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# Do public banks have a competitive advantage?

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**by**

**Astrid Matthey**

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# Do Public Banks have a Competitive Advantage?

Astrid Matthey*

December 5, 2007

**Abstract**

Private banks often blame state guarantees to distort competition by giving public banks the advantage of lower funding costs. In this paper I show that if borrowers perceive the public bank as supporting economic development, private banks may be able to separate firms by self selection, enter the market, and obtain profits in equilibrium despite their cost disadvantage. The public bank's competitive advantage may be offset, independently of what its true objective function is. Even perfect competition between private banks does not lead to zero profits.

JEL classification: G21

Keywords: public banks, state guarantee, self-selection

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# 1 Introduction

Public banks that hold state guarantees on their deposits often enjoy lower funding costs than private banks in the same market. Wherever this is the case, this cost difference tends to be blamed to distort competition in favor of the public bank.

In this paper, I show that the support of the state may turn out to be a disadvantage for the public bank. The reason is that public (i.e., state-owned) and private banks do not only differ in funding costs, but also in their perceived objective function. To what extent the true objective functions differ is subject to debate. But public banks usually have the *mandate* to support the economy, which they cannot publicly breach. Accordingly, most borrowers assume that if they take out a loan from the public bank their firm will not get liquidated at the first sign of financial difficulties. Independently of the public bank's true objective function this perception may suffice to allow private banks to enter the market, separate the borrower pool, and obtain profits in equilibrium. What was meant as a policy to support the economy may turn out to increase the interest rates for all borrowers. Interestingly, even perfect competition between private banks does not drive profits to zero, or interest rates to a minimum.

Consider a loan market with safe and risky firms, where risky firms are those that have a higher probability of experiencing financial distress. The incumbent public bank initially serves the whole market at a uniform pooling rate. Now the market opens for competition. If private banks have higher funding costs but are otherwise equal to the public bank, their loan offers are not competitive, and the public bank continues to serve the whole market. This is the stylized case that may be cited to show the adverse effect of state guarantees.

However, since private banks are not restricted in setting their policy, they can offer a contract that includes the liquidation of all borrowers in financial distress but an interest rate lower than that of the public bank. Due to its mandate, the public bank cannot compete by offering a similar contract. The private banks' loan is more attractive for safe than for risky firms, since risky firms have a higher probability of being in financial distress, that is, a higher probability of inefficient

liquidation under the private banks' loan. Hence, private banks can induce firms to separate by self-selection and lend only to safe firms. Safe firms produce higher expected returns, such that the private banks can offer lower interest rates than the public bank and still overcome their cost disadvantage. The public bank is left with the risky firms.
This result is confirmed by data on the German loan market for small and medium-sized firms. It shows that a relatively higher share of firms with a low (self-reported) degree of creditworthiness borrow from public banks (73%) than from private banks (19% ). For firms with a high (self-reported) degree of creditworthiness, the difference is less pronounced (51% vs. 30%) (Paul et al, 2007). This tendency is consistent with data which shows that especially very small firms (up to 10 employees), which are usually seen as being risky, tend to borrow from public banks (BDS/DGV, 2007).

A key component of the private banks' strategy to separate firm types is the credibility of their threat to liquidate all firms in financial distress. Since their lower interest rate attracts all firms, only the liquidation threat keeps risky firms from applying for their loans. Accordingly, private banks have to develop a long-term strategy, and ensure that the profits from repeatedly lending to safe firms exceed the one-time profits from extending the loans of distressed but viable firms instead of liquidating them. This eliminates the incentive to deviate from the announced strategy and makes the liquidation threat self-enforcing. It implies that even under perfect competition private banks can sustain profits in equilibrium.

Two of the model's assumptions merit additional explanation. First, by focusing on the competition between the two types of banks, I implicitly assume that firms do not have other sources of external funding. In particular, they cannot issue stocks or bonds. This seems a realistic assumption for the sector of small and medium-sized enterprises, which form a large part of the economy, for example, in Germany. In addition, it applies to almost all firms in countries with less developed financial markets. However, ruling out other sources of funding also means that I ignore any implications that the competition between banks and financial markets may have on the behavior of banks. (For literature on how different firms choose between bank finance and, e.g., bonds, see Diamond, 1991,

Houston and James, 1996, Johnson, 1997, Bolton and Freixas, 2000). For example, in the model of Chemmanur and Fulghieri (1994) banks compete with financial markets. There, establishing a reputation for auditing firms in distress creates a competitive advantage for the bank over bond holders. Obviously, their result contrasts sharply with mine, and a combination of both strategies could hardly be pursued. Which strategy a bank prefers may ultimately depend on the relative importance of the different groups of customers.

The second important assumption is the perceived restriction of the public bank's objective function. The evidence on what objective public banks actually follow is mixed. Bichsel and Spielmann (2004) do not find that public banks in Switzerland1 set lower rates than private ones, suggesting that they maximize profits just as their private competitors. In contrast, Sapienza (2002) finds that public banks set lower rates than private banks in Italy, though she cannot clearly determine the motive for this behavior. More generally, Yeyati, Micco and Panizza (2004) find no strong evidence for public banks either promoting or hindering economic development.
However, public banks have a *mandate* to support the economy (see their statutes, e.g., in Germany and Switzerland). For example, in Germany public banks ("Sparkassen") are obliged to "ensure an appropriate and sufficient provision of money and loans to all parts of the population and especially to small and medium-sized enterprises" (§4, no. 1, Niedersächsisches Sparkassengesetz 16.12.2004 / 15.11.2005). This means that, whatever their true objective function is, they are not able to announce profit maximization as their single goal, but at least have to *claim* to follow policies in support of economic development.

In addition to this legal requirement, public banks indeed communicate to the public a business policy which is not exclusively based on profit maximization. The german association of (public) savings banks (Sparkassenverband) describes the "orientation towards common welfare, based on economic performance" (DSGV, 2007) as one important pillar of its policy. This policy receives support by the so called "regional principle", which limits the public banks' activities to a certain geographic region. Referring to this principle, public banks are perceived as having a natural interest in the economic prosperity of the region they are based in

(see, e.g., SGK, 2006). The banks themselves enforce this perception by stating explicitly that they "support the firm even through critical times as long as it is economically [..] justifiable" (Sparkassenfinanzgruppe, 2007). Overall, this strategy seems to be successful in convincing people that public banks are different from private banks. For example, the Reader's Digest finds that for all years between 2001 and 2007, the "Sparkassen" were the banks that Germans trusted most (Reader's Digest, 2007). A similar picture arises in several other European countries where strong non-private banks exist (e.g., in Austria, France, Netherlands, Switzerland and Russia, where public and cooperative banks head the list).

This justifies the assumption that a considerable share of firms *perceives* public banks as granting firms in financial difficulties a chance to complete their projects if they turn out to be viable. Apart from this perception, however, I do not assume that public banks differ in their policies from private banks. Rather, I analyze their behavior as profit maximizers. Hence, in contrast to the literature on soft budget constraints (SBC; see, e.g., Dewatripont and Maskin, 1995; Maskin, 1996) I do not assume that the state encourages the public bank to make unprofitable loans, but to assess the viability of all firms in distress. Projects that are not viable are liquidated. Hence, the interference of the state does not soften the budget constraints of the public bank's borrowers, but restricts the bank's strategy space within the scope of profitable business strategies. "Risky loans" in this context are those with a positive, though lower net present value (NPV). Bad projects in the sense of the SBC literature, i.e., projects with an ex-ante negative NPV, are assumed to be detected through a pre-loan audit. This audit is able to distinguish negative NPV from positive NPV projects, i.e., to determine the rough quality of a project, but not to distinguish between different types of profitable projects. This assumption can be interpreted, e.g., as banks being able to assess the technological quality of a project, but not the quality of the management.

Note that if the public bank audits all firms in distress and extends the loans of viable firms, the firms' perception of the public bank being "nicer" than the private banks is confirmed, even if the bank has the underlying objective of profit maximization. Accordingly, the firms' beliefs of the public bank auditing firms in distress are equilibrium beliefs.

Contrary to some recent work that found state-owned banks to be less efficient than their privately-owned competitors (Caprio et al., 2004; La Porta et al., 2002), I do not assume the public bank to be inefficient per se. On the one hand, such an assumption would obscure the focus of the paper, which is on the implications of the competition between private and public banks. On the other hand, in some countries, public banks were found to be as efficient or even more efficient than private financial institutions (see Altunbas, Evans, Molyneux, 2001, for evidence from Germany), such that no final conclusion can be drawn on the prevailing situation.

The argument I develop is based on a simple self-selection mechanism as introduced by Rothschild and Stiglitz (1976). But rather than themselves offering two different contracts, the private banks use the restriction of the public bank's strategy space and offer a contract that this bank is unable to offer. There emerges a separation of agents and principals, where the private banks separate intentionally, while the public bank separates unintentionally. Since private banks have to keep up this separation to stay in the market, positive profits persist despite perfect competition.

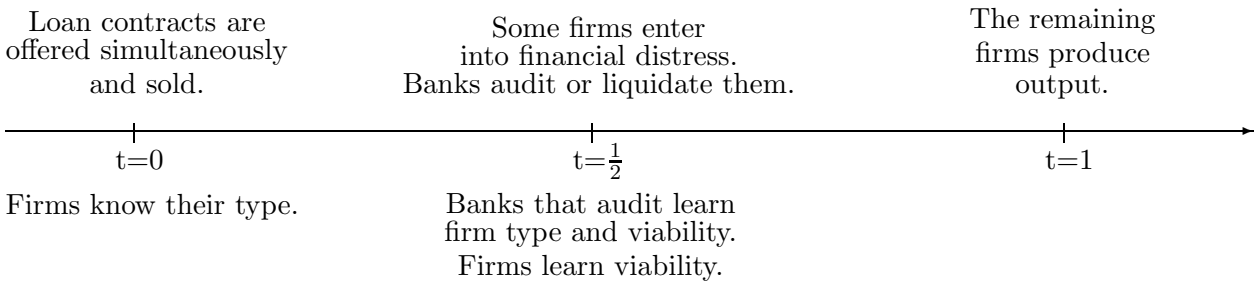
In sections 2 and 3 I develop the model and describe the pooling equilibrium. Separation is analyzed in section 4, while section 5 derives the credibility condition. Section 6 concludes. Proofs are in the appendix.

## 2 Model

There are two types of firms, safe and risky, indexed $s$ and $r$, respectively. Firm types are private information, i.e., only the firm itself knows its type. Each firm has a single investment project that requires external finance in $t = 0$ and produces output $x_j$ in $t = 1$, $j \in \{s, r\}$ (see figure 1 for the sequence of events). Investment is normalized to 1. All projects have non-negative net present value. As mentioned above, this could be the result of a pre-contract audit, which assesses the hard facts of a project, but not the soft facts like the risk attitude of the management, its skill, etc. Lending occurs recurrently in each period, and loan contracts are

offered simultaneously. In this and the next two sections, I analyze only one loan cycle, $t = 0$ to $t = 1$. In section 5 I extent the analysis to an infinite horizon.

Figure 1: Sequence of events in one loan cycle




In $t = \frac{1}{2}$, some firms enter into financial distress. In this case, with probability $p_v$ the firm is viable and able to produce output $x_j$ in $t = 1$. With probability $1 - p_v$ it produces nothing. The a priori quality of a firm (safe or risky) is not related to the probability that a distressed firm is viable. If liquidated in $t = \frac{1}{2}$, firms of either type return a liquidation value of $y$.

Safe firms have a lower probability of distress than risky firms, $p_s < p_r$, and a higher expected output, $(1 - p_s)x_s > (1 - p_r)x_r$. But their output in case of success is lower than that of risky firms, $x_s < x_r$. This assumption captures the fact that risky firms are not bad per se but might well have a higher possible output than safe firms, e.g., because their managers take higher risks. Relaxing this assumption strengthens rather than weakens the argument.

There are two types of banks in the market: an incumbent public bank, indexed $pu$, and a number of private banks, indexed $pr$, that attempt to enter the market. In the model, the sector of private banks is treated as one entity. Neither type is assumed to be budget-constrained, i.e., both could serve the whole market. However, banks are not allowed to incur expected losses in any period. This means that I do not consider price wars as in the entry games of Benoit (1983,1984) or Fulghieri and Nagarajan (1996), where banks can fight competitors at the price of making losses in these periods. The public bank holds a state guarantee on its liabilities and enjoys lower funding costs than the private banks, $r_{pu} < r_{pr}$, where $r_i$ with $i \in \{pu, pr\}$ includes face value and interest. $R_i$ denotes the loan

repayment that bank $i$ charges its borrowers, with $R_i \geq r_i \geq 1$.

Financial distress in $t = \frac{1}{2}$ gives banks the right to foreclose loans, even though the loans are due only in $t = 1$. This may be due, e.g., to the firm defaulting on coupon payments (which I do not explicitly model). An alternative interpretation is that the bank does not grant an essential follow up loan, which leads to the insolvency of the firm due to liquidity problems.
Distress can be caused by two events. First, temporary liquidity shortages can force economically viable firms into distress. These firms produce output $x_j$ in $t = 1$ if their loan is extended. Second, firms can be unprofitable due to, e.g., strategic mistakes, unfavorable market development etc. that occurred between $t = 0$ and $t = \frac{1}{2}$. These firms will not produce output in $t = 1$ even if their loan is extended. Their value in $t = 1$ is zero. Hence, in $t = \frac{1}{2}$ it is efficient for a bank to extend the loan in the first case but liquidate the firm in the second.

To distinguish the two cases, banks can audit firms. The audit reveals unprofitable firms with certainty and viable firms with an error margin. $q$ denotes the quality of the audit, i.e., the conditional probability that an economically viable firm in financial distress is identified as such.[1] If the firm is identified as viable, the bank extends its loan but renegotiates the loan contract to obtain a share $k_j$ of the output. The firm's output $x_j$ is known in $t = \frac{1}{2}$, i.e., the firm type is revealed through the audit. For the renegotiation, I assume a form of Nash bargaining where both players receive equal shares of the surplus over the original repayment, $\frac{x_j - R_i}{2}$, and the bank additionally receives its repayment $R_i$. Hence, the bank receives a share $k_j = \frac{x_j + R_i}{2x_j}$ of $x_j$, while the firm receives $1 - k_j = \frac{x_j - R_i}{2x_j}$ of $x_j$. The audit is assumed to have a positive expected value, i.e., it is ex-ante efficient to audit all firms in distress. Since it does not affect the argument, I set the discount factor between $t = 0$ and $t = 1$ to one.

[1] This means that I assume the audit to produce Type II error of $1 - q$ but no Type I error (see Chemmanur and Fulghieri, 1994, for a similar renegotiation outcome). A possible explanation for this assumption is that banks only renegotiate a loan if they are certain that the expected output will be produced. If there are doubts, they prefer to liquidate. I do not explicitly include costs of the audit. However, they would strengthen rather than weaken the argument.

# 3 Pooling

Consider the static game where banks interact only once. The two types of banks simultaneously enter the market for loans, and compete for borrowers. Since auditing firms in distress is ex-ante efficient, it is a dominant strategy in the static game. Accordingly, private banks cannot credibly commit to liquidating firms in distress. This means that they cannot separate borrower types, since all firms would be attracted if they offered a lower repayment. The quality of the audit is assumed to be the same for all banks, e.g., as the result of a commonly available audit technique. Banks compete only in loan repayments. Firms then obtain profits under pooling of

$$P_j^{pool} = (x_j - R_i^{pool})(1 - p_j + \frac{1}{2}p_j p_v q)$$

where $R_i^{pool}$ denotes the repayment that bank $i$ charges a pooled firm population. Given the firms' participation constraints, $P_j^{pool} \geq 0$, banks can charge maximum repayments of $R_r^{max} = x_r$ for risky firms and $R_s^{max} = x_s$ for safe firms. Since $x_s < x_r$ by assumption, $x_s$ is binding for the repayment if a bank wants to lend to all firms.

However, depending on the parameters, it may be more profitable for a bank to set $R_i^{pool} = x_r$ and lend to risky firms only, instead of serving the whole market at a repayment of $x_s$. Since credit rationing is not the focus of this paper, I assume that the share $\phi$ of safe firms in the population is large enough such that credit rationing is not profitable for the banks, i.e., the profit from lending to safe firms cannot be overcompensated by charging all risky firms a higher rate:

$$\textbf{A1:} \qquad \frac{\phi}{1-\phi} > \frac{(x_r - x_s)(1 - p_r + \frac{1}{2}p_r p_v q)}{(1-p_s)x_s + p_s(y + p_v q(x_s - y))} \quad .$$

Banks then obtain expected profits

$$\Pi_i^{pool} = \overbrace{\phi\,[(1-p_s)R_i^{pool} + p_s(y + p_v q(\frac{1}{2}(x_s + R_i^{pool}) - y))]}^{\text{exp. profit from lending to safe firms}} + \underbrace{(1-\phi)\,[(1-p_r)R_i^{pool} + p_r(y + p_v q(\frac{1}{2}(x_r + R_i^{pool}) - y))]}_{\text{exp. profit from lending to risky firms}} - r_i.$$

Neither type of bank is allowed to incur losses in expectation, i.e., banks' participation constraints are given by $\Pi_i^{pool} \geq 0$. Banks therefore have to charge minimum repayments of

$$R_i^{pool,min} = \frac{2(r_i - \bar{p}y) + p_v q(2\bar{p}y - \bar{px})}{2(1-\bar{p}) + p_v q\bar{p}} \quad (1)$$

where $\bar{p} = \phi p_s + (1-\phi)p_r$ and $\bar{px} = \phi p_s x_s + (1-\phi)p_r x_r$.

With $r_{pu} < r_{pr}$, the public bank can charge a lower repayment than the private banks. Here as in the rest of the paper, I assume that if firms are indifferent between the two banks, they stay with their status quo bank. Since the public bank is the incumbent, initially it is the status quo bank for all firms. Accordingly, if banks compete, the public bank can offer $R_{pu}^{pool} = R_{pr}^{pool,min}$, the lowest profitable rate of the private banks, and lend to all firms in the market. The results for a pooled market are summarized in proposition 1

**Proposition 1** .
*i) Consider the situation where A1 is fulfilled and the public bank is the only lender in the market. In equilibrium the public bank with audit policy q charges all firms* $R_{pu}^{pool*} = x_s$ *and serves the whole market.*
*ii) Consider the situation where A1 is fulfilled and the public bank competes with private banks in the market for loans. In equilibrium the public bank with audit policy q charges all firms* $R_{pu}^{pool*} = min\{x_s, R_{pr}^{pool,min}\}$ *and serves the whole market.*

The proof is in the appendix.

# 4 Separation

Consider now the case when it is the private banks' policy never to audit any firm in distress. In this section, I will simply assume that this policy is credible in the stage game, and that private banks cannot credibly change their policy from one period to the next. The conditions under which this is actually the case are derived in section 5.

As before, in each period all banks enter the market simultaneously. If loans were granted in the previous period, outcomes are realized and payments made before new loans are made.

Firms obtain profits under separation of

$$\begin{aligned} P_j^{sep,pu} &= (1-p_j)(x_j - R_{pu}^{sep}) + \frac{1}{2}p_j p_v q(x_j - R_{pu}^{sep}) \\ P_j^{sep,pr} &= (1-p_j)(x_j - R_{pr}^{sep}) \end{aligned}$$

from the public and private bank loan, respectively, with $R_{pu}^{sep}$ and $R_{pr}^{sep}$ denoting the banks' repayments under separation. As before, maximum repayments from firms' participation constraints are $R_r^{max} = x_r$ and $R_s^{max} = x_s$. Separation is obtained if firms self-select, i.e., if risky firms prefer the loan of the public bank, while safe firms prefer the loan of the private banks. This yields the incentive constraints

$$\begin{aligned} P_r^{sep,pu} &> P_r^{sep,pr} \quad \text{for risky firms and} \\ P_s^{sep,pu} &< P_s^{sep,pr} \quad \text{for safe firms.} \end{aligned}$$

From these constraints it follows that given the public bank's repayment $R_{pu}$, private banks have to charge a minimum repayment to deter risky firms from choosing its loan of

$$R_{pr}^{min} = R_{pu} - \frac{p_r}{2(1-p_r)} p_v q(x_r - R_{pu}).$$

To attract safe firms they can charge a maximum repayment just below

$$R_{pr}^{max} = R_{pu} - \frac{p_s}{2(1-p_s)} p_v q(x_s - R_{pu}) \qquad . \tag{2}$$

Banks obtain profits per contract of

$$\begin{aligned} \Pi_{pu}^{sep} &= (1-p_r)R_{pu}^{sep} + p_r(y + p_v q(\frac{1}{2}(x_r + R_{pu}^{sep}) - y)) - r_{pu} \\ \Pi_{pr}^{sep} &= (1-p_s)R_{pr}^{sep} + p_s y - r_{pr} \qquad . \end{aligned}$$

From their participation constraints (non-negative expected profits) result the minimum feasible repayments that banks can charge under separation as

$$\begin{aligned} R_{pu}^{sep,min} &= \frac{r_{pu} - p_r y - p_r p_v q(\frac{1}{2}x_r - y)}{1 - p_r + \frac{1}{2}p_r p_v q} \\ R_{pr}^{sep,min} &= \frac{r_{pr} - p_s y}{1 - p_s} \qquad . \end{aligned} \tag{3}$$

Separation is feasible if the minimum repayment that private banks have to set under separation in order not to make losses is lower than the maximum repayment they can set in order to attract safe firms. If the public bank tries to avoid separation, i.e., market entry of private banks, the lowest repayment it can charge is $R_{pu}^{pool,min}$ from (1), which depends on $r_{pu}$. This defines the critical disadvantage in funding costs $r_{pr}^*$, such that private banks with funding costs below $r_{pr}^*$ are able to enter the market:

$$r_{pr}^* = (1-p_s)R_{pu}^{pool,min} - p_s(p_v q(\frac{1}{2}(x_s - R_{pu}^{pool,min}) - y).$$

The details are in the appendix.

Assuming the credibility of the liquidation threat, the competitive equilibrium of the stage game is then defined as follows:
In equilibrium, private banks set the minimum feasible separation repayment from (3), while the public bank sets the maximum repayment that ensures separation given the private banks' equilibrium repayment:

$$\begin{aligned} R_{pr}^* &= \frac{r_{pr} - p_s y}{1-p_s} \\ R_{pu}^* &= \frac{R_{pr}^* + \frac{p_s}{2(1-p_s)} p_v q x_s}{1 + \frac{p_s}{2(1-p_s)} p_v q}. \end{aligned}$$

## 5 Credibility

I now drop the assumption that the private banks' audit policy is credible and derive instead the conditions under which this is the case. For this I consider the game in which the lending process of the stage game is repeated an infinite number of times. The private banks' discount factor, reflecting their time preference and continuation probability (or time horizon), is $\delta$. Firms live only for one period, but information regarding the banks' behavior is transmitted from one generation of firms to the next; it is common knowledge.
The assumption of firms living only for one period is a simplification that can be interpreted as follows. Each period, some firms newly enter the market and some drop out. For those firms that stay, the management may change or they may

invest in new projects. This means that a firm that was of safe type in period $t$ (and could be identified as such since it took a loan from a private bank) is not necessarily of safe type in period $t+1$. Accordingly, the public bank cannot give firms contract offers according to their type. The information asymmetry persists and hence the chance for the private banks to separate firms.

Since the audit is assumed to have a higher expected return than liquidation, the public bank's policy to audit distressed firms is self-enforcing. For the private banks, credibility has to be achieved through reputation building. However, sticking to the threat to liquidate distressed firms without an audit leaves both players, bank and viable firm, worse off in the short run. Although the bank can execute the liquidation threat because distress gives it power over the firm, short-term rational behavior would induce it to audit all firms, as the expected return from the audit exceeds the liquidation value. Given rational expectations, risky firms would anticipate the bank's deviation from its liquidation policy and free-ride on the cheaper loan.

In order to make foregoing short-term profits from the audit profitable, and thus the liquidation threat credible and self-enforcing, the discounted profits from lending to safe firms in the future have to exceed the expected profits from extending the loan of distressed but economically viable firms today. Given the private banks' repayment under separation, $R_{pr}^{sep}$, credibility requires that

$$\frac{\Pi(R_{pr}^{sep})}{1-\delta} \geq p_s p_v q(\frac{1}{2}(x_s + R_{pr}^{sep}) - y) \tag{4}$$

where $\Pi(R_{pr}^{sep})$ is the banks' profit per contract if charging repayment $R_{pr}^{sep}$. The details are in the appendix. If a private bank deviates from its liquidation strategy, the credibility of the liquidation threat is lost. Risky firms are then attracted by the lower repayment and separation fails. Accordingly, private banks cannot change their audit policy from one period to the next without compromising the policy's credibility. This justifies the assumption of section 4.

In the competitive equilibrium of section 4, the profits of the private banks are zero, such that (4) would fail. In order for credibility to be achieved, the profit of the private banks must be positive. This means that for a separating equilibrium

that ensures credibility to exist, the following condition has to be satisfied: The minimum repayment from (4) that private banks have to set in order to credibly commit to liquidation and separate borrowers is lower than the maximum repayment from (2) they can set in order to attract safe firms, given that the public bank sets its lowest feasible pooling rate from (1). This yields the critical rate $r_{pr}^{**}$ for the private banks' funding costs as

$$r_{pr}^{**} = (1-p_s)R_{pr} + p_s y - (1-\delta)p_s p_v q(\frac{x_s + R_{pr}}{2} - y) \tag{5}$$

where $R_{pr} = \frac{2(r_{pu}-\bar{p}y)+p_v q(2\bar{p}y-\bar{p}x)}{2(1-\bar{p})+p_v q\bar{p}} - \frac{p_s}{2(1-p_s)}p_v q(x_s - \frac{2(r_{pu}-\bar{p}y)+p_v q(2\bar{p}y-\bar{p}x)}{2(1-\bar{p})+p_v q\bar{p}})$.

In the competitive equilibrium of the repeated game, the private banks then set repayments such that (4) is fulfilled with equality, while the public bank sets the maximum separating repayment, given the equilibrium repayment of the private banks.

**Proposition 2** *Assume that A1 is satisfied and $r_{pr} < r_{pr}^{**}$. In the competitive equilibrium of the infinitely repeated game, private banks liquidate all firms in distress, lend only to safe firms and set*

$$R_{pr}^{**} = \frac{(1-\delta)p_s p_v q(\frac{1}{2}x_s - y) - p_s y + r_{pr}}{1 - p_s - \frac{1-\delta}{2}p_s p_v q}.$$

*The public bank with audit policy q lends only to risky firms and sets*

$$R_{pu}^{**} = \frac{R_{pr}^{**} + \frac{p_s}{2(1-p_s)}p_v q x_s}{1 + \frac{p_s}{2(1-p_s)}p_v q}.$$

Setting $R_{pr}^{**}$, all private banks make positive profits in equilibrium. Even perfect competition between private banks does not drive profits to zero, because this would render the liquidation threat non-credible by violating condition (4). Separation would then fail and the private banks would be forced to leave the market.

Data on the German loan market confirms this separation result. For a sample of 3500 small and medium-sized firms in Germany, it shows that 73% of the firms that

characterize their own creditworthiness as "bad" (risky firms) borrow from public banks, vs. only 19% that borrow from private banks. In contrast, of the firms that report to have a "good" creditworthiness (safe firms), only 51% borrow from public banks, but 30% from private banks (Paul et al, 2003). This tendency is consistent with data which shows that public banks in Germany disproportionately lend to very small firms (BDS/DGV, 2007), which are usually perceived as being riskier than larger firms.

What does separation mean for borrowers? As usual in self-selection models, the riskier firms are worse off under separation than under pooling. However, since private banks can sustain positive profits in equilibrium, safe firms may also be charged higher rates under separation than under pooling. In particular, if

$$1-\delta > \frac{(r_{pr}-p_s y)a-(1-p_s)b}{\frac{1}{2}p_s p_v q((2y-x_s)a-b}$$

with $a=(2(1-\bar{p})+p_v q\bar{p})$ and $b=(2(r_{pr}-\bar{p}y)+p_v q(2\bar{p}y-p\bar{x}))$, then $R_{pu}^{pool*}<R_{pr}^{**}$. That is, if the private banks' discount factor is sufficiently low (but still high enough to achieve separation), safe firms pay higher rates under separation than under pooling.

## 6 Conclusion

Most public banks directly or indirectly hold state guarantees on their deposits and enjoy lower funding costs than their privately owned competitors. This is often blamed to distort competition in favor of the public banks. The model shows that if public banks also have the mandate to support economic development, private banks can enter the market despite their cost disadvantage. With the public bank being *perceived* as supporting borrowers in financial distress, private banks have an instrument to separate firms and lend only to the safe types. This does not depend on the public bank's true objective function. Data on the German loan market confirms this result.

Interestingly, since the private banks' liquidation strategy is not credible if they

earn zero profits, positive profits are sustainable in equilibrium even if there is perfect competition between private banks. The entry of private banks into the market may then lead to a deterioration of lending conditions for all firms, relative to the situation when private banks can only threaten to enter into the pooled market. The restriction of the public bank's policy space, which is meant to support economic development, may therefore result in the opposite effect.

Economic policy makers seem to react to the initially mentioned argument of competition distortion by state guarantees. For example, to comply with EU standards, the state's guarantee for its banks' liabilities was abandoned in Germany in July 2005. This was advertised as a step towards a level playing field for public and private banks. The results of this paper, however, cast doubt on this conclusion. Rather, they imply that as long as public banks are perceived as being restricted in setting their policy - and data suggest that they are - while private banks are not, competition is potentially distorted, with all the adverse effects this may induce. If economic policy makers want public banks to continue supporting the economic development, but otherwise want to foster free competition, the conditions on the loan market may not respond as desired. The true effect on loan conditions, however, is ultimately an empirical question, and should be subject of future research.

# Appendix

## Proof of Proposition 1

Part i)

$x_r > x_s$ per assumption. If the public bank sets $R_{pu}^{pool} > x_r$, it violates the participation constraints of all firms, does not lend and obtains zero profit. If it sets $R_{pu}^{pool} < x_s$ it lends to all firms, but obtains lower profits than with $R_{pu}^{pool} = x_s$. If it sets $x_s < R_{pu}^{pool} \leq x_r$, it lends only to risky firms. Per assumption, this is less profitable for all $R_{pu}^{pool} \leq x_r$ than lending to the whole population at $x_s$. □

Part ii)

First, for $x_s < R_{pu}^{pool,min}$ the proof of part i) applies. Second, $x_s > R_{pu}^{pool,min}$. If the private banks offer a repayment below $R_{pr}^{pool,min}$ they incur losses. If the public bank charges $R_{pu}^{pool} < R_{pu}^{pool,min}$ it serves the whole market as before, but makes lower profits. If it charges $R_{pu}^{pool} > R_{pu}^{pool,min}$, the private banks offer $R_{pu}^{pool,min}$, serve the whole market, and the public bank makes zero profits. □

## Derivation of $r_{pr}^{*}$

The maximum repayment the private banks can set in order to attract safe firms, dependent on the public bank's repayment, is given by safe firms' incentive constraint as

$$R_{pr}^{max} = R_{pu} - \frac{p_s}{1-p_s} p_v q \frac{1}{2}(x_s - R_{pu}).$$

The lowest feasible repayment the public bank can set under separation is $R_{pu}^{sep,min}$ as determined by its participation constraint from equation (3). Hence, one obtains

$$R_{pr}^{max} = R_{pu}^{sep,min} - \frac{p_s}{1-p_s} p_v q \frac{1}{2}(x_s - R_{pu}^{sep,min})$$

as the highest incentive compatible repayment the private banks can charge if the public bank competes with its lowest feasible separation repayment. In order for

the private banks' participation constraint to be met, $R_{pr}^{max}$ has to exceed their minimum repayment under separation, $R_{pr}^{sep,min}$ in (3). This gives the condition

$$R_{pu}^{sep,min} - \frac{p_s}{1-p_s} p_v q \frac{1}{2}(x_s - R_{pu}^{sep,min}) \geq \frac{r_{pr} - p_s y}{1-p_s} \tag{6}$$

Solving (6) for $r_{pr}$ yields

$$r_{pr}^{*} = (1-p_s) R_{pu}^{sep,min} - p_s(p_v q \frac{1}{2}(x_s - R_{pu}^{sep,min}) - y)$$

## Derivation of the credibility condition (4)

The profit that is lost per contract per period if distressed but viable firms are liquidated is given by $p_s p_v q(\frac{1}{2}(x_s + R_{pr}^{sep}) - y)$. The private banks lend to safe firms, of which $p_s$ enter into distress. A share $p_v$ of these is viable, but only $q$ of them would be identified as such in an audit. Compared to liquidating them, the private bank would obtain an increase in profits by extending their loans of $\frac{1}{2}(x_s + R_{pr}^{sep}) - y$.

The profit the private bank forgoes by having to leave the market after having lost the credibility of its liquidation threat is determined as the present value of obtaining the profit $\Pi(R_{pr}^{sep})$ from cooperation in infinitely many periods, given its discount factor $\delta$.

Note that since the number of firms a private bank lends to is the same over time as long as the market does not change, if the credibility condition holds for one contract, it holds for an arbitrary number of contracts a bank sells each period.

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