The Goal Achievement of Federal Lending Programs

Matthias Raith • Thorsten Staak • Christoph Starke

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The Goal Achievement
of Federal Lending Programs

Matthias Raith, Thorsten Staak[*], and Christoph Starke

Department of Economics and Management
Otto-von-Guericke University
Magdeburg, Germany

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Abstract

Governmental intervention in credit markets typically involves the allocation of credit in the light of market failures. In this paper we evaluate federal lending programs while presuming positive externalities and symmetrically informed market participants. For common objectives of governmental lending institutions we verify that optimal lending structures require the application of the *gap lender principle*. We also show that lending programs can never be self-financing, due to the positive subsidy margin. Within this general framework, we contrast the policies of the US SBA and the German KfW and show that neither institution features an optimal lending structure.

[*] Corresponding author: Department of Economics and Management, Otto-von-Guericke University, P.O. Box 4120, 39016 Magdeburg, Germany. Email: Thorsten.Staak@ww.uni-magdeburg.de

1. Introduction

Entrepreneurs are frequently restricted by external financiers in exploiting their innovative ideas, which critics typically attribute to unfavorable financing conditions or access barriers to outside capital. Governments oppose these identified malfunctions by intervening in credit markets. In most cases the presumption of asymmetric information between borrower and debtor serves as the basis for evaluating the impact of federal initiatives on the allocation of credit.[1] In contrast, some authors have analyzed governmental policies by assuming symmetric information in the credit market. They justify governmental initiatives with positive externalities, incompletely competitive markets, and regulative intentions.[2]

In this paper we take the view of symmetrically distributed information between lender and borrower. We find this assumption plausible, given that private banks equipped with improved screening and monitoring techniques are currently moving from volume to risk control modes.[3] Additional incentives to price the risk of loans adequately are provided by the second Basel-Accord. In the future, banks' deposits of equity capital will presumably be more oriented towards default risk, thus requiring a clearer identification of debtors' payment probabilities. This brings borrower-bank-relations closer to informational symmetry.

Whereas credit rationing may call for federal credit programs in markets with asymmetric information, we justify governmental intervention here with the occurrence of positive externalities. Projects fail to be executed, because the private rate of return falls short of financing costs, even though the project is socially desirable. Especially innovative investment projects

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[1] Examples are Smith (1983), Mankiw (1986), Smith and Stutzer (1989), Gale (1990), Innes (1991), Lacker (1994), Williamson (1994), and Parker (2002), who provide theoretical frameworks to evaluate the effectiveness of federal credit programs in coping with market imperfections. By additionally drawing on empirical data, Gale (1991) shows serious inefficiencies of those governmental interventions.

[2] See, for example, Penner and Silber (1973) or Lombra and Wasylenko (1984). Mayshar (1977) explains the subsidization of risky private projects with the incompleteness of the capital market and the existence of an income taxation system.

[3] An example of research in this field is Frame, Srinivasan and Woosley (2001). Using empirical data, they support the view that credit scoring, as an automated underwriting technique, reduces information asymmetry between borrowing small businesses and their lenders.

may feature social benefits that exceed their corresponding private rents. The reluctance of external sources to finance these ventures can then lead to market failure. The credit market fails because the social benefit, as a result of project realization, is not included in the decision calculus of market participants. In their empirical assessment of industrial innovations Mansfield et al. (1977) find that "in about 30 percent of the cases, the private return was so low that no firm, with the advantage of hindsight, would have invested in the innovation, but the social rate of return from the innovation was so high that, from society's point of view, the investment was well worthwhile."[4] In these cases governmental intervention would not only be desirable for entrepreneurs, but also socially legitimate.

Our objective with the current analysis is to examine the conditions for optimal lending structures. The deduction of properties for the optimal design of federal credit programs requires, in a first step, the determination of federal lending objectives. We, therefore, compare the objectives of a sample of governmental institutions and programs. From this comparison three fundamental goals can be determined: (1) Correction of market failure, (2) compliance with the subsidiarity principle, and (3) efficient employment of means.

We evaluate the achievement of the three identified objectives by means of a general credit-market model embedded in an interest-rate-risk-space. We choose this framework for policy evaluation because we believe that most federal lending activities can be reduced to the use of either risk-reduction or interest-rate-subsidization instruments. A construction of two alternative lending structures embodying one of these instruments reveals that both are potentially able to achieve the stated objectives if certain principles are applied. First, federal institutions have to implement the so called *gap-lending principle*. In contrast to Chaney and Thakor (1985), we find that the public promotion of entrepreneurial investment projects should

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[4] Mansfield et al. (1977) find a median social return rate of 56 percent compared to a median private rate of 25 percent within their 17 case studies. Further results can be found in Griliches (1992), who gives an overview of alternative R&D-models and emphasizes that, for all of these models, social rates of return lie significantly above the corresponding private rates.

concentrate on those investors that are not able to obtain the necessary financing from the credit market and, thus, belong to the market gap. Moreover, cost efficiency would require adjusting the subsidy margin to those loan costs that the borrower is not able to cover, or, in case of processing costs, to sacrifice this flexibility and grant fixed margins. Finally, we find that governmental lending programs can never achieve their goals when they are self-financed.[5]

In practice, even optimal lending structures are typically applied with restrictions. As examples we investigate the policies of two prominent institutions, namely the US American SBA and the German KfW. We find differences in the application of the gap-lending principle, self-financing efforts and interest rate limitations. In both cases we find room for additional reform.

The rest of the paper is organized as follows. In section 2 we deduce federal lending objectives from the statutes of selected governmental institutions. Section 3 introduces a general model of the credit market, which displays a market failure due to positive externalities. In sections 4 and 5 alternative lending structures are formulated as well as evaluated with respect to their goal achievement and the conditions for optimality are derived. In section 6 we apply this framework to the federal lending structures of the SBA and the KfW. Section 7 shows the stability of our results in a more general situation. We conclude in section 8 with an interpretation of our results.

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[5] Public lending institutions that implement self-financing programs try to cover their expenditures by charging participants a fee. Examples are the UK's Loan Guarantee Scheme (LGS) launched by the Department of Trade and Industry (see Cowling and Clay (1995)), the American SBA (see SBA (2005)) and the Canadian SBLA (see Riding (1997)).

2. Federal Lending Objectives

The international comparison of federal lending institutions reveals three fundamental objectives that are consistently formulated for a large number of federal lending programs:[6]

<div style="border:1px solid black">

<u>Federal Lending Objectives</u>

1. Correction of market failure
2. Compliance with the subsidiarity principle, i.e. ensuring competitive neutrality
3. Efficient use of means

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The first objective is based on the assumption that there is some form of imperfection in the credit market and that it is the government's duty to correct the corresponding failure. For instance, small and medium-sized enterprises often receive less and smaller loans than public institutions find economically desirable. In terms of its strategic plan, the American SBA, thus, tries to "increase small business success by bridging competitive opportunity gaps facing entrepreneurs" and the Administration is, therefore, "continuing its efforts to bridge the gaps the market place does not address" (SBA 2003). Accordingly, Rappaport and Wyatt (1990) speak of the SBA's "original goal of overcoming an imperfection in the business credit market." Analogously, Cowling and Clay (1995) state in their empirical study of the British Loan Guarantee Scheme (LGS) that "the Department of Trade and Industry launched the LGS with the intention of 'filling in' gaps in the availability of loan finance for SMEs in the UK." Likewise, the final report of the European MAP[7] points to "the importance of facilitating access to finance for SMEs […] through addressing well identified market gaps and/or fail-

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[6] The sample encompasses the following institutions and programs: the American SBA, the British LGS, the European MAP, and the German KfW whose programs additionally serve as patterns in (South-) East European countries to support their transition processes towards market economies.
[7] Multiannual Programme for Enterprise and Entrepreneurship, and in particular for small and medium-sized enterprises (SMEs) 2001-2005

ures."[8] Finally, Mann and Pöhler (2003) take a clear position towards the correction of market failures as a rationale for governmental intervention in German credit markets.

The second objective of federal lending institutions is to comply with the subsidiarity principle which embodies the requirement for competitive neutrality between the federal agency and the private banking sector. Stated differently, credit-market interventions of the government must not create additional market distortions by substituting private banks' business. In his cross-country analysis Winkler (1999) claims that federal lending institutions, "by their very design, do not compete with commercial banks because they function solely as second-tier institutions. As a rule, a [federal agency] will not lend directly to the target group, but will channel funds to the final borrowers via local commercial banks and savings banks." The SBA as well as the KfW embedded this rule in their corporate laws. In the Small Business Act §7(a)(1)(A) the Administration states clearly that "no direct financing may be made unless it is shown that a participation [(i. e. guaranteed bank loan)] is not available."[9] The Law concerning the KfW (2004) refers to this objective in §3(1): "In connection with the granting of financings […], credit institutions or other financing institutions must be involved […]. In carrying out its operations the Institution must respect with regard to credit institutions or financing institutions the principle of non-discrimination under European Community law."[10] Finally, the Commission of the European Communities (2004) confirms that the financial instruments applied under the MAP "operate on a commercial basis, and so do not entail market distortions," which could be generated by direct financing modes.

The third objective aims at minimizing the costs of lending institutions' operating activities. According to Cowling and Clay (1995), the British LGS was initiated to generate a "cost-effective job/wealth generation package." Analogously, the SBA seeks to "ensure that all

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[8] See Commission of the European Communities (2004).
[9] See also Riding and Haines (2001).
[10] This law also constitutes the basis for the KfW's outreaching activities to (South-)East European countries. Köhn and Erhardt (2004) speak of interventions "guided by the overarching principle of subsidiarity […] [and therefore] aim at strengthening local financial intermediaries instead of supporting parallel delivery structures."

SBA programs operate at maximum efficiency and effectiveness" (SBA 2003). Efficiency is also emphasized by Reich (2002), who lists this objective explicitly for the KfW.

Although there are several other goals that may also be taken into account, the three fundamental objectives outlined above are shared by most federal lending institutions. In the course of the subsequent analysis we suppose a hybrid federal agency which takes these three objectives as guidelines for policy formulation.

3. The Model

The presence of asymmetric information is the most common explanation for credit rationing. Indeed, under information symmetry, it is difficult to justify – from the supply side – why some debtors are offered a private bank loan while others are not. Theoretically, every risk can be compensated by a payment of the respective risk margins.[11] Consequently, all applicants should be supplied with a loan by the banking sector.

Nevertheless, it can be observed that debtors are not always able to obtain funds, even when their risk properties can be revealed. We explain this phenomenon from the demand side: Suppose that all investors value projects by their expected private rates of return. Within each risk class there then exist investments, whose return rates exceed or fall short of the respective risk corresponding market interest rate. Those investors, whose projects feature expected returns that cannot cover the market price, refrain from demanding loans.

In order to construct a model which solely captures this feature, we assume that information between borrowers and debtors is distributed symmetrically, i. e., all investors are perfectly informed about federal and market loan conditions of the participating banks. Conversely, banks have full information concerning the risks and the expected internal return rates of the planned investments. Fig. 1 depicts the credit market in terms of interest rate and

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[11] Machauer and Weber (1998) speak of ‚loan pricing’ by the lender.

risk. Within this setting the perfectly competitive price-setting behavior of the private banking sector is represented by the market interest-rate curve $i^M(\sigma)$. This function is increasing in the borrower's risk level σ [12], due to the fact that borrowers with higher risks must pay larger risk premiums in order to offset lower repayment probabilities. Without loss of generality, we assume that the $i^M(\sigma)$-curve has a linear form.[13]
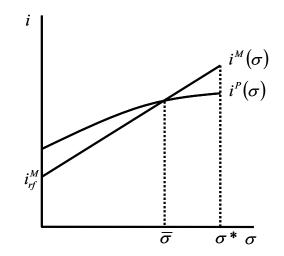

Fig. 1: Market curve, private rate of return function and the loan gap

We focus our analysis on only those entrepreneurial investment projects which feature positive external effects, e. g. because of their innovative content.[14] As with the market rate, we characterize the *private* rate of return of socially desirable projects by an increasing func-

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[12] We assume that the risk level σ of the projects accounts for an adjustment of collaterals. For instance, if an investor's project possesses an initial risk level of 30 percent and the investor is able to cover 50 percent of the risk level by collaterals, the collateral adjusted risk level σ equals 15 percent. This assumption simplifies the analysis by including collaterals in the risk level, thus allowing us to avoid handling collaterals as an additional parameter within the model.

[13] The positive relationship between terms for bank loans and borrower risk defined by the banks' internal credit rating has been shown to be statistically significant by Machauer and Weber (1998). Although one might expect the $i^M(\sigma)$-curve to be convex, the exact shape crucially depends on how risk is measured. For instance, as long as risk is defined in rating terms, e. g. of Moody's or Standard & Poor's, the market interest-rate curve, indeed, has a convex shape. On the other hand, if risk is measured in terms of default probabilities, its shape is more likely to be concave. As can be seen later, our results are independent of the specific curvature.

[14] Innovating businesses are often the source of so-called R&D spillovers. New knowledge, which is generated within the business, is made public when the invention is offered to potential buyers. In this case, other market participants also benefit from the generated knowledge, but without having to discharge an adequate compensation. Consequently, the social rate of return, encompassing the businesses' as well as the other participants' surplus from that innovation, exceeds the private rate of return of the considered business. Griliches (1992) gives an extensive overview of attempts to measure both rates of return and emphasizes that all considered studies show social rates of return to be significantly above private rates.

tion of the investment risk. In Fig. 1 the distribution of these projects is represented by the $i^P(\sigma)$-curve. Two features of the $i^P(\sigma)$-curve are crucial for our analysis: First, there are investments that obtain financing from the credit market, because $i^P(\sigma) \geq i^M(\sigma)$, but there are also projects with private rates that do not meet market conditions, i. e. where $i^P(\sigma) < i^M(\sigma)$. Second, the vertical distance between the $i^P(\sigma)$-curve and the $i^M(\sigma)$-curve varies for different projects. It is important to note that the results of our analysis can be derived for any distribution of eligible investment projects with these two features. We verify this claim in section 7 by explicitly acknowledging individual investment projects.

In Fig. 1 we denote the critical risk level where $i^P(\sigma) = i^M(\sigma)$ holds by $\bar{\sigma}$. In order to specify market failure, we presume for each considered investment project up to a certain risk level of $\sigma^* > \bar{\sigma}$ an expected social return rate which lies above the respective market interest rate. By definition, σ^* denotes the risk level above which the social rate of return is lower than the market interest rate. Projects with higher risk levels should not be carried out, because their positive effects on the economy do not justify investment costs. Market failure is, therefore, given by the difference: $\sigma^* - \bar{\sigma}$. We refer to this difference as the *loan gap*. As can be seen from Fig. 1, the loan gap comprises all eligible investment projects lying below the market interest-rate curve.

The subsidiarity principle embodies the requirement for competitive neutrality between the federal agency and the private banking sector. In other words, credit-market activities of the public institution must not create additional market distortions by negatively affecting private banks' business. The most common way to fulfill this principle is to allocate federal offerings indirectly through private banks. Under this procedure, private banks only grant loans voluntarily, if their incomes comply with laissez-faire market conditions. Consequently, public loan activities are blocked, if private banks are not compensated adequately. In the

following, we focus on those lending structures which utilize this indirect lending procedure and, thus, satisfy the second federal lending objective.

The efficient use of means, as the third fundamental goal, will be measured in terms of the lowest possible costs for a given amount of internalized externalities. In order to evaluate federal credit programs from a cost perspective, we assume the number of projects in a certain risk class to be limited to one. Consequently, there exist exactly σ projects with a risk of at most σ in the modeled economy. This enables us to construct cost areas within our graphical model as the risk axis now also serves as a quantity axis.

4. Alternative Lending Structures

We evaluate alternative lending structures by explicitly focusing on two parameters: interest rates and risk levels. We justify this approach with the observation that public agencies essentially have two instruments to make investment projects marketable: interest rate subsidies and measures of risk reduction, e. g. the application of a guarantee rate, which we denote by γ.[15] In both cases governmental programs lead to a duality of market and federal loan prices. We denote the federal interest rates of publicly supported funds by $i^F(\sigma, \gamma)$, in contrast to the price of a market loan, $i^M(\sigma)$.

For the subsequent analysis, we present two alternative federal credit programs, (a) and (b), where each employs one of the two policy instruments. Specifically, program (a) consists of a fixed guarantee rate and a market determined interest rate, whereas in program (b) the governmental institution subsidizes the market interest rate by a constant margin but without any guarantee support.

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[15] We follow the line of Penner and Silber (1973), who divide mortgage credit programs into first, policies designed to affect the interest rate paid by borrowers, without changing the risk characteristics, and second, programs designed to change the risk characteristics of mortgages, so that they become more desirable for lenders.

(a) Fixed Guarantee Rate, Market Determined Interest Rate

Within structure (a) the federal agency offers a guarantee rate of a fixed percentage $\gamma = \bar{\gamma} > 0$ to all investors, while letting the interest rate adjust to market price conditions, i. e. $i^F(\sigma, \gamma)\big|_{\gamma=0} = i^M(\sigma)$. Aside from specific details, this is the institutional arrangement under which many countries operate, e. g. the USA, UK, Canada, Japan, France, and the Netherlands.[16] The guarantee reduces the private banks' costs of credit risk, thus inducing them to lower the price for the guarantee complemented funds in a competitive market. As a consequence, lower risk premiums let investors' demand for conditioned federal loans rise. The implications of structure (a) are illustrated in Fig. 2.
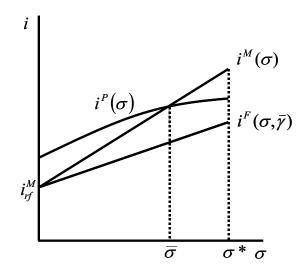

Fig. 2: Fixed guarantee rate, market determined interest rate

The market interest rate curve for guaranteed loans is denoted by $i^F(\sigma, \bar{\gamma})$. Since federal lending reduces the risk of financing a given project from σ to $(1-\bar{\gamma})\sigma$, the $i^F(\sigma, \bar{\gamma})$-curve results from a downward rotation of the $i^M(\sigma)$-curve at its ordinate intersection, i. e. the risk-free interest rate i_{rf}^M. Hence, public risk coverage rises with the level of risk.

(b) Fixed Interest Subsidization, No Guarantee

Under structure (b) the federal agency offers loan endowments with a constant interest-rate subsidization, regardless of the project's risk $\left(i^F(\sigma,\gamma)\big|_{\gamma=0} < i^M(\sigma)\right)$. However, the agency refrains from warranting guarantees to private banks ($\gamma = 0$). This setting characterizes the current lending arrangement of the German KfW in a significant part of its programs. According to Stiglitz et al. (2000) interest rate subsidies are also common in Ireland, Scotland and Wales. The qualitative outcome is the same as with structure (a), namely a subsidization of the private banks' cost structures. Consequently, the banking sector competes with loan prices until profit levels match the former market situation. Fig. 3 shows the effect of structure (b) on the credit market. Graphically, the agency transfers the margin $i^M_{rf} - i^F_{rf}$ to the private bank, thus inducing a parallel downward shift of the $i^M(\sigma)$-curve. The subsidized interest rate curve $i^F(\sigma,0)$ now constitutes the new borrowers' market conditions.
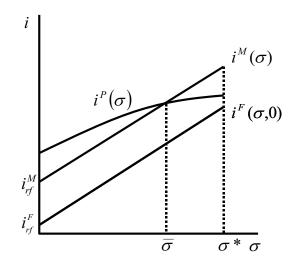

Fig. 3: Fixed interest subsidization, no guarantee

5. Optimal Lending Structures

In order to compare the alternative lending structures, we assess their goal achievement given the three fundamental objectives, namely correction of market failure, compliance with the subsidiarity principle, and efficient use of means.

Complete market failure correction requires the following condition to hold:

$$(1)\ i^F(\sigma,\gamma) \le i^P(\sigma)\ \ \forall \sigma \in [\bar{\sigma}, \sigma*].$$

As one can verify from Figures 2 and 3, in both scenarios described in the previous section, the federal agency achieves a complete market failure correction, provided subsidies are available and sufficiently large for all projects within the loan gap.[17] Independent of the respective policy, the interest rate that all loan-gap applicants discharge must be covered by the expected returns of their projects to ensure their participation in the federal lending program.

By construction, both lending structures also comply with the subsidiarity principle. Note that market conditioned loans are fully crowded out by public loans, irrespective of the underlying risk properties. In other words, no applicant with a risk profile between 0 and $\sigma*$ demands a non-subsidized loan with a higher price. Nevertheless, the subsidiarity principle ensures that the private banking sector can distribute subsidized loans in a competitively neutral form.

In order to assess the efficient use of means of both alternative lending structures, the different costs of market failure correction are displayed by areas **A, B, C** and **D** in panels (a) and (b) of Fig. 4, respectively. The two figures correspond to Figures 2 and 3 of the preceding section. As a new element, Fig. 4 also features the $i^{F*}(\sigma,\gamma)$-curve which characterizes a cost minimal policy for the given lending structures of the preceding section. Efficiency is, there-

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[17] Note that, for $i^P(\sigma) < i_{rf}^M$, a market failure correction cannot be achieved by guarantees. Regardless of the guarantee in the contract, the private bank would always obtain an interest rate that falls short of the corresponding market interest rate.

fore, reached when the subsidy level is set at the minimum level which is necessary to elimi-

nate market failure. Mathematically, the $i^{F*}(\sigma,\gamma)$-curve is obtained from the following opti-

mization problem:

$$(2) \quad i^{F*}(\sigma,\gamma) = \underset{i^{F}(\sigma,\gamma)}{\arg\min} \int_{\bar{\sigma}}^{\sigma*}\left[i^{P}(\sigma)-i^{F}(\sigma,\gamma)\right]d\sigma \quad \text{subject to condition (1).}$$

(a) Fixed guarantee rate, market interest rate   **(b)** Fixed interest subsidization, no guarantee

Fig. 4: The costs of alternative lending structures

For any lending structure equation (2) describes the necessary condition to achieve inner

optimality. However, it does not question whether the structure itself is optimal. In panels (a)

and (b) of Fig. 4 areas **B**, **C**, and **D** characterize the redistribution of capital from the agency

to investors of all risk classes without any superior goal achievement, thus quantifying the

inefficiencies of the individual lending structures. In contrast, area **A** represents costs that are

necessary to correct the market failure. Under an optimal lending structure it is, therefore,

sufficient to reimburse the private banking sector for only those costs that investors in the

loan gap are not able to cover. In other words, investors should be obliged to carry credit costs

up to the maximum amount $i^{P}(\sigma)$ that is covered by their project. For the federal interest rate

this implies

$$(3) \quad i^{F*}(\sigma,\gamma) = i^{P}(\sigma) \qquad \forall \sigma \in [\bar{\sigma},\sigma*] \text{ and}$$

$$i^{F*}(\sigma,\gamma) = i^M(\sigma) \qquad \forall \sigma \notin [\overline{\sigma}, \sigma*].$$

Condition (3) requires the public agency to implement a federal interest rate for loan gap applicants which corresponds exactly to the respective private return rate of the project. To accomplish this, one option is to reimburse the private bank with a flexible interest margin. Alternatively, the agency could provide a flexible guarantee rate, which reduces any risk level $\sigma' \in [\overline{\sigma}, \sigma*]$ to a lower level σ'', in order to meet market conditions, where σ'' is related to σ' through the condition $i^M(\sigma'') = i^P(\sigma')$. The minimum costs that are necessary to correct market failure are then given by area **A** in Fig. 5.
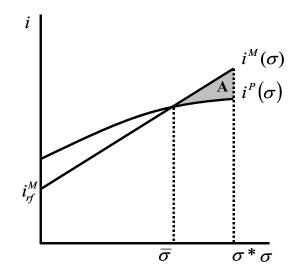

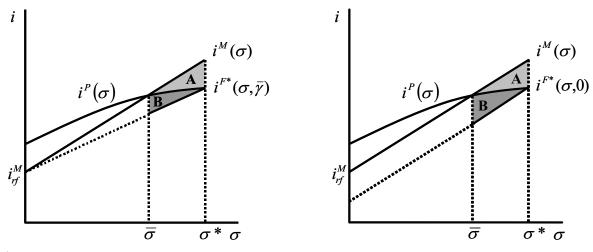**Fig. 5:** Minimal costs of the optimal lending structure

Our result has two important implications. First, the federal agency must only promote those risky investments which belong to the loan gap, i. e. $\sigma' \in [\overline{\sigma}, \sigma*]$. Consequently, a cost-minimizing agency should act as a pure gap lender, if it wishes to avoid promoting projects, which would also be financed by the private banking sector without intervention. This implies that the lending structures discussed above both entail inefficiencies.

Second, market failure based on positive externalities cannot be corrected by a self-financing lending program. Any fee required to finance the subsidy margin can be interpreted

as a reduction of the expected private rate of return, which by itself would already require a higher subsidy margin. By giving the fee back to investors in the form of an interest-rate subsidy or a guarantee, the private rate of return could at best reach its initial level. Consequently, the costs of area **A** cannot be covered by investors, since they can afford to pay only $i^P(\sigma)$.

In practice, however, processing costs arise, because the guarantee rate or, alternatively, the reimbursement interest margin must be adjusted to the characteristics of every specific project in order to achieve optimality. As long as processing costs are sufficiently large – at least as large as area **B** in Fig. 6 – the federal agency should either introduce a fixed guarantee rate (panel (a)) or a constant interest margin (panel (b)), while both should be available only for loan-gap applicants. The amount of the corresponding subsidy is given by the following optimization problem:

$$(4) \quad i^{F*}(\sigma,\gamma) = \arg\min_{i^F(\sigma,\gamma)} \int_{\underline{\sigma}}^{\sigma*} \left[i^P(\sigma) - i^F(\sigma,\gamma) \right] d\sigma$$

subject to condition (1) and $i^{F*}(\sigma,\gamma) = i^M(\sigma) \quad \forall \sigma \notin [\overline{\sigma}, \sigma*]$.

(a) Fixed guarantee rate, market interest rate   **(b)** Fixed interest subsidization, no guarantee

Fig. 6: Optimal lending structure in presence of processing costs

By fixing guarantee rates or interest-rate subsidies, minimum costs of the amount **A** + **B** accrue when the gap-lender principle is applied. In contrast, if policy instruments were risk-dependent, the $i^{F*}(\sigma,\gamma)$-curve could be adjusted flexibly to the $i^{P}(\sigma)$-curve. Specifically, optimality then requires the subsidy margin to be adjusted flexibly to the exact financial needs of the debtor (area **A**). The situation changes, though, when processing costs are taken into account. Programs with fixed spending margins then become optimal. Area **B**, thus, displays the additional costs of designing risk-independent promotional instruments.[18]

In contrast to areas **A** and **B**, which have a specific function in correcting market failure, areas **C** and **D** in Fig. 4 depict costs that are avoidable. Specifically, area **C** represents costs that arise from violating the gap-lender principle, i. e. expenditures from promoting projects that could just as well be served by the market. In contrast, area-**D** costs are related to loan-gap applicants, but they exceed the amount necessary to correct market failure, e. g. due to imprecise policy targeting. It should be noted, however, that the implementation of $i^{F*}(\sigma,\gamma)$ and, hence, the avoidance of these excess subsidies, requires exact knowledge of $i^{P}(\sigma)$. In practice, the acknowledgement of area-**D** costs, therefore, seems inevitable.

6. The Lending Structures of the SBA and KfW

The lending structure with a fixed guarantee rate for loan gap applicants corresponds to the policy of the American SBA's 7 (a) Loan Guarantee Program. To ensure that only the loan gap is filled, banks must verifiably deny a loan offer under market conditions – this is referred to as the *Credit Elsewhere Test* (SBA (2004) § 7. (a) (1) (A)): "CREDIT ELSEWHERE. - No financial assistance shall be extended pursuant to this subsection if the applicant can obtain

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[18] In practice, the additional expenditures of the amount **B** should be economically justified by the social rate of return of loan-gap projects.

credit elsewhere. [...]"[19] Within our framework the institutional arrangement of the SBA is generally optimal, provided that processing costs are sufficiently large.

However, the SBA places two operational barriers on its program. First, "the SBA's legislative package includes language that will give the agency the authority to adjust the fees every year to keep the 7(a) program at a zero subsidy."[20] As the preceding analysis shows, a completely self-financing program can never correct market failure.[21] Second, the SBA places an upper limit, $\hat{i}$, on the interest rate charged by private banks when loans are complemented by federal guarantees.[22] Fig. 7 depicts the impact of the SBA's practiced lending policy of a fixed guarantee rate and an interest-rate limitation.
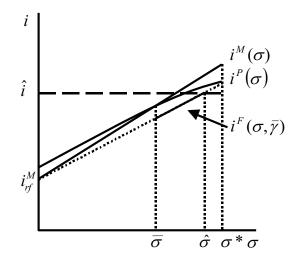

Fig. 7: The lending policy of the SBA

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[19] According to Riding and Haines (2001) lenders under the UK's Loan Guarantee Scheme must also certify to have denied applicants a conventional loan, due to lack of collateral. Hence, the UK's Department of Trade and Industry may also be considered as a gap lender. In contrast, Hatakeyama, Yamamori and Nakamura (1997) state that "the credit guarantee corporations of Japan and the Korea Credit Guarantee Fund (KCGF) have set clear policies of extending guarantee services to any small entrepreneurs with good business reputation."
[20] See SBA (2005).
[21] As an example for the ineffectiveness of self-financing programs, Cowling (1998) analyses the attempts of the British LGS to avoid former losses by equalizing revenues and expenditures. In 1984, the increase of the guarantee premium from 3 to 5% and the reduction of the guarantee rate from 80 to 70% resulted in a dramatic fall of take-up rates from 1,600 to 40 loans per quarter.
[22] Interest-rate caps are common in other countries as well (Riding and Haines (2001)). For instance, the Canadian Small Business Loan Act (SBLA) limits the maximum mark-up on the risk-less market interest rate by 1.75 percent.

Within the framework of our model, the interest-rate cap could again interfere with the SBA's objective of complete market failure correction. As long as the loan price limit $\hat{i}$ lies above $i^F(\sigma,\bar{\gamma})$ $\forall \sigma \in [\bar{\sigma},\sigma*]$, the interest-rate cap is ineffective and, thus, does not hinder market failure correction. In this case, the SBA would, indeed, implement the optimal lending structure. On the other hand, if $i^F(\bar{\sigma},\bar{\gamma}) < \hat{i} < i^F(\sigma*,\bar{\gamma})$, objective 1 is no longer met. For project risks above $\hat{\sigma}$ [23] the interest-rate cap renders the private bank's compensation below market conditions and thus impedes its cooperation – this is the case illustrated in Fig. 7. In the worst case, $\hat{i}$ falls short of $i^F(\sigma,\gamma)$ $\forall \sigma \in [\bar{\sigma},\sigma*]$. As a consequence, the SBA cannot correct market failure with a fixed guarantee rate at all, and the market situation is the same as without governmental intervention. Since any effective interest-rate limitation below the $i^F(\sigma,\gamma)$-curve impedes market-failure correction, our analysis suggests that the SBA should operate without these additional restrictions.[24]

An alternative arrangement is implemented by the German KfW. According to §1a of the Law Concerning KfW (KfW Bankengruppe (2004)) the German government guarantees all obligations of the federal agency entailing an AAA-refinancing status. These refinancing conditions have then been made available for private banks' federal loan transactions resulting in an interest-rate subsidy margin. In April, 2005, the KfW transformed its lending structure by changing the mode of its loan price subsidization. Under the new structure the institution switched from fixed to risk-dependent interest rates and abolished the warranting of guarantees. Nevertheless, similar to the SBA, the KfW continues to limit the price-setting scope for private banks by now administering interest-rate caps for every specially defined risk class.

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[23] $\hat{\sigma}$ can be obtained from the equation $\hat{i} = i^F(\hat{\sigma},\bar{\gamma})$.

[24] In support of this conclusion, the European Commission (2003) argues that "for allowing the microcredit operator to be fully self-sustainable, the public authority could increase the ceiling of usury rate, in countries where such a rate is legally binding."

Under the present KfW lending structure (Fig. 4, panel (b)) optimal lending is possible, in principle, given that processing costs are sufficiently large. Nevertheless, our analysis shows that two potential obstacles still need to be removed to ensure optimality. First, the KfW should refrain from offering its loan conditions to all eligible investors and, instead, focus on loan-gap applicants. Second, in line with our argument concerning the SBA, the KfW should abolish its interest-rate limitation.

7. Generalization of the Model

Our conclusions in the previous sections were all derived within the analytical framework based on the construction of the $i^P(\sigma)$-curve in Fig. 1. In this section we show how our results carry over to a more general situation, where socially desirable investments are scattered around the market interest-rate curve, instead of being allocated along a clearly defined $i^P(\sigma)$-curve. The significant difference between both approaches is given by diverging distributions of investment projects and, thereby, varying degrees of market failure.

In Fig. 1 the market failure is depicted on the risk axis by the risk interval, in which the $i^P(\sigma)$-curve falls short of the market interest-rate curve. In the more general setting, though, the market gap cannot be determined on the basis of risk levels alone. Moreover, in order to identify whether a particular investment project is situated below the market curve, additional knowledge of the private rate of return is required.

Without loss of generality, consider, for example, lending structure (b), depicted in Fig. 4, where the federal agency subsidizes the interest rate imposed on eligible projects by a constant amount. The associated costs, characterized by areas **A**, **B**, **C**, and **D**, can be represented in Fig. 8 by the vertical distances **a**, **b**, **c**, and **d** for three representative investment projects.
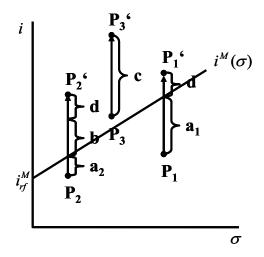
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Fig. 8: Transferability of derived results

The distance to the market interest rate curve is largest for project P_1, which we suppose represents the marginal project that the federal agency must promote in order to fully correct market failure. To make this project marketable a minimum subsidy of the amount a_1 is required. In practice, the actual reimbursement margin will presumably exceed the necessary minimum a_1, thus creating a slack which we denote by d.

Due to the policy of a constant subsidy margin, the same cumulative amount $a_1 + d$ must be granted to all projects. Therefore, consider next project P_2, another candidate for promotion. This investment could be subsidized with a minimum amount a_2, but the additional cost $b = a_1 - a_2$ arises, because of the non-risk adjusted constant subsidy margin. In addition, the slack d accrues here as well. Finally, consider project P_3, which normally should not be eligible for promotion under the gap-lender principle, since its private rate of return meets market requirements. Hence, federal funds spent on this project create costs of the amount c ($= a_1 + d = a_2 + b + d$), which could also be avoided under an optimal lending structure.

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8. Conclusion

Our objective in this paper was to develop a general framework for evaluating alternative federal lending structures by means of an interest-rate-risk model and observable federal lending objectives. Our comparison reveals that federal credit programs are only efficient when they are designed as *gap lending* structures. This entails the promotion of only those applicants that are not able to obtain financing from the credit market. Ideally, the subsidy margin should exactly reimburse the loan costs that investors are not able to pay themselves, i. e. the difference between market loan costs and the private rate of return. Since this requires a flexible subsidy margin that has to be adjusted to the project characteristics in each individual case, lending structures, which do not employ such flexible instruments, can never achieve optimality. As we pointed out, though, the adjustment of risk dependent instruments causes processing costs. Thus, with sufficiently high processing costs, the least expensive way of correcting market failure is to impose a constant subsidy margin over all projects. We also showed that every federal lending system which aims at correcting market failure due to positive externalities requires governmental cost contributions and, thus, cannot be self-financing. This result stands in line with the analyses of Gale (1990) and Williamson (1994) who derive similar results for credit markets characterized by asymmetric information.

In practice, as we have found, the derived conditions for optimal lending structures are not consistently applied. Although the American SBA does act as gap lender, it simultaneously limits the interest rate which can be maximally charged by private banks, if loans are complemented by federal guarantees. In addition, the SBA's statutes require the agency to act as self-financer, i. e., to finance the 7(a) loan guarantee program with the fees of participants. These two restrictions could prevent the SBA from achieving market failure correction. Interest-rate caps can also be observed with the policy of the German KfW. Moreover, the KfW promotes investors regardless of whether or not they can obtain financing elsewhere, thus

indicating structural inefficiencies here as well. Unless the current practices of the SBA and KfW can be justified with arguments beyond the scope of our model, we see room for greater efficiency and, thus, further reform with both institutions.

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