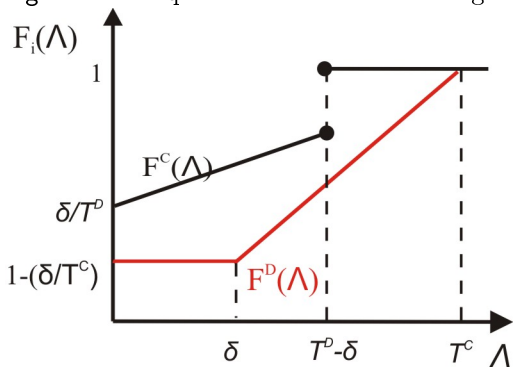
Each bank i chooses its efforts λ_i simultaneously and the cost of effort is simply $C(\lambda_i, J)$ with $C_{\lambda_i} > 0$ and $C_J > 0$. The positive derivative of the cost function with respect to the size of the associated banking group $J \epsilon [C, D]$ reflects the individual incentive to free ride on the lobbying of the other banks in this pressure group. The bigger the banking group the more virulent is the free riding problem and as a result the higher are the agency costs, e.g. costs for each banking group to coordinate. Differences with respect to banking groups' free riding problem equivalently translate into differences in cost of providing a given level of effort. Specifically, assume that one group consists of more banks than the competing banking group $D \neq C$. With this asymmetry and given $C_J > 0$ we can implement any market structure in a situation in which the smaller banking group has a headstart advantage; suppose, e.g., the contestants are symmetric with respect to their valuation of a policy switch, but the defending banking group consists of more banks than the challenging high-capitalized banks $D > C$. Then it becomes clear that $C^C(\Lambda^C) = \Lambda^C(\Upsilon^D/\Upsilon^C) \equiv \delta$ and $C^D(\Lambda^D) = \Upsilon^D$. In this case, the challenging banking group needs to expend almost δ units fewer than the opponent and still wins the contest. The probability of realization of the two policies in this complete information contest are formally given by the contest success function. It maps the vector of efforts into probabilities for the competing pressure groups. The challenging banking group with cumulative lobby effort $\Lambda^C = \sum_{c=0}^{C} \lambda$ wins with probability

$$\rho_1(\Lambda^D, \Lambda^C) = \begin{cases} 1 & \Lambda^C > \Lambda^D - \delta, \\ 1/2 & \Lambda^C = \Lambda^D - \delta, \\ 0 & \Lambda^C < \Lambda^D - \delta. \end{cases}$$

The probability that the defending pressure group wins is $\rho_0(\Lambda^D, \Lambda^C) = 1 - \rho_1(\Lambda^D, \Lambda^C)$.

Of course no bank has an incentive to spend more than his valuation of the regulatory rent υ. Thus, $\Upsilon^D - \delta$ defines the upper limit of reasonable efforts. For $\Upsilon^D = \Upsilon^C > 0$ the challenger group can guarantee itself a payoff of δ by spending just slightly more than $\Upsilon^D - \delta$. But even though there is complete information about valuations, each bank tries to make an inference as to what his competitor's strategy will be. If the challenger will spend $\Upsilon^D - \delta + \varepsilon$, the defender group has no incentive to stay in the public-policy contest. But by knowing this, the challenger would have an incentive to make only a very small effort and achieve a much larger payoff. As a result, there is no equilibrium in pure strategies, but in mixed strategies in intervall $\left[0, \Upsilon^D - \delta\right]$. The slope of the equilibrium cumulative distribution functions can be computed by the equilibrium payoff.

Fig. 2: Nash-equilibrium in mixed strategies



Proposition 3. *For $\Upsilon^D = \Upsilon^C$ the equilibrium outcome with asymmetric free riding ($\delta \neq 0$) is given by the cumulative distribution functions:*

$$F^C(\Lambda^C) = \begin{cases} \delta/\Upsilon^D + \Lambda^C/\Upsilon^D, & \Lambda^C \epsilon [0, \Upsilon^D - \delta], \\ 1, & \Lambda^C \geq \Upsilon^D - \delta \end{cases}$$

and

$$F^D(\Lambda^D) = \begin{cases} \delta/\Upsilon^C, & \Lambda^D \epsilon [0, \delta], \\ \delta/\Upsilon^C + \Lambda^D - \delta/\Upsilon^C, & \Lambda^D \epsilon [\delta, \Upsilon^D], \\ 1, & \Lambda^D \geq \Upsilon^D. \end{cases}$$

The mixed strategies in Lemma 3 are mutually optimal replies and characterize the equilibrium in the lobbying game.[20] Figure 2 illustrates this point. The callengers have the option to win for sure with a contribution just above $T^D - \delta$ whereas the slope between $0, T^D - \delta$ charactarizes the change in the probability to win if the banking group spends marginal more effort.

A remarkable feature of the equilibrium is that the bigger banking group, e. g. small banks have a disadvantage in the contest due to his higher agency costs. The free riding effectively constrains each pressure group. This group-effect δ does not change the basic nature of the political contest, there is still an equilibrium in mixed strategies, but it may swing the advantage from the high-valuation banking group to his competitor whose agency costs are lower. In equilibrium, if both banking groups have the same aggregate valuation of a policy switch, the smaller banking group is able to use this size-advantage to secure himself a positive expected payoff. In this context a highly concentrated banking sector generates less competition between lobby groups and hence garner fewer donations. However, at $\Upsilon^{-i} - \Upsilon^i = \delta$, the group effect for banking group i just offsets his disadvantage in the political contest from his low valuation of the policy switch. In this case the playing field is leveled and expected aggregate efforts are maximized.

After having presented our model with banks that are grouped together in two differently-sized lobbying rivals, which have different lobbying cost structures because of their different size, we now want to discuss some of the policy implications of our results and their applicability to the real world of banking in the next section.

4 Policy Implications

Our model's main policy implication is that high capitalized banks will always spend on lobbying costs to influence politicians and regulators to implement regulations in order to increase minimum capital requirements

[20] The mixed-strategy equilibrium was first derived by Hilman and Riley (1989) and is compactly summarized by Konrad (2007).

with detrimental effects to their competitors. Of course, this result follows from our empirically motivated assumption that there *are* big banks with huge equity endowment and small banks that are less capitalized. One can interpret the interest of big banks to tighten the regulatory standards as an attempt to increase their market share and to increase the entry barriers for potential competitors. We showed that policy interventions that lower the entry barriers i.e. lax capital regulation thereby intensivy competition may worsen the excessive risk-taking problem in our setup because risk-shifting incentives arise with decreasing market share. Whilst we agree that the heterogeneity of banks with respect to equity buffers is a strong assumption, we believe that the banking sector can indeed be characterized by this assumption. Our model's extension has shown that lobbying gets even more intense when there is a high degree of fragmentation in the banking sector. In case of Germany, this is an assumption which seems very plausible to make given empirical results of concentration measures in the banking industry. To provide some basic empirical motivation, we consider some key descriptive statistics of the German banking sector in the following table:

Selected statistics about banking groups in Germany
End of July 2010, in Millions of Euro
Source: Deutsche Bundesbank, Bankenstatistik

Banking group	Number of banks	size of balance sheet	loans to non-banks	capital
Large banks	4	1310865	407174	70629
Landesbanken	10	1392781	539672	65740
Sparkassen	430	1064262	652697	59699
Kreditgenossenschaften	1154	692991	398778	41162

Tab. 1: Selected statistics about banking groups in Germany; The four large banks (Großbanken) were in July 2010 the Deutsche Bank AG, Commerzbank AG, UniCreditbank AG and Deutsche Postbank AG. Sparkassen are the German savings banks. For more information about the banking groups please see the explanatory notes of the Bankenstatistik of the Deutsche Bundesbank.

The table gives the size of the relevant banking groups together with the total value of their combined balance sheets, loans to non-banks and capital. The four large German banks in July 2010 were the Deutsche Bank AG, Commerzbank AG, UniCreditbank AG and Deutsche Postbank AG. The aggregate balance sheet of the four large German banks is almost the same as the aggregate balance sheet of the ten German Landesbanken and around one-third larger than the aggregate balance sheet of all 430 German savings banks together. More importantly for our purposes, the aggregate capital of the four large banks is bigger than that of the savings banks. Our model's key assumption thus seems to be grounded well in the data for the German banking industry: There are only four large banks in Germany which have individually by far more capital than their competing savings banks which are individually small but large in number.

Finally, the current debate in Germany about new banking regulations under the so-called Basel III-accord deserves mentioning. Basically, German savings banks were initially opposed to stricter capital rules, whilst the large German banks were in favor of stricter rules on capital. Savings banks argued this would unnecessarily reduce loan supply to businesses and households.[21] The Association of German Public Sector Banks (VÖB) representing the ten Landesbanken as well as the development banks owned by the federal and state governments declares the Basel III agreement as regulatory blind flying with unknown consequences for the German banks and companies. Instead large banks believe they would be well-enough equipped with capital to satisfy the more stringent higher capital ratios, for example the Deutsche Bank AG announced that they

[21] See Zentraler Kreditausschuss (an association of German savings banks like Volksbanken, Raiffeisenbanken, Sparkassen- und Giroverband) Position Paper on the Consultative Document of the Basel Committee "Strengthening the Resilience of the Banking Sector". In particular note their statement on page 3: "There is a need for a grandfathering clause of at least 30 years for own funds instruments which are recognised as such under the current rules in order to give the institutions time to adjust to the new conditions and to avoid provoking friction in lending."

will be able to fulfill the Basel III requirements already in the year 2013. Thus, even though it is unclear as to *why exactly* savings banks were initially opposed to higher capital ratios, this would in fact be in line with the model we presented above. In our case, small banks loose by not being able to optimally - and fully - invest in the risky asset, whilst large banks gain from cheaper refinancing conditions on the deposit market. Needless to say, our model is highly stylized, but we believe the basic line of argument can be applied to different forms of banking regulations with similar results.

5 Conclusion

Regulatory intervention gives rise to political contests in which the regulatory scheme is determined by the existing status quo and some new public policy proposal. In this paper we analyze the competitive effects of capital regulation and its feedback on the public policy contest. Without regulatory intervention asymmetric information results in excessive risk-taking because of moral hazard and risk-shifting incentives. The immediate effect of the introduction/ an increase of capital requirements is a reduction in the total supply of risky loans and accordingly a shortfall of refinancing costs in the banking sector. Thereby the regulator indirectly affects the stakes of the competitors and their equilibrium expected profits. Since short-term recapitalization is costly, capital requirements temporarily constrain the bank's lending activities of low-capitalized banks. With this capacity constraint, it has been shown that, depending on the equity endowment of the banks defining a new capital ratio has rent shifting effects within the banking sector. An increase of capital requirements decreases the low capitalized bank's margins inducing them to shift their portfolio choice, while high capitalized banks benefit from lower refinancing costs.

Thus, in contrast to the literature of the impact of capital regulation, this analysis suggests that some banks may benefit from the introduction of binding capital constraint due to regulatory requirements. This certain demand for regulation provides the ground for a political contest for capital regulation. Our results demonstrate the importance of the market as well as the organisation structure of the banking market. When competition is intense, the incentives to take risk are maximal, since the risk assumed by the investments of the individual bank is not observable. So we have argued that increasing capital requirements may stabilize the banking system because it lowers the variance of equity buffers and thereby low-capitalized competitors to take less risk.

In the political equilibrium higher capitalized banks make it more likely that the regulator implements the policy alternative they prefer (an increase in capital requirements). This trend is reinforced the higher the headstart advantage of this challenging banking group, e.g. the lower their coordination costs for the lobbying game. If high-capitalized banks have a bigger market-share, they need to expend almost δ units fewer than the opponent and still win the contest. If both groups have the same aggregate valuation of a policy switch, the smaller one is able to use its size-advantage. Thus, our model suggests that a highly concentrated banking sector generates less competition between lobbyist, garners fewer donations and leads to more prudent investments.

However, one may argue that competition also lower the rates that firms have to pay for loans and may improve the average quality of loan applicants (see Boyd and De Nicolò 2005). Banks may not fully control the risk-taking of their portfolio. Taking this into account, Boyd and De Nicolò stated a U-shaped relationship between competition and excessive risk-taking. When both banks and firms have to monitor their investments there is a potential ambigious relationship between market structure and risk-taking. Available empirical evidence points out a complex relationship between concentration and stability and has not so far come to a consensus.[22]

[22] see Vives (2010) for an overview.

The simple model presented here deserves some comments. To simplify the analysis and to focus on competitive effects of capital regulation in a banking sector with heterogenous banks, we have build a model with no possibilities of discrimination between heterogenous banks by depositors in setting the interest rate. Yet we argue that our modelling captures a key feature of the financial sector that was highlighted by the financial crises: a high degree of opaqueness where the signaling by banks for example with capital endowment declared in the balance sheet is seen as cheap talk. This assumption illustrates a finding of the Basel Committee (2009) saying that, as they went to the crisis, large banks had equity amounting to only 2% of their balance sheets - despite regulatory requirements of 10%. However, a natural extention of our model would include the possibility of depositors to observe banks' capital or screening possibilities before setting default premia. The incorporation of the effects of transparency on the political equilibrium seems to be a fruitful area for future research..

A second line of future research is to conduct a more thorough analysis of the optimal field of lobby activities by banks. So far we have concentrated our view on the political contest for the degree of tightness of the capital regulation. But one may think of alternative policy instruments that would change the risk-allocation for example monetary policy. Via influencing the interest rate set by the central bank, thereby the opportunity costs of depositors, banks may seek to distort the arbitrage condition of investors strategically. Incorporating the decision under which conditions a bank should lobby for capital adequacy rules or monetary policy changes into our model is a promising project for future extentions.

A Appendix: Proof of Proposition 1

The implicit equation for the optimal amount of loans invested in the risky asset L^* for $s \cdot (D + K_i - L_i) < r_D\left[\overline{L}\right] \cdot D$ is given by

$$R - s = r'_D\left[L_i\right] \frac{L_i}{\overline{L}} \cdot D_i,$$

with $\overline{L} = L_i + L_{-i}$, where L_{-i} is the aggregate loan volume of bank i' s competitors. For each bank the interest rate on the deposit market can be described by a function $r_D\left[L_i + L_{-i}\right]$, which incorporates the banking sector's investment in the risky market. Substituting r'_D (cf. equation 4) yields

$$R - s = \underbrace{\left(\frac{s \cdot (1-p) \cdot \int_{\underline{K}}^{\overline{K}} \cdot U'\left[s\left(\overline{D} + \overline{K} - L_i - L_{-i}\right)\right] \cdot g\left[K\right]}{p \cdot \int_{\underline{K}}^{\overline{K}} \overline{D} \cdot U'\left[r_D \cdot \overline{D}\right] \cdot g\left[K\right]} \right)}_{>0} \frac{L_i}{L_i + L_{-i}} \cdot D_i.$$

Hence for $U' > 0$, we can rewrite this as

$$L_i^* = (R - s) \cdot \frac{L_i^* + L_{-i}}{D_i} \cdot \left(\frac{p \cdot \int_{\underline{K}}^{\overline{K}} \overline{D} \cdot U'\left[r_D \cdot \overline{D}\right] \cdot g\left[K\right]}{(1-p) \cdot s \cdot \int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D} + \overline{K} - L_i^* - L_{-i}\right)\right] \cdot g\left[K\right]} \right) > 0. \tag{12}$$

Comparing this optimality condition with the corresponding investment problem under unlimited liability

$$L^{Soz} = (p \cdot R - s) \cdot \frac{L_i^* + L_{-i}}{D_i} \cdot \left(\frac{p \cdot \int_{\underline{K}}^{\overline{K}} \overline{D} \cdot U'\left[r_D \cdot \overline{D}\right] \cdot g\left[K\right]}{(1-p) \cdot s \cdot \int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D} + \overline{K} - L_i^* - L_{-i}\right)\right] \cdot g\left[K\right]} \right) > L_i^* \tag{13}$$

shows the inefficient overinvestment in the risky investment market. Furthermore, we can total differentiate (12) in order to derive the optimal reaction of a bank to the investments behaviour of its competitors:

$$dL_i^* = \left(\frac{R-s}{D_i}\right) \cdot dL_i^*(\cdot) + \frac{s \cdot (1-p) \cdot \int_{\underline{K}}^{\overline{K}} U'[-s] \cdot g[K]}{\left((1-p) \cdot s \cdot \int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D}+\overline{K}-L_i^*-L_{-i}\right)\right] \cdot g[K]\right)^2} \cdot dL_i$$

$$+ \left(\frac{R-s}{D_i}\right) \cdot dL_{-i}^*(\cdot) + \frac{s \cdot (1-p) \cdot \int_{\underline{K}}^{\overline{K}} U'[-s] \cdot g[K]}{\left((1-p) \cdot s \cdot \int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D}+\overline{K}-L_i^*-L_{-i}\right)\right] \cdot g[K]\right)^2} \cdot dL_{-i}.$$

Rearranging leads to

$$\frac{dL_i^*}{dL_{-i}} = \frac{\frac{R-s}{D_i}(\cdot) + \frac{\int_{\underline{K}}^{\overline{K}} U'[-s] \cdot g[K]}{(1-p) \cdot s \cdot \left(\int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D}+\overline{K}-L_i^*-L_{-i}\right)\right] \cdot g[K]\right)^2}}{1 - \frac{R-s}{D_i}(\cdot) - \frac{\int_{\underline{K}}^{\overline{K}} U'[-s] \cdot g[K]}{(1-p) \cdot s \cdot \left(\int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D}+\overline{K}-L_i^*-L_{-i}\right)\right] \cdot g[K]\right)^2}}. \tag{14}$$

From equ. (14) it is not straightforward to see whether an increase in L_{-i} increases or decreases L_i and hence which effect the competitors investment behavior has on L_i. However, it can be shown that for $\frac{R-s}{D_i}(\cdot) + \frac{\int_{\underline{K}}^{\overline{K}} U'[-s] \cdot g[K]}{(1-p) \cdot s \cdot \left(\int_{\underline{K}}^{\overline{K}} U'\left[s\left(\overline{D}+\overline{K}-L_i^*-L_{-i}\right)\right] \cdot g[K]\right)^2} < 1$, the loan volumes are strategic complements. The marginal increase in the competitors' loan volumes translates into a rise in the loan volume. Thus, the decrease in the competitor loan volumes induces a bank i to decrease its loan volume even further and so on. This illustrates the risk-mitigating effect of rising market dominance in the market of loans. The moral hazard behavior of big banks is limited. Hence, when the competitors' reactions are taken into account, there is a strong tendency for banks to take less risk in response to an increase in market share. In turn, this implies that there is a tendency to take excessive risk in highly competitive market structures.

B Appendix: Proof of Proposition 2

We first show that the loan volume in the banking sector shrinks as capital requirements increase. Consider the loan market volume in the banking sector:

$$\overline{L} = \int_{\underline{K}}^{\widetilde{K}} \frac{K_i}{\chi} \cdot g[K] + \int_{\widetilde{K}}^{\overline{K}} (L_i^*) \cdot g[K], \tag{15}$$

where χ is the capital minimum requirement. For given $\chi > \frac{K}{\overline{L}}$ the derivative with respect to χ yields

$$\frac{d\overline{L}}{d\chi} = \int_{\underline{K}}^{\widetilde{K}} \left(\frac{-K_i}{\chi^2}\right) \cdot g[K] < 0. \tag{16}$$

The introduction of capital requirements that are at least binding for one bank results in a contraction of risky loans. As shown above, the contraction of $\overline{L}$ leads to a reduction in the interest rate r_D demanded by depositors:

$$\frac{dr_D}{d\overline{L}} = \frac{\frac{dU(s^D D)}{d\overline{L}}}{\frac{dU(s^D D)}{di}} = \frac{-\int_{\underline{K}}^{\overline{K}} -s \cdot U'\left[s\left(\overline{D}+\overline{K}-\overline{L}\right)\right](1-p) \cdot g[K]}{\int_{\underline{K}}^{\overline{K}} \overline{D} \cdot U'\left[r_D \cdot \overline{D}\right] \cdot p \cdot g[K]} > 0. \tag{17}$$

References

[1] Abrams, Burton A. and Russell F. Settle (1993), "Pressure-group Influence and Institutional Change: Branch-banking Legislation During the Great Depression", *Public Choice* 77, pp. 687-705.

[2] Allen, Franklin and Douglas Gale (2004), "Competition and financial stability", *Journal of Money, Credit and Banking* 36, pp. 453–80.

[3] Alesina, Alberto and Allan Drazen (1991), "Why are Stabilizations Delayed?", *American Economic Review* 81, pp. 1170-88.

[4] Basel Committee on Banking Supervision (2009), "Strengthening the Resilience of the Banking Sector", Consultative Document, Bank for International Settlements, Basel 2009.

[5] Becker, Gary (1983), "A Theory of Competition among Pressure Groups for Political Influence", *Quarterly Journal of Economics* 98, pp. 371 - 400.

[6] Boyd, John and Gianni De Nicolò (2005), "The Theory of Bank Risk-taking and Competition Revisited", *Journal of Finance* 60, pp. 1329-43.

[7] Coates, Dennis and Bonnie Wilson (2010), "Banking Crises: Do Special Interest Groups Matter?", *mimeo.*

[8] Dewatripont, Mathias, Rochet, Jean-Charles and Jean Tirole (2010), "Balancing the Banks: Global Lessons from the Financial Crisis", Princeton University Press 2010.

[9] Epstein, Gil and Shmuel Nitzan (2002), "Endogenous Public Policy, Polarization and Welfare", *Journal of Public Economic Theory* 4, pp. 661 - 77.

[10] Flannery, Mark and Kasturi Rangan (2002), "Market Forces at Work in the Banking Industry: Evidence from the Capital Buildup of the 1990s", AFA 2003 Washington, DC Meetings; EFA 2002 Berlin Meetings Presented Paper.

[11] Goodhart, Charles and Ashley Taylor (2006): "Procyclicality and Volatility in the Financial System: The Implementation of Basel II and IAS 39", in S. Gerlach und P. Gruenwald (ed.) *Procyclicality of Financial Systems in Asia*, New York 2006.

[12] Gropp, Reint and Florian Heider (2010), "The Determinants of Bank Capital Structure", *Review of Finance* 14 (4), pp. 587- 622..

[13] Grossman, Gene and Elhanan Helpman (2001), *Special Interest Politics*, MIT Press, Cambridge, Mass. 2001.

[14] Hardy, Daniel (2006), "Regulatory Capture in Banking", *IMF Working Paper* 06/34.

[15] Hillman, Arye and John Riley (1989), "Politically Contestable Rents and Transfers", *Economics and Politics* 1, pp. 17 - 39.

[16] Igan, Deniz, Mishra, Prachi and Thierry Tressel (2009), "A Fistful of Dollars: Lobbying and the Financial Crisis", *IMF Working Paper* 09/287.

[17] Johnson, Simon (2009), "The Quiet Coup", The Atlantic Montly Group, *http://www.theatlantic.com/magazine/archive/2009/05/the-quiet-coup/7364.*

[18] Konrad, Kai (2007), "Strategy in Contests - An Introduction", *WZB-Markets and Politics Working Paper* 2007-01.

[19] Kroszner, Randall and Philip Strahan (1999), "Obstacles to Optimal Policy: The Interplay of Political and Economics in Shaping Bank Supervision and Regulation Reforms", *NBER Working Paper* 7582.

[20] Laffont, Jean-Jacques (1999), "Political Economy, Information and Incentives", *European Economic Review* 43, pp. 649 - 69.

[21] Nitzan, Shmuel (1993), "Modeling Rent-Seeking Contests", *European Journal of Political Economy* 10, pp. 41 - 60.

[22] Pastine, Ivan and Tuvana Pastine Nitzan (2010), "Politician Prefeences, Law-Abiding Lobbyists and Caps on Political Contributions", *Public Choice* 145, pp. 81 - 101.

[23] Stigler, George (1971), "The Economic Theory of Regulation", *Bell Journal of Economics* 2, pp. 3–21.

[24] Vives, Xavier (2010), “Competition and Stability in Banking”, *CESifo Working Paper* 3050.

[25] Zentraler Kreditausschuss (2010), "Strengthening the Resilience of the Banking Sector", *Position Paper on the Consultative Document of the Basel Committee*, April 2010.