Authors
Eduardo Fernandez-Arias, Jiajun Xu

OCTOBER 2020
No. 171

Research papers

Effective development banking: loans or guarantees?

THE VISIBLE HAND: Development Banks in Transition

AFD éditions
AGENCE FRANÇAISE DE DÉVELOPPEMENT

Research Initiative on Public Development Banks

About the research program
This paper is published in the framework of the International Research Initiative on Public Development Banks (PDBs) working groups, part of the research program: "*Realizing the Potential of Public Development Banks for Achieving Sustainable Development Goals*".

This research program aims to deliver concrete policy recommendations to decision-makers on how to scale up Public Development Banks' potential at achieving the Sustainable Development Goals (SDGs). The academic research focuses on five major themes:
• Characterization of SDG-compatible investments
• Business Models
• Governance
• Financial regulation
• Global Development Finance Architecture

Partners and coordinators
This research program was launched by the Institute of New Structural Economics (INSE) at Peking University, and sponsored by the *Agence Française de Développement* (AFD), Ford Foundation and International Development Finance Club (IDFC). It is coordinated by Jiajun Xu, Executive Deputy Dean at the Institute of New Structural Economics (INSE) at Peking University ; Stephany Griffith-Jones, Initiative for Policy Dialogue, Columbia University ; and Régis Marodon, Special Adviser on Sustainable Finance at the *Agence française de développement* (AFD).

The research program's working groups first presented their works and findings during the Academic Days of the 14th AFD International Research Conference on Development, *The Visible Hand: Development Banks in Transition*, on the occasion of the Finance in Common Summit in November 2020. These Academic Days were co-organized by INSE and AFD.

All the information about this program, and all working papers published are available at: www.afd.fr/en/carte-des-projets/realizing-potential-public-development-banks-achieving-sustainable-development-goals

Agence française de développement

Papiers de recherche

Les *Papiers de Recherche de l'AFD* ont pour but de diffuser rapidement les résultats de travaux en cours. Ils s'adressent principalement aux chercheurs, aux étudiants et au monde académique. Ils couvrent l'ensemble des sujets de travail de l'AFD : analyse économique, théorie économique, analyse des politiques publiques, sciences de l'ingénieur, sociologie, géographie et anthropologie. Une publication dans les Papiers de Recherche de l'AFD n'en exclut aucune autre.

Les opinions exprimées dans ce papier sont celles de son (ses) auteur(s) et ne reflètent pas nécessairement celles de l'AFD. Ce document est publié sous l'entière responsabilité de son (ses) auteur(s).

AFD Research Papers

AFD Research Papers are intended to rapidly disseminate findings of ongoing work and mainly target researchers, students and the wider academic community. They cover the full range of AFD work, including: economic analysis, economic theory, policy analysis, engineering sciences, sociology, geography and anthropology. AFD Research Papers and other publications are not mutually exclusive.

The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the position of AFD. It is therefore published under the sole responsibility of its author(s).

Effective development banking: loans or guarantees?

Eduardo Fernandez-Arias
Visiting Research Fellow, Peking University

Jiajun Xu
Executive Deputy Dean of the Institute of New Structural Economics (INSE), Peking University

Abstract
How should National Development Banks (NDBs) assess the cost-effectiveness of using loans and loan guarantees in order to choose the type of financial instrument most appropriate for each program? We find that the development impact per dollar of fiscal resource required by each instrument largely depends on the kind of market failure that the NDB program addresses. Broadly speaking, theory suggests that the failure of the market to carry out investment projects with high social return due to positive externalities calls for soft loans or subsidy grants to incentivize investors, while poor enforcement of loan repayment or shortcomings of the private financial system to bear risk would generally favor the use of loan guarantees to improve the profitability of private loans to borrowers deemed uncreditworthy. Agency costs in second-tier operations may justify first-tier operations with a larger scope for lending, including a role for contingent lending with equity participation to reduce the fiscal burden. This stylized benchmark provides a starting point to analyze NDBs' rationales for instrument choice and assess whether actual financial frictions are sufficiently important to justify deviations from these guidelines.

Keywords
National development banks, public loans, public guarantees, market failure, positive externality, financial friction

Acknowledgements
We appreciate the constructive feedback from Gustavo Atilio Crespi, Qiang Gong, Jiayin Hu, Zhiyun Li, Justin Lin, Ugo Panizza, Jianye Yan, and participants from the research workshops of the International Research Initiative of DFI Working Groups. Financial support of the Ford Foundation is gratefully acknowledged.

JEL Classification
G21, G23, H23

Original version
English

Accepted
October 2020

Résumé
Comment les banques nationales de développement (BND) devraient-elles évaluer la rentabilité de l'utilisation des prêts et des garanties de prêts, afin de choisir le type d'instrument financier le plus approprié pour chaque programme ? Nous constatons que l'impact sur le développement par dollar de ressources fiscales requises par chaque instrument dépend largement du type de défaillance du marché auquel le programme répond. De manière générale, la théorie suggère que l'incapacité du marché à réaliser des projets d'investissement à haut rendement social en raison d'externalités positives nécessite des prêts à taux réduit ou des subventions pour inciter les investisseurs. Tandis qu'une mauvaise application du remboursement des prêts, ou des lacunes du système financier privé pour supporter le risque, favoriserait généralement l'utilisation de garanties de prêts pour améliorer la rentabilité des prêts privés aux emprunteurs jugés non solvables. Les coûts d'agence dans les opérations de second niveau peuvent justifier des opérations de premier niveau avec un champ d'application plus large pour les prêts, y compris un rôle pour les prêts contingents avec une prise de participation afin de réduire la charge fiscale. Cette référence stylisée fournit un point de départ pour analyser les raisons du choix des instruments par les BND et évaluer si les frictions financières réelles sont suffisamment importantes pour justifier des dérogations à ces lignes directrices.

Mots-clés
Banques nationales de développement, prêts publics, garanties publiques, défaillance du marché, externalité positive, frictions financières

Introduction

National Development Banks (NDBs) around the world often issue a mix of loans and loan guarantees in their programs to support credit for economic development. According to the database of development financial institutions (DFI) worldwide established by the Institute of New Structural Economics at Peking University (Xu et al., 2019), among over 300 NDBs worldwide at least 217 NDBs provide both loans and guarantees (while specific markets NDBs provide loans only). Anecdotal evidence suggests that this mix often results from casuistic considerations that are difficult to assess as valid rationales without reference to a framework to weigh pros and cons of loans and loan guarantees. The key policy question is: how should NDBs assign financial instrument to credit support programs in order to make the best of them under a variety of circumstances? This paper sheds light on how NDBs ought to decide whether to deploy loans or loan guarantees.

This study provides an analytic framework and derives a rule of thumb to guide the assignment of financial instrument to NDB programs. NDBs often shoot in the dark when it comes to assessing whether their financial programs should be implemented with loans or loan guarantees, be it directly or indirectly through the private banking system. Lack of clarity stems from two sources: a) confusion regarding the cost/benefit framework appropriate for NDBs to assess their performance; and b) insufficient analytical research on the effectiveness of various financial instruments in NDB programs within such framework. Our paper advances knowledge in both fronts from a normative perspective: first, we lay out an evaluation framework tailored to NDBs grounded on development impact; second, we use this analytical framework to compare the effectiveness of loans and loan guarantees in various types of credit support programs and discuss their merits in different situations.

Our paper makes a contribution to the literature on the appropriate usage of financial instruments by development banks. While there are a number of useful policy papers discussing the kind of institutional and practical considerations that development banks need to take into account when deciding how to apply its resources (Humphrey and Prizzon, 2014 and Lee 2017), there is very little information on NDB actual use of loans and loan guarantees, let alone when and why each instrument is issued. The analytical framework in this paper can be used to guide the assessment of NDB practice in this regard, taking its stylized guidelines as a benchmark.

The evaluation framework builds on the ideas advanced in Fernandez-Arias, Hausmann and Panizza (FHP, 2019) and Fernandez-Arias, Panizza and de Olloqui (FPO, 2014) concerning the principles for NDB evaluation as public entities, whose aim is not financial success but policy objectives. It follows the principle of focusing on additionality to the private banking system as the relevant development impact metric. At the same

time, it identifies the level of fiscal resources available to the NDB as the binding constraint to its development impact and derives an evaluation metric for instruments and programs in terms of their development impact yield per unit of fiscal requirement. Its analysis on how to maximize NDB effectiveness builds on papers showing that there is a role for public financial support to increase credit to efficient levels (e.g. Mankiw 1986, Smith and Stutzer 1989, Innes 1991, Benavente et al. 2006, Arping et. al 2010).

This paper draws from the companion piece Fernandez-Arias and Xu (2020) concerning the analytics of the financial evaluation of loans and loan guarantees to maximize the development impact of NDB programs. While the constellation of programs analyzed is by no means exhaustive, it looks at a canonical typology of programs to show when and why one particular instrument is relatively more advantageous. This analysis dispels the notion that financial instruments are normally equivalent, in contrast to the findings in Eslava and Freixas (2016) based on special models in which lenders make loans to an undistinguishable pool of individual borrowers. With informative signals available to lenders to set loan terms, financial instruments are generally not equivalent. The aim of the analysis on the effectiveness of financial instruments in a variety of circumstances meriting intervention is similar to that in Anginer, De la Torre and Ize (2013), where the authors study the potential use of public guarantees to address types of market failures, classified in agency and collective action frictions. However, by contrast, we focus on efficiency gains (without imposing assumptions on tax redistribution) and find that loan guarantees are especially useful for agency frictions.

The paper is organized as follows. Section 2 (Effective Development Banking) establishes the appropriate evaluation framework for NDB programs based on their development impact and the fiscal burden they entail. Section 3 (The Interplay with Private Banks) looks at how NDBs interplay with the private banking system in a market economy and can use private banks as lending agents to implement their operations. This interaction is key to focus on the aggregate benefit of the resulting investments that are additional to those that would have also been financed by the private system in the absence of the NDB program.

In the remaining sections, it compares the merits of loans and loan guarantees applying this evaluation framework and provides a stylized guideline for the assignment of financial instrument to NDB programs. The exercise shows the importance of conducting this analysis for program design and illustrates when loans or loan guarantees are preferable in a canonical typology. Section 3 (Second-tier lending: Loans or Loan Guarantees?) evaluates the use of funding loans and loan guarantees to incentivize private banks to lend in stylized cases of market failures in both the supply and the demand for credit abstracting from frictions in private bank intermediation. Here the term market failure means any circumstances preventing the market from backing socially beneficial projects. It covers the cases of poor repayment enforcement cutting off credit access to low-collateral, excessively risk aversion penalizing

innovative and long gestation projects, and externalities of pioneering investments. Section 4 (Direct loans and loan guarantees) discusses how agency costs of second-tier lending may justify first-tier arrangements, elaborates on the preferred financial instruments in this setting, and qualifies the guidelines. Finally, the last section summarizes the conclusions of this investigation on the use of loans and loan guarantees by NDBs, including ideas for an agenda for further research.

I – Effective development banking

We posit that National Development Banks (NDBs) are tools to help productive development policies (PDPs) designed to address areas of market failure, be them vertical policies focused on fostering selected economic activities (aka industrial policies) or horizontal policies geared towards correcting the workings of specific markets.[1] The role of NDBs in this context is to provide the required financial support to productive investments or projects aligned with PDPs, mainly to promote certain economic activities of social value that the market's private perspective fails to regard as valuable or to address failures in financial markets impeding the financing of efficient productive investments.[2] In this way, NDBs support investments of high social value that the market fails to support. In this paper, we focus on the social value of investments in terms of increasing aggregate wealth, leaving the distributional concerns of fiscal policy to translate additional wealth into higher social welfare outside the purview of NDBs. In other words, we focus on the aggregate efficiency of NDB programs. To avoid confusion with social welfare considerations, we use the term aggregate return of investment instead of the customary social return of investment.

To summarize our terminology in what follows, the return of an investment is its gross yield per dollar invested and the net return of an investment is its return minus the cost of capital. The private return of an investment accrues to the investor. If the market is not efficient, it would fail to finance some high private return investments, meaning those with return above the cost of capital (positive net private return). The aggregate return (and hence aggregate net return) of an investment may be different from the private counterparts if other external parties also capture part of its wealth effects, so that the aggregate return is the private return plus an external return irrelevant to the investor. Even an efficient financial market may fail to finance high aggregate return investments, meaning those with return above the cost of capital (positive aggregate net return). A NDB cares about the financing of high aggregate return investments that the market would not finance because they would increase national wealth, irrespective of whether the market is efficient or not. This is a set of investments of high social value or high development impact. The accumulation of the aggregate net returns of these investments, or aggregate benefit, is the development impact of the NDB portfolio.

[1] See Crespi, Fernández Arias and Stein (2014) for more details on the scope of these policies and the range of instruments available, from market interventions on prices and regulations to the provision of complementary public inputs.

[2] We focus on the long-term development impact of NDBs, leaving aside their incidental countercyclical role in macroeconomic stabilization or emergency lending in downturns (Levy Yeyati et al 2007).

In the context of a market economy, the justification of PDPs, and therefore of NDBs, is anchored in addressing market failures. As far as NDBs are concerned, market failure refers to any situation preventing the market from financing investments with high social value. To repeat, the social value of an investment is its aggregate return yield in excess of the cost of capital. The raison d' être of NDBs is to secure financing of high social value investments when the market fails to provide them, as opposed to compete with private banks and replace their financing.[3] In other words, the development impact of NDBs ought to be measured by the aggregate benefit of the additional investments it finances, not investments resulting from crowding out private bank financing that do not improve market allocation.

The profit objective of the commercial financial system, private banks for short, may lead to their failure to finance productive investments with high social value that a NDB would like to be carried out. This is because private banks only care about profitability on market financial terms at the project or transaction level while NDBs also care about the aggregate benefit of the investments at the system or societal level. Notice that the focus of NDBs on high social value projects that lack commercial financing cuts in two ways: not only that low aggregate benefit projects should not be supported, an obvious requirement because it would be inefficient and therefore undesirable, but also that high aggregate benefit projects should not be supported either if they would be otherwise financed by private banks (Warner 2013). Additional valuable projects is what counts.

When is it the case that lack of commercial profitability leads to private banks failing to finance socially valuable investments? There are two main sets of market failures that are relevant to NDB consideration. One set refers to financial market failures springing from shortcomings or imperfections in the workings of the private financial system that renders the market credit supply inefficient. Some examples of financial failures include limitations to debt payment enforcement and the need of posting safe collateral, lenders' excessive risk aversion, insufficient financial development and weak competition in the private banking system. As we will see, these shortcomings explain why investment opportunities with high private returns, above the market cost of capital, may fail to be commercially profitable to private banks. Being efficient, these wasted investments would increase aggregate wealth and therefore would be socially valuable. Generally speaking, shortcomings of the private financial system may render good projects in need of financing commercially uncreditworthy.

[3] FHP argue that smart development banks also have a role concerning the very discovery of market (and government) failures and the corresponding contribution to PDPs. In this paper we do not consider this facet of NDBs.

The second set of market failures refers to externalities, in which case the aggregate return exceeds the investor's private return because it also includes the additional return of a spillover accruing to other economic agents. (Barring externalities, aggregate and private returns coincide; with positive externalities, aggregate returns would be correspondingly higher than private returns).[4] If the private return of the investment generating spillovers is high but not realized due to financial market failures, the case in the previous paragraph still applies: once the shortcomings are resolved, the investment will be carried out and its spillovers will follow. The relevant case in this paragraph is that of investment opportunities with low private returns to the investing firm but high aggregate returns due to positive productive externalities or spillovers to other firms.

A key example of externalities is the case of a pioneering investment by a firm with potential diffusion to the rest of the industry through demonstration effects or to downstream industries opening new business opportunities. Spillovers may be very large and beneficial to economic development, but the pioneer would not capture their financial benefit. These investments are not commercially profitable to private banks because their return to the pioneer is below the cost of capital (low private return) and do not generate borrowing demand at market lending rates. In this case, commercial profitability to private banks would cease to be useful as a project screening device, because the project's aggregate return is higher than the market lending rate and yet it is not financed. In this case the market credit demand would be inefficient. Notice that externalities are a case related to the real economy rather than a case of financial failures: even a perfectly efficient private financial system would miss externalities in the real sector because of the uncoordinated nature of market contracts.[5]

Table 1: Types of Market Failures

		Positive Productive Externalities	
		No	Yes
Shortcomings of Private Financial System	No	No market failure (financed by private banks)	Type 2 market failure
	Yes	Type 1 market failure	Type 1 & Type 2 market failures

[4] If externalities are negative (like generating air pollution), the aggregate return would be correspondingly lower and a high private return would not be sufficient to ensure a positive aggregate benefit. In fact, if the aggregate return turned out to be below the cost of capital, it would be in the public interest to discourage the financing of the investment despite having a high private return. We assume that this responsibility of impeding bad investments is not in the mandate of the NDB and neglect the case of negative externalities.

[5] A number of development agencies focus on financial policies to reduce avoidable failures or address real sector externalities directly by helping the coordination of producers within a sector and along value chains (see Crespi, Fernandez-Arias and Stein 2014). In this paper we focus exclusively on the implications for NDBs to support credit to help correct investment allocation in the economy.

Both sets of market failures have in common that investments with high aggregate returns are not carried out because the terms of the borrowing that would be required by investors are commercially unprofitable to private banks. It follows that NDB financial support for these investments needs to be extended at commercially unprofitable terms, meaning at below-market rates. Therefore, unless NDBs are more efficiently run than private banks, NDBs that successfully address market failures would be expected to be commercially unviable. Relative to competitive private banks, which are expected to yield zero economic profits (after the risk-adjusted opportunity cost of capital is deducted from accounting profits), these NDBs would be expected to yield losses in economic terms (yield accounting gains below the relevant opportunity cost of capital) (see estimations in Lucas, 2012).

In other words, to the extent that NDB are not viable at commercial terms, its operations should be expected to entail a fiscal burden. Fiscal resources are needed to offset their likely economic losses coming from supporting credit at better-than-market terms to sustain them financially. Such conclusion would not follow if NDBs are more cost-efficient than private banks, have better repayment enforcement, or superior screening technologies. Being part of the public sector, NDBs may very well have additional levers to extract payments from private debtors, and a case can be made that their industrial expertise may enable them to do better monitoring (Armendariz 1999). But even in areas of technical superiority, the question remains of whether governance incentives would allow them to exercise it. It appears difficult for an NDB to outperform a private bank in commercial terms, given that it is an institution not subject to competitive market pressure to minimize costs and exposed to political pressure to favor influential interests, including labor interests, and be lenient with them. The fact that the private banking system is regarded as a key contributor to the efficiency of a market economy alongside public banks goes to show that, overall, a NDB should not be expected to be commercially competitive. The traditional conditions for a successful development bank (Gutierrez et al, 2011) of addressing market failures (supporting credit for high social return investments with additionality) in a financially sustainable fashion appear to be quite constraining.

One caveat to this conclusion is the public sector probable superior tolerance for risk because of its economy-wide scope for diversification (Arrow and Lind 1970), which could allow the NDB to provide additionality in high-risk projects without incurring a fiscal cost. This advantage of NDBs is larger in countries with underdeveloped financial sectors (Rudolph 2009), but even in fully developed systems it can be argued that the market cannot bear risks to the same extent because of coordination and monitoring costs (Anginer, de la Torre and Ize 2013). To the extent that long-term operations involve higher risks because uncertainty typically grows over time, similar considerations would apply to supporting long-term credit. Barriers to entry into the private financial system leading to monopoly profits could also provide a safe margin of action for a public bank to underprice private banks without making losses, but only on a temporary basis until its competition erodes the monopoly profits.[6] Barring the caveat concerning risk tolerance, if financially sustainable is

[6] If private banks are not fully competitive and retain monopoly profits, NDBs would also have some scope for pricing below the market and still avoid fiscal costs. In that case, an important additional role for an NDB could be to induce competition in the private system, at the expense of its own

taken to mean commercially profitable, it would be very difficult for a development bank to succeed.

The overall conclusion is that, with the possible exception of high-risk projects, especially in underdeveloped financial systems, a NDB that does not count with substantial fiscal resources is bound to have a limited scope for additionality and development impact. While it is true that niches of profitability in areas of weakness of the private financial system could be used to fund commercially unviable programs, such cross-subsidization would be inefficient (because it comes from artificially increasing the cost of capital for high-risk projects to turn a profit) and would still leave projects with high development impact starved from the kind of funding needed to elicit them. A NDB designed to achieve high development impact needs to be backed by substantial fiscal resources.

Ideally, fiscal resources for NDBs would be budgeted and transferred transparently, be it as a periodic flow or capital injection grants. A less transparent way of achieving the same result is to secure funding at below-market terms for the NDB, be it by subsidized funding from public sources or through tax exemptions. These uses of fiscal powers amount to fiscal costs, because the financial resources made available in this way could have been used elsewhere. One common way to conceal the fiscal costs is to just require the NDB to preserve its capital, making zero accounting profits in real terms. In this case the implied fiscal cost amounts to the opportunity cost of capital. Public guarantees of NDB liabilities, either explicit or implicit, subsidize the funding costs of a NDB. This is fiscally costly because the public exposure to NDB risk translates into future costs when guarantees are called. Issuing public debt to fund the NDB at low rates increases the sovereign risk spread, also a fiscal cost. In practice, fiscal resources channeled to NDBs are often opaque, hidden from view and deliberation (see FHP). It is key that all fiscal costs be accounted for realistically and transparently to know the cost of running a NDB. Headline financial results that do not account for fiscal costs, explicit and implicit, are meaningless exercises.

Contrary to commercial banks, a NDB cannot be evaluated by its profitability because its cost of funding is likely to be subsidized in some fashion and development impact need not be reflected in financial revenue. In fact, a NDB that maximized profits would tend to crowd out private banks and be largely useless as a development institution. Insisting on praising the financial result of NDBs creates the wrong incentives. On what would be the benefit side, NDB performance evaluation should look at the value of its development impact, meaning the aggregate benefit of the additional investments that its financial support yields. This metric has little to do with financial revenues. On what would be the cost side, it should look at the fiscal burden entailed by NDB operations, that is to say, the fiscal resources it employs in the process. However, this fiscal burden is not a real cost for society and should not be netted out from the social value or development impact that the NDB creates. Contrary to the efficiency gain involved in the development impact (additional aggregate benefits), the fiscal burden is a transfer among economic agents mediated by the State, not a measure

---

profitability, thus diffusing monopoly profits. In what follows we disregard this scenario in which the role of the NDB is to discipline the private financial system.

of resources being used up or dissipated. The fiscal burden is not a reduction in wealth but a distribution of wealth. NDB performance ought to be evaluated by the value of the development impact it manages to attain with the fiscal resources envelope it is given to achieve it.[7]

In summary, NDBs ought to maximize the value of the development impact obtained from applying the fiscal resources they are entrusted with.[8] To repeat, the value of the development impact is the aggregate benefit of additional investments, not the financial revenue the NDB obtains, and the objective is not to maximize the value of the development impact minus the fiscal transfer it received, because these two factors are not comparable. As an agency, NDBs ought to take the allotted fiscal resources as given and simply do the best they can with them. Presumably the government would attach a real cost to the fiscal resources transferred to the NDB in terms of the distortionary taxation needed to levy them. This associated cost would be an offset to the value of the development impact to take into account from a public policy perspective when determining the size of the fiscal resources to endow the NDB. Similarly, the fiscal authority should also consider the distributive effects of aggregate benefits and fiscal costs associated with the NDB and how to alter them with taxes and transfers to maximize social welfare. These are issues exceeding the NDB responsibilities and not covered in this paper.

In the rest of the paper we apply this evaluation framework to the issue at hand of whether NDB programs should use loans or loan guarantees to support credit to investments. NDB programs offer uniform terms to clients meeting certain eligibility criteria. In order to find the better alternative, we derive for each instrument the value of the development impact it yields as a function of the fiscal resources it requires, to determine the one that delivers a higher yield for a given level of fiscal resource utilized.[9] For the NDB to maximize the value of its development impact within the fiscal resource envelope it is given, each one of its programs should utilize the financial instrument identified by this rule. NDBs would maximize their effectiveness by equating the resulting marginal yields across programs to determine which ones to run and at what scale.

---

[7] This is not to say that cost efficiency does not count, of course. This metric still encourages operational cost minimization, which is an offset to the fiscal resources needed to attain development impact.

[8] It is natural to assume that the fiscal burden is positive and substantial. However, this formulation is valid irrespective of the level of fiscal burden. It would still apply to a case in which the NDB is instructed to make profits and contribute to the fiscal pot.

[9] In order to focus on the differential financial implications of various instruments, we will assume that the non-financial cost of managing each instrument is the same, to be taken as zero for simplicity.

Formally, the NDB chooses the intervention vector I across programs that maximizes development impact D for a given fiscal resource envelope F:

$$Max_I \;\; D(I) \;\; such\ that\ F(I) \leq F$$

Being m the value of the Lagrangian multiplier associated to the constraint (how much development gain could be obtained with one more unit of fiscal resources at the margin), the associated metric for NDB performance for each program is D – mF

and the optimization rule to choose the most appropriate financial instrument i in each program is:

$$Max_i \;\; D(i) - mF(i) \qquad (1)$$

If fiscal resources are tight, m is high and there will be a premium on using instruments that tend to economize in fiscal burden (low F(i)). If fiscal resources are ample, m is low and there will be a premium on using instruments that are better able to reap high development gains (high D(i)), even if imposing a high fiscal burden. Of course, if one financial instrument is uniformly better than other m would be irrelevant for the choice. Still, the above metric would be relevant to determine the scale of the intervention with the chosen financial instrument.

II – The interplay with private banks

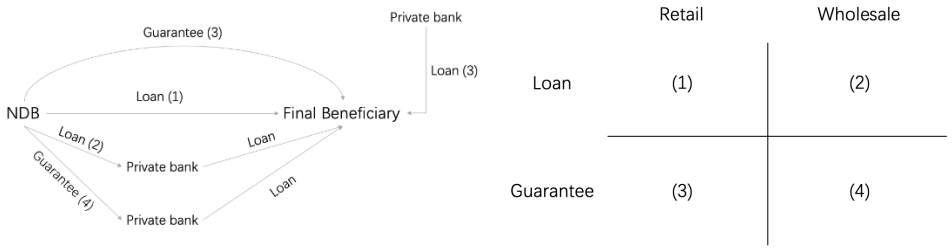
The central question in this paper is about when a NDB should intervene issuing loans or loan guarantees. However, it is important to take into account that these instruments come in two flavors depending on how their implementation interacts with the private banking system. The answer to the question may be perhaps bifurcated, dependent on the modality of implementation. To simplify, let' s consider a 2x2 matrix to represent the possibilities. A NDB may choose to provide credit support for investment through loans or loan guarantees, and may implement it through direct (retail or first-tier) financial operations or indirect (wholesale or second-tier) financial operations.

In the first-tier implementation, the NDB selects the final beneficiary and either extends a direct loan or a loan guarantee certificate that the beneficiary can subsequently use to attach to a loan from a private bank of its choice. In the second-tier implementation, the NDB selects the private financial intermediaries that would lend to final beneficiaries according to a negotiated lending agreement reflecting NDB program objectives.[10] In exchange, the NDB provides credit support by extending either a loan or loan guarantees to

[10] By negotiated lending agreement we mean the agreement stipulating the guidelines for the private bank loans to beneficiaries concerning eligibility, pricing issues, etc.

the intermediary private banks at better-than-market terms to make it attractive (providing funding for the program or guaranteeing its loans, respectively).[11] In both modalities of implementation, retail and wholesale, the NDB needs to choose between extending loans or loan guarantees (see figure 1).

Figure 1: Retail vs Wholesale Operations of NDBs



(1). Loans by retail: The NDB lends directly to the final beneficiaries;

(2). Loans by wholesale: The NDB lends to a private bank first and then the private bank on-lends to the final beneficiaries;

(3). Guarantees by retail: The NDB directly provides guarantee certificates to the final beneficiaries, who in turn apply the guarantee to get loans from private banks;

(4). Guarantees by wholesale: The NDB provides a guarantee to a private bank on the loans it will extend to the final beneficiaries.

In a market economy, NDBs exist side by side a private financial system, so a key question for NDBs is how to interact with the private financial system to fulfill their social objective in the best possible way. When the private financial system is still underdeveloped, NDBs may have superior capabilities, for example in bearing the financing of large infrastructure projects, justifying their autonomous participation to fill the gap. However, as long as a market economy with a private banking system is recognized as beneficial, it has to be assumed that eventually, once the private system develops, private banks are generally better banks than NDBs to run traditional lending. Otherwise a NDB could replicate the decentralized private banking system and improve upon it in terms of social welfare, thus negating the usefulness of a private banking system. In a market economy, the assumption has to be that there are unavoidable governance and incentive weaknesses of NDBs, government failures for short, that make them an inferior alternative to private banks except, possibly, in cases where there are market failures. The assumption is that NDBs are "worse" banks by market metrics, but still have a valuable role to play because they are different banks, with social objectives. Whether their intervention is justified depends on the balance between the theoretical benefits from addressing the market failures and the cost of the governance failures it would incur in doing so.

[11] Attractive conditions could also take the form of regulatory or tax advantages in the case of agreement or the threat of a corresponding burden in the case of disagreement. Private banks would not agree to be intermediaries without an incentive, because otherwise they would have engaged in the program's lending by themselves.

On the one hand, the role of NDBs is constrained by private banks because crowding out their activities would not only have no development impact but also, under the assumptions, it would be inefficient and/or fiscally costly. NDB programs need to be mindful of potential crowding out implications because part of the credit support often leaks to unintended investments not subject to market failures. But on the other hand, the presence of private banks would expand the role of NDBs if they can be employed as financial agents, relieving the NDBs from the inefficiencies and shortcomings of direct intervention. In that case, a NDB may avoid some of its governance failures and in this way further its social objectives.[12] This section elaborates on how the interplay with the private financial system is key to NDB performance.

In a market economy, a NDB may intervene in parallel to the private system or in conjunction with the private system, supplementing it under some form of collaboration. In the jargon of Crespi, Fernández-Arias and Stein (2014), it may provide public inputs or engineer market interventions, respectively. It is clear that at lower stages of development when the private financial system is weak and cannot handle large or complex operations, separate lending by NDBs is necessary to ensure the financing of target investments. However, as the private financial system matures, collaborative arrangements for credit support become possible. For example, a NDB may issue guarantee certificates to eligible clients that they can attach to enhance private bank loans they negotiate. In that case, credit for investment would be the joint result of a private loan enhanced by a public guarantee. In a deeper form of collaboration, the NDB may outsource its participation more drastically and employ private banks as financial agents in so-called second-tier or wholesale arrangements. In this case, private banks are financial intermediaries between the NDB and the final client: the NDB makes a financial contract with private banks as financial intermediaries for them to lend to clients. In this case, private banks run the loans' credit risk (and the NDB risk becomes the counterparty risk of the financial intermediary).

A NDB may be interested in collaborative arrangements if there are substantial government failures that prevent it from operating in a sound manner as a financial institution.[13] Government failures may lead to unnecessary operational costs and, perhaps more importantly, distortions in project vetting and constraints to effective debt collection due to political economy interests and capture. The NDB may face technical or incentive challenges to set sound pricing for its products and may find it easier to experiment with incentive-based market interventions through second-tier arrangements. In this way, it would rely on competitive private banks to vet and price loans under the program, absorb

[12] The use of private financial entities as agents of a NDB principal is a particular instance of incentive-compatible public-private collaboration (see Fernandez-Arias et al. 2016). In reference to NDBs, it opens up a wide set of possibilities, richer than the ones explored in this paper (see Carter and Plant (2020)).

[13] Apart from political economy factors, the public sector may be financially weak and face constraints to mobilize large enough amounts of funds by itself and find it useful to cofinance with the private system.

the costs of processing the loans, and take responsibility for payment collection and default.[14]

On the other hand, collaborative arrangements with private banks face the problem that their profit incentives tend to distort the development effectiveness that NDB programs seek. First, private banks will naturally try to obtain the best financial compensation they can extract from NDBs from agreeing to perform in a second-tier arrangement. In this regard, it is important to ensure that private banks compete among themselves for the support of the NDB in order to eliminate any extra-profit from the deal and therefore minimize its fiscal cost. This may be achieved through an auction in which the best overall deal is selected, thus pinning down profits to minimum levels, or allowing a number of qualified banks to access a financial facility created to manage the NDB support so that eligible clients can shop around and find the private bank willing to offer the best lending terms. In this way, only minimum-profit private banks would make use of the facility. Second, it is in the interest of each private bank to lend to the most profitable investments, which are not necessarily the ones with the highest aggregate return or additional to what it (or other private bank) would have financed for its clients on its own. NDBs need to control these leakages of development impact by negotiating lending guidelines with private banks to regulate eligibility and pricing concerns of the final loans in the best possible way.

Whether or not NDBs can gain from collaborative arrangements with private banks depends on a number of circumstances. The more severe government failures limiting traditional banking capabilities, the more it can be gained.[15] At the same time, crafting collaborative arrangements that serve the NDB´s objectives require substantial capabilities in themselves. To extract value from the efficiency and independence of private banks as agents requires well-honed capabilities to negotiate, instruct and monitor, to ensure that financing helps the achievement of the policy objectives rather than private financial intermediation profits. Even in the best of circumstances, the negotiated guidelines specifying the activities of private banks are bound to be imperfect and incomplete, with unverifiable provisions that further complicate their enforcement. If enforceable guidelines ensuring substantial development impact without unnecessary private banks profits inflating fiscal costs cannot be attained, the NDB may find that second-tier arrangements are not advantageous and prefer direct provision. The whole question hinges on the balance between government failures and the agency costs of second-tier arrangements.

[14] In loans covered by credit guarantees, however, uncollected claims would revert to the NDB after the guarantee is called for it to seek reimbursement. In this case, the NDB still retains a potential loan repayment responsibility.

[15] If these failures are especially problematic in particular areas, hybrid arrangements could be considered. For example, if the problem is enforcing payments, the NDB could still issue direct loans and then sell them to private banks or debt collectors expost.

III – Second-tier lending: loans or guarantees?

In a nutshell, recapping the previous sections, the NDB is endowed with certain fiscal resources and tries to use them to maximize development impact. The main question is under what conditions loans or loan guarantees, in the extreme grants and free full credit guarantees respectively, is a better financial instrument for applying the fiscal resources to address market failures. By loan guarantees we mean to encompass all forms of guarantees attached to loans, namely credit guarantees (covering the event of non-repayment) and risk guarantees embedded in loan operations (covering the event of specific risks with high impact on returns and, possibly, default, often political or policy based in nature), but leave aside the provision of plain insurance, a risk coverage not attached to loans. In the next section we will also discuss contingent loans with equity features. The usefulness of this range of specific instruments will be discussed as variations within their loan or loan guarantee family.

The central point of this section is that the choice of instrument to implement NDB programs matters for results, so it needs to be decided with deliberation. The analysis is not exhaustive but illustrative of how the relative performance of each instrument depends on the type of market failure justifying the NDB intervention. To be sure, the preferred instrument also depends on a wide variety of practical factors and details concerning implementation that need to be evaluated in any given situation, some of which we will consider in the next section. However, we will show that, leaving aside these frictions, there is a natural matching between instrument and market failure that ought to be the starting point for the assignment of financial instrument.

We are interested in the loan vs. loan guarantee choice by the NDB, irrespective of whether the credit support is extended directly to the final beneficiary or through a financial intermediary. In all cases the final beneficiary eventually ends up receiving a loan to finance an investment project, either from the NDB or from a private bank. The question is whether the NDB funds this loan (directly or indirectly) or it enhances the (private) loan with a guarantee. As discussed in the previous section, whether to implement the intervention through first and second-tier arrangements depends on the balance between government failures and agency costs. In order to focus on how the type of market failure drives the choice of instrument and simplify the analysis without dealing with the additional problem of selecting the best implementation modality, in what follows we will assume away all agency costs, so that both instruments can be implemented with a second-tier arrangement under ideal conditions, without frictions. Under these assumptions, second-tier implementation would be justified and the comparison of the effectiveness between loans and loan guarantees can be made in a crisp fashion. This is a good reference point to discuss the implications of relaxing some of these assumptions in the next section.

In our framework, each NDB program would make use of the financial instrument (loan or loan guarantee) that, for a given development impact, is less costly in terms of NDB fiscal resources. In the case analyses that follow we characterize some typical NDB programs in a stylized fashion, where certain eligibility conditions are set to qualify for accessing the credit support provided. As mentioned, we consider an implementation where the loan or loan guarantee to back the program is issued to private banks acting as financial intermediaries on-lending to final beneficiaries according to the guidelines of the NDB program. In particular, we consider a funding loan at a subsidized rate or a free partial guarantee to cover default of the program' s loans. The subsidy element involved in the pricing of each instrument is a correct assessment of the expected fiscal burden associated with its use, irrespective of accounting conventions that may fail to reflect it. In order to focus on the comparison between loan and loan guarantee under various market failures, we assume that private bank intermediation is cost free: safe private banks compete among themselves to gain access to NDB credit support and do not retain any extra profits from their participation in the program, fully passing any NDB enhancement to any borrower eligible under the program. We start considering the case in which private banks and the NDB have the same risk-bearing capacity (assuming that they are risk neutral for simplicity) and later consider the case where private banks are excessively risk averse.

It may be useful to think that the NDB creates a financial facility to support a certain lending program and private banks compete to access the facility in order to lend to eligible borrowers under the program.[16] In this context, lending at a subsidized rate to fund financial intermediaries and providing them with a grant for the same value to be used to supplement their own funding is equivalent because there is no counterparty risk or other frictions that could make a difference. One implication is that inasmuch as subsidized loans and equivalent grants are interchangeable, liquidity considerations are not really relevant to the analytical comparison between loans and loan guarantees.

The analytics of this section draws heavily from the companion piece Fernandez-Arias and Xu (2020). In the following models, we assume without loss of generality that the cost of capital or (gross) rate of funding is 1 (so that the real funding rate is zero). Banks charge a (gross) interest rate of R. Assuming that they are risk neutral, their expected financial repayment is 1 (their funding cost). Projects yield gross returns G and are carried out by risk-neutral firms that can offer collateral C. Note that the net return of these projects is G-1 (the excess return over the cost of capital), so that any project with (marginal) return G>1 that is not fully funded is a wasted opportunity and any reduction in this waste is an efficiency gain.

[16] Alternatively, the NDB auctions access to credit support among private banks or has all the bargaining power when negotiating with a selected private bank, all ways to ensure that the financial intermediary does not siphon off fiscal costs as profits.

The NDB can intervene with two instruments: i) a subsidized loan to private banks to fund the program with a subsidy rate s (so that the funding rate is 1-s); ii) a free partial guarantee of the loans made under the program by which, in the case of default, up to a fraction f of the loan payment due is paid to the private banks to cover their loss. Notice that s=1 would correspond to a grant and f=1 would correspond to a full guarantee, so that these parameters are between 0 and 1. We first consider the simplest models and then extend them to the more complete models analyzed in Fernandez-Arias and Xu (2020).

3.1. Poor repayment enforcement

In this simple case, there is a population of firms each one with a project yielding a known return G>1 from a unit investment. Since the return is above the cost of capital, these are all efficient investments. We assume that firms do not have cash and require funding to carry out the investment. If firms could commit to pay back in full, all projects would be financed. This outcome does not require full repayment commitment: it would suffice to commit up to the project return, in the spirit of limited liability. Here the market failure is that the enforcement of the contractual repayment promise is defective (assumed null to simplify), so that private banks only lend against safe collateral. The firms have collateral C, which ranges between 0 and Cmax ⩾1 and is uniformly distributed. This failure will preclude the financing of low-collateral firms, which is inefficient because the return of their projects is above the cost of capital.

Fernandez-Arias and Xu (2020) show that programs based on subsidized funding loans and loan guarantees are equivalent when individual borrowers are indistinguishable concerning creditworthiness, but are generally not equivalent when lenders have an informative signal of creditworthiness available to set specific loan terms to categories of borrowers. The companion paper illustrates this proposition with a simple model with two categories of borrowers, showing that guarantees are superior in this model of market credit rationing due to low collateral. In the continuous formulation of our model that follows all variables are assumed to be observable or can be ascertained at no cost, that is screening signals are fully revealing, in order to obtain sharp results, but it is not a critical assumption.

In this very simple case private banks offer to lend one unit at rate R=1 to every firm with collateral C⩾1. These riskless loans lead to break even. (They cannot charge more because of competition; they would not offer loans to firms with lower collateral because they would lose money irrespective of the interest rate charged). All firms offered take this loan because their return is G>1. Therefore, the market yields N unit loans (the fraction of projects with a minimum collateral of one) with an aggregate benefit B equal to N multiplied by the net return of each unit loan:

$$N = \frac{Cmax-1}{Cmax} \quad and \quad B = \left(\frac{Cmax-1}{Cmax}\right)(G-1) \qquad (2)$$

Notice that with sound contract enforcement (no market failure) all projects would be financed (N=1 and B=(G-1)). Given the market failure, the NDB would like to intervene to alleviate it either with a subsidized loan or a free partial guarantee to bring investment closer to the efficient allocation.

3.1.1 Subsidized loan

With a NDB funding loan at rate 1-s, private banks would correspondingly lend at rate 1-s (break even) to firms with collateral C≥1-s (riskless loans), thus expanding the set of firms accessing financing to those with collateral between 1-s and 1. This intervention yields the corresponding additional benefit b' :

$$N' = \frac{Cmax-(1-s)}{Cmax} \; and \; b' = \left(\frac{s}{Cmax}\right)(G-1) \qquad (3)$$

The cost of this intervention is s for each unit lent:

$$C' = sN' = s\left(\frac{Cmax-(1-s)}{Cmax}\right) \qquad (4)$$

3.1.2 Free partial guarantee

In this case, if payment is not made in full, the NDB pays up to a fraction f of the payment due. This intervention has the effect of pushing the relevant collateral to C+f. Private banks keep making riskless unit loans at the rate 1, now to all firms with collateral C≥1-f (the portion in excess of collateral will not be paid but that is not a concern of the private bank because the guarantee would cover it). Therefore, like in the previous case, access to finance is expanded, in this case to firms whose collateral is in between 1-f and 1, which yields an additional benefit b" :

$$N'' = \frac{Cmax-(1-f)}{Cmax} \; and \; b'' = \left(\frac{f}{Cmax}\right)(G-1) \qquad (5)$$

In this case the cost of intervention is incurred when the guarantee is called, that is when the payment due (of size 1) is not paid in full. This happens when 1-$f \leq C \leq 1$ (if the collateral is higher than one the guarantee would not be called, if the collateral is lower than 1-f, the loan had not been made). In this range of collateral, the NDB reimburses the private banks to make payment whole up to f, for an average payment f/2. The cost of this intervention is therefore:

$$C'' = \left(\frac{f}{2}\right)\left(\frac{f}{Cmax}\right) \qquad (6)$$

3.1.3 Evaluation

Both loans and loan guarantees have the beneficial effect of efficiency gains by expanding access to credit to low collateral firms that were not commercially creditworthy. In fact, if s and f are set to the same value, the same additional benefit accrues (b' =b" when s=f). However costs are not the same. It is easy to check that if s=f so that benefits are the same, the cost of a guarantee is smaller than the cost of a loan (C" <C'). The fiscal burden of the subsidy is at least twice as large (when Cmax=1). Therefore, the guarantee is more effective because it economizes in NDB fiscal resources.

The guarantee is superior in this case because NDB resources are only used when needed to expand access to credit to low-collateral firms. When collateral is sufficiently high to ensure private creditworthiness, the guarantee is not called. Otherwise, the fiscal burden imposed by the guarantee is capped by the collateral shortfall, so it is called partially. However, subsidized loans "waste" the entire subsidy resources in all loans, including those to high-collateral firms that could have been made at commercial terms without requiring a subsidy. Even if the latter is avoided with a tighter demarcation of eligibility to exclude firms with collateral above 1 (that is, make Cmax=1), loan guarantees remain superior because they call for funds only as needed. A subsidized loan could mimic loan guarantees only if the NDB provided contingent loan funding depending on the final loan being made. These provisions go against the grain of utilizing the market as an intermediation mechanism to avoid NDB micromanaging. The overall conclusion is that loan guarantees dominate subsidized loans and achieve the best results parsimoniously.

As explained above, NDB performance is evaluated as D-mF (the development impact net of fiscal burden evaluated at its shadow price m). With the application of loan guarantees the program would yield:

$$\left(\frac{f}{Cmax}\right)(G-1) - m\left(\frac{f}{2}\right)\left(\frac{f}{Cmax}\right) \qquad (7)$$

and therefore the optimal guarantee level would be:

$$f^* = \frac{G-1}{m} \qquad (8)$$

We notice that the optimal guarantee increases with higher efficiency gain G-1 and lower shadow price of fiscal burden m, but it is always active (f^*>0). In this model, if low collateral is binding, some NDB intervention is always justified.

3.2. Externalities

Projects with productive externalities are of interest of the NDB because they may entail a high aggregate return that the market fails to bring about. As we saw above, the market may fail to finance high return projects because of shortcomings in the credit supply, and it could very well happen that some of them have positive externalities on top of high private returns. In that case, the discussion in the previous model is still applicable: as long as projects with externalities are "bankable", the additional aggregate returns would naturally follow. The interesting case we study now is one in which there are productive externalities yielding a high aggregate return but the project's private return is not enough to justify the investment on commercial terms. This is not a defect of the financial system to deliver access to financing to an efficient firm but a limitation to the private appropriation of all the benefits that an investment may yield in a market economy. The reason to intervene resides in the productive sector, not the financial sector. It is a problem of credit demand, not credit supply.

In this simple model, we assume that the private return of the projects G <1. Being below the cost of capital hurdle, the market will not finance them even if there is no financial failure of the kind analyzed above. In an ideal financial system with full repayment commitment, private banks would offer loans at the funding rate 1 and no firm, even if it is severely cash strapped, would take them because the net return would be G-1<0. This is normally the desirable outcome, because these projects are not (privately) efficient, they give less than they take. However, we now assume that these projects have positive externalities yielding an aggregate return of λG, $\lambda > 1$. Assuming that $\lambda G > 1$, the aggregate return of these projects exceed the cost of capital and would bring benefits if realized. The problem for the NDB is how to induce them.

It is easy to see that a guarantee would not work in this case. In this setup this conclusion is trivial because in the ideal financial system we are assuming these firms have perfect access to finance, so a guarantee would be worthless. In a more realistic setting it is possible that firms face some risk premium that could be alleviated with a guarantee, but unless the project itself has a high private return, the relaxation of a credit constraint will do nothing to promote the project. A sufficiently high private return is necessary to induce the investment. By contrast, a loan at a subsidized rate in order to change the cost of capital of the project would work. A subsidized loan would work only because it includes a subsidy to incentivize the activity. Strictly speaking, if the firm has cash or access to financing, a simple subsidy grant would also work, as we will see.

With a NDB funding loan at rate 1-s, private banks would correspondingly lend at rate 1-s (break even) to projects with externalities eligible in the program (we are assuming that the there is no binding collateral or repayment limitation, at least for contractual payments below the project return). Since firms will take the subsidized loan as long as the cost of capital 1-s does not exceed the project return, the required subsidy is s = 1-G. This intervention delivers an aggregate benefit of $\lambda G - 1$. Evaluating this intervention as D-mF, we note that the intervention is justified only if fiscal resources are sufficiently ample relative to the development gain:

$$s^* = 1 - G \; if \; m < \frac{\lambda G - 1}{1 - G} \qquad and \; s^* = 0 \; otherwise \qquad (9)$$

Because the issue in this case is not facilitating access to financing but shaping incentives, a loan is not necessarily the most practical way to achieve the objective. A loan is being used as a conduit. A subsidy grant of s per project would do the same, effectively reducing the cost of capital in that amount. Arguably a grant is more easily processed. However, it is important to notice that this would not be a grant to the firm but a grant to the project, meaning that the transfer needs to be made conditional on the project being carried out as planned. A loan implicitly brings these elements of conditionality (and its monitoring) into the process. Once these complexities are incorporated, the difference between a conditional grant and issuing a loan may not be as large. In any event, if the firm does not have cash on hand and needs financing, a loan may be more practical. The key point is that the main function of the loan in this case is to provide an incentive.

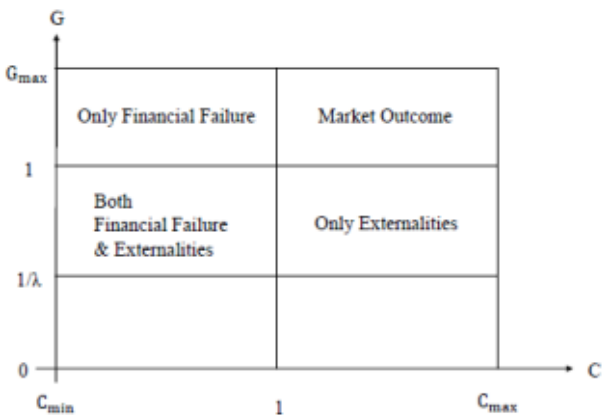
3.3. Joint failures to credit supply and demand

We now extend the simple cases above to a more complete model with private information that jointly incorporates binding collateral and externalities. This model is analyzed in Fernandez-Arias and Xu (2020), from which we draw.

As before, for tractability reasons, firms' collaterals (or more generally, creditworthiness) are assumed observable and distributed uniformly between Cmin≥ 0 and Cmax≥ 1.[17] Each firm at each level of collateral has in its hands a unit project with return G that is private information. Returns G are distributed uniformly between 0 and Gmax>1. In the absence of failures to credit supply, banks would make riskless loans at rate R=1, which will be taken up by those firms that would turn a profit from investing (G≥ 1). (We are assuming that penalties keep fraud in check and firms do not have an incentive to divert or steal the funds, so they invest as contracted). Barring externalities, this is the socially efficient outcome.

With a failure to credit supply so that low collateral is a binding constraint, low-collateral firms (C<1) would be cut off from credit and their efficient projects would not be carried out. With a failure of credit demand due to externalities, socially efficient projects that are not privately profitable $(1/\lambda \leq G < 1)$ would not be carried out. With both failures at the same time, the market misses additional socially efficient projects (see Figure 2).

Figure 2 Efficient Investments



This fuller model confirms the conclusions above and extends some of the insights. When only the Financial Failure is present (C_{min} <1 and $\lambda = 0$), it again holds true that both instruments would expand credit to low collateral firms: a subsidized loan would open access to firms with collateral 1-s≤C<1 and loan guarantees to firms with collateral 1-f≤C<1 (assuming that interventions are not that large that C_{min} becomes binding). However, as we will see, this credit expansion is now a mixed bag, because it enables some inefficient projects to be financed. Considering the case f=s helps to make the comparison.

[17] Qualitative results extend to imperfect screening of borrowers' creditworthiness.

In the case of a subsidized funding loan, lending to firms will take place with riskless loans at R=1-s and will therefore also be taken by firms with inefficient projects in the return range 1-s≤G<1. In fact, this distortion applies not only to the low-collateral firms that were previously credit rationed but also to the ones that already had access to commercial lending (if C≥ 1 is eligible under the program). In the case of loan guarantees, the inefficiency leakage is not as serious because lending to firms would still take place at the undistorted cost of capital R=1, and therefore would only introduce inefficient projects in the low-collateral range C≤G<1 (with f=s, it would reach the same level of inefficiency only for the lowest collateral firm with C=1-f). Therefore, there is an additional advantage to loan guarantees concerning development impact.

As to the fiscal burden, again subsidized loans are costly blunt instruments while loan guarantees are flexible and economize because they are called only when required to supplement payment and only in the amount of the collateral shortfall. In this case the average guarantee that is called is actually larger than f/2 because lower collateral firms, which call the guarantee more often, carry out more projects and therefore receive more loans, but still less than f. The optimal intervention is always to provide loan guarantees and no subsidized funding:

$$f^* = \frac{G_{max}-1}{1+2m} \quad and \quad s^* = 0 \qquad (10)$$

When only Externalities are present (C_{min}=1 and $\lambda > 0$), it remains true that only subsidized funding (or a grant) is a suitable intervention. As long as $\lambda G \geq 1$, projects are socially efficient. Therefore, lending at the rate R=1/λ would bring the efficient projects. A subsidy s = $(\lambda - 1)/\lambda$ would yield a lending rate R=1-s and do the trick. While it is clear that a larger

subsidy would serve no purpose because it would bring additional investments with negative aggregate benefit, the optimal subsidy may very well be smaller because of the fiscal burden it entail. The optimal subsidy is:

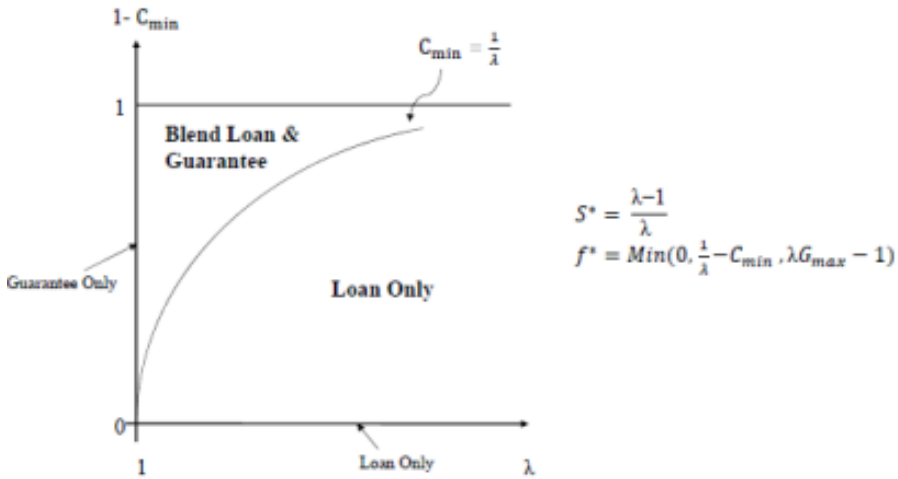
$$s^* = \frac{\lambda-1-m(G_{max}-1)}{\lambda+2m} \qquad (11)$$

Importantly, the above expression assumes that the shadow price m is sufficiently small (m≤ $(\lambda - 1)/(G_{max} - 1)$), because otherwise, as before, an intervention is not justified (s*=0). No intervention is more likely the lower the externalities effect $(\lambda - 1)$ and the larger the subsidy wasted in financing privately profitably investments (G_{max} -1).

If both market failures occur jointly (C_{min} <1 and $\lambda > 1$), subsidized funding has an added advantage in dealing with expanding credit to low-collateral firms because its effect on reducing the interest rate is no longer a distortion to the cost of capital but a welcome incentive to investors. In other words, up to $(\lambda - 1)/\lambda$, subsidies serve a positive purpose concerning both market failures. The companion paper also analyzes this case and show that optimal intervention may include a blend of both subsidized funding and loan guarantees if the credit expansion afforded by the subsidy is incomplete. In that case, loan guarantees (which would be called only by the lowest collateral firms) would be needed to extract additional efficiency gains as before, in this case magnified by the presence of

externalities. Figure 3 reproduces the qualitative map of optimal interventions, where the axes correspond to the cases discussed above and the interior describes the joint case.

Figure 3 Optimal policy package with ample fiscal resources (m=0)



3.4. Overly Risk-Averse Lenders

A key financial market failure of the banking system relevant to our study relates to its capacity to absorb risk. There are reasons to presume that private banks are likely to exhibit excessive risk aversion. As shown in Arrow and Lind (1970), if risk can be spread out across a large number of investors, each one holding a portfolio of the underlying risky assets, then risk is reduced and tends to be eliminated. The implication is that the tax and borrowing authority of the sovereign allows the public sector to effectively spread out risk, which in turn justifies the public sector and the NDB being risk neutral. In contrast, it is natural to assume that private banks are risk averse and require a risk premium to compensate any uncertainty associated with loan payments. Aginer, de la Torre and Ize (2011) convincingly argue that even in advanced financial systems, private guarantees would be costly. The public sector is more diversified and better able to absorb risks, so in this regard, NDBs are better banks.

The superiority of the NDB to bear risks appears especially relevant for innovative projects, which are subject to a substantial risk of failure when prospects do not pan out. This type of investment often generates positive spillovers and is of high development impact. Similarly, better capacity to bear risks is important for projects with long maturation, which are subject to a variety of risks that often look more uncertain as the time horizon lengthens. Long-term projects, for example infrastructure projects, are key for economic development but may be suppressed by risk-averse private banks. Private bank risk aversion leads to inefficient financing from the point view of the NDB, meaning that investments whose expected returns are above the cost of capital (positive net expected return) are not financed and carried out. In what follows, we analyze this market outcome and evaluate NDB interventions.

In this case, the unit projects yielding returns G>1 do so with probability p (the probability of success) and 0 with probability 1-p (the probability of failure). In order to focus on the problem of risky returns, we assume away collateral constraints (or for that matter risk mitigation through collateral), and let repayment capacity be capped by the project ex-post return. We allow G to be private information, but assume that the failure probability is known. These projects are efficient as long as pG ≥ 1, so that the NDB would like that all projects with G $\geq 1/p$ = G* be financed. As we will see, risk-averse private banks will not offer finance to some of these projects because they do not price default efficiently.

In this simple case banks offer to lend one unit at a rate R>0. Such loan would imply default when the project fails. In equilibrium, the firms taking the loan have projects with G$\geq R$.[18] Therefore, the loan will deliver repayments (R,0) with probabilities p and 1-p respectively. A risk-neutral competitive bank would evaluate the expected value of that uncertain repayment (pR) and agree to make such loan when it is not less than 1, thus setting R=G* and financing all efficient projects G $\geq$ G*. However, a risk-averse bank will assess these payments at less than the expected value, and therefore refuse to finance some efficient projects. Specifically, in order to evaluate whether to engage in lending it would evaluate net revenues W (R-1 with probability p and -1 with probability 1-p) and see whether such prospect is better than not engaging in lending (zero net revenues for sure). The market cutoff return G_{mkt} > G* would be found when the bank is indifferent between lending and not lending. Let U be the utility function of the risk averse banks, increasing and concave, where U(0) is normalized to 0:

$$EU(W) = pU(R-1) + (1-p)U(-1) \quad (12)$$
$$EU(W) = U(0) = 0 \implies R = R_{mkt} > 1/p \quad (13)$$
$$G_{mkt} > G^* \quad (14)$$

Which is the best way for an NDB to induce banks to lend to efficient projects that the market misses because of excessive risk aversion? With a NDB funding loan at rate 1-s, private banks would charge an interest rate R' that restores their indifference break-even condition. The new net revenues W' is now (R' -1+s) with probability p and (-1+s) with probability 1-p, because banks now get to keep s for each unit lent (that they do not have to pay back to the NDB) irrespective of the project' s outcome. As the subsidy increases the equilibrium interest rate R*(s) decreases to compensate for the payoff increase due to the subsidy, getting closer to the efficient level 1/p. At the same time, each loan made carries a fiscal burden of s.

$$EU(W') = pU(R' - 1 + s) + (1-p)U(-1+s) \quad (15)$$
$$EU(W') = U(0) = 0 \implies R^*(s), R^*(s) \text{ decreasing with } s \quad (16)$$

[18] Projects with G<R would always default and turn zero profit, so firms are indifferent. Here we assume that they would choose not borrow. Alternatively, assume that G is observable ex-ante and the bank does not offer the loan to these firms.

With loan guarantees, the NDB would pay f in compensation in the default state, which happens with probability 1-p. As banks charge R" , the new net revenues W" is now: (R" -1) with probability p and (-1+f) with probability 1-p, because banks now get to keep the extra payment f only in the default state. As the guarantee level increases, the equilibrium interest rate R**(f) decreases to compensate for the higher payoff, so that a larger guarantee also pushes the interest rate downwards towards its efficient level G*. In the case of the loan guarantee, each loan made carries a fiscal burden f with probability (1-p), when the guarantee is called. Therefore:

$$EU(W') = pU(R'' - 1) + (1 - p)U(-1 + f) \quad (17)$$

$$EU(W') = U(0) = 0 \implies R^{**}(f), \text{ decreasing with } f \quad (18)$$

Both interventions look similar, but they are not equivalent. To see this, consider interventions s and f requiring equal fiscal burden, so that

$$s = (1 - p)f \quad (19)$$

Fernandez-Arias and Xu (2020) prove that in that case the loan guarantee intervention leads to a lower equilibrium interest rate (R**<R*) and therefore yields a larger development impact (as long as it does not go beyond the efficient level 1/p). If market financing is excessively risk averse, loan guarantees are preferable to a subsidized loan, as in the case of other financial failures discussed above leading to shortcomings in the supply of credit.

The insight of this result is that a subsidy does not reduce the spread of the net revenues received by risk-averse banks because it increases payments in both states, while the guarantee does reduce their spread because it concentrates on boosting payments only when they are low, in the default state. While both instruments compensate for risk and help efficiency gains by boosting expected repayments, ceteris paribus guarantees require less fiscal resources. They are better suited because they actually reduce risk in terms of closing the spread of the repayments received by private bank.

Risk guarantees covering the risk of occurrence of specific events that may have a major implications for default is a variant of the above discussion on credit guarantees. To the extent that payment compensation associated with default is the issue, the previous discussion applies. One important potential difference between risk guarantees and credit guarantees is that in the former the concern is not necessarily the expected variability of repayment flows due to default, which can be priced, but the difficulty or lack of confidence in appraising the likelihood of a specific major event, for example because it falls outside the experience of the bank. In the case of long-term projects, the longer the horizon the larger the imprecision with which risks can be assessed conditional on current technologies and circumstances. Such difficulty may also be an obstacle for a risk-neutral lender to the extent that the issue is not variable payoffs but uncertainty about how to estimate expected payments, what is sometimes termed Knightian uncertainty.

In the case of risk associated with man-made circumstances the NDB may be in a better position to absorb these risks not only because it can diversify them better but also because in some instances, such as events subject to political risk like the maintenance or change of certain relevant national policies, it may have better knowledge or its presence with skin in the game may discipline political actors. In these cases, the risk guarantee needed to incentivize private lenders may come at a low expected fiscal burden to the extent that the NDB can anticipate that its calling is unlikely.

3.5. A Rule of Thumb for Instrument Assignment

The choice of financial instrument, loan or loan guarantee for short, makes a difference to the effectiveness with which fiscal resources can be used to deliver development impact and needs to be analyzed with deliberation. While the analysis is not exhaustive, it suggests a matching between the nature of the market failure and the financial instrument to be used in second-tier lending. In a nutshell, the failure of the market to back projects with high aggregate return due to positive externalities would call for a subsidized funding loan or grant, while shortcomings of the private financial system to finance efficient, high private return investments would generally call for loan guarantees to improve the profitability of private loans to uncreditworthy beneficiaries. The latter was analyzed for shortcomings in repayment enforcement and for excessive market risk aversion. At a more general level, the rule of thumb suggests that failures in credit demand call for loans and failures in credit supply call for loan guarantees. The conjunction of both types of failure may justify blended finance.

This rule of thumb was derived on the basis of a second-tier mechanism in which private banks do not impose any agency cost to their financial intermediation, meaning that they faithfully honor the eligibility criteria defined by the NDB and do not make profits, passing all NDB incentives to borrowers. There are however a variety of potential frictions in second-tier mechanisms that merit evaluation to make sure that NDBs prefer this modality of program implementation over direct interventions through first-tier financing. The next section discusses how the rule of thumb may need to be qualified if the NDB finds it advisable to replace second-tier private intermediation with direct interventions.

IV – Direct loans and loan guarantees

In this section we review a number of frictions abstracted away in the previous section that may put in doubt that second-tier intervention is advantageous and qualify some of the conclusions. In particular, with agency costs burdening second-tier operations, the best modality to implement NDB programs depends on the balance between government failures and agency costs. In this context, the inability of the NDB to craft a satisfactory agreement with private banks to arrive at lending guidelines that substantially deliver the social objectives sought by the program without letting banks unduly profit from the intervention increasing its fiscal cost would be a major source of agency costs. Specific frictions may tend to favor one or other instrument, qualifying the conclusions of the previous section. Likewise, government failures need not be neutral across instruments. With frictions, it is possible that the best choice of instrument depends on the preferred modality of implementation, which would give rise to a bifurcated optimization.

The first point to notice is that the rule of thumb described above can be extended to direct interventions if government failures are negligible as long as the NDB and private lenders are equally risk averse (risk neutral in the models of the last section). In fact, the private loans that subsidized funding at the rate 1-s yield can be mimicked by the NDB charging an interest rate R=1-s at the same fiscal burden of s per loan in the models. Similarly, the loan guarantees at the rate f correspond to the NDB directly identifying eligible firms and issuing a guarantee certificate in their favor with the same terms, which they can in turn attach to a commercial loan pledging the agreed-upon collateral. These guarantees produce the same outcome as long as there are no agency costs by private banks in the lending phase. Alternatively, NDBs could mimic loan guarantees by lending at an expected loss equal to the value of the guarantee. The key point is that the matching between financial instrument and financial failure expressed in the rule of thumb is intrinsic, not dependent on the implementation modality.

4.1. Risk-bearing capacity

As discussed above, the NDB is likely to have better capacity to bear risks. In the previous section we showed that the best way to deal with overly risky intermediary private banks is through loan guarantees. Nevertheless, such program still imposes a substantial fiscal burden to compensate private banks. It stands to reason that the NDB consider whether direct intervention may be preferable as a whole. It is clear that direct loan guarantees would not make a difference because it would still be true that private banks would need to be compensated, leading to the same free partial loan guarantees issued in favor of eligible firms cut-off from the credit market. However, NDB direct lending would do away with the fiscal burden of this program, because being risk neutral it can lend at the fair rate of 1. If the extent of governance failures is limited, this alternative may be preferable. In this case the choice of financial instrument to finance risky projects becomes bifurcated: loan guarantees in a second-tier implementation and loans in a first-tier implementation.

4.2. Direct loan guarantees as cofinancing

Direct loan guarantees involve the coparticipation of the NDB and private banks, the NDB taking care of eligibility (and assuming the guarantee risk) and the banks making the final guaranteed loans. Because NDBs issuing direct loan guarantees outsource lending and collection to private banks, government failures for loan guarantees may be lower than for loans. If so, this could be a factor weighing in favor of using loan guarantees instead of loans if first-tier implementation is used.[19] On the other hand, if direct intervention is premised on substantial agency costs on the part of private banks across the board, then this would be a factor against guarantees because they are more exposed to agency costs.

4.3. Moral hazard

NDBs may suffer moral hazard on the part of private banks trying to maximize their own profits in any second-tier arrangement. In particular, credit guarantees may be a fertile ground for moral hazard. For example, if borrowers perceive that the NDB would not press for payment as vigorously as a private bank when the guarantee is called, then the guarantee cost will be higher than it should, and perhaps distort investment allocation. In the previous section we implicitly assumed that the NDB would pursue the reimbursement of its claim as if it were the original lender (against the collateral), but if the NDB is unable or unwilling to do so, that would be a government failure weighing against loan guarantees. In this case, the problem would be that in the case of a guarantee a second-tier arrangement does not fully provide incentives to private banks to collect. This risk would be magnified if there is a risk of private banks colluding with selected borrowers to write down weak contracts (in our model, to accept lower collateral) in order to split the value of the NDB guarantee.

If moral hazard is sufficiently important to justify the consideration of discarding the generalized use of loan guarantees in second-tier financing, it would be important to devise hybrid schemes to mitigate the problem. For example, if moral hazard is associated with the selection of borrowers and collateral assessment by private bank intermediaries in second-tier operations, direct guarantees may offer a solution. A direct guarantee may be an excellent compromise: be more effective than a loan on technical grounds to address financial failures, avoid some of the government failures by outsourcing key responsibilities to the private sector and still be protected from moral hazard. Similarly, since guarantees to cover default triggered by exogenous events that cannot be manipulated does not generate moral hazard, the use of risk guarantees to cover this kind of event allow the NDB to enjoy the benefits of guarantees while controlling moral hazard.

4.4. Contingent loans and equity financing

Even if project returns are uncertain and their stochastic distribution is private information, loans contingent on their realization are contractible as long as returns are verifiable ex-

[19] This argument also works to some extent for hybrid NDB lending operations in which post-loan monitoring and collection are outsourced.

post. Would a loan with an equity-like component (a variable payment contingent on project return) serve the purpose of achieving aggregate efficiency while economizing in NDB resources? Fernandez-Arias and Xu (2020) show in the companion paper that in the context of our stylized models, competitive private banks would never make contingent loans: if they lend, they would do it with pure loans. The reason is that loans that are more onerous for high-return projects cannot be sustained in equilibrium because competitor banks can steal high-return borrowers with an interest rate that is lower overall and make a profit on that transaction. However, a NDB lending at below-market terms would not face competition from other lenders. May contingent loans be useful to the NDB to share the upside of high-return projects to help reduce the fiscal cost of the intervention?

Contingent loans would be difficult to implement in second-tier arrangements because they would imply that the NDB provides a funding subsidy contingent on the investment return of each loan that the private bank makes. That would be the way to induce private banks to make contingent loans in equilibrium. In our models we assumed that this was too complicated to manage in a second-tier arrangement and worked with a fixed subsidy rate for the overall funding of the program in the spirit of second-tier arrangements, in which the private system does the retail lending and the NDB provides the framework to make it profitable. However, contingent loans could be more manageable as direct loans, which opens an additional rationale for direct lending.

Consider loan contracts charging a variable interest rate contingent on the project's return

$$R + \alpha G \qquad \alpha \geq 0 \tag{20}$$

where G is the investment return. The parameter α is akin to an equity participation. The pure loans studied so far obtain with $\alpha = 0$. Can the NDB improve its performance by using contingent loans, with $\alpha > 0$? The companion paper, analyzes this question for the case of lending to investments with externalities, in the same framework of the same model of the previous section, and answer positively: there are advantages in contingent lending. In what follows we draw from it.

They find that the NDB is able to reduce the fiscal burden of subsidized lending by capturing additional payments from high-return investments. In fact, in this linear formulation, the fiscal burden was on average cut in half for each loan made relative to pure loans. In this model, however, this savings is only part of the story, because contingent lending can also allow the NDB to concentrate in lending to additional investments, leaving the rest to commercial lending (with pure loans). In fact, when the participation parameter α is high, the implicit tax on the higher-return investments make the NDB more expensive than the market. In this model this segment would be effectively served by the market, so that the NDB finances only new investments, thus minimizing the fiscal burden. In this simple model the optimal contract amounts to an equity claim (R=0 and $\alpha = 1$). Fernandez-Arias and Xu (2020) show that in a model incorporating moral hazard on the part of the entrepreneur, who has available an outside option to devote her effort, the NDB needs to cap the equity participation to maximize performance. But it remains true that contingent loans are optimal.

Concluding remarks

Our paper has proposed an evaluation framework for NDBs in terms of development impact and the fiscal burden it requires as well as an analytical approach for assessing the pros and cons of loans and loan guarantees in that context. We find that the assignment of financial instrument in NDB programs merits careful deliberation. While the analysis is by no means exhaustive, we model programs concerning poor repayment enforcement and low collateral, excessive lenders' risk aversion, and investment externalities to examine some of the key market failures that NDBs address. By and large, there is a matching between the type of market failure that the program addresses and the financial instrument that suits it. We obtained this matching from stylized models of NDB programs implemented through second-tier arrangements with no agency costs and showed how it can be extended to direct interventions in the absence of government failures.

The rule of thumb derived from the analysis suggests that market failures in credit supply, or financial failures, generally favor the use of loan guarantees to improve the profitability of private loans, while market failures in credit demand, or investment failures, call for loans to incentivize investors by reducing their cost of capital.

However, frictions such as agency costs and government failures may qualify this benchmark. For example, direct loan guarantees, in which the NDB takes the responsibility for identifying eligible borrowers, may surface as a good compromise to control moral hazard risks in second-tier arrangements. Direct lending may eliminate the fiscal burden required to incentivize private banks to lend to risky projects and become the preferred financial instrument if government failures are not dominant. More broadly, direct contingent lending with equity-like features has the potential of minimizing the fiscal burden.

If private banks do not have the capacity assumed in this analytical benchmark to undertake their responsibilities, the conclusions may not follow. For example, underdeveloped private banking systems unable to adequately price loan guarantees and incorporate their value in loan pricing may tilt the balance away from the use of guarantees even if they are theoretically better. In the extreme, the absence of a private banking system sufficiently developed to engage in collaboration or the inability of the NDB to negotiate satisfactory agreements may preclude the use of second-tier modalities and leave the NDB with no choice other than direct loans. These frictions may be relevant to explain the increasing use of loan guarantees and of second-tier arrangements as countries develop and frictions diminish.

Likewise, the previous discussion assumes that the NDB is in a position to soundly evaluate and choose the most appropriate instrument. In practice, the effective scope that a NDB has to select the appropriate financial instrument depends on its own internal constraints. NDBs may be conditioned by its by-laws, legal authority, funding donors or regulation, in which case the issue of choice would be a moot point. NDBs may also lack the technical capacity to implement complex instruments such as guarantees or make a technical evaluation of the choice of instrument in a sound cost/benefit framework.

The next point in the agenda is to explore the assignment of instruments to NDB programs in practice and why they do it that way. We believe that the discussion in this paper will be useful to organize empirical observations on NDB practice across stages of economic and financial development as well as testing some of the theoretical hypotheses it suggests. This analytical framework can be used to conduct case studies in selected NDBs to understand their rationales for instrument choice. The rule of thumb derived from simple models can be used as a benchmark to assess whether actual financial frictions abstracted away are sufficiently important to overturn its validity and justify deviations in practice.

References

Anginer, Deniz, de la Torre, Augusto, and Ize, Alain. 2013,
Risk Absorption by the State: When Is It Good Public Policy? Journal of Financial Stability, vol. 10(C): 76-86.

Armendariz de Aghion, Beatriz. 1999,
Development Banking. Journal of Development Economics 58, no. 1:83-100.

Arping, Stefan, Gyöngyi Lóránth, and Alan D. Morrison. 2010,
Public initiatives to support entrepreneurs: Credit guarantees versus co-funding. Journal of Financial Stability 6, no. 1:26-35.

Arrow, Kenneth and Lind, Robert C. 1970,
Uncertainty and the Evaluation of Public Investment Decisions. American Economic Review, 1970, vol. 60, issue 3, 364-78.

Bachas, Kim and Yannelis. 2018,
Loans Guarantees and Credit Supply. TRIMESTRE ECONOMICO 72, no. 286:217-254.

Benavente, J. M., A. Galetovic, and R. Sanhueza. 2005,
Industrial dynamics and the financing of small- and medium-sized companies. TRIMESTRE ECONOMICO 72, no. 286:217-254.

Buiter, Willem .2002,
Blended Finance and Subsidies: An Economic Analysis of the Use of Grants and Other Subsidies in Project Finance by Multilateral Development Banks". European Bank for Reconstruction and Development, mimeo.

Cater, P and Plant, M. 2020,
The Subsidy Sorting Hat. Center for Global Development.

Crespi, Gustavo, Eduardo Fernandez Arias, and Ernesto Stein. 2014,
Rethinking Productive Development Policies: Sound Policies and Institutions for Economic Transformation. Inter-American Development Bank.

Eslava, Marcela, and Freixas, Xavier. 2016,
Public development banks: Who to target and how? CEDE Working Paper No. 6.

Fernández-Arias, Eduardo, Ricardo Hausmann, and Ugo Panizza. 2020,
Smart Development Banks. Journal of industry, competition and trade 20, no. 2:395-420.

Fernandez Arias, E, U. Panizza and de Olloqui .2014,
Giving Credit to Productivity, chapter 6 in the IDB book Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation, edited by G. Crespi, E. Fernandez Arias and E. Stein.

Fernandez Arias, E, C. Sabel, E. Stein and A. Trejos. 2016,
Two to Tango: Public-Private Collaboration for Productive Development Policies. Inter-American Development Bank.

Gutierrez, Eva, et al. 2011,
Development Banks: Role and Mechanisms to Increase their Efficiency. World Bank Policy Research Working Paper.

Humphrey, C; Prizzon, A. 2014,
Guarantees for Development: A Review of Multilateral Development Bank Operations. ODI.

Innes, R. 1991,
Investment and government intervention in credit markets when there is asymmetric information", Journal of Public Economics, Vol 46(3).

Lach, Saul, Zvika Neeman and Mark Schankerman. 2018,
Government Financing of R&D: A Mechanism Design Approach. CEPR.

Lee, Nancy. 2017,
Billions to Trillions: Issues on the Role of Development Banks in Mobilizing Private Finance. Center for Global Development.

Lucas, Deborah. 2012.
Valuation of Government Policies and Projects. Annual Review of Financial Economics 4, no. 1:39-58.

Warner, Andrew M. 2013,
A Framework for Efficient Government Investment. INTERNATIONAL MONETARY FUND.

Mankiw, N. Gregory. 1986,
The Allocation of Credit
and Financial Collapse.
The Quarterly Journal of
Economics 101, no. 3:455-470.

**Saul Lach, Zvika Neeman,
and Mark Schankerman. 2017,**
Government Financing of R&D:
A Mechanism Design Approach.
Maurice Falk Institute for
Economic Research in Israel.
Discussion paper series
no. 6:1 - 46.

**Smith, Bruce D., and
Michael J. Stutzer. 1989,**
Credit Rationing and
Government Loan Programs:
A Welfare Analysis. Real Estate
Economics 17, no. 2:177-193.

Stanton, Thomas. 2002,
Loans and Loans Guarantees.
The Tools of Government, NY;
Oxford 381-409.

Stiglitz, J and A. Weiss. 1981,
Credit Rationing in Markets
with Imperfect Information. AER.

Willem H. Buiter. 2002,
The Fiscal Theory of the Price
Level: A Critique. The Economic
Journal 112, no. 481:459-480.

Xu, J., X. Ren, and X. Wu, 2019,
Mapping Development Finance
Institutions Worldwide:
Definitions, Rationale and
Varieties. New Structural
Economics Development
Financing Report No. 1.

**Yeyati, Eduardo L., Alejandro
Micco, and Ugo Panizza. 2004,**
Should the Government
Be in the Banking Business?
The Role of State-Owned
and Development Banks.
Working Paper, Inter-American
Development Bank, Research
Department.

Agence française
de développement
5, rue Roland Barthes
75012 Paris I France
www.afd.fr

What is AFD ?
The Agence Française de Développement (AFD) Group is a public entity which finances, supports and expedites transitions toward a more just and sustainable world. As a French overseas aid platform for sustainable development and investment, we and our partners create shared solutions, with and for the people of the global South.
Active in more than 4,000 projects in the French overseas departments and some 115 countries, our teams strive to promote health, education and gender equality, and are working to protect our common resources – peace, education, health, biodiversity and a stable climate.
It's our way of honoring the commitment France and the French people have made to fulfill the Sustainable Development Goals.
Towards a world in common.

Publication Director Rémy Rioux
Editor-in-Chief Thomas Melonio

Legal deposit 4th quarter 2020
ISSN 2492 - 2846 **© AFD**
Graphic design MeMo, Juliegilles, D. Cazeils
Layout AFD
Printed by the AFD reprography service

To browse our publication:
https://www.afd.fr/en/ressources-accueil