Feasible Institutions of Social Finance: A Taxonomy

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Keywords Social Finance, Philanthropy, Foundations, Social Banks.

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Feasible Institutions of Social Finance: A Taxonomy*

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Abstract

This paper unpacks the continuum of social finance institutions (SFIs), ranging from foundations offering pure grants to social banks supplying soft loans. The in-between category includes "quasi-foundations" granting loans requiring partial repayment. In our model, SFIs maximize their social contribution arising from financing successful social projects, under a budget constraint dictated by their funders. We determine the feasibility of each SFI category. Quasi-foundations appear to be efficient and adapted to low market rates. However, reciprocity from SFI borrowers can elicit a so-called "hold-up" effect, whereby the SFI charges a high interest rate to its loyal clients.

1. Introduction

Philanthropy and charitable giving have existed since time immemorial. In the twelfth century, Maimonides established an eight-level classification of charitable giving (*tsedakah* in Hebrew), which placed pure gifts and zero-interest loans on an equal footing, together with business partnerships.[1] Today's institutions involved in social finance encompass charities, ethical and social banks, credit cooperatives, microfinance institutions, and crowdfunding platforms. They have in common social, ethical, or environmental motivations, but their operations, such as giving, lending, or investing, are typically segmented by type of institutions, and therefore analyzed separately. In Maimonides' spirit, we provide a global definition of the concept of social finance institutions (SFIs) and establish the conditions under which these institutions are financially sustainable.

In economic theory, charitable giving by individual donors and philanthropic institutions is typically separate from lending at favorable conditions by socially oriented financial intermediaries (Bekkers & Wiepking, 2011).[2] This line of reasoning regrettably leaves intermediate situations unaddressed, namely, where an institution asks the beneficiary to repay less than 100% of the capital it has provided. Yet this missing middle of the segment that extends between a full gift (nothing to be reimbursed) and loans from commercial banks (full reimbursement plus the market interest rate) offers attractive opportunities for philanthropic and

[1] In Chapter 10 of *Laws on Gifts for the Poor*. See Raphael (2003) for a Hebrew-English annotated translation of Moses Maimonides' treatise on philanthropy by Rabbi Joseph Meszler.

[2] Yet distinguishing between favorable and regular lending conditions can be difficult for intertwined reasons, such as regulatory factors (e.g., usury rate ceiling, creditor protection) and reputational considerations (banking relationship, progressive lending), which affect lenders' interest-rate setting (Brown et al., 2009).

socially oriented activities. Therefore, we argue that acknowledging the full spectrum of social finance will not only enrich economic theory; it will also help account for poorly understood phenomena, such as "blending," which combines grants and loans.[3] For this reason, this paper aims to develop a unified theory of feasible social finance.

SFIs finance social projects, which may be viewed as endeavors set up in pursuit of the common good (Peredo & Chrisman, 2006). Typically, these projects are introduced for funding by social enterprises and nonprofits (Borzaga & Defourny, 2001; Ghatak, 2020). The objective of SFIs is to maximize their social contribution arising from the success of the social projects they finance. Social projects are often more financially fragile than regular ones and their success depends crucially on the charged interest rates, which can put at risk the mission of SFIs.

This paper builds on the assumption that doing good is no "free lunch." In line with King and Pucker (2021), this assumption questions the economic relevance of "win-win" strategies. Hence, we theorize that SFIs need extra budget from their funders to engage in a value-based financial intermediation. In our model, all SFIs supply preferential loans[4] to projects selected through a social screening process. The central question raised in this paper is: How generous must the sponsors of SFIs be to make SFIs sustainable? By unpacking the SFI feasibility

[3] So far, the optimal design of money transfer to beneficiaries—the "loan versus grant" debate—has been mainly confined, at the macro level, to foreign-aid programs and supranational funding schemes, either from a theoretical perspective (e.g., Schmidt, 1964; Cohen et al., 2007) or in practical terms.
[4] Henceforth, we will use the term "loan" to include both regular loans (with positive interest rates) and blended loan/grant products (i.e., loans with negative interest rates).

conditions, we open new avenues for designing cost-conscious social institutions that optimize the use of the precious funds provided by motivated investors.

One original feature of our approach is to consider pure gifts and subsidized credit together. We argue that separating philanthropy (or grants) from subsidized lending is artificial, since access to financial instruments “blending” grants and loans helps charitable institutions maximize their social impact. Starting from the continuum of hypothetical SFIs, we classify them from two complementary perspectives: the funder’s side and the borrower’s side. Funders determine the SFI’s budget constraint. From that perspective, SFIs range from grant-making foundations that are financed solely by donors up to, but excluding, commercial banks funded at market prices and supplying loans at market rates. In between, we introduce two categories: “nonprofit” SFIs whose funders consent to a partial sacrifice of their capital, and “hybrid” SFIs whose funders expect a positive but below-market return. On the borrower’s side, we split the full SFI segment into three categories: grant-making foundations; “quasi-foundations” delivering grant-plus-loan contracts, which are equivalent to loans with negative interest rates; and “social banks” supplying soft loans, a type of debt with a positive but below-market interest rate. The borrower’s side classification is introduced to ease the interpretation of our results, but in our analysis the products supplied by the SFIs are endogenously determined. SFI feasibility therefore depends on the funders' financial sacrifice, the cost of social screening, and the economic environment.

A key contribution of our model is to emphasize that quasi-foundations, i.e., SFIs granting loans with negative interest rates, are optimal institutions either when information asymmetries are low or when social screening is cheap. Under these circumstances, disregarding "giving plus lending" opportunities would negatively affect the SFI's mission fulfillment (Värendh-Mansson et al., 2020). Moreover, quasi-foundations significantly increase the feasibility of social finance, especially if market interest rates are low or even negative.

Another contribution of this paper concerns the implications of reciprocity in lending on feasible and optimal SFIs. Reciprocity refers to the additional effort that motivated borrowers are willing to make when they share values with their lender (Cornée & Szafarz, 2014; Barigozzi & Tedeschi, 2015). Accounting for reciprocity yields a two-faceted outcome depending on whether the additional effort is conditional on generosity or unconditional. As expected, conditional reciprocity has the virtuous effect of decreasing the interest rate charged to borrowers. In contrast, feasible SFIs with unconditionally reciprocal clients can, in some realistic circumstances, paradoxically charge them an above-market interest rate to increase their capacity to generate social outcomes. This unusual situation is reminiscent of the so-called "hold-up" effect, whereby banks request high interest rates from trustful clients who lack any outside options.

The rest of the paper is organized as follows. Section 2 reviews the relevant SFI literature. Section 3 introduces and characterizes the proposed SFI taxonomy. Next, Section 4 investigates the financial feasibility of the different categories of SFIs. Section 5 discusses the consequences of introducing reciprocity from socially oriented borrowers. Section 6 elaborates on the practical implications of our results and opens avenues for further research. Section 7 concludes the article.

2. Socially Oriented Financial Intermediation: A Literature Overview

The motivation of prosocial investors stems from a mixture of factors, such as ideological obedience and value-based solidarity. This section lists social finance drivers identified by the economic literature and the subsequent characteristics of existing SFIs.

Prosocial behavior is governed by other-regarding preferences. A large proportion of individuals—40% to 60% according to Fehr and Schmidt (2003)—not only care for their own self-interest, but also exhibit concern for the well-being of others (Gintis et al., 2004). Strongly reciprocal—or, alternatively, purely altruistic—individuals are prone to sacrifice their own resources in order to encourage positive action or punish negative action (Fehr & Gächter, 2000; Abdulkadiroğlu & Bagwell, 2013). Typically, they expect the norms of fairness to be respected as a result of their actions (Charness & Rabin, 2002).

Less noble forces can also be at play in prosocial behavior. According to Bénabou and Tirole (2010), people may exhibit fairness and generosity not because of intrinsically other-regarding motivations, but because of material incentives, such as tax-deductibility, and image-based motivations, such as self-esteem and warm-glow behavior. People do not wish to appear unfair, either to others or to themselves. The quest for social prestige is part of the reason for engaging in conspicuous, estimable deeds (Glazer & Konrad, 1996). Likewise, people enjoy the warm glow of giving, which reinforces self-esteem (Andreoni, 1990). But moral wiggle room makes image-based motivations shallow and circumstantial: People who are generous while the action-outcome relationship is clear tend to change their behavior when the link is less transparent (Bénabou & Tirole, 2006).

A third type of prosocial motivation stems from social identity, i.e., a person's sense of self, derived from perceived membership of a social group (Akerlof & Kranton, 2005). With variable salience, social identities are associated with factors such as gender, ethnicity, nationality, social class, and corporate culture. They produce norms and encourage close connections and networking between individuals sharing similar characteristics (McPherson et al., 2001).[5] In the case of social lending, identity-sharing between the lender and the borrower can explain why preferential credit conditions afforded to the latter bring non-pecuniary utility to the former. In addition, social identification boosts reciprocal and altruistic motivations (Chen & Li, 2009).

Real-life SFIs embrace a myriad of institutions with specific operations. First, ethical or social banks match socially minded funders expecting below-market returns with motivated borrowers necessitating preferential credit conditions (Becchetti et al. 2011; Krause & Battenfeld 2019; Cornée et al. 2020). They spend real-money resources to screen loan applicants on both a financial *and* a social basis (Cornée & Szafarz, 2014). Accountability to social funders is facilitated by carrying out simple and transparent financial operations (Cornée et al., 2016). In addition, a stakeholder governance structure can help prevent breaches in the moral contract. Socially responsible mutual funds abide by the same value-based logic. Investors identify themselves with the financed firms and accept lower returns and higher

[5]Experimental evidence shows that activation of prosocial motivations varies with prevailing norms (Frey & Bohnet, 1995).

management fees stemming from costly social screening (Bauer & Smeets, 2015; Riedl & Smeets, 2017).[6]

Second, some financial intermediaries develop a value-based model within a specific framework. In grassroots credit cooperatives, member-depositors are ready to receive a return lower than that from other banks (Hesse & Čihák, 2007), provided that the cooperative offers inclusive and fair credit conditions to the member-borrowers (Angelini et al., 1998; Fulton, 1999). Microfinance institutions (MFIs) typically benefit from a cost of capital lower than that of conventional banks (Cull et al., 2018). Crowdfunding allows social projects to collect funds from a multitude of individuals thanks to digitalization (Chang, 2020). The compensation mechanisms embedded in crowdfunded projects blur the boundaries between giving and lending. These innovative and very varied mechanisms often include non-cash compensation, such as illiquid equity or future products (Mollick, 2014).

Last, philanthropy shares significant commonalities with SFIs. Charitable giving is massively present in English-speaking countries. In the US, as many as 90% of citizens give money to charities (DellaVigna et al., 2012). Typical recipients of philanthropic projects are nonprofit organizations, with religious institutions capturing the lion's share of donations (Havens et al., 2007). Charities have to comply with accountability standards for raising and allocating funds (Steinberg, 1994; Jegers, 2008). Transparency requirements are attested by the emphasis on watchdog agency evaluations (Silvergleid, 2003).

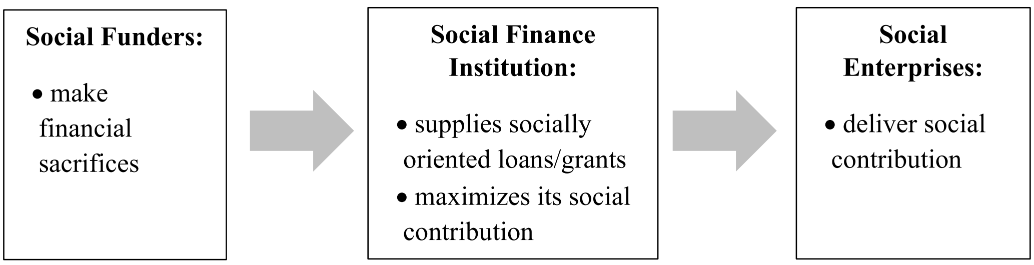
[6] Evidence shows that investors tolerate lower returns from socially responsible investments (SRIs) and require compensation for investment with negative externalities (Hong & Kacperczyk, 2009; El Ghoul et al., 2011). Some scholars argue, however, that an SRI is compatible with financial returns equal to, or even higher than, same-risk non-SRI options (Margolis & Walsh, 2003; Derwall et al., 2011).

Depending on the circumstances, SFI funders can be pure donors, lenders, depositors, or equity holders. They delegate the tasks of project selection and taking care of funding practicalities to an SFI, which may be depicted as a "delegated philanthropic intermediary" (Bénabou & Tirole, 2010) or "value-based intermediary" (Scholtens, 2006). In sum, the mission of social financial intermediation may be theorized as maximizing social contribution under the return constraint imposed by motivated funders. The next section builds a model that captures this idea.

3. A Taxonomy of Social Finance Institutions

Philanthropic intermediaries are transferring the financial sacrifices of their motivated funders to final beneficiaries which, typically, are social enterprises or nonprofit organizations. An SFI supplies socially oriented grants or preferential loans that maximize its social contribution under the budget constraint imposed by its social funders who are willing—to varying extents—to forgo capital and/or revenues in exchange for social returns (see Figure 1).

Figure 1: Overview of Socially Oriented Financial Intermediation



Within our framework, we speak of "social" funders as soon as they are ready to relinquish part of their financial return or donate some of their capital to deserving ventures or enterprises, i.e., projects generating a positive social contribution. In line with the contemporary theory of financial intermediation (Diamond, 1984; Bhattacharya & Thakor, 1993), the SFI’s mission consists in channeling capital from prosocial investors to their beneficiaries, using efficient selection and monitoring mechanisms. The spread between the market return and the funders' required return is a signal for the SFI of the expected weight of the social bottom line.

Since the lending/giving activity is plagued by severe information asymmetries, SFIs rely on both social and financial screening to meet their funders’ hybrid objective as far as possible. At the same time, the probability of SFI-supported projects enjoying financial success depends on the charged interest rate. Ultimately, the problem for the SFI is to determine the (positive or negative) below-market interest rate they charge to selected projects. Our model determines the optimal strategy for an SFI facing costly social screening. The next subsections present successively the funder’s side, the borrower’s, and the equilibrium condition, which altogether constitute the backbone of our taxonomy.

3.1 The Funder’s Side

The loan market is overwhelmingly dominated by profit-maximizing, or “normal”, banks, which grant loans to regular clients. The funders of normal banks expect to earn the market return. At the other end of the spectrum of social finance are grant-making foundations, whose funders are pure donors expecting no financial return on investment, not even a partial one. All the funds they provide are for a social purpose, meaning that their financial sacrifice is maximal. Between these two polar cases, SFIs are small players with a social agenda and no influence on the market price of credit. The funders of SFIs are willing to make (partial) financial sacrifices to let the institutions generate a social contribution through socially oriented loan granting. Akin to foundations, SFIs maximize their social contribution. However, their budget is set by funders who expect some money back, limiting their scope of social action.

To simplify the presentation, let us assume that all institutions are risk-neutral, and the demand for social funding exceeds the capacity of SFIs.

We first present the notations used (see also Appendix A). The funders of normal banks expect the equilibrium rate of return $(R^m - 1) > 0$ on their investment, which translates into a borrowing interest rate for the bank's clients of $(\mathcal{R}^m - 1) > 0$. In line with the classic model of Stiglitz and Weiss (1981), we consider $\mathcal{R}^m$ and R^m as exogenous.[7] Hence, the way they are determined is irrelevant to our purpose. We also assume that all normal banks provide the same loan conditions, and that the interest rate they charge takes all costs into account, including financial screening and inevitable defaults. Hence, $\mathcal{R}^m$ exceeds R^m. By contrast, the cost of social screening concerns SFIs only.

To gauge the SFI funder's financial sacrifice, we use their required expected return *R,* where: $0 < R < R^m$. Thus, R is zero for foundations (full sacrifice), between 0 and R^m for SFIs (sacrifice between full and no sacrifice), and the market rate R^m for normal banks (no sacrifice). For convenience, we define the funders'

[7] Stiglitz and Weiss (1981, p. 394) call $\mathcal{R}^m$ the "bank-optimal" interest rate, which in turn determines R^m, the "expected return to the bank".

sacrifice with the multiplicative specification $R^m/R \in [1, +\infty]$ and use its inverse, $\rho = R/R^m \in [0,1]$ as our parameter of interest:

$$R = \rho R^m, 0 \leq \rho \leq 1 \tag{1}$$

Table 1. Characterization of Social Finance Institutions according to the Funder's Sacrifice

Type of institution	Grant-making foundation	Nonprofit SFI	Hybrid SFI	For-profit bank
Funders' expected return: *R*	$R = 0$	$0 < R < 1$	$1 \leq R < R^m$	$R = R^m$
Inverse of sacrifice: ρ	$\rho = 0$	$0 < \rho < \frac{1}{R^m}$	$\frac{1}{R^m} \leq \rho < 1$	$\rho = 1$

Table 1 introduces two categories of SFIs depending on the size of this sacrifice represented by ρ. First, in "nonprofit" SFIs $(0 < \rho < 1/R^m)$, the funders sacrifice part of their capital. Second, "hybrid" SFIs $(1/R^m \leq \rho < 1)$ are more constrained since their funders expect to receive their capital back, possibly with a below-market return. Appendix B gives a justification as to why both categories of SFIs can co-exist. Table 1 presents the classification, including the two polar cases: grant-making foundations (for which $\rho = 0$) and for-profit banks (for which $\rho = 1$).

3.2 The Borrower's Side

The SFI supplies a single financial product that blends loan and grant. There are two initially indistinguishable categories of applicants for SFI loans/grants, which all apply for the same amount of funds. First, social applicants, indexed by "s", seek funding for projects generating a social contribution. Second, "normal"—or non-social—applicants are indexed by "n" and entail no social contribution.[8] Normal applicants merely try to take advantage of the lower, subsidized interest rate provided by the SFI. As the SFI openly advertises its commitment to financing social projects, the number of normal applicants is limited by their capacity to hide their true nature. Typically, this number will vary according to the social cause the SFI is willing to promote. In that respect, SFIs with narrowly defined social causes are less at risk of attracting impostors.

To clarify our definition, let us consider the example of an SFI with the mission of providing cheap credit to "social" stores serving people in need and charging them below-market prices. The business of these stores is evidently less profitable than that of "normal" stores. Since the SFI does not directly observe the clientele of its applicants, there is asymmetric information and opportunistic managers of normal stores might be attracted to the SFI cheap credit opportunity. In this case, social screening can take the form of surveying the clientele of stores applying for SFI loans. Since store clientele is heterogeneous, screening is imperfect, and its accuracy depends on the number of surveyed clients. This example suggests that the effectiveness of social screening varies with the social cause the SFI is willing to promote. Our model will acknowledge this evidence by parametrizing the probability p_s of correctly identifying social projects.

The SFI's objective is to maximize the social contribution made possible through its loans. To carry out its mission, it has two tools: social screening and

[8] We do not exclude that normal projects lead to social outcomes. If so, the social contribution we ascribe to social projects is the excess contribution with respect to that provided by normal projects.

interest rate setting. Let us denote by $\mathcal{R}$ the repayment required by the SFI from its borrowers on a one-dollar basis:

$$\mathcal{R} = \delta\mathcal{R}^m,\ 0 < \delta \leq 1 \tag{2}$$

where $\mathcal{R}^m$ is the repayment required by for-profit banks. A grant-making foundation would set $\delta = 0$ by definition, whereas SFIs are characterized by: $0 < \delta < 1$. If $\delta = 1$, borrowers are charged the normal market rate. The situation where $\delta > 1$ is excluded, since we assume that SFIs charging above-market rates would contravene their mission, namely, supporting social projects by offering them financial conditions more favorable than those of regular banks, which operate at market rate (Cornée et al., 2020).[9] Table 2 summarizes the situation.

Table 2. Characterization of Social Finance Institutions According to the Charged Interest Rate

Type of institution	Grant-making foundation	Quasi-foundation	Social bank	For-profit bank
Required repayment: $\mathcal{R}$	$\mathcal{R} = 0$	$0 < \mathcal{R} < 1$	$1 \leq \mathcal{R} < \mathcal{R}^m$	$\mathcal{R} = \mathcal{R}^m$
Inverse of interest rebate: δ	$\delta = 0$	$0 < \delta < \frac{1}{\mathcal{R}^m}$	$\frac{1}{\mathcal{R}^m} \leq \delta < 1$	$\delta = 1$

3.3 Matching the Two Sides

The SFI maximizes its social contribution (SC) by granting preferential loans to fund projects screened for their social purpose. *SC* is defined as the number of successful social projects financed by the SFI, normalized by the amount received from its funders. Any other project—be it either normal, or social and unsuccessful—generates no social contribution, which emphasizes the need for screening applicants and selecting beneficiaries that the SFI's funders are willing

[9] In Section 5, we will relax this assumption in the context of unconditional reciprocity and social identification.

to support, and not some opportunistic applicants attracted by favorable funding conditions.

We normalize the funds made available to the SFI by funders to 1 and assume that the SFI knows the share $\sigma \in [0,1]$ of social applicants, but not their actual identities. The SFI engages in social screening in order to identify social projects and thus better target its loans. This comes at a fixed cost $C \in [0,1]$,[10] leading to probability $p_s \in [0,1]$ of correctly identifying the applicant's social character. Hence, the probability for a social project to be rightly selected is $p_s\sigma$ and the probability for a normal project to be wrongly selected is $(1-p_s)(1-\sigma)$. Overall, the probability for a random project in the pool of applicants to be selected is:

$$P = p_s\sigma + (1-p_s)(1-\sigma) = 1-\sigma+p_s(2\sigma-1) \tag{3}$$

Since SFI funds are normalized to 1 and the social screening cost is *C*, the amount left for funding projects is $(1-C)$. With that amount, the SFI is willing to finance as many selected projects as possible. If the social contribution generated by one unit of funds granted to a successful social project is also normalized to 1, the *SC* maximization program of the SFI is given by:

$$Max\ SC = (1-C)\ \frac{Prob\ [\text{project is social and successful}]}{P} \tag{4}$$

The success of a project is testified by its capacity to pay back the amount required by the SFI, $\mathcal{R}$. For example, if all the projects had the same probability, say π, of being successful regardless of $\mathcal{R}$, then *SC* would be the constant value:

[10] We assume that social screening is necessary to signal the SFI's commitment to deterring impostors. In a further refinement, one could endogenize the intensity of screening, making both the cost and ensuing effectiveness of social screening components of the SFI's decision making (see Cornée et al., 2018). However, this would not only make the problem more complex, but also distract from the key issue, which is the feasibility of social finance.

$(1 - C)\pi\ p_s \sigma/P$. The assumption that all projects are equally successful is however unrealistic, and this for two reasons. First, success is undeniably easier to achieve if the SFI demands less money back, which implies that the success probability is a decreasing function of δ. Second, regardless of δ, social enterprise scholarship argues that financial success is more difficult to achieve for social projects (Besley & Ghatak, 2017; Cornée, 2019). Their sponsors prioritize social change over private wealth creation and therefore do not view profit maximization as their prime objective (Defourny & Nyssens, 2010), although profits are not necessarily illegitimate (Wilson & Post, 2013). Social enterprises tend to internalize social costs and create positive externalities (Doherty et al., 2014). Hence, we assume that a) the success probabilities of the two types of projects are negatively affected by the interest rate charged by the SFI, and b) financial default is more probable for social projects than for normal ones, regardless of the interest rate.

As in Stiglitz and Weiss (1981), we assume that the ability to successfully generate repayment is not affected by the market value $\mathcal{R}^m$, but only by the initiator's ability to develop the project under their credit conditions. The probabilities of success are denoted $\pi_n(\delta)$ and $\pi_s(\delta)$ for normal and social projects, respectively. Both depend positively on the interest rebate and have thus a negative derivative w.r.t. δ: $\frac{\partial \pi_n(\delta)}{\partial \delta} < 0$ and $\frac{\partial \pi_s(\delta)}{\partial \delta} < 0$. (5)

Since a zero value of δ means that no repayment is expected, we impose that both $\pi_n(\delta)$ and $\pi_s(\delta) \to 1$ if $\delta \to 0$. For the market interest rate, $\delta \to 1$, we assume that $\pi_n(\delta) \to \pi_n > 0.5$ and $\pi_s(\delta) \to \pi_s > 0.5$, meaning that the probability of projects being successful under market conditions lies above 50%. This technical assumption enables a smooth development of our model.[11] For simplicity, we also assume that the impact of δ on success probabilities is linear. Since π_s is smaller than π_n, we may write it as: $\pi_s = \pi_n - \varepsilon$, with $0 < \varepsilon < \pi_n - 0.5$ (to have $\pi_s > 0.5$), and we have:

$$\pi_n(\delta) = 1 - \delta(1 - \pi_n) \tag{6}$$

$$\pi_s(\delta) = 1 - \delta(1 - \pi_s) = 1 - \delta(1 - \pi_n + \varepsilon) = \pi_n(\delta) - \delta\varepsilon \tag{7}$$

In the limit case where $\varepsilon = 0$, the probabilities of financial success are the same for social projects and normal ones mistakenly financed by the SFI.

In sum, the interest rate charged by the SFI, represented by parameter δ (see Table 2), is linked to the funder's sacrifice, inversely represented by parameter ρ (see Table 1), but their relationship is moderated by two SFI characteristics: the cost of social screening and the probability of success of social projects, which is lower than that of regular ones. The relationship between δ and ρ is further discussed in the next section. However, the key issue in this paper is not as much the value of the equilibrium value of δ in itself as the feasibility of the SFI, i.e., the very existence of such a value of δ given the funder's sacrifice.

Taking into consideration the effect of δ on success probabilities, the normalized expected social contribution of the SFI is:

$$SC = (1 - C)\frac{p_s\,\sigma\,\pi_s(\delta)}{P} = (1 - C)\frac{p_s\,\sigma\,[1 - \delta(1 - \pi_n + \varepsilon)]}{P}, \tag{8}$$

[11] This condition represents a theoretical limitation of our model. From a practical standpoint, however, it is realistic since most empirical studies report high repayment rates in real-life SFIs, suggesting that the success probability of social projects, which is typically smaller than that of normal projects, is greater than 50% (e.g., Becchetti et al., 2011; D'Espallier et al., 2011).

where P is defined by Equation (3). All other things being equal, *SC* decreases with ε and δ, and increases with p_s and σ. The budget constraint linking the funder's required return with the SFI's decision on the interest rate charged to borrowers reads:

$$\rho\, R^m \leq\ (1-C)\,\delta\,\mathcal{R}^m\ \frac{p_s\,\sigma\,\pi_s(\delta)+(1-p_s)(1-\sigma)\pi_n(\delta)}{P} \qquad (9)$$

Condition (9) is binding (see Appendix C). Since $1-C \leq 1$ and $[p_s\,\sigma\,\pi_s(\delta) + (1-p_s)(1-\sigma)\pi_n(\delta)]/P$ is a weighted average of two variables smaller than 1, Condition (9) implies that $\delta\,\mathcal{R}^{\mathrm{m}} > \rho\, R^m$, leading to the impossibility of a quasi-foundation $(0 < \delta < 1/\mathcal{R}^{\mathrm{m}})$ being a hybrid SFI $(1/R^m < \rho < 1)$.

We have thus proved the next proposition that provides a formal link between the predetermined types of SFIs (nonprofit and hybrid), defined by their funders' financial requirements, and the post-determined types (quasi-foundation and social bank), defined by the interest rate they charge:

Proposition 1 (necessary condition):

The SFI budget constraint for nonprofit and hybrid SFIs implies the following conditions:

(i) Revenues of SFIs from their borrowers are greater than what they pay to their funders: $\delta\mathcal{R}^{\mathrm{m}} > \rho R^m$.

(ii) Nonprofit SFIs can be either social banks charging positive interest rates or quasi-foundations providing loans with negative interest rates.

(iii) Hybrid SFIs can only be social banks charging positive interest rates.

Thus, only nonprofit SFIs can structure themselves as quasi-foundations since the sacrifice consented by hybrid SFI funders is insufficient to give partial grants. At best, hybrid SFIs manage to be social banks. Some nonprofit SFIs must also be social banks because they need to charge a positive yet below-market rate. Proposition 1 is a necessary, but not sufficient, condition for the existence of an equilibrium interest rate charged by the SFI. It can be that even within the feasible $\rho - \delta$ combinations, some parameter configurations will not allow an equilibrium where the charged interest is sufficient to remunerate SFI funders at their required level. The next section will determine the conditions under which 1) a nonprofit or hybrid SFI generates enough sacrifice to make the institution viable and, 2) the optimal nonprofit SFI is a quasi-foundation rather than a social bank.

4. Feasible and Optimal SFIs

As the previous section shows, funder generosity is instrumental in determining the type of SFIs (social bank or quasi-foundation) that ends up being feasible. We will now derive necessary and sufficient conditions for SFI feasibility and solve the SFI optimization problem. In line with Proposition 1, we will consider first quasi-foundations, which are necessarily nonprofit SFIs. Next, we will examine the feasibility of social banks, which can be either non-profit or hybrid SFIs.

4.1 Feasible Quasi-Foundations

Let us consider quasi-foundations, which, by definition, require a negative interest rate. A low cost of screening C is instrumental for feasibility, since it constitutes a share of the SFI capital provided by funders that does not deliver any direct social contribution. But the model's other parameters play a role as well. Since the budget constraint in (9) is binding, we have:

$$\rho\, R^m = (1 - C)\, \delta\, \mathcal{R}^m\, \frac{p_s\, \sigma\, \pi_s(\delta) + (1 - p_s)(1 - \sigma)\pi_n(\delta)}{P} \tag{10}$$

With the success probabilities in Equations (6) and (7), the RHS of Equation (10) increases in δ, implying that ρ and δ are positively related (see the proof in Appendix C). Let us impose that the SFI is a quasi-foundation: $\delta < \frac{1}{\mathcal{R}^m}$. The upper bound for $\delta\mathcal{R}^m$ is thus 1. Consequently, the maximum feasible return $\hat{\rho}$ for funders of a nonprofit SFI willing to finance a quasi-foundation is obtained by determining the value of ρ obtained in Equation (10) for $\delta\mathcal{R}^m = 1$.

$$\hat{\rho} = \frac{(1-C)}{R^m}\, \frac{p_s\, \sigma\, \pi_s\left(\frac{1}{\mathcal{R}^m}\right) + (1 - p_s)(1 - \sigma)\pi_n\left(\frac{1}{\mathcal{R}^m}\right)}{P} = \frac{(1-C)}{R^m \mathcal{R}^m}\, \frac{P[\mathcal{R}^m - 1 + \pi_n] - p_s\, \sigma\varepsilon}{P} \tag{11}$$

This result leads to the next proposition, which combines the feasibility condition for a quasi-foundation in Proposition 1 and Condition (11). The quasi-foundation feasibility condition is expressed as a lower bound for the funder's sacrifice.

Proposition 2a (necessary and sufficient condition):

A quasi-foundation is feasible if and only if:

$$0 < \rho < \hat{\rho} = \frac{(1-C)}{R^m \mathcal{R}^m}\, \frac{P[\mathcal{R}^m - 1 + \pi_n] - p_s\, \sigma\varepsilon}{P}$$

Parameter $\hat{\rho}$ draws a clear line between quasi-foundations (supplying a mix of grants and loans) and social banks (charging a positive, but preferential, interest rate). From the investor's side, Proposition 2a shows that social investors willing to create a quasi-foundation must accept a return on investment not higher than $\hat{R} = \hat{\rho} R^m$, where R^m is the market rate for same-risk investment opportunities. Above this maximum return, funders of nonprofit SFIs will support social banks. The next subsection examines the feasibility of social banks.

4.2 Feasible Social Banks

Social banks can arise from either nonprofit SFIs or hybrid SFIs. We compute the equilibrium interest rate set optimally by the SFI and check whether it is feasible under the constraint that SFIs may not charge an interest rate higher than the market rate $\mathcal{R}^m$.

We start by rewriting the budget constraint in Equation (10) as:

$$K = \delta P - \delta^2[P(1-\pi_n) + p_s\sigma\varepsilon] \tag{12}$$

where:

$$K = \frac{\rho R^m P}{(1-C)\mathcal{R}^{\mathrm{m}}} \tag{13}$$

Appendix C shows that the RHS of Equation (12) is 0 for $\delta = 0$ and increases in $\delta \in [0,1)$. Hence, the following condition ensures the existence of a feasible δ:

$$K < P\pi_n - p_s\sigma\varepsilon \tag{14}$$

Condition (14) means that the maximal ρ corresponding to the minimal sacrifice that enables the SFI to offer preferential loans to socially screened projects is:

$$\rho_{max} = \frac{(1-C)\mathcal{R}^{\mathrm{m}}}{R^m P}(P\pi_n - p_s\sigma\varepsilon) \tag{15}$$

In Appendix D, we prove that $\hat{\rho} \le \rho_{max}$. The feasibility condition for social banks is $\rho < \rho_{max}$ regardless of whether the institution is a hybrid or a nonprofit SFI.

Proposition 2b (necessary and sufficient condition):

A social bank is feasible if and only if:

$$\rho \le \rho_{max} = \frac{(1-C)\mathcal{R}^{\mathrm{m}}}{R^m P}(P\pi_n - p_s\sigma\varepsilon).$$

4.3 Optimization

Under Condition (14), the maximum of the RHS of Equation (12) is beyond $\delta = 1$, implying that the optimal δ is the lowest root of the following quadratic polynomial:

$$Q(\delta) = [P(1-\pi_n) + p_s\sigma\varepsilon]\,\delta^2 - P\delta + K \tag{16}$$

Hence, acknowledging that the discriminant of $Q(\delta)$ is positive (see Appendix E), we have the next proposition.

Proposition 3: *If $\rho \leq \rho_{max}$, then the SFI supplies loans to socially screened projects and charges them the (positive or negative) interest rate $(\delta^*\mathcal{R}^m - 1)$ maximizing its social contribution, where:*

$$\delta^* = \frac{P - \sqrt{P^2 - 4K(P(1-\pi_n) + p_s\sigma\varepsilon)}}{2[P(1-\pi_n) + p_s\sigma\varepsilon]}\ . \tag{17}$$

The discriminant of $Q(\delta)$ is smaller than *P*, making the numerator of Equation (17) positive, as expected. Since *K* is proportional to ρ (see Equation (13)), Equation (17) confirms that ρ and δ^* are positively related. Intuitively, this relationship shows that, other things being equal, SFIs funded by more generous funders charge lower interest rates to their borrowers. In line with Propositions 2a and 2b, the business model of a nonprofit SFI is a (feasible) quasi-foundation with $\delta^* < 1/\mathcal{R}^m$ if $\rho < \hat{\rho}$ and a (feasible) social bank with $\delta^* > 1/\mathcal{R}^m$ if $\hat{\rho} < \rho < \rho_{max}$.

A similar reasoning based on Equation (13) establishes that *C* and δ^* are positively related, showing that a higher screening cost implies charging a higher interest rate to borrowers. Further, the partial derivative of δ^* w.r.t. ε is positive (see Appendix F), implying that a larger difference between the success probabilities of normal and social projects—i.e., a higher ε—requires the SFI to charge higher interest rates.

Table 3 summarizes the feasibility constraints of nonprofit and hybrid SFIs and presents the optimal type of SFIs in relation to the generosity of their funders. The quasi-foundation feasibility constraint is more demanding than the constraint imposed on social banks. All feasibility constraints are, however, particularly strong if social projects are far less profitable than normal ones (ε is high) and if social screening is expensive (C is high).[12] Overall, funder generosity is key to the sustainability of social finance.

Table 3. Feasible and Optimal SFIs

Inverse of funder's sacrifice: ρ	**Feasible SFI**	**Feasibility condition[a]**	**Optimal feasible SFI**
Nonprofit SFI: $0 < \rho < \frac{1}{R^m}$	Quasi-foundation	$\rho < \hat{\rho}$	Quasi-foundation
	Social bank	$\hat{\rho} \leq \rho < \rho_{max}$	
Hybrid SFI: $\frac{1}{R^m} \leq \rho < 1$	Social bank	$\rho < \rho_{max}$	Social bank

[a] knowing that: $\hat{\rho} < \rho_{max}$.

5. Reciprocity and "Hold-up" Effect

The previous section shows that the difference between the success probabilities of normal and social projects, represented by parameter ε, has a significant impact on the feasibility of social finance. This section takes into consideration the possibility of a positive reaction from social borrowers when dealing with an SFI. This reaction

[12] Since C includes all the additional costs resulting from the social character of the bank, unusually high values of C could also signal an agency problem, whereby employees of the social bank award themselves high salaries or tolerate high operating costs. This situation is reminiscent of the "soft budget constraint" (Kornai 1979), a concept borrowed from transition economics to describe firms that live comfortably thanks to subsidies.

based on value sharing, known as "reciprocity", leads borrowers to try harder to reimburse loans contracted with a social lender, as opposed to a regular bank.

To illustrate reciprocity, let us come back to the example of an SFI that provides cheap credit to socially oriented stores charging low prices to poor people. The business of these social stores is evidently less profitable than that of normal stores serving better-off clients. Reciprocity occurs when, because of their social orientation, the stores serving the poor make an additional cost-reducing effort, which increases the chances of financial success of the social projects and the probability of reimbursing their SFI loans. The additional effort may, for instance, occur through motivated workforce agreeing to work for lower wages.

In our model, reciprocity would reduce the value of ε in a way that can either just mitigate the financial penalty of funding social projects (where ε is still positive) or even make social projects more successful than their normal competitors (where ε is negative). This section starts with a literature review elucidating the mechanisms behind reciprocity in the credit market. Next, we revisit the previous propositions under the assumption that reciprocity allows parameter ε to take values in a wider range, including negative numbers.

5.1 Reciprocity and Value Sharing

In a context of market imperfections and asymmetric information, the type of an applicant (normal or social) is unobservable to the SFI without any social screening. As a result, non-social applicants might pretend to be social ones in order to benefit from preferential credit conditions offered by the SFI. The scholarship on social finance increasingly recognizes that reciprocity and social identification—either individually or in conjunction—are likely to enhance the borrower's motivation and commitment to duly repaying the loan. These mechanisms can be efficient to combat moral hazard (Akerlof & Kranton, 2005; Chen & Li, 2009). The literature has developed two distinct, yet complementary, approaches to model reciprocity and social identification.

The first approach relies on the assumption that a below-market interest rate is a costly signal sent to social borrowers, who will react positively by increasing their repayment effort. This responsiveness stems from value sharing between the two contractual parties. In the asymmetric-information model proposed by Cornée and Szafarz (2014), the SFI invests in a costly screening device to select borrowers who share its social values and signals their privileged status by charging a discounted interest rate. In return, these motivated borrowers reciprocate the SFI's gesture by undertaking an efficient investment project lowering the default risk, since cheating would come at a moral cost.

Empirical evidence from a French social bank supports this theoretical setting: Borrowers identified as "social" benefited from lower interest rates and had a significantly lower default probability compared with other borrowers with similar characteristics, thereby indicating that social borrowers benefiting from favorable credit conditions will behave less opportunistically afterwards. In a laboratory setting, Cornée et al. (2012) confirm that, on the basis of strong social preferences, social bankers charge lower interest rates than commercial bankers, which in turn reduces the borrowers' propensity to engage in moral hazard. In sum, reciprocity is understood here as a response to a favorable signal; it is thus conditional.

The second approach to reciprocity assumes that social borrowers react virtuously regardless of any signal. Knowing that they are dealing with an SFI is sufficient to stifle the temptation of moral hazard they would be facing with a normal bank. In this context, reciprocity is unconditional and based solely on social identification, or value sharing, acting as a strong cement between contractual parties. The models proposed by Barigozzi and Tedeschi (2015, 2019) encapsulate this view, assuming that motivated borrowers perceive an added stream of utility if their own projects, financed by a social bank, are successful, thereby increasing their willingness to repay their debt. Within this framework, the borrower’s reaction is dictated by the nature of the SFI, and not by a signal. This theoretical setting helps rationalize the strikingly low share of nonperforming loans held by an Italian social bank, as reported by Becchetti et al. (2011).

To model reciprocity, we reformulate the assumption about the success probability of normal and social projects (see Equation (7)). In the case of conditional reciprocity, we assume that the signal is sent through parameter ρ, which gauges funder generosity and is observable to borrowers. Following Barigozzi and Tedeschi (2015), unconditional reciprocity is characterized by social projects being more successful than normal ones. While the analysis based on the maximization of social contribution still works, the feasibility conditions in Table 3 need to be adapted to the presence of reciprocity. For the qualitative interpretation of the results, the most notable difference will appear under the parameter configuration that allows unconditional reciprocity to generate a hold-up effect, whereby the SFI charges an above-market interest rate to social projects (see Subsection 5.3).

5.2 Conditional Reciprocity

When reciprocity is conditional, more generosity (lower ρ) increases reciprocity and, hence, decreases the difference between the success probabilities of social and normal projects. According to Equation (7), this difference is driven only by parameter ε, implying that: $\pi_n(\delta) - \pi_s(\delta) = -\delta\ \varepsilon$. Let us now replace Equation (7) by the assumption that it is also a function of funder generosity, described by parameter ρ:

$$\pi_n(\delta) - \pi_s(\delta) = -\delta\ \varepsilon\ \rho \tag{19}$$

With Equation (19), the optimal interest rate in Equation (17) changes to:

$$\delta^{**} = \frac{P - \sqrt{P^2 - 4K(P(1-\pi_n) + p_s\ \sigma\varepsilon\rho)}}{2\left[P(1-\pi_n) + p_s\sigma\varepsilon\ \rho\right]} \tag{20}$$

The condition allowing for a solution to the SFI program is now:

$$K < P\pi_n - p_s\sigma\varepsilon\ \rho \tag{21}$$

where K is defined by Equation (13). This result leads to the next proposition.

Proposition 4 (conditional reciprocity):

If the return required by funders is such that $\rho < \rho_{max}$ and if borrower reciprocity is conditional on the SFI's funder generosity, then the SFI can supply loans at a discount to socially screened projects at the below-market interest rate determined by Equation (20).

Here, as in the case of no reciprocity, δ^* and ρ are positively related, the link being stronger than under zero reciprocity (see Appendix F). Logically, the fact that reciprocity increases in line with funder generosity exacerbates the impact of lowering the return required by SFI funders on the interest charged to borrowers. In return, conditional reciprocity is "rewarded" by decreasing the interest rate. To see this effect, let us first derive the impact of conditional reciprocity on the limit situation where funders require the market return ($\rho = 1$). This benchmark case leads to the same equilibrium borrowing rate as in the previous section: $\delta^{**} = \delta^{*}$. Next, for $\rho < 1$, since the correlation between δ^{*} and ρ is stronger for conditional reciprocity, the interest rate charged by the SFI will be lower if borrowers are conditionally reciprocal than if they are not reciprocal.

5.3. Unconditional Reciprocity

The previous section examines the situation where borrowers pursuing a social project reciprocate the gesture of receiving a loan from an SFI by making an extra repayment effort proportional to the generosity of SFI funders. Let us now consider the case where this reciprocal effort is unconditional, meaning that initiators of social projects will put more effort into repaying their debts than regular borrowers in an identical financial situation. The additional effort can be rationalized as the social borrowers' motivation stemming from being financed by a financial intermediary whose social values they share.

The most obvious way to model the situation of unconditional reciprocity would be to lower the difference between the success probabilities of normal and social projects: $\pi_n(\delta) - \pi_s(\delta) = \varepsilon$. If ε is still positive, normal projects remain financially more successful and baseline results in Section 4 are qualitatively unaffected.

The only case where unconditional reciprocity would really make a difference is whenever the borrower's identification with the SFI is strong enough to reverse the inequality between success probabilities and leads to $\pi_n(\delta) - \pi_s(\delta) < 0$, implying that $\varepsilon < 0$. This is the situation we are considering now. We will show that, under certain conditions, the optimal interest rate can exceed the market rate ($\delta > 1$) because it brings more social benefits to the SFI than the lower rate derived in Section 3.

Typically, an above-market interest rate will automatically repel normal borrowers who have access to the market rate. By contrast, however, some social borrowers may prefer borrowing from an SFI at above-market rate over borrowing from normal banks at market rate, either because of ideological reasons (which contribute to a reciprocal attitude towards SFIs), or because they have no access to normal banks. This set-up departs significantly from the one proposed in the previous sections. The most significant adaptation of Table 3 will therefore relate to whether SFIs of any kind find it optimal to impose an above-market interest rate to reciprocal social borrowers. If so, reciprocity acts as a segmentation design, making social screening unnecessary.

As $\varepsilon < 0$, Equations (6) and (7) imply that: $\pi_n(\delta) - \pi_s(\delta) < 0$. Since probabilities cannot surpass 1, Equation (6) imposes that: $\varepsilon > -(1 - \pi_n)$. By imposing that

$$\delta < \frac{1}{1-(\pi_n-\varepsilon)} \tag{22}$$

we ensure that the financial success probability of social projects is positive. Since $\pi_n > \frac{1}{2}$, the range of δ goes beyond the value of 2, which corresponds to a repayment twice as high as the market repayment, or an interest rate of more than 100%.[13] Condition (22) is likely to cover most realistic situations.

Consequently, the SFI's budget constraint boils down to:

$$\rho R^m = \delta \mathcal{R}^m \pi_s(\delta) = \delta \mathcal{R}^m \left[1 - \delta\left(1 - (\pi_n - \varepsilon)\right)\right]$$

and can be written as:

$$K' = \delta - \delta^2\left(1 - (\pi_n - \varepsilon)\right) \tag{23}$$

where:

$$K' = \frac{\rho R^m}{\mathcal{R}^m} \tag{24}$$

The relevant range of δ lies between 1 and $1/[1 - (\pi_n - \varepsilon)]$, the maximum[14] of the RHS of Equation (23) being obtained for: $\delta = 1/2[1 - (\pi_n - \varepsilon)] < 1/[1 - (\pi_n - \varepsilon)]$. Hence, a necessary condition for the existence of an interest rate higher than the market rate compatible with the budget constraint is:

$$K' < \frac{1}{4[1-(\pi_n-\varepsilon)]} \tag{25}$$

Evidently, the SFI imposes an above-market interest rate only if this strategy maximizes its social contribution. To show that this outcome is a real possibility under unconditional borrower reciprocity, consider an SFI whose budget constraint is met by two interest rates in Equation (23) for the same $\varepsilon < 0$: $\delta_1 < 1$ and $\delta_2 > 1$. The corresponding social contributions are, respectively:

$$SC_1 = (1 - C)\frac{p_s\sigma\left[1-\delta_1\left(1-(\pi_n-\varepsilon)\right)\right]}{P} \tag{26}$$

[13] Call r^m the market interest rate, equal to $(\mathcal{R}^m - 1)$, and r the actual rate. For $\delta = 2$ we have $(1 + r) = 2(\mathcal{R}^m - 1)$ from which $r = 1 + 2r^m$, i.e., 100% plus twice the market interest rate.

[14] Note that the first derivative of the RHS of Equation (23) is positive at $\delta = 1$ and negative for $\delta = \frac{1}{1-(\pi_n-\varepsilon)}$.

$$SC_2 = 1 - \delta_2\big(1 - (\pi_n - \varepsilon)\big) \qquad (27)$$

The first expression is based on Equation (8), acknowledging that social finance is feasible at a below-market interest rate SC_2, the social contribution with the interest rate δ_2, is based on the success probability of social projects, because the high interest rate deters normal projects from applying and the value of a successful social contribution is normalized to 1.

Together, the facts that $SC_2 < 1 - \delta_1[1 - (\pi_n - \varepsilon)]$ and $(1 - C)p_s\sigma/P < 1$ imply that neither of the two social contributions dominates the other. There exist parameter configurations that can make either $SC_1 > SC_2$, and other configurations leading to $SC_2 > SC_1$. In the first case, the SFI charges the social below-market interest rate. The second case, where the SFI favors the above-market interest rate δ_2 over the lower one δ_1, is more probable if the fixed cost of social screening C is particularly high.

Proposition 5 (unconditional reciprocity):

If $\varepsilon < 0$ *and borrower reciprocity is unconditional, then there exist feasible SFIs with parameter configurations implying an optimal below-market interest rate* $(\delta_1 < 1)$ *and others implying an optimal above-market interest rate* $(\delta_2 > 1)$.

The possibility of a feasible social finance[15] scenario where it is optimal for the SFI to charge a high interest rate ($\delta_2 > 1$)—instead of a preferential interest rate—points to the risk of a so-called socially-based "hold-up". In the standard "hold-up" effect, long-term credit relationships increase the bank's bargaining

[15] We disregard unfeasible SFIs where there exists no admissible below-market interest rate.

power over its faithful borrowers, leading it to charge them excessively high interest rates (Sharpe, 1990). In our situation, the effect would be driven by a high degree of unconditional reciprocity from social borrowers willing to display their gratefulness toward the SFI that would grant them a loan at any condition. This outcome does, however, raise inevitable ethical issues since the *raison d'être* of SFIs is to provide affordable, below-market credit conditions to initiators of social projects. Table 4 summarizes the conclusions stemming from Propositions 4 and 5.

Table 4. Reciprocity, Feasibility, and Optimality

Type of Reciprocity	Feasibility conditions	Optimal interest rate[a]	Hold-up Effect
No reciprocity	$\rho < \rho_{max}$	$\delta^* < 1$	NO
Conditional reciprocity	$\rho < \rho_{max}$ and $\frac{\rho R^m P}{(1-C)\mathcal{R}^m} < P\pi_n - p_s \sigma \varepsilon \rho$	$\delta^{**} < 1$	NO
Unconditional reciprocity	$\rho < \rho_{max}$ and either $\varepsilon > 0$ or ($\varepsilon < 0$ and $\frac{\rho R^m}{\mathcal{R}^m} \geq \frac{1}{4[1-(\pi_n-\varepsilon)]}$)	$\delta_1 < 1$	NO
	$\rho < \rho_{max}$ and $\varepsilon < 0$ and $\frac{\rho R^m}{\mathcal{R}^m} < \frac{1}{4[1-(\pi_n-\varepsilon)]}$	If $SC_1 \geq SC_2$: $\delta_1 < 1$	NO
		If $SC_1 < SC_2$: $\delta_2 > 1$	YES

[a] $\delta^*, \delta^{**}, SC_1$, and SC_2 are defined in Equations (17), (20), (26) and (27), respectively. δ_1 and δ_2 are the two roots of the second-degree polynomial: $P(\delta) = \delta^2[1-(\pi_n-\varepsilon)] - \delta + \frac{\rho R^m}{\mathcal{R}^m}$.

6. Discussion and Policy Implications

6.1 Summary of the Results

To supply below-market loans to socially screened borrowers and deliver a social contribution, SFIs need below-market capital financing. Since social screening is costly and some loans are defaulted, the interest rate rebate an SFI can provide to its borrowers depends on both its screening cost and the success probability of social projects. Feasibility constraints are stronger if social projects are far less profitable than normal ones and if social screening is onerous. Yet the major factor is the cashback offered by its funders. The interest rate charged to borrowers is necessarily higher than the rate of return promised to investors. The results in Table 3 indicate that the only feasible hybrid SFIs are social banks, which lend at a preferential, but positive, rate. By contrast, feasible nonprofit SFIs, where investors recoup less than their invested capital, can be both social banks and quasi-foundations providing loans with negative interest rates. But the optimal SFI—maximizing its social contribution—is always a quasi-foundation if it is feasible.

Our baseline results in Section 4 (Table 3) show how SFIs can supply debt at below-market interest rates. In real life, however, some prosocial lenders, such as microfinance institutions (MFIs) discussed below, charge high, likely above-market interest rates. To address this issue, Section 5 adds reciprocity to our setting. The concept of reciprocity reflects the idea that borrowers who pursue a social project make an extra effort to repay the preferential debt obtained from the SFI. Reciprocity can be associated with both social identification and the lack of outside funding options. To differentiate the two possibilities, we define *conditional reciprocity* and *unconditional reciprocity*, and consider them successively in Section 5 (Propositions 4 and 5). The results in Table 4 indicate that when reciprocity is conditional on SFI funder generosity (acting as a measure of their "skin in the game"), the extra creditworthiness of the social borrowers translates into a larger interest rate rebate from the SFI. By contrast, in the case of unconditional reciprocity, understandable as borrower reliance on the lender, the SFI's optimal choice can exploit the situation by charging an above-market interest rate even though a social, i.e., below-market, interest rate would be feasible.

6.2 *Implications for Real-Life SFIs*

Out of our general taxonomy, Table 3 selects two sets of optimal feasible SFIs: hybrid social banks and nonprofit quasi-foundations. These two sets correspond to real-life SFIs. The hybrid social banks account for the backbone principle of social finance practices, which intermediate socially minded funders expecting positive, but below-market returns and motivated borrowers receiving preferential credit conditions. The most natural group of real institutions based on this principle includes ethical and social banks (Cornée et al., 2020). Similar patterns are observable in the business model of alternative financial intermediation schemes, such as cooperative banking, crowdfunding, and microfinance, which do not systemically advertise a social motivation, but often have one.

Real-life SFIs, particularly social banks, rely heavily on deposits for their funding because these institutions are committed to use basic intermediation principles, which help them abide by both relationship lending and transparency (Cornée et al., 2016). This business model proves to be critical to assess often opaque social projects (Cornée, 2019). During periods of negative interest rates, not considered in our model, high reliance on deposits is a threat to bank profitability because supplying negative interest to depositors is barely doable. Indeed, banks want to retain their clientele and keep depositors away from their outside option of holding cash. Deposits also help banks meet regulatory liquidity requirements. Thus, negative market rates hurt particularly banks funded by a large share of deposits. To survive, they must increase their lending rates and/or seek riskier, more profitable lending opportunities (Eggertsson et al., 2019).[16] Under these circumstances, social banks may find it difficult to offer the interest rebate they usually consent. The need to offer non-negative interests to depositors leaves social banks with no other option than charging market (or even above-market) rates to their borrowers to break-even. Interestingly though, the pro-social *Alternative Swiss Bank* and *Triodos* were among the few banks to set explicitly negative deposit rates. But overall, negative policy rates tend to compromise the social mission of SFIs, especially those whose funders make relatively low sacrifices.

From the SFI theory standpoint, MFIs deserve special interest. MFIs serve large pools of disadvantaged borrowers (De Quidt et al., 2018), but often charge them above-market, and therefore ethically questionable, interest rates (Sandberg, 2012). The extension of our model to account for unconditional reciprocity helps address this thorny issue. Charging high interest rates to poor borrowers lacking bargaining power might seem unfair because many MFIs benefit from cheap capital through subsidies and preferential loans (D'Espallier et al., 2013; Morduch & Ogden, 2019; Cozarenco et al., 2022). In many places around the world, the microcredit market is still characterized by poor competition, so that MFIs often are price setters. By the same token, unconditional reciprocity, attested by high repayment rates, especially from women (D'Espallier et al., 2011), may reflect that borrowers have few or no alternative opportunities (Hudon & Sandberg, 2013). It is also difficult to assess MFI interest rate rebates since reference market rates are mostly inexistent. The literature has, however, uncovered the high operating costs

[16] Many banks compensate part of their losses by charging fees to their depositors.

of microcredit. Thus, inferring systematic unfairness from the interest rates charged is a possibly misrepresenting view (Sandberg, 2012; Hudon et al., 2020). In our model, this situation would correspond to a large value of C associated with the costly lending technology needed to grant microloans. Relatively small donations from funders, high costs and unconditionally reciprocal borrowers are a likely scenario associated with MFIs in our setting.

The second optimal situation indicated in Table 3 concerns nonprofit quasi-foundations, which iron out the differences between giving and lending. By requiring only partial reimbursement of the capital they supply, these SFIs fill the gap between foundations providing grants only and social banks, which lend money at (preferential) positive rates. We further examine quasi-foundations in the next section.

6.3 The Centrality of Quasi-Foundations

Since real-life quasi-foundations barely exist, their development in the market for philanthropic and social funding could significantly increase global welfare, especially where “pure” foundations would be too restrictive to attract socially minded donors, whose alternative option would be to make no donation at all. Surrogates for quasi-foundations already do exist in public policies, albeit to a modest extent. For instance, the European Union uses innovative "blending financial instruments" as a way to enhance the efficiency of its poverty reduction agenda (Janda, 2011). However, the development of quasi-foundations—especially those that could take the form of digital crowdfunding platforms—is hampered by regulatory obstacles. The lending/giving products that quasi-foundations could offer do not fall into any category set by the prevailing tax and accounting rules, which are based on the deemed nature of the funder's financial interest (Heminway, 2017). Giving, lending, or investing transactions are governed by distinct operating provisions aiming to protect funding interests from various threats, primarily financial risk. In this context, social enterprises are forced to secure access to capital by resorting to *ad hoc* strategies that are often unsatisfactory. Sometimes they create dual legal structures to accommodate resources stemming simultaneously from commercial equity and deductible donations (Doherty et al., 2014). Yet digital solutions are technologically sound tools for ensuring that capital will flow to the fast-growing sector of the social economy. Since quasi-foundations offer promising avenues to foster and support the hybridization of innovative entrepreneurial forms, a major policy recommendation derived from our theoretical model is to provide a regulatory framework that allows and encourages hybrid forms of funding.

Quasi-foundations may also play a crucial role when the financial leeway of social banks shrinks due to low or negative market rates. Regardless of their funders' generosity, when market rates are close to zero and even negative, granting preferential loans with a positive interest becomes arduous, if not infeasible.

6.4 Avenues for Future Research

Our work is only a first step towards a more comprehensive theory of social finance. One main limitation of our model stems from imposing one-period financial constraints, which may underestimate social contributions in the long run. Indeed, the typical legal status of SFIs stipulates that they should retain a significant portion, if not all, of their profits in reserve to be reinvested in subsequent periods. Likewise, the capital that SFIs allocate may also spawn multi-periodic social effects (Borzaga & Defourny, 2001). Promising developments of our model might include a dynamic setting acknowledging the long-term perspective in social finance, which may contrast with excessive short-termism in mainstream financial institutions (Dallas, 2011). In addition, in our setting social success (failure) means financial success (failure) of a social project. Decoupling both successes would constitute a valuable refinement.

Another avenue for further investigation would be to determine the market characteristics under which sustainable social projects rejected by normal banks might benefit from funding by SFIs. More generally, one could scrutinize the robustness of the credit-rationing approach *à la* Stiglitz and Weiss (1981) under the paradigm of social finance.

A further suggestion for theoretical development is to endogenize social screening efforts. An endogenously determined cost of screening would impact the probability of correctly identifying social projects. Social screening could then be traded off against borrowing rates in the pursuit of the greatest social contribution possible. All these refinements open fruitful avenues for conceptualizing the key principles of social finance. But regardless of the precise model at stake, the feasibility issue will most likely have to be addressed along the lines drawn in this paper.

Last, our baseline results rely on the assumptions that the probability of success is above 50% and that market interest rates are positive. These two assumptions are debatable. Considering the possibility of a low probability of success would enlarge the scope of our model to SFIs that purportedly finance highly risky social endeavors. As to the sign of market interest rates, the historically unprecedented policy that major central banks, such as the European Central Bank, are conducting tends to invalidate the standard assumption that interest rates are positive (Heider et al., 2019), suggesting a further refinement of our model in this direction.

7. Conclusion

Do we really need social financial institutions? Is it not enough to combine two polar types of institutions, namely, philanthropic foundations and commercial banks? By transposing Modigliani and Miller's (1958) argument to social finance, one may argue that socially minded investors can separate their profit-maximizing investment strategies from their impact-maximizing charitable donations (Chu, 2015). This argument is close in spirit to the tenets of effective altruism that recommend doing the "most good you can do" (Singer, 2015). Yet the institutional relevance of SFIs should not be underestimated in at least two respects. First, in line with Maimonides' intuition, evidence suggests that both investors and providers of soft loans are particularly involved in the governance of subsidized institutions, whereas pure charitable donations sometimes boil down to one-shot actions (Hudon et al., 2021). Second, SFIs not only synchronize funders' financial requirements, as mainstream financial intermediaries do (Diamond, 1984), but they also coordinate an unmet heterogeneous demand for value-based investment on the funder's side. By filling this gap, SFIs contribute to the common good and increase global welfare.

Our model formalizes the decision-making process of the burgeoning yet understudied realm of SFIs. Our model reveals the conditions for the existence of

SFIs, i.e., hybrid or nonprofit social banks and nonprofit quasi-foundations. It also helps understand the strategies followed by alternative financial organizations, such as ethical banks, credit cooperatives, microfinance institutions, and crowdfunding platforms. To generate a social contribution, SFI feasibility heavily depends on the funders' required return on investment. A key takeaway of this paper concerns the special case of quasi-foundations that we have unearthed. We advocate the adoption of regulatory frameworks favoring this form of SFI granting loans requiring partial repayment.

Overall, SFIs do make a difference by materializing individual investors' social preferences in financial terms while serving social projects. Acting on such principles of value-based intermediation may indirectly incentivize normal projects to limit their negative externalities or foster their social contribution in order to tap less onerous capital. In this regard, too, feasible SFIs participate in a virtuous circle of aligning financial services with societal benefits.

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Appendix A. Description of the Variables

Table A1. Variables, Notations, and Restrictions

Variable	Description	Restrictions
$\boldsymbol{R^m - 1}$	Market rate of return for bank owners	$\boldsymbol{R^m} > 1$
$\boldsymbol{R - 1}$	Rate of return required by SFI owners	
$\boldsymbol{\mathcal{R}^m - 1}$	Market borrowing rate	$R^m > \mathcal{R}^m$
$\boldsymbol{\mathcal{R} - 1}$	SFI borrowing rate	
$\boldsymbol{\delta}$	$\frac{\mathcal{R}}{\mathcal{R}^m}$	$0 < \delta < 1$
$\boldsymbol{\rho}$	$\frac{R}{R^m}$	$0 < \rho < 1$
$\boldsymbol{C}$	Fixed cost of social screening	$C \in [0,1]$
$\boldsymbol{p_s}$	Probability of correctly assessing the applicant's social status	$p_s \in [0,1]$
$\boldsymbol{SC}$	Social contribution enabled by the SFI	
$\boldsymbol{\sigma}$	Share of social projects applying for funds from the SFI	$\sigma \in [0,1]$
$\boldsymbol{P}$	Probability for a random project to be funded by the SFI	
$\boldsymbol{\pi_n}$	Probability of financial success for normal projects for $\delta = 1$	$\pi_n \in (½, 1]$
$\boldsymbol{\pi_{.}(\delta)}$	Probability of financial success, with subscript *s* for social projects, and *n* for normal projects	$\pi_{.}(\delta) \in (½, 1]$
$\boldsymbol{\varepsilon}$	Decrease in probability of financial success for social projects compared with normal projects under market conditions	$\varepsilon < \pi_n - \frac{1}{2}$
$\boldsymbol{K}$	$\frac{\rho R^m P}{(1-C)\mathcal{R}^m}$	
$\boldsymbol{K'}$	$\frac{\rho R^m}{\mathcal{R}^m}$	

Appendix B. Co-existence of Nonprofit and Hybrid SFIs

To understand how nonprofit SFIs and hybrid SFIs can co-exist, we assume that their social funders have utility functions $U(\rho, SC)$, where ρ is defined by Equation (1) $\left(\frac{\partial U}{\partial \rho} < 0\right)$, and SC is the expected social contribution generated by the SFI $\left(\frac{\partial U}{\partial SC} > 0\right)$. Funders can have different relative weights of ρ and SC. Moreover, SC ultimately depends on ρ since a greater sacrifice made by its funders allows the SFI to generate a higher level of social performance, so that: $SC = SC(\rho)$.

Potential funders can be grouped into three categories: (i) funders for which $U(\rho, SC)$ is maximized for $\rho = 0$ $\left(U^* = U\big(0, SC^*(0)\big)\right)$, and among the others $\left(U^* = U\big(\rho^*, SC^*(\rho^*)\big), \rho^* > 0\right)$, (ii) those for which $0 < \rho^* < \frac{1}{R^m}$, and (iii) those for which $\frac{1}{R^m} \leq \rho^* < 1$. These funders will respectively opt for: (i) foundations, (ii) nonprofit SFIs, and (iii) hybrid SFIs.

Potential funders requiring a positive return, however small or partial, might be fiercely opposed to simply giving away their money, thus implying that, for them, $U^* = U\big(0, SC^*(0)\big)$ would fall short of their reservation utility. A similar argument applies to funders reluctant to finance hybrid SFIs because the latter's social contribution is insufficient to meet their reservation utility constraint. For social funders combining both characteristics, only nonprofit SFIs will be attractive enough to invest in. If these SFIs do not exist, their only alternative is no social investment at all.

Appendix C. Impact of δ on the Budget Constraint

We already established that the lower δ, the higher *SC*. We will now prove that the RHS of the budget constraint in Equation (9) is increasing in δ, so that the budget constraint is binding while maximizing *SC*.

Partially deriving the RHS of Equation (6) w.r.t. δ results in:

$$\frac{\partial}{\partial\delta}\left[(1-C)\,\delta\,\mathcal{R}^m\,\frac{p_s\,\sigma\,\pi_s(\delta)+(1-p_s)(1-\sigma)\pi_n(\delta)}{P}\right]$$

$$= (1-C)\,\mathcal{R}^m\,\frac{p_s\,\sigma\,\pi_s(\delta)+(1-p_s)(1-\sigma)\pi_n(\delta)+\delta[p_s\,\sigma\,\pi'_s(\delta)+(1-p_s)(1-\sigma)\pi'_n(\delta)]}{P}$$

$$= (1-C)\,\mathcal{R}^m\,\frac{p_s\,\sigma\,(1-2\delta(1-\pi_n+\varepsilon))+(1-p_s)(1-\sigma)(1-2\delta(1-\pi_n))}{P}$$

Since $\pi_s(\delta)$ and $\pi_n(\delta) \in \left(\frac{1}{2},1\right)$ and $\delta < 1$, this expression is positive over the relevant range of δ. A similar argument shows that the second partial derivative w.r.t. δ is negative over the relevant range of δ.

Appendix D. Proof that $\widehat{\boldsymbol{\rho}} \leq \boldsymbol{\rho_{max}}$

We have:

$$\frac{\hat{\rho}}{\rho_{max}} = \frac{P[\mathcal{R}^m-1+\pi_n]-p_s\,\sigma\varepsilon}{(\mathcal{R}^m)^2(P\pi_n - p_s\sigma\varepsilon)} \quad \text{(D.1)}$$

and:

$$\frac{\partial\left(\frac{\hat{\rho}}{\rho_{max}}\right)}{\partial\mathcal{R}^m} = \frac{\mathcal{R}^m(-\mathcal{R}^m P-2P+2\pi_n P+2p_s\,\sigma\varepsilon)}{(\mathcal{R}^m)^4(P\pi_n - p_s\sigma\varepsilon)^2}$$

This derivative is negative because $\pi_n < 1$, $\mathcal{R}^m > 1$, $\varepsilon < \frac{1}{2}$, and $P > p_s\,\sigma$:

$$\mathcal{R}^m(-\mathcal{R}^m P-2P+2\pi_n P+2p_s\,\sigma\varepsilon) < \mathcal{R}^m(-\mathcal{R}^m P+2p_s\,\sigma\varepsilon) < \mathcal{R}^m(-P+2p_s\,\sigma\varepsilon) < \mathcal{R}^m(-P+p_s\,\sigma) < 0$$

Hence, $\frac{\hat{\rho}}{\rho_{max}}$ decreases with $\mathcal{R}^m$. By definition, $\mathcal{R}^m > 1$ and (C.1) implies that: $\frac{\hat{\rho}}{\rho_{max}} \to 1$ for $\mathcal{R}^m \to 1$, we obtain $\frac{\hat{\rho}}{\rho_{max}} < 1$.

Appendix E. Sign of the Discriminant in Proposition 3

The quadratic equation defined in Equation (16):

$$Q(\delta) = [P(1-\pi_n)+p_s\sigma\varepsilon]\,\delta^2 - P\delta + K = 0$$

can be rewritten as:

$$Q(\delta) = a\delta^2 - P\delta + K = 0 \quad \text{(E.1)}$$

with: $a = P(1-\pi_n)+p_s\sigma\varepsilon > 0$. (E.2)

From Equation (12), we know that: $K = \delta P - a\delta^2 < P - a$. Hence, the discriminant of Equation (E1) is positive since:

$$P^2 - 4aK > P^2 - 4a(P-a) = P^2 + 4a^2 - 4aP = (P-2a)^2 \geq 0$$

Appendix F. Relation between δ^* and ε

As Equations (6) and (7) show, financial success probabilities for normal and social projects are, respectively:

$\pi_n(\delta) = 1 - \delta(1 - \pi_n)$

$\pi_s(\delta) = 1 - \delta(1 - \pi_s) = 1 - \delta(1 - \pi_n + \varepsilon)$

If $\varepsilon = 0$, the relationship between δ and the probability of financial success is the same for both normal and social projects.

Let us consider again Equation (E.1) in Appendix E. The impact of ε on this equation is restricted to coefficient a (see Equation (E.2)) and $\frac{\partial a}{\partial \varepsilon} = p_s \sigma > 0$. Hence, we have:

$$\frac{d\delta}{d\varepsilon} = \frac{\delta^2 \frac{\partial a}{\partial \varepsilon}}{P - 2a\delta} > 0$$

because within the relevant range of δ, we have: $P - 2\,a\delta > 0$.