The Politician and his Banker*

Christa Hainz† Hendrik Hakenes‡

University of Munich, CESifo, and WDI Max Planck Institute Bonn

November 26, 2007

Abstract

Should the European Union grant state aid through an institution like the European Investment bank? This paper evaluates the efficiency of different measures for granting state aid. We use a theoretical model with firms that differ in their creditworthiness and compare different types of subsidies with indirect subsidization through public banks. We find that, in a large parameter range, the politician prefers public banks to direct subsidies because they avoid windfall gains to entrepreneurs and they economize on screening costs. For similar reasons, they may increase social welfare relative to subsidies. One important prerequisite for this result is that public banks must not be allowed to fully compete with private banks. However, from a welfare perspective, a politician uses public banks inefficiently often.

Keywords: Public bank, development bank, state aid, subsidies, governance

JEL-classification: G21, G38, H25.

*We thank Guido Friebel, Thomas Gall, Ela Glowicka, Martin Hellwig, Anke Kessler, Christian Koziol, Johannes Münster, Panu Poutvaara, Rajshri Jayaraman, Nadine Riedel, Lars-Hendrik Röller, Isabel Schnabel, Monika Schnitzer, Christiane Ströh, Tuomas Takkalo, Silke Übelmesser and participants of the CEPR/EBRD conference "Partnership between Government and the Private Sector" in London, the German Economic Association in Munich, the CESifo Area Conference Public Sector Economics in Munich, the SFB/TR 15 conferences in Frauenwörth and Mannheim, the Annual Conference of the Research Committee Development Economics of the Verein für Socialpolitik in Göttingen, the Annual Conference of the Verein für Socialpolitik in Munich, the WZB Berlin, the Max Planck econ-workshop in Bonn and the University of Munich for discussion. Financial support from the Deutsche Forschungsgemeinschaft through SFB/TR 15 Governance and the Efficiency of Economic Systems is gratefully acknowledged.

†University of Munich, Department of Economics, Akademiestr. 1/III, 80799 München, Germany, christa.hainz@lrz.uni-muenchen.de

‡Max Planck Institute for Research on Collective Goods, Kurt Schumacher Str. 10, 53113 Bonn, Germany, hakenes@coll.mpg.de

1 Introduction

Politicians want to promote certain investment project; but levying the necessary taxes becomes increasingly expensive (European Economic Advisory Group, 2007). Two examples highlight the recent debates about the best way to promote desired projects. The first example is the International Finance Corporation (IFC) which finances in developing countries private sector projects that generate externalities.[1] The Meltzer Report, which was commissioned by the US Congress, suggests merging the IFC with the World Bank and recommends that the merged entity should no longer provide loans but only give grants (Meltzer, 2000). The second example is the State Aid Action Plan according to which the European Commission will allow only those state aid measures of member states that are the most efficient and the least costly (Friederiszick, Röller, and Verouden, 2007).

These discussions indicate how important efficiency considerations are for the choice of a state aid measure. Up to now the academic literature does not provide recommendations about which measures of state aid should be favored.[2] Thus, this is the first paper that addresses the following questions. Suppose a politician wants to grant state aid so as to have positive externalities realized. Which measure to grant state aid allows a government to make the most of its expenditures? How do public banks fare relative to other state aid measures? Do efficiency considerations justify the existence of development banks such as the European Investment Bank (EIB) or the IFC?

When answering these questions we have to take into account that, in reality, politicians are not necessarily benevolent but may want to maximize their own rent, for instance by increasing the probability of being reelected (Boycko, Shleifer, and Vishny, 1996), or as a reward for specific favors.[3] Therefore, we develop a theoretical model that captures the so-called political view by studying projects that yield an externality to the politician. However, projects differ in their creditworthiness. Some are profitable enough to be financed by private banks. Others are only financed if they receive a high enough subsidy. For the politician, it pays to subsidize only those that have a relatively high probability of success. However, the politician does not have the necessary skills to assess the creditworthiness of an individual

[1] Currently, the IFC finances projects in the private sector in developing countries that have "good prospects of being profitable and benefit the local economy" (IFC homepage) and thus generate positive externalities.

[2] By state aid we mean all measures that (in expected terms) transfer state resources.

[3] Empirical evidence shows that the US government gives financial favors to countries that hold a rotating seat on the U.N. Security Council (Kuziemko and Werker, 2006).

project. Only so-called credit specialists, who have access to a screening technology, can determine the creditworthiness. Furthermore, subsidization of projects requires taxation, and thus entails some distortion that reduces the politician's utility.

We analyze and compare a number of different measures of state aid. First, the politician can employ a credit specialist at a *public bank*. Second, he can offer an *(uninformed) subsidy* to all firms that produce a rent. Third, the politician can grant an *(informed) subsidy* by employing credit specialists as consultants. Based on the resulting information, he picks out and subsidizes only those projects that need a subsidy to become profitable. Finally, the politician can create *public firms*.

We define a public bank as a bank that takes instructions from the politician, and in return receives a subsidy from the politician. Thus, we take a functional approach and do not base our analysis on the ownership structure of the bank. This needs not necessarily be owned by the state. In reality, development banks resemble most closely the public bank we model here.[4]

Our analysis yields four important results on the efficiency of state aid measures. First, in the case of a public bank, the politician restricts competition for loans to firms that have profitable projects. If this were not the case, the public bank would use subsidies to capture market shares from private banks and this would result in a cost for the politician without yielding an additional benefit. Second, the politician prefers a public bank to an informed subsidy because this reduces the amount of screening costs he has to bear. Using a public bank means that the burden of screening firms that are not the targets of the politician's intervention is born by the private banks. In a large parameter range, the public bank even *welfare*-dominates informed subsidies. Third, the public bank can dominate the uninformed subsidy. This happens if the windfall gains that the most creditworthy firms get because the politician cannot avoid their receiving the uninformed subsidy are large relative to the screening costs of the public bank. Finally, the politician uses the public bank inefficiently often. The reason is that the politician does not take into account the duplication of screening costs.

Our paper contributes to the literature on public banks and state aid. The papers on state aid evaluate state aid control by multilateral institutions such as the European Commission (Collie, 2000; Dewatripont and Seabright, 2006). To the best of our knowledge there are no papers that compare different measures of state aid. This is also not done in the literature on public banks.

[4]Commercial banks can also be state owned. Given our definition, however, they are not the subject of this paper.

The theoretical literature on public banks shows that they can foster economic development (Hakenes and Schnabel, 2006). They also have positive effects on the financial system by contributing to its stability (Allen and Gale, 2004; Andrianova, Demetriades, and Shortland, 2007). It might happen that public banks operate with a soft budget constraint because the government cannot commit to not refinancing poorly performing public banks (Kornai, 1980; Dewatripont and Maskin, 1995), This relationship explains why government interventions often cause inefficiencies and provides an argument for the result of a cross-country study which shows, that in countries with higher government ownership of banks, both financial development and growth rates per capita are lower (La Porta, Lopez De Silanes, and Shleifer, 2002). However, no causal links are tested in this study.

Moreover, when evaluating the effects of public banks one must be careful in choosing the point of reference. We believe that a comparison between public and private banks neglects the fact that the objectives of public banks are different from those of private banks. Therefore, such a comparison might be misleading. Suppose there is a market failure that the politician needs to cure. The politician can use a public bank to intervene but he cannot use a private bank. For this reason, we compare the public bank with other measures of state aid. For all these measures, the politician faces the challenge of committing to hard budget constraints in a dynamic context.

There is evidence that public banks operate as efficiently as their competitors (Altunbas, Evans, and Molyneux, 2001). Our description of a public bank that is restricted in competition fits the concept of development banks fairly well.[5] They play an important role in providing state aid and are a means by which the politician can pursue economic policy. The development banks in Germany, Japan, France and Korea are operating particularly successfully (United Nations, 2005). The Japan Development Bank (JDB) can serve as an example showing that directed lending works. Its purpose was to finance the modernization of the Japanese economy after World War II. The management of the JDB was politically independent and based its decisions on the professional judgement of its loan department.[6] As a matter of fact, the JDB kept the level of loan losses much lower than the private financial sector (Vittas and Cho, 1995).

We choose to model a politician that pursues his own objectives. There are several papers supporting this political view. The fact that, in election years, public banks

[5]In the only theoretical paper about development banks, Armendáriz de Aghion (1999) also argues that interventions by development banks must be targeted.

[6]The World Bank provides recommendations for good corporate governance of state financial institutions (Scott, 2007).

increase their lending more than private banks suggests that politicians try to increase the probability of being re-elected (Dinç, 2005; Cole, 2006). Evidence from Pakistan shows that politically connected firms get larger loans from public banks than unconnected firms, pay lower interest rates and have higher default rates.[7] Remarkably, about 25 per cent of the loans from public banks are granted by banks that explicitly have social objectives. Interestingly, these banks are not used to favor politically connected firms (Khwaja and Mian, 2005). Moreover, after the deregulation of the French banking sector that started in 1985, bank debt declined sharply, especially for poorly performing firms which, as a consequence, were more likely to exit (Bertrand, Schoar, and Thesmar, 2007). In line with this evidence, our model argues that some entrepreneurs, although they create a rent for the politician, do not receive finance from private banks but are financed by public banks. Therefore, we predict that after deregulation these poorly performing firms are no longer financed.

All these studies clearly indicate that politicians use public banks to pursue their own goals. These studies also point out the important role the electorate plays in monitoring politicians by showing, for instance, that the rents granted by politicians decrease if electoral participation increases (Sapienza, 2004; Khwaja and Mian, 2005; Cole, 2006). None of the studies, however, compares the costs of granting subsidies through a public bank with other means of subsidization. We fill this gap by comparing the efficiency of different means of subsidization under the political view.

The remainder of the paper is organized as follows. In section 2, we present the set-up of the model. We describe different measures to (directly or indirectly) subsidize projects in section 3. In section 4, we compare these measures from the politician's perspective, and from a social welfare perspective. In section 5, we discuss the results and conclude. Proofs are in the appendix.

2 The Model

Consider an economy with three groups of agents - entrepreneurs, credit specialists, and a politician. All agents are risk neutral, and there is no discounting. Entrepreneurs want to undertake investment projects but do not have own funds and must credit finance their projects. Since each entrepreneur has only one project, we use the expressions *project* and *entrepreneur* interchangeably.

There are three types of **entrepreneurs** of mass m_1, m_2 and m_3, with $m_1 + m_2 + m_3 = 1$. Each of them has a project that requires an investment of I and that leads

[7] It thus seems that politicians exercise influence on bank employees in order to grant favors to connected firms.

to a return of Y with probability p_1, p_2 and p_3 (depending on the type, stochastically independent, with $p_1 > p_2 > p_3$), otherwise it returns 0. Hence, different projects have different degrees of creditworthiness. Type 1 projects are called *excellent*; type 2 projects are called *medium*; type 3 projects are called *bad*. We will give conditions on the success probability later in this section. We assume that only entrepreneurs know their own type; investors, credit specialists and politicians do not know the type of an entrepreneur.

A **credit specialist** carries out a credit analysis before granting a loan. He spends effort c to find out the success probability p of a project because financing without conducting a creditworthiness test yields an expected loss, i. e., $(m_1\, p_1 + m_2\, p_2 + m_3\, p_3)\, Y < (m_1 + m_2 + m_3)\, I$. The (result of ? the) credit analysis is not observable and it is noisy. With probability $1-\varepsilon$, the bank receives an informative signal, with probability ε, it gets a random signal, distributed like the types of entrepreneurs. Hence, the signal is "excellent" with probability m_1, "good" with probability m_2, and "bad" with probability m_3. Consequently, the probability of success of an entrepreneur with an "excellent" rating is

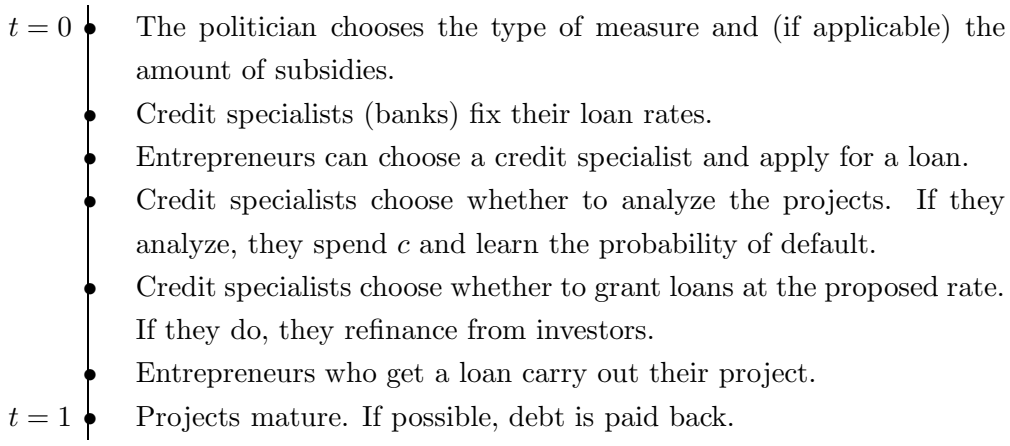
$$P_1 := (1-\varepsilon)\, p_1 + \varepsilon\, (m_1\, p_1 + m_2\, p_2 + m_3\, p_3), \tag{1}$$

P_2 and P_3 are defined analogously, $P_i = (1-\varepsilon)\, p_i + \varepsilon \sum_j m_j\, p_j$. Note that $P_1 < p_1$ and $P_3 > p_3$. The assumption of a noisy screening technology implies that even bad entrepreneurs apply for loans because if they – by mistake – receive a loan, they make positive profits. We use quotes to refer to entrepreneurs with an excellent rating ("excellent"), but who not necessarily have excellent projects (and equivalently for other types).

There is perfect competition between a finite number of credit specialists. We assume that the screening signals of different banks are perfectly correlated. This assumption implies that rejected entrepreneurs do not apply again at another bank if they know they will be rejected again - this is consistent with the evidence in Shaffer (1998). We assume that all banks can raise funds at the same costs and normalize these costs to zero.

In our model a **politician** maximizes his own utility. He gets a rent X_{pol} from successful projects. The rent could be interpreted as the benefit he gets from increasing the probability of being reelected if a project is carried out and is successful. In order to have projects realized, the politician can subsidize them. If he wants to grant subsidies, he must collect taxes. Like in Boycko, Shleifer, and Vishny (1996), d_{pol} is the disutility that the politician suffers for each unit of tax he raises. The politician wants to maximize his net utility, i. e., X_{pol} times the number of successful projects

Figure 1: Time Structure



that are carried out, net of the required taxation times d_{pol}.[8] The politician can decide upon the type of subsidy before entrepreneurs apply for loans (see Figure 1). It is important to note that the politician does not know the success probability of the individual projects.

The projects can be ranked as follows: An excellent project has a success probability p_1 high enough for the project to be financed without the help of the politician, $p_1 Y > I + c/m_1$, taking into account the costs for screening. Both medium and bad projects have a negative net present value (NPV), $p_2 Y < I$ and $p_3 Y < I$. However, the probability of success of a medium project is higher than that of a bad project, $p_3 < p_2$. We assume that the politician increases his utility by subsidizing medium projects, i. e., $p_2 X_{\text{pol}} > d_{\text{pol}} (I - p_2 Y)$, but not by subsidizing bad projects, i. e., $p_3 X_{\text{pol}} < d_{\text{pol}} (I - p_3 Y)$.

3 Measures of State Aid

In this section, we discuss different types of measures that the politician may use to subsidize projects in order to get the corresponding rents. Some of the project may have positive effects on social welfare; this effect will be studied in section 4.2. We study the measures proposed by the European Commission (1998), and start with the least intervening one. The laissez faire case acts as a reference point.

[8]The study by Khwaja and Mian (2005) shows that the social costs of lending to politically connected firms is high - the direct costs of politically connected lending are about 1.6 per cent of GDP per year. In addition, the deadweight loss from levying these transfer payments from the taxpayer are estimated to be about 0.15–0.30 per cent of the annual GDP.

3.1 Laissez Faire

Consider the case where the politician does not influence which projects are undertaken and therefore does not need to collect taxes. Because the average NPV of a project is negative, entrepreneurs will have to be screened in equilibrium. One institutional possibility is that credit specialists act as intermediaries between investors (from whom they collect funds at zero cost) and entrepreneurs. They will screen entrepreneurs, sorting out "medium" and "bad" ones. Hence, credit specialists endogenously act as private *bankers*. In the appendix, we prove the following lemma, elaborating on (technical) necessary conditions.

Lemma 1 (Laissez Faire) *In equilibrium, all types of entrepreneurs apply for loans at private banks. Those entrepreneurs who are rated "excellent" (type 1) get a loan at rate*

$$R_1 = \frac{I}{P_1} + \frac{c}{m_1 P_1}. \tag{2}$$

The politician's utility is

$$U_{\text{pol}}^{\text{LF}} = m_1 P_1 X_{\text{pol}}. \tag{3}$$

In equilibrium, all entrepreneurs, even the bad and medium ones, apply for loans at private banks. Bad and medium entrepreneurs anticipate that banks will give them a blurred rating with probability ε, and hence give them a loan with positive probability. Without screening costs, the gross loan rate (consisting of the repayment of the principal and the markup for default risk) would be I/P_1. Note that this rate is higher than I/p_1, because the bank acknowledges that it misjudges the entrepreneur's creditworthiness with some probability. In order to break even, the bank's lending rate must cover the whole screening costs. Because a fraction m_1 of applicants is accepted, banks must add $c/(m_1 P_1)$ to the gross loan rate.

The politician's utility function (3) is determined by the utility X_{pol} he derives from each successful project. The fraction of projects that is financed is m_1, the fraction of successful projects is $m_1 P_1$. Among the projects rated as "excellent", not only will the excellent projects be successful with probability p_1, but also some medium projects (that receive a loan by mistake) with probability p_2 and some bad projects with probability p_3. Of course, in the laissez faire case, no taxation is needed.

3.2 Uninformed Subsidies

From the politician's point of view, one drawback of laissez faire obviously is that medium projects are not implemented, and the corresponding externalities do not accrue. One natural way of guaranteeing the implementation of medium projects is to grant a direct subsidy. The subsidy can take the form of a guarantee, meaning that the politician promises to repay the loan if the entrepreneur fails. However, the politician cannot directly use the information generated by credit specialists. Of course, to subsidize projects, the politician will have to levy taxes.

Lemma 2 (Uninformed Subsidy) *The politician grants a limited deficit guarantee to entrepreneurs by committing to a subsidy of*

$$S^{\mathrm{US}} = \frac{I - P_2\, Y}{1 - P_2} \tag{4}$$

to all entrepreneurs that produce but are not successful. In equilibrium, all types of entrepreneurs apply for loans at private banks. Those entrepreneurs who are rated "excellent" and "medium" get a loan at rate

$$R_1 = \frac{I - (1 - P_1)\, S^{\mathrm{US}}}{P_1} + \frac{c}{m_1\, P_1} \quad \textit{and} \tag{5}$$

$$R_2 = \frac{I - (1 - P_2)\, S^{\mathrm{US}}}{P_2} = Y, \tag{6}$$

respectively. The politician's utility is

$$U_{\mathrm{pol}}^{\mathrm{US}} = \sum_{i=1,\,2} \big(m_i\, P_i\, X_{\mathrm{pol}} - d_{\mathrm{pol}}\, m_i\, (1 - P_i)\, S^{\mathrm{US}} \big). \tag{7}$$

In equilibrium, the politician grants a subsidy that is just high enough to guarantee the implementation of "medium" projects. Not only "medium" but also "excellent" entrepreneurs take the subsidy and, as a result, "excellent" entrepreneurs receive windfall gains. For "bad" entrepreneurs, the subsidy is insufficient to allow private finance. Hence without a project, they will not get subsidies in the first place.

Naturally, the politician does not want to waste tax revenues, he wants to minimize these windfall gains. He can do this by making the subsidy contingent on observable variables. If he pays a subsidy only in the case of an entrepreneur's default (in which case the subsidy is in fact a guarantee, potentially partial), then the expected subsidy to an "excellent" entrepreneur is lower than that to a "medium" entrepreneur—the politician saves tax revenues.[9]

[9] In our model, there is no moral hazard problem, entrepreneurs cannot influence their success probability. In the presence of moral hazard, a deficit guarantee might no longer be the optimal form of an uninformed subsidy.

The size of the (expected) subsidy depends on the loan rate, which is endogenous. Projects cannot repay more than Y in the case of success. Since the resulting expected repayment is too low for the bank to recover I, the missing amount has to be covered by a guarantee. Of course, if interest rates are high, the politician must pay a higher subsidy. Interest rates are determined by price competition between banks. Relative to "medium" entrepreneurs, "excellent" entrepreneurs pay a lower interest rate because they have a lower default risk. However, "excellent" entrepreneurs must bear all screening costs, due to a selection mechanism. Assume that one of the banks demands exceptionally low loan rates from their "excellent" borrowers and commits to offering loans to "excellent" borrowers only. Then this bank would attract not only all excellent projects but also bad and medium ones. The latter groups also apply because, with lower loans rates, their expected profit increases. All firms would have to be screened. As a consequence, the costs of screening are born by "excellent" borrowers. Since "medium" entrepreneurs cannot repay more than Y, the size of the subsidy equals the (negative) NPV, $I - P_2\,Y$, also plus a markup for the default risk because it is paid only in the case of default.

For the politician's utility, note that, due to the subsidy, not only the "excellent" but also the "medium" projects are implemented. However, the subsidy is also paid to both "excellent" and "medium" entrepreneurs.

3.3 Public Banks

Let us define a public bank as a bank that gets instructions from the politician, and in return receives a subsidy from the politician. As a bank, it employs credit specialists (public bankers) in order to screen projects. In fact, we identify the credit specialist with the public bank. Public bankers are assumed to pursue their own interest, given the constraints created by the politician's instructions.

All instructions for the public banker need to be based on variables that are observable by the politician. For example, he can set a loan rate floor; public banks must then grant loans at rates that are above some threshold level, or above the rate of their private competitors. However, he *cannot* instruct bankers to grant loans only to "medium" entrepreneurs.

Lemma 3 (Public Bank) *The politician will subsidize the public banks with*

$$S^{\mathrm{PB}} = I + c - P_2\,Y \tag{8}$$

per loan. Furthermore, he will restrict competition between the public and the private sector, e. g., by forbidding the public bank to match a private banks' loan rate.

In equilibrium, all types of entrepreneurs apply for loans at private banks. Those entrepreneurs that are rated "excellent" receive an offer from a private bank. Those that are rated "medium" apply at the public bank and get an offer. Equilibrium loan rates are

$$R_1 = \frac{I}{P_1} + \frac{c}{m_1\, P_1} \quad \textit{and} \quad R_2 = Y. \tag{9}$$

The politician's utility is

$$U_{\rm pol}^{\rm PB} = \sum_{i=1,\,2} \left(m_i\, P_i\, X_{\rm pol}\right) - d_{\rm pol}\, m_2\, S^{\rm PB}. \tag{10}$$

All entrepreneurs apply for loans at the private banks because they offer favorable interest rates for entrepreneurs with "excellent" rating. Therefore, the loan rate is just like that in the laissez faire case. Entrepreneurs who are rejected from a private bank because they are only "medium" apply at the public bank and here they must pay the complete return Y from their project to the public bank. From this return alone, the expected profit of the public bank would still be negative. Hence the politician must compensate the public banker for the expected loss per loan, $I - p_2\, Y$. Furthermore, he must pay the public banker a wage for his screening effort, $m_2\, c$.

Importantly, the banker must not be allowed to compete with private banks. The reason is simple: if an entrepreneur gets a loan offer from a private bank, this implies that the help of the public bank is not needed. If the public bank really did undercut the private bank and gave a (subsidized) loan to this entrepreneur, he would just waste tax revenues. In the extreme case where the public bank always undercuts private loan offers, there is a complete crowding out of private finance by the public sector, and the waste of tax revenues would be the same as with an uninformed subsidy.

How independent of the politician´is the public bank? It does not belong to the politician in the sense that the politician can claim the public bank's profits. The public banker must keep the profits for himself, otherwise he would not have any incentives to screen. The politician must be able to give the public bank instructions, but he cannot be the residual claimant of the public bank. However, the politician needs some right to punish the public banker, e. g., to cut the subsidy, or to sack the banker. When comparing public banks to uninformed subsidies, we get the following result.

Proposition 1 *The politician prefers public banks to uninformed subsidies if*

$$c < \bar{c}_{\rm pol} = \frac{m_1}{m_2}\, \frac{1 - P_1}{1 - P_2}\, (I - P_2\, Y). \tag{11}$$

In both cases, with the uninformed subsidy or with the public bank, projects with an "excellent" or a "medium" rating are carried out. In neither case are projects with a "bad" rating financed. In both cases, the politician must subsidize "medium" projects, to raise their NPV to at least zero. Hence the (possibly indirect) expected subsidy to a "medium" entrepreneur is the same in both cases. However, the politician faces the following trade-off. On the one hand, he also grants uninformed subsidies to "excellent" entrepreneurs who take the subsidy and experience a windfall gain. On the other hand, he must remunerate his public banker for screening. Hence, the politician prefers a public bank if screening costs are not too large.

3.4 Informed Subsidies

There is an obvious alternative to public banks in which the politician does not directly interfere in the financial system but still uses the information that credit specialists can gather. In practice, proposals are submitted to the program manager in a ministry and are pre-screened, short-listed and evaluated by a team of experts on basis of their scientific and economic merits. Eventually, starting with those projects with the best grades the projects are graded and projects are financed until the budget is exhausted (Giebe, Grebe, and Wolfstetter, 2006). In our model, we capture the informed subsidy as follows: the politician can delegate the assessment of creditworthiness to a credit specialist who gives a subsidy only to medium entrepreneurs. Entrepreneurs apply first for a subsidy, then for a loan from a private bank. In this section, we will analyze how the politician can optimally get the information from his consultant.

Lemma 4 (Informed Subsidies) *A politician seeks advice from a consultant before subsidizing, if his consultant rates an entrepreneur as "medium", he grants a subsidy of*

$$S^{\mathrm{IS}} = I - P_2\, Y. \tag{12}$$

In equilibrium, entrepreneurs with "medium" or "excellent" ratings apply for loans at private banks; they receive the offers

$$R_1 = \frac{I + c}{P_1} \quad \textit{and} \quad R_2 = I + (1 - P_2)\, Y. \tag{13}$$

The politician's utility is

$$U^{\mathrm{IS}}_{\mathrm{pol}} = \sum_{i=1,\,2} m_i\, P_i\, X_{\mathrm{pol}} - d_{\mathrm{pol}}\, m_2\, S^{\mathrm{IS}} - \, d_{\mathrm{pol}}\, c. \tag{14}$$

The politician will grant a subsidy of exactly $I - P_2 Y$, lifting the expected profit for a "medium" entrepreneur to exactly zero, such that "medium" projects can be financed by private banks. Because entrepreneurs with a subsidy (and only these) can credibly signal that they were rated as "medium" (because the screening technologies of all credit specialists are identical), the private bank does not have to screen them again. Therefore, screening costs c do not enter into the interest rates for subsidized projects. For the same reason, entrepreneurs that get a "bad" rating from the consultant will not apply for a private loan. Interestingly, the interest rate for "medium" entrepreneurs depends on Y - the repayment to the bank is $Y + S^{\text{IS}}$ in the case of success, and only S^{IS} under failure. An increase in Y induces the politician to reduce the subsidy, but not to the same degree. Hence, the maximum payment to the bank, $Y + S$, depends positively on Y. When comparing public banks to informed subsidies, we get the following result.

Proposition 2 *The politician prefers public banks to informed subsidies.*

If the politician pays the subsidy through a public bank, then, for the entrepreneur, getting the subsidy comes at the cost of paying a relatively high loan rate. Consequently, excellent entrepreneurs do not apply for loans at public banks in the first place. This saves screening costs for the public bank, which are indirectly paid for with tax revenues from the politician. If, as an alternative, the politician pays the subsidy after screening applicants, excellent entrepreneurs have an incentive to apply for the subsidy because, in expected terms, they make a windfall gain as the credit specialist may make a mistake. Hence, all entrepreneurs apply for the subsidy, and the politician must foot the bill by paying higher screening costs.

3.5 Public Firms

In many cases, politicians have projects carried out simply by public firms. Within our framework, one could allow the politician to create his own firm. However, because he does not have the ability to carry out projects, he would need to employ entrepreneurs. To employ them, he needs to offer them a wage. The politician can choose to have large public firms with a continuum of entrepreneurs (such that the law of large numbers applies within a firm), or to have many small firms (such that the law of large number applies between firms). Each of these cases leads to identical allocations, hence we consider only the first case. Also, note that the politician does not need to pay the complete investment of public firms with tax revenues. He can take a loan from investors, and guarantee the repayment. That way, credit

specialists (private banks) are not even needed as intermediaries between investors and public firms. Loans from public firms are like treasury bonds - they do not need to be screened and can directly be traded on the capital markets.

Lemma 5 (Public Firms) *In equilibrium, the politician pays zero wages to his employees. All entrepreneurs apply for loans at private banks. Entrepreneurs rated as "medium" or "bad" are rejected; they become state employees. The aggregate tax burden from the guarantee for the public firm is*

$$S^{\mathrm{PF}} = \sum_{i=2,\,3} m_i \,(I - P_i \,Y). \tag{15}$$

Equilibrium loan rates for "excellent" projects are as in (2). The politician's utility is

$$U^{\mathrm{PF}}_{\mathrm{pol}} = \sum_{i=1,\,2,\,3} \left(m_i \,P_i \,X_{\mathrm{pol}}\right) - \, d_{\mathrm{pol}} \,S^{\mathrm{PF}}. \tag{16}$$

Here, the aggregate subsidy equals the aggregate (negative) net present values of "medium" and "bad" projects. The state guarantees for the repayment of the loans of its firm, then competition between private banks guarantees that the value of these guarantees equals exactly the gap in net present value. Because all types of projects are carried out in equilibrium, the politician's utility contains the externalities of all three types.

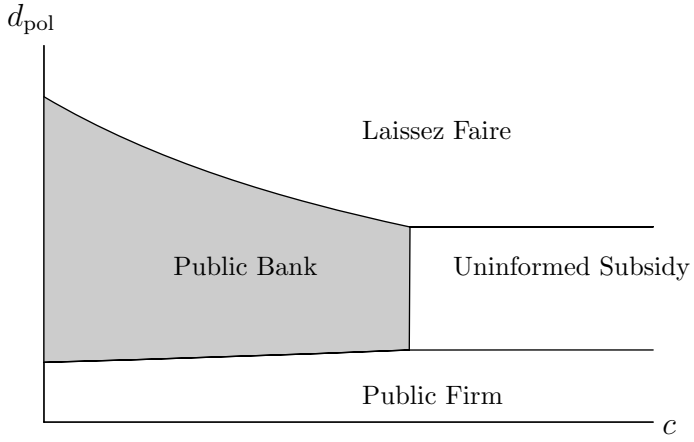
4 Comparison of Measures of State Aid

4.1 The Politician's Choice

Depending on the parameter constellations, the politician chooses the optimal state aid measure. We illustrate the politician's choice in Figure 2 for certain parameter values and plot the optimal measure for the politician.[10] Curves mark the borders between the optimal types of aid. Clearly, the measure that the politician picks depends on the parameters c and d_{pol}. As stated in the above propositions, informed subsidies are dominated by public banks, and uninformed subsidies are dominated by public banks if c is not too large.

[10]For the plot, we fix parameters at $I = 1.0$, $Y = 1.3$, $p_1 = 0.9$, $p_2 = 0.7$, $p_3 = 0.5$, $m_1 = 1/2$, $m_2 = m_3 = 1/4$, ε small (we take the limiting case of $\varepsilon \to 0$), and $X_{\mathrm{pol}} = 0.2$.

Figure 2: Subsidization Measures under the Political View

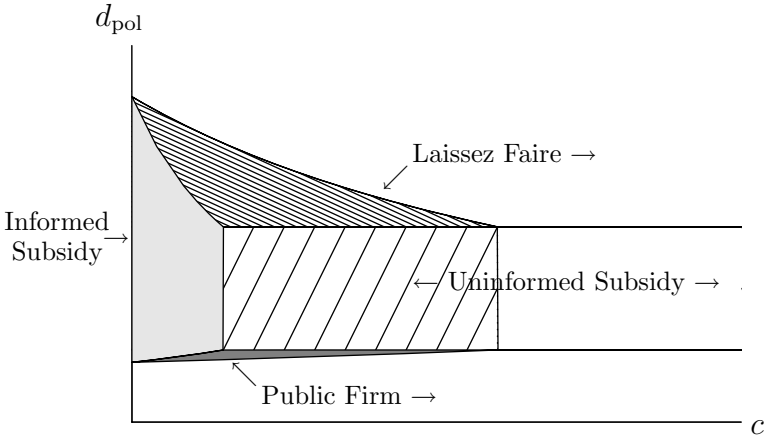


For relatively high d_{pol}, the costs of intervention are so high that the politician prefers not to interfere at all (laissez faire). For very low d_{pol}, the politician prefers to have all projects financed and hence uses public firms to carry out projects. That way, he benefits from the rent X_{pol} from "medium" projects, avoiding the screening costs c, but has to accept that also "bad" projects are carried out. For medium d_{pol} and not too large c, the politician will choose a public bank. In this range, the politician prefers a public bank to public firms because his costs of taxation d_{pol} are relatively high. This disadvantage is high enough to compensate the politician for giving up the rent of "bad" projects, which are not undertaken under a public bank. The politician prefers a public bank to laissez faire because the costs of raising taxes are low enough to justify the realization of "medium" projects which would not be undertaken in the laissez faire case. For medium d_{pol} and larger c, the politician will choose an uninformed subsidy. In this range, his utility is higher if he grants subsidies to "excellent" entrepreneurs but economizes on bearing the screening costs of the public bank.

Now suppose that for some reason public banks were not an option. In Figure 3, we show how the politician's choice changes. In the light gray region, the politician opts for an informed subsidy which was dominated by the public bank before. The regions in which the politician chooses laissez faire, uninformed subsidies, or public firms have increased.

This exercise also allows us to study the argument, made by Shleifer and Vishny (1994), that a politician reduces the number of interventions if the costs of an intervention increase. Our analysis comes to a different result. In the white regions, the politician's behavior is not affected by whether or not he has access to a public bank. For low d_{pol} in the dark gray region, the politician implements public firms. This means that now a mass of m_2+m_3 entrepreneurs enjoy being a public firm - the

Figure 3: Subsidization Measures in the Absence of Public Banks



degree of state intervention increases. For medium d_{pol} in the lightly shaded region, the politician switches to an informed or uninformed subsidy - the mass of subsidized entrepreneurs remains unchanged, but the cost of subsidization increases. Only for relatively high d_{pol} in the strongly shaded region, do we have the same result as Shleifer and Vishny; instead of using a public bank for indirect subsidization, the politician chooses laissez faire. Hence, how the degree of state intervention changes if public banks are no longer available depends crucially on the alternative options of the politician, on the characteristics of the project (X_{pol}, c, m, p and ε), and on the politician's costs of increasing taxes (d_{pol}).

4.2 Social Welfare

In this section, we compute social welfare for the five different measures of state aid. In our current set-up of the model, projects lead to an externality on the politician (the rent X_{pol}), but not on the public. Additionally, let us assume that the implementation of a project also influences social welfare, leading to a social externality of X_{soc}.[11] For $X_{\text{soc}} > 0$, not only the politician but also the public benefits from a successful project. For $X_{\text{soc}} < 0$, the project even has a negative effect on public welfare and medium projects should never be undertaken.[12] Furthermore, we must take into account that taxation leads to a social distortion that is proportional

[11] Without loss of generality, let us assume that the externality to the politician is also already contained in X_{soc}; otherwise, the aggregate social externality from a successful project would add up to $X_{\text{soc}} + X_{\text{pol}}$.

[12] If the negative externality is large, even the impact of an excellent projects on social welfare can be negative. However, the measures we study here cannot be used to avoid excellent projects being undertaken in this case.

to the tax, d_{soc}. Note that, even for $X_{\text{pol}} = X_{\text{soc}}$ and $d_{\text{pol}} = d_{\text{soc}}$, the politician does not always pick the welfare-optimal subsidization measure. Social welfare takes into account profits and losses of third parties (e. g., private banks or entrepreneurs), but the politician's utility function does not.

Aggregate welfare under the social view consists of the NPV of projects including the social externality, weighted by the mass of types financed, net of the costs of taxation, and the costs of screening.

Lemma 6 (Social Welfare) *Depending on the measure of subsidization, social welfare is*

$$\begin{aligned}
W_{\text{soc}}^{\text{LF}} &= m_1 \left(P_1 \left(Y + X_{\text{soc}}\right) - I\right) - c, \\
W_{\text{soc}}^{\text{US}} &= \sum_{i=1,\,2} \left(m_i \left(P_i \left(Y + X_{\text{soc}}\right) - I\right) - d_{\text{soc}}\, m_i \left(1 - P_i\right) S^{\text{US}}\right) - c, \\
W_{\text{soc}}^{\text{PB}} &= \sum_{i=1,\,2} m_i \left(P_i \left(Y + X_{\text{soc}}\right) - I\right) - d_{\text{soc}}\, m_2\, S^{\text{PB}} - \left(1 + m_2\right) c, \\
W_{\text{soc}}^{\text{IS}} &= \sum_{i=1,\,2} m_i \left(P_i \left(Y + X_{\text{soc}}\right) - I\right) - d_{\text{soc}}\, m_2\, S^{\text{IS}} - \left(1 + m_1 + d_{\text{soc}}\right) c, \quad \textit{and} \\
W_{\text{soc}}^{\text{PF}} &= \sum_{i=1,\,2,\,3} m_i \left(P_i \left(Y + X_{\text{soc}}\right) - I\right) - d_{\text{soc}}\, S^{\text{PF}} - c.
\end{aligned}$$

If X_{soc} is not too small, a public bank can even welfare dominate the laissez faire regime. However, if X_{soc} is small, zero, or even negative, then laissez faire is the optimal policy. This is obvious from comparing the welfare of the different regimes. For rather small d_{soc}, positive X_{soc} and large c, it can be optimal to have public firms even from a social perspective. The public wants the externality, taxation is not very costly, and screening (even by public banks) is prohibitively costly. Comparing the different measures, we derive the following proposition.

Proposition 3 *A public bank welfare dominates uninformed subsidies iff*

$$c < \bar{c}_{\text{soc}} = \frac{d_{\text{soc}}}{1 + d_{\text{soc}}} \frac{m_1}{m_2} \frac{1 - P_1}{1 - P_2} \left(I - P_2\, Y\right); \tag{17}$$

it welfare dominates informed subsidies iff

$$d_{\text{soc}} > \frac{m_2 - m_1}{1 + m_2}. \tag{18}$$

If there are more positive NPV projects in the economy than negative NPV projects that the politician wants to implement ($m_1 > m_2$), then condition (18) is satisfied

for all $d_{\text{soc}} \geq 0$. As with a politician who maximizes his own utility, the public bank can welfare dominate both informed and uninformed subsidies. In comparison to the uninformed subsidy, the public bank avoids the windfall gains to "excellent" entrepreneurs. Thereby, the deadweight loss of taxation decreases. However, the total screening costs with the public bank are higher because entrepreneurs rated as "medium" apply twice (at the private bank and after the rating at the public bank). As long as screening costs are not too high, the public bank is the more efficient measure for granting state aid also from a social welfare perspective.

Next, we compare informed subsidies and a public bank in terms of social welfare. We find that on the one hand the screening costs for "excellent" projects are duplicated under the informed subsidy, and the costs of screening all entrepreneurs must be financed by tax revenues. On the other hand, with a public bank the screening costs of "medium" entrepreneurs are duplicated, but only the costs of screening "medium" entrepreneurs through the public bank are financed by taxes. Thus, for high enough m_1, social welfare is higher with a public bank. The higher the costs of taxation, the lower the threshold value of m_1 where the public bank becomes the more favorable alternative.

Given the result of Proposition 3 we want to know whether the politician chooses to use a public bank when it is the best choice from the point of view of social welfare. We can prove the following result.

Proposition 4 *The politician uses the public bank inefficiently often.*

The explanation for the discrepancy is that the politician does not take into account screening costs and, in particular, the duplication of screening costs. For him screening costs only matter if they have to be covered by the subsidy. When comparing the threshold values where the politician switches from using the public bank to using an uninformed subsidy to the threshold value where social welfare changes, we can show that the threshold value is higher for the politician. The reason is that the politician does not take into account that the screening costs for "medium" entrepreneurs arise twice because he does not care about the costs of private banks. Moreover, the politician always prefers the public bank to an informed subsidy. However, as shown in Proposition 3, there exist parameter ranges where an informed subsidy is more efficient from a welfare perspective. (Note that the result of Proposition 4 is independent of the size of d_{pol} relative to d_{soc}.)

This section has made three points. *First*, and almost trivially so, laissez faire is the first best alternative if the social externality of projects is negative, $X_{\text{soc}} \leq 0$.

Second, public banks can be welfare-optimal if $X_{\text{soc}} > 0$. *Third*, in a large parameter range, public banks welfare-dominate both the informed and the uninformed subsidies (Proposition 3). But politicians use public banks inefficiently often (Proposition 4).[13]

5 Conclusion

We started this paper by asking what the most cost efficient measures of state aid are. In a globalized world it becomes even more important to use the most efficient means of subsidization. As some factors of production become more mobile, it becomes more difficult to tax them (European Economic Advisory Group, 2007). As a result, immobile factors have to bear a higher tax burden and, thereby, the deadweight loss of taxation increases. What do we suggest with respect to the reform of the World Bank,[14] or public banks in general, and the reform of state aid in the EU?

Concerning the reform of state aid, empirical studies confirm that state aid within Europe is very much influenced by considerations of political economy (Neven and Röller, 2000).[15] This evidence might suggests that, in reality, politicians maximize their own utility. Of course, one fundamental way to deal with this problem would be a thorough reform of the political system,[16] which might be difficult in the short run. As a less radical alternative, one could restrict the measures of state aid that

[13]However, it is also conceivable that the public prefers laissez faire (because X_{soc} is small), and the politician switches from a public bank to laissez faire if public banks are banned (hence he is in the densely shaded region of Figure 3).

[14]Although the World Bank is a multilateral development bank, considerations of political economy might play an important role. The results by Kuziemko and Werker (2006) suggest that the United Stated try to influence the rotating members of the U. N. Security Council by providing them more funds through U. N. agencies. Just like U. N. agencies, multilateral development banks can potentially be used for promoting certain projects.

[15]In Neven and Röller (2000), only a few political economy variables explain 90 percent of the variation in state aid across the member states. This general result confirms that the political disutility d_{pol} depends on the quality of the political system. Neven and Röller's study shows, for instance, that federal structures and transparency of procedures help in limiting state aid. Thus, there exist structural characteristics of the the political system which determine the amounts of state aid.

[16]Studies on Pakistan and India point out that the role of the electorate in controlling politicians has a significant impact on the effect that the state ownership of banks has on the economy. A better democratic control should not only help to limit the abuse of public banks by politicians but also to (for example) reduce corruption.

a politician may use. The effect of such a restriction depends on the characteristics of the projects.

First, for projects that not only generate a rent for the politician but also a positive externality on social welfare (implying that these projects should be undertaken) the politician should be able to use the most efficient means of intervention. In a large parameter range this is the public bank. In this range, forbidding a public bank would decrease social welfare. But we have also shown that the politician still prefers a public bank to direct subsidies when the latter measure is more efficient (Proposition 4). Here, privatization would indeed improve social welfare.

Second, for projects that have a negative externality on social welfare, the laissez faire case would be optimal from a welfare perspective. We have shown that the policy implication is not clear cut in this case either. If the politician who maximizes his own utility can no longer use a public bank, he may either abstain from interventions (which obviously increases social welfare) or use less efficient means of state aid (which decreases welfare even further).

The Meltzer report suggests replacing loans made by the World Bank group through grants. Our model does not broadly support this suggestion but points out that having a public bank is often the most efficient measure for granting state aid. Furthermore, the Meltzer report criticizes the World Bank for financing projects that are also viable on the capital market. Here the policy implication of our model concurs with the Meltzer report. We emphasize in our analysis that a public bank can dominate straight subsidies only if competition with private banks is restricted (see Lemma 3). One potential way to design such a restriction is to not allow public banks to match the loan rates of their private competitors. Such a restriction guarantees that public banks grant loans only to entrepreneurs who do not have access to the private banking sector rather than wasting tax money by interfering in the private sector.

A Appendix

Proof of Lemma 1. Because banks make mistakes with positive probability, and a loan application is not costly to entrepreneurs, all types of entrepreneurs will apply for loans. Of all these applicants, a fraction m_1 is excellent, hence the bank's refinancing costs are $m_1 I$. The entrepreneurs who get the loan are of mixed quality, their probability of success is P_1 as defined in (1). The expected profit for the bank

is hence

$$\Pi = m_1 P_1 R_1 - m_1 I - c.$$

Due to the assumption of perfect competition, the expected profit from a loan must be zero. Solving for R_1 yields (2).

Under what conditions does a banker reject entrepreneurs with a "medium" rating? When the screening costs are already sunk, the expected profit from a "medium" entrepreneur is $\Pi = m_2 P_2 R_2 - m_2 I$. The banker can demand a loan rate of at max $R_2 = Y$. A sufficient condition that bankers reject entrepreneurs with a "medium" rating is thus $P_2 Y < I$. For small ε, this inequality becomes $p_2 Y < I$, medium projects must have a negative NPV. The expected return from entrepreneurs with a "bad" rating is even lower, they will also be rejected under the above condition. In order to have intermediated finance, the return from a screened loan must exceed that from an unscreened loan, $\Pi \geq \bar{p} Y = [m_1 p_1 + m_2 p_2 + m_3 p_3] Y$. This term is assumed to be negative, hence finance is always intermediated.

The politician derives utility X_{pol} from all successful projects. Projects that get finance (mass m_1) are successful with probability P_1, hence the politician's utility is given by (3). For small ε, the politician's utility is approximately $m_1 p_1 X_{\text{pol}}$. ■

Proof of Lemma 2. We show that the politician cannot improve upon the subsidy described in the lemma. The necessary subsidy depends on the loan rates for different entrepreneurs, so we have to determine these rates first.

Step 1: Determine loan rates. Note that banks must make their interest rate offers contingent on the rating of the entrepreneur. If a bank offered the same loan rate for all classes of entrepreneurs, this rate would have to be relatively high, hence especially entrepreneurs with "excellent" ratings would rather go to banks with attractive loan offers for "excellent" entrepreneurs. A bank that grants loans to entrepreneurs with "excellent" and "medium" ratings at rates R_1 and R_2 makes a profit of

$$\Pi_{1,2} = \sum_{i=1,2} \Big(m_i \left(P_i R_i + (1 - P_i) S^{\text{US}} - I \right) \Big) - c.$$

However, the interest rates for "excellent" projects R_1 cannot be arbitrarily high. For too high rates R_1, banks that specialize on "excellent" projects could emerge and attract excellent projects with a lower R_1. Because banks err with positive probability, medium and bad projects would also try to get a loan from these banks. Hence, the expected profit of such a bank (out of equilibrium) would be

$$\Pi_1 = m_1 \left(P_1 R_1 + (1 - P_1) S^{\text{US}} - I \right) - c.$$

If both $\Pi_{1,2} = 0$ and $\Pi_1 = 0$, then the interest rates constitute an equilibrium; no bank can improve profits by adjusting its loan rates, and

$$R_1 = \frac{I - (1 - P_1)\, S^{\mathrm{US}}}{P_1} + \frac{c}{m_1\, P_1},$$
$$R_2 = \frac{I - (1 - P_2)\, S^{\mathrm{US}}}{P_2}.$$

The politician must grant the "medium" entrepreneur a subsidy high enough to make the application for a loan worthwhile. On the other hand, he wants to choose S^{US} just high enough to raise the creditworthiness of "medium" entrepreneurs so that they get access to private finance. This yields $R_2 \geq Y$, and in the limit $R_2 \to Y$. Solving the three equations $\Pi_{1,2} = 0$, $\Pi_1 = 0$, and $R_2 = Y$ for R_1, R_2 and S^{US}, we get (4), (5) and (6).

Step 2: Derive the optimal kind of subsidy. With a subsidy as in (4), both "medium" and "excellent" entrepreneurs will produce. With a subsidy *lower* than in (4), "medium" entrepreneurs could not produce, because the loan rate demanded by banks would exceed the highest repayment possible Y. As a consequence, production decisions would be the same as without any subsidy. With a subsidy slightly *higher* than (4), "medium" and "excellent" entrepreneurs would produce, but tax revenues would be wasted because the same production decisions could be achieved with a lower subsidy. With an even higher subsidy (for instance an unlimited deficit guarantee that covers the total repayment), even "bad" entrepreneurs would get access to loans.

If the politician granted a subsidy unconditional on success, then the expected amount of subsidy paid to "excellent" projects would be the same as that paid to "medium" projects. In the case of a (partial) deficit guarantee, the expected subsidy paid to "excellent" projects is lower because their probability of success is higher and that way the politician can economize on tax revenues. If the politician granted a subsidy unconditional on production, then *all* entrepreneurs would take the subsidy as a windfall gain. Even "bad" entrepreneurs would take a subsidy although they cannot produce because they do not get access to private loans. This wastes tax revenues and creates a disutility to the politician. Summarizing, we find that, given the politician uses a subsidy to influence production decisions, the method of lemma 2 is the most efficient way of using tax revenues.

Finally, let us derive the politician's utility from implementing a direct, uninformed subsidy. Both medium and excellent projects are carried out and take the subsidy. An aggregate tax of $\big(m_2\,(1 - P_2) + m_1\,(1 - P_1)\big)\, S^{\mathrm{US}}$ must be levied to finance the subsidy. Hence, the politician's utility is given by (7). ■

Proof of Lemma 3. *Step 1: Determine loans rates.* In equilibrium, private banks will grant loans only to "excellent" projects, hence they will offer the most favorable loan rates. As a consequence, bad entrepreneurs will apply at a private bank. If they are rejected because they are "bad", they know that they will never get a loan (because the screening technologies of all banks are identical) so they will not apply again. "Medium" entrepreneurs will first apply at a private bank as well, to have the chance to benefit from the favorable loan rates if they are rated as "excellent." After being rejected, they apply at a public bank which finances "medium" projects since the expected loss it makes which each "medium" project is compensated by a subsidy from the politician. Given the subsidy in (8), the public banks demands $R_2 = Y$ we are exactly in the limiting case where medium entrepreneurs only just participate.

"Excellent" entrepreneurs always apply for a loan at the private bank (the one with the lowest rate). There is perfect competition between private banks for "excellent" projects and this drives down their expected profit to zero. Thus, the private bank's expected profit is $\Pi_1 = m_1 (P_1 R_1 - I) - c$. Now $\Pi_1 = 0$ implies (9).

Step 2: Derive optimal subsidy. The maximum loan rate that a public bank can demand is $R_2 = Y$. In this case, the public bank's profit function is given by

$$\Pi^{\mathrm{PB}} = m_2 (P_2 Y + S^{\mathrm{PB}} - I) - m_2 c. \tag{19}$$

This term must be non negative, otherwise the public banker's participation constraint would be violated. Choosing S^{PB} as in (8), we find that the participation constraint just holds, the public banker's expected profits are zero.

The subsidy must not be higher than necessary to satisfy the public bankers' participation and incentive compatibility constraints, otherwise tax revenues would be wasted.

Step 3: Restriction in competition is necessary. An important feature of the public bank is that competition with private banks must be restricted, for example, by not allowing public banks to offer the same loan rates as private banks. If there were unrestricted competition, the public bank could give loans to "excellent" entrepreneurs and still collect the subsidy. This would allow them to make positive profits. Consequently, public banks would grant loans to all "excellent" and "medium" entrepreneurs. The aggregate subsidy to the public bank would then be higher than with direct subsidization of entrepreneurs, as in Section 3.2.

The politician derives utility from both "excellent" and "medium" projects. In equilibrium, only "medium" entrepreneurs get the indirect subsidy through the public bank. Hence, the politician's utility is given by (10). ■

Proof of Proposition 1. Compare the politician's utilities under the two subsidization measures, $U_{\text{pol}}^{\text{PB}}$ and $U_{\text{pol}}^{\text{US}}$. Straightforward algebraic manipulation shows that $U_{\text{pol}}^{\text{PB}} > U_{\text{pol}}^{\text{US}}$ as long as (11) holds. ■

Proof of Lemma 4. *Step 1: Determine the loan rates.* The politician grants a subsidy to entrepreneurs rated as medium. They can use the subsidy to signal their rating. The profit of a private bank from a subsidized entrepreneur is

$$\Pi_2 = m_2 \left(P_2 \, R_2 + (1 - P_2) \, S^{\text{IS}} - I \right),$$

Under perfect competition, the loan rate will be

$$R_2 = \frac{I - (1 - P_2) \, S^{\text{IS}}}{P_2}.$$

Now, after entrepreneurs have received a subsidy and a loan, only entrepreneurs rated as "excellent" by the credit specialist will apply for loans at private banks. Entrepreneurs who were rated as "bad" will not apply because they know for sure that they will not receive a loan. As a consequence, the profit function from a non-subsidized loan is

$$\Pi_1^{\text{Bank}} = m_1 \left(P_1 \, R_1 - I \right) - m_1 \, c,$$

hence, in market equilibrium the interest rate is R_1 as in (9).

Step 2: Derive optimal subsidy. In order to analyze the size of the subsidy, we need to find out which entrepreneurs are screened by whom. All entrepreneurs will apply for the subsidy, because they do not want to risk of being rejected by the bank and then lose the chance to get the subsidy. As a result, the aggregate screening cost of the consultants is at least c. It is also possible to find a contract that needs no more than c: Employ one consultant and let him screen all entrepreneurs, employ another consultant and let him control a random fraction η, pay the first consultant only if the second finds no mistakes, and let η converge to zero. Based on the first consultant's report, the politician grants subsidies only to "medium" entrepreneurs. Now private banks can observe the subsidy, and hence can give loans without further screening to these subsidized entrepreneurs (if the subsidy is sufficiently high). The politician can again set the subsidy such that the medium entrepreneurs' participation constraint binds. Setting $R_2 = Y + S^{\text{IS}}$, we get $S^{\text{IS}} = I - P_2 \, Y$.

The public consultants cannot be the owners of private banks, but must be independent agents. The politician cannot allow his public consultant to give loans to

entrepreneurs who get a subsidy: The public consultant would have – in terms of information – a competitive advantage on the loan market compared to other private banks. Therefore, he could always offer a lower loan rate than the private bank and make sure that he can grant the loan. Anticipating this, the public consultant could tell the politician to subsidize even if an entrepreneur is already "excellent." The public consultant could profit indirectly because of his competitive advantage. As a consequence, both "excellent" and "medium" entrepreneurs would get the subsidy, and the consultant's advice would be worthless. Moreover, if the public consultant gave the loan himself, the institutional setting might be indistinguishably close to a public bank.

Now the politician's utility comprises the following components. Projects are carried out by "medium" and "excellent" entrepreneurs. The subsidy is paid only to "medium" entrepreneurs. Furthermore, the politician must pay a wage of c per screened loan to his advisors (credit specialists). Consequently, the aggregate utility is (14). ■

Proof of Proposition 2. We only need to compare $U_{\text{pol}}^{\text{PB}}$ from (10) with $U_{\text{pol}}^{\text{IS}}$ from (14). Using straightforward algebra, we find that $U_{\text{pol}}^{\text{PB}}$ always exceeds $U_{\text{pol}}^{\text{IS}}$ because $c\,d_{\text{pol}} > m_2\,c\,d_{\text{pol}}$ for any strictly positive c and d_{pol}. ■

Proof of Lemma 5. All entrepreneurs apply at the bank, but "medium" and "bad" entrepreneurs will be rejected. They apply at the politician to become a public employee. When making wage offers, the politician needs to take into account the outside option that different types of entrepreneurs have. Entrepreneurs rated as "medium" have expected profits of zero if they do not sell their project because they cannot get loans from private banks. Consequently, the politician does not need to offer more than an infinitesimal wage to employ entrepreneurs rated as "medium." In the limiting case, he can pay zero wages. However, at any weakly positive wage, entrepreneurs rated as "bad" will apply as well. Only entrepreneurs rated as "excellent" will choose to remain independent at a zero wage. However, the politician does not aim to employ entrepreneurs rated as "excellent" in the first place – their projects are carried out without government intervention, because they are sure to be financed by private banks.

Although the politician does not need to pay for the projects, public firms do not come free of cost. The politician needs to be liable for the debt of public firms, otherwise investors would not grant loans. Because investors can observe that the government guarantees the repayment, they do not need to screen public firms. They

get the same repayment in the case of success or failure, independent of the quality of the entrepreneurs within the firm. Therefore, they do not need a compensation for risk, and every public firm has a loan rate of $r = 1$.

Hence, the politician's expected payment for such bailouts is $(m_3\,(1-p_3)+m_2\,(1-p_2))\,I$. However, the politician does not need to finance these payments completely from taxes. He can use the revenues from the successful public firms, which amount to $(m_3\,p_3+m_2\,p_2)\,(Y-I)$. Only the difference between the expected revenues and the expected bailouts must be levied by taxation,

$$S^{\mathrm{PF}} = \sum_{i=2,\,3} m_i\,(1-p_i)\,I - m_i\,p_i\,(Y-I),$$

which is equal to (15). Because entrepreneurs can still get a public job after a rejection from a private bank, all entrepreneurs apply for loans, just like in the laissez faire case. As a consequence, screening out "bad" and "medium" entrepreneurs is just as costly for private banks, and the equilibrium loan rate is $R_1 = (I + c/m_1)/P_1$ like in (2). ■

Proof of Proposition 3. Comparing social welfare under different measures,

$$W_{\mathrm{soc}}^{\mathrm{PB}} - W_{\mathrm{soc}}^{\mathrm{US}} = \frac{d_{\mathrm{soc}}\,m_1\,(1-P_1)\,(I-P_2\,Y) - c\,m_2\,(1-P_2)\,(d_{\mathrm{soc}}+1)}{1-P_2},$$

which is positive for if (17) holds. Along the same line,

$$W_{\mathrm{soc}}^{\mathrm{PB}} - W_{\mathrm{soc}}^{\mathrm{IS}} = c\,(m_1 + d_{\mathrm{soc}} - d_{\mathrm{soc}}\,m_2 - m_2),$$

which is positive if (18) holds. ■

Proof of Proposition 4. Comparing the threshold values in Proposition 1 and Proposition 3 shows that $\bar{c}_{\mathrm{soc}}/\bar{c}_{\mathrm{pol}} = d_{\mathrm{soc}}/(1+d_{\mathrm{soc}})$, hence $\bar{c}_{\mathrm{pol}} > \bar{c}_{\mathrm{soc}}$. ■

References

Allen, F., and D. Gale (2004): "Financial Intermediaries and Markets," *Econometrica*, 72(4), 1023–1061.

Altunbas, Y., L. Evans, and P. Molyneux (2001): "Bank Ownership and Efficiency," *Journal of Money, Credit and Banking*, 33(4), 926–954.

Andrianova, S., P. Demetriades, and A. Shortland (2007): "Government Ownership of Banks, Institutions, and Financial Development," *Journal of Development Economics*, forthcoming, 530–542.

Armendáriz de Aghion, B. (1999): "Development Banking," *Journal of Development Economics*, 58, 83–100.

Bertrand, M., A. Schoar, and D. Thesmar (2007): "Banking Deregulation and Industry Structure: Evidence from the 1985 French Banking Act," *Journal of Finance*, 62(2), 597 – 628.

Boycko, M., A. Shleifer, and R. W. Vishny (1996): "A Theory of Privatisation," *Economic Journal*, 106(435), 309–319.

Cole, S. A. (2006): "Fixing Market Failures or Fixing Elections? Elections, Banks and Agricultural Lending in India," unpublished manuscript, Harvard Business School.

Collie, D. R. (2000): "State Aid in the European Union: The Prohibition of Subsidies in an Integrated Market," *International Journal of Industrial Organization*, 18(6), 867–884.

Dewatripont, M., and E. Maskin (1995): "Credit and Efficiency in Centralized and Decen-tralized Economies," *Review of Economic Studies*, 62(4), 541–555.

Dewatripont, M., and P. Seabright (2006): "'Wasteful' Public Spending and State Aid Control," *Journal of European Economic Association*, 4(2-3), 513–522.

Dinç, I. S. (2005): "Politicians and Banks – Political Influences on Government-Owned Banks in Emerging Markets," *Journal of Financial Economics*, 77(2), 453–479.

European Commission (1998): "Sixth Survey on State Aid in the European Union in the Manufacturing and Certain Other Sectors," Discussion paper, Brussels.

European Economic Advisory Group (2007): *EEAG Report on the European Economy*. CESifo Group, Munich.

Friederiszick, H. W., L.-H. Röller, and V. Verouden (2007): "European State Aid Control: an economic framework," in *The Economics of Competition Law*, ed. by P. Buccirossi. MIT Press, Cambridge, Massachusetts, forthcoming.

Giebe, T., T. Grebe, and E. Wolfstetter (2006): "How to Allocate R&D (and Other) Subsidies: An Experimentally Tested Policy Recommendation," *Research Policy*, 35(9), 1261–1272.

Hakenes, H., and I. Schnabel (2006): "The Threat of Capital Drain – A Rationale for Public Banks?," MPI Preprint 2006/11, Max Planck Institute for Research on Collective Goods.

Khwaja, A. I., and A. Mian (2005): "Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market," *Quarterly Journal of Economics*, 120(4), 1371 – 1411.

Kornai, J. (1980): *Economics of Shortage*. North Holland Press, Amsterdam.

Kuziemko, I., and E. Werker (2006): "How Much Is a Seat on the Security Council Worth? Foreign Aid and Bribery at the United Nations," *Quarterly Journal of Economics*, 114(5), 905–930.

La Porta, R., F. Lopez De Silanes, and A. Shleifer (2002): "Ownership Of Banks," *Journal of Finance*, 57(1), 265–302.

Meltzer, A. H. (2000): "Report of the International Financial Institution Advisory Commission," Discussion paper.

Neven, D. J., and L.-H. Röller (2000): "The Political Economy of State Aid: Econometric Evidence for the Member States," in *The political economy of industrial policy in Europe and the member states*, ed. by D. J. Neven, and L.-H. Röller, pp. 25–37. Edition Sigma, Berlin.

Sapienza, P. (2004): "The Effects of Government Ownership on Bank Lending," *Journal of Financial Economics*, 72(2), 357–384.

Scott, D. H. (2007): "Strengthening the Governance and Performance of State-Owned Financial Institutions," Discussion paper, World Bank Policy Research Working Paper No. 4321, World Bank, Washington D. C.

Shaffer, S. (1998): "The Winner's Curse in Banking," *Journal of Financial Intermedation*, 7(4), 359–392.

Shleifer, A., and R. W. Vishny (1994): "Politicians and Firms," *Quarterly Journal of Economics*, 109(4), 995–1025.

United Nations (2005): "Rethinking the Role of National Development Banks," Discussion paper, Ad Hoc Expert Grout Meeting "Rethinking the Role of National Development Banks", New York, 1-2 December 2005.

Vittas, D., and Y. J. Cho (1995): "Credit Policies. Lessons from East Asia," Discussion paper, World Bank Policy Research Working Paper No. 1458, World Bank, Washington D. C.