Financing from Family and Friends*

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The majority of informal finance, in developed and developing countries, is provided by family and friends. Yet existing models of informal finance better fit "informal moneylenders" insomuch as they fail to match two salient characteristics of family finance: family investors often accept below-market or even negative returns, and despite this, borrowers tend to prefer formal finance. We explain both of these characteristics in a model of external financing that allows for social preferences between relatives or friends. The social preferences make family finance cheap but also create shadow costs that nonetheless discourage its use: Committing family funds to a risky investment crowds out familial transfers in low-consumption states, and undermines limited liability. The very characteristics that generate intra-family insurance thus render family finance a poor source of risk capital. In contexts where contracts must harness social ties to overcome capital constraints, our findings suggest that third-party intermediation and semi-formalization may be crucial for promoting risky investment. This is relevant to the limited success of group-based microfinance in generating entrepreneurial growth, and to the emergence of social lending intermediaries and crowd funding.

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A friend in need is a friend in deed.
— Popular proverb

Neither a borrower nor a lender be;
For loan oft loses both itself and friend.
— Hamlet, Act I, Scene 3

1 Introduction

The use of informal finance is extensive, both in developed and developing countries. In 2006, for example, several million small companies from 42 countries raised over $600 billion from informal investors, and some entrepreneurs relied exclusively on informal finance.[1] How can informal finance subsist where formal finance cannot? And, given that, why does it not close the financing gap? The standard answer to the first question is that informal investors have information or enforcement advantages that allow them to reduce contracting frictions such as moral hazard or adverse selection. The standard answer to the second question is that informal investors have insufficient funds, and thus a very high cost of capital. In short, in these "information/cost theories," informal funds are limited and costly, which constrains investment.

While accurate for informal moneylending, this account is at odds with key features of financing from family and friends, which accounts for the majority of all informal finance in both developed and developing countries (see Table 1). First, family finance is cheap. In the U.S., low-interest loans among family members are so common that they spurred a legal debate on whether to tax them as loans or gifts (see, e.g., Hutton and Tucker, 1985). As the Wall Street Journal (2012) writes, "budding entrepreneurs" often turn to the "Bank of Mom or Dad" for a "dream-come-true interest rate." Many informal investors indeed expect low or even negative returns, as shown in Figure 1. Similarly, among the poor, family loans are frequently interest-free (Collins et al., 2010). If family finance suffers fewer contracting problems *and* is cheaper than formal finance, one would expect it to be first choice: borrowers should prefer and exhaust it.

Paradoxically, it often is not. Small business advisors urge entrepreneurs to "think twice before borrowing from family" and to see family finance as "a last resort, not a first resort"

[1] This estimate is from the Global Entrepreneurship Monitor (GEM) survey (Bygrave and Quill, 2006). By comparison, across all 85 countries included in the survey, formal venture capitalists invested $37.3 billion into 11,066 companies in 2005, of which 71% was invested in the United States. Informal finance is probably even more important in developing countries. The Global Financial Inclusion Database, which covers 184 countries, estimates that, in developing countries, currently 59% of adults have no bank account and 55% of borrowers use only informal sources of credit (Demirguc-Kunt and Klapper, 2012).

(BusinessWeek, 2006). Consistent with this, in Bygrave and Hunt (2004), the largest informal investments come from strangers, not relatives or friends, even though the required return increases with the investor's social distance to the entrepreneur. As the most likely reason, the survey does not cite limited family funds but rather that "investments in strangers are made in a more detached and business-like manner." Similarly, Guerin et al. (2012) found that, when asked whom they would approach first for money, only a small percentage of surveyed rural Indian households mentioned kin and many said that they dislike going into debt inside their family circle.[2]

The fact that family finance is cheap but still not preferred suggests, first, that family finance comes with shadow costs and, second, that the source of these costs is compatible with below-market, commonly even negative, required returns. Information/cost theories of informal finance cannot match these facts: there, the aspects that make informal finance less attractive (e.g., greater risk aversion of informal investors, monitoring costs, social penalties, etc.) imply a premium on required return. Thus, the typical prediction is that, if a borrower uses *both* informal and formal finance, informal finance is not less expensive. Moreover, if it were cheaper, it would be preferred, not avoided.

This paper proposes a new model of external finance where the informal lending relationship is characterized by social preferences. This is the single difference between informal and formal finance; in particular, the informal lender has no informational or cost (dis)advantages. In this model, we can account for both negative required returns and shadow costs. Further, we show that the very features that make family funds an excellent source of insurance make family finance a poor source of risk capital. Family finance increases access to funds, but this comes at the price of reduced risk taking and, ultimately, stifled investment. Therefore, to mitigate this negative impact of family financing, even counterparties with social ties benefit from formal contracts and third-party intermediaries.

Our message is novel in that it emphasizes the value of *im*personal transactions, such as channeling risk out of the borrower's social circle and immunity to social tensions. While many information/cost theories advocate contractual innovations that harness or emulate the power of social relations, our theory thus advertises the opposite: using formal contracts and neutral third parties to mitigate the drawbacks of mixing social relations with financial transactions. This is consistent both with the limited success of group-based microfinance in generating entrepreneurial growth (Crépon et al., 2011; Banerjee et al., 2015a,b), and with the emergence of financial institutions that combine formal intermediation with social relations, such as community funds, social lending intermediaries, and crowdfunding.

[2]In a similar vein, while documenting financial decisions of households in developing economies over several years, Collins et al. (2010) found that family finance, though the most prevalent and usually cheapest form of (informal) finance, is frequently not the most preferred.

We depart from a standard moral hazard model of external finance (à la Holmstrom and Tirole (1997)) where an entrepreneur can approach two investors, a family member (friend) and an outsider. Section 2 presents our benchmark model with selfish preferences. In Sections 3 and 4, we then study two different characterizations of the social preference relation between family members, and demonstrate the insights in each of them.

In the first characterization, family members simply exhibit standard altruistic preferences with respect to each other; the outsider has no such ties.[3] It is intuitive that sufficiently strong altruism generates intra-family insurance – family members are willing to insure each other against low consumption. But we show that this intra-family insurance, in turn, generates a shadow cost of family finance: using family resources for the entrepreneur's (NPV-positive) risky project taps into the "insurance fund" that she would access if the project fails. Put differently, using family finance as risk capital undermines the pre-existing familial insurance arrangement. This makes the entrepreneur rely on outside funds whenever available. When the entrepreneur is capital constrained, altruism also makes family investors willing to provide funds at possibly negative expected returns, if this makes the project realizable. When needed, family finance is thus cheaper (moreover, it mitigates moral hazard). Even so, the entrepreneur uses only as much family finance as is needed to secure outside co-financing.

Not all social transactions, even among friends or relatives, operate on pure altruism, however. In our second characterization, we model informal finance as a *gift exchange*. Specifically, we translate Akerlof (1982)'s idea of a social norm that employees who are paid above-market wages reciprocate by working harder into the context of financial markets: borrowers financed by family members at below-market rates reciprocate the gift by working harder to repay those lenders – by paying them "favors" even if the project fails – since a violation of this norm harms the relationship.[4] Gift exchange also generates both negative required returns and shadow costs. Now, the shadow costs stem from the social obligations owed to family members upon default. Intuitively, family debt "never really goes away" – it effectively lacks limited liability. If the project fails, the entrepreneur can reciprocate through costly favors, or renege but harm the relationship; outside financing avoids both. So as in the first model, the entrepreneur uses only as much family finance as is needed to alleviate moral hazard enough to secure outside co-financing.

Thus, in both environments, the single assumption of social preferences between family

[3] Altruistic behavior has been documented for a wide range of organisms. See Trivers (1971), Becker (1976), and Axelrod and Hamilton (1981) on sociobiological explanations of altruism, especially among kin, including *kin selection*, *reciprocal altruism*, and *inclusive fitness*.

[4] Formally, we assume *reciprocal* altruistic preferences as modeled in Levine (1998). Under these preferences, one person's effective altruism towards another depends on primitive sentiments of both. Moreover, we assume that a violation of the gift exchange norm reduces the sentiment of the party that has been disappointed. This can sustain a gift exchange because the quality of the (altruistic) relationship serves as "social" collateral.

members leads to a non-trivial set of predictions:

(1) *Coexistence.* Both family and formal finance are used, sometimes simultaneously.

(2) *Financial deepening.* Some projects cannot be undertaken without family finance.

(3) *Co-signing.* Family finance helps raise outside finance.

(4) *Negative returns.* Family investors accept negative expected returns.

(5) *Pecking order.* Despite its lower required returns, family finance is less preferred.

(6) *Risk taking.* Some projects are not undertaken without outside finance.

The first three predictions ((1)-(3)) echo those derived in existing theories of informal finance. One strand focuses on information advantages: Informal lenders have superior information or lower monitoring/verification costs, which reduce moral hazard or adverse selection (Stiglitz, 1990; Varian, 1990; Banerjee et al., 1994; Jain, 1999; Mookherjee and Png, 1989; Prescott, 1997; Gine, 2011; Ghatak, 1999). The other strand posits that social ties mitigate incentive problems through the threat of social sanctions, modeled as (non-pecuniary) costs of default (Besley et al., 1993; Besley and Coate, 1995; Karlan et al., 2009; Karaivanov and Kessler, 2015). Existing theories that focus on trade-offs between formal and informal finance usually assume that informal financiers have a higher cost of capital because of monitoring costs, risk aversion, illiquidity, or the cost of sanctions.

The social preference models proposed in this paper are distinct from these theories in that they additionally generate three novel predictions ((4)-(6)): That informal investors offer finance at negative rates of return; that entrepreneurs nonetheless prefer outside finance; and that entrepreneurs may even forgo risky investments rather than rely exclusively on (available) informal finance. These predictions match the data on the most important informal financiers, family and friends. Moreover, they yield a key insight: Much as family finance increases an entrepreneur's access to funds, this may come at the price of reduced risk taking. Thus, while many information/cost theories advocate contractual innovations that harness or emulate the power of social relations, our theory cautions that this may stifle investment. In fact, even in contexts where contracts must harness social relations to overcome capital constraints, third-party intermediation and semi-formalization may be crucial for bringing about entrepreneurial risk taking.

By emphasizing the costs of family ties in financing, our analysis complements a literature that, so far, has focused mainly on the benefits. For example, Ghatak and Guinnane (1999) write in their survey that "the literature on group lending shies away from discussing the possible negative implications." We focus explicitly on such shadow costs of mixing social

relations and financial transactions, and emphasize the advantages of formal contracts and arm's-length relationships. As we discuss in more detail in Section 5, our paper sheds light on why harnessing social relationships in lending has proved successful in generating insurance, but, at the same time, has generally failed to generate entrepreneurial profit growth (Tarozzi et al., 2013; Banerjee et al., 2014).

Outside the literature on informal financing, our paper contributes to the body of work on intra-household relations and on family firms. While the *unitary* (Becker, 1973) and *collective* (Browning et al., 2012) models assume that households always achieve Pareto efficiency, our paper adds to a smaller set of household models where intra-family conflicts entail inefficiencies (Konrad and Lommerud, 1995; Lundberg and Pollak, 2003; Basu, 2006; Alger and Weibull, 2010; Hertzberg, 2012). Similarly, early theories of family firms treat families as single entities (Burkart et al., 2003; Almeida and Wolfenzon, 2007), but more recent work explicitly models familial ties in firms as altruistic relations (Lee and Persson, 2010; Noe, 2011).[5]

2 Benchmark model with selfish preferences

Project. An entrepreneur E requires an amount $I > 0$ to invest in a project idea. If the project is started, E can either 'work' or 'shirk.' Working generates an uncertain cash flow $\tilde{R}$, equal to $R > 0$ with probability q and 0 otherwise. By contrast, shirking provides the entrepreneur with an uncertain private benefit $\tilde{B}$, equal to $B \geq 0$ with probability q and 0 otherwise, but generates no cash flow.[6] We assume that shirking is inefficient ($B < R$) and that, without it, the project has a positive expected return ($qR > I$). Cash flows are observable. However, private benefits and E's decision whether to work or shirk are unobservable.

Financing. There are two sources of external finance: a friend or family member, F, and an unrelated outsider, O. Financing contracts specify amounts $\{I_O, I_F\}$ the investors contribute to the project subject to the funding constraint ($I_{ext} \equiv I_O + I_F \geq I$), and amounts $\{R_O, R_F\}$ they receive if the project yields the cash flow R subject to limited liability ($R_{ext} \equiv R_O + R_F \leq R \Leftrightarrow R_E \equiv R - R_{ext} \geq 0$). So, a contract specifies uncertain cash flows $\tilde{R}_O$, $\tilde{R}_F$, and $\tilde{R}_E$, which are equal to $R_i \geq 0$ with probability q and 0 otherwise, for $i \in \{E, F, O\}$. Contracting occurs at the initial stage. To later highlight that F may accept a negative expected return, we assume that E has full bargaining power.[7]

[5] See also the early conjecture in Schulze et al. (2001) that altruism between family members may aggravate incentive problems.

[6] The assumption that the private benefits (of shirking) have a binary distribution analogous to the project cash flows (from working) simplifies the analysis but is not crucial.

[7] This is not a necessary condition for negative expected returns. For any distribution of bargaining power, there exist parameters in the model with altruism such that the incentive compatibility constraint pushes the repayment to F below her investment outlay.

Consumption utilities. Preferences are homogeneous and represented by the concave piecewise linear utility function

$$u(x) = \begin{cases} x & \text{for } x \leq \underline{x} \\ \underline{x} + m(x - \underline{x}) & \text{otherwise} \end{cases}$$

with $m < 1$. A suitable interpretation of this utility function is that an agent with consumption below $\underline{x}$ is "needy" (with a high marginal utility of consumption) whereas an agent with consumption above $\underline{x}$ is "wealthy" (with a low marginal utility of consumption). m gauges the relative difference in marginal utility between a needy and a wealthy agent. We will throughout the paper refer to $u(\cdot)$ interchangeably as *selfish* or *consumption* utility.

Homogeneity ensures that our results do not hinge on differences in consumption utility functions. Also, in combination with Assumption 1 below, the piecewise linear specification makes the investors risk-neutral with respect to the project, thus eliminating risk aversion of F and O as a reason for co-financing. The crucial role of the "kink" is to allow agents' marginal consumption utilities to differ depending on their wealth. Furthermore, it implies that an efficient risk allocation may require E to transfer a sufficient proportion of cash flow risk to the investors. As will become clearer, all of these properties help us to systematically isolate the various effects of social preferences on financing choices.

Endowments. E is penniless. F and O are each endowed with W, and each is sufficiently wealthy to buy the entire project without becoming needy:

Assumption 1. $W \geq \underline{x} + qR$.

All wealth not invested with E is invested in a storage technology with zero return.

The optimal financing contract is the solution to

$$\begin{aligned} \underset{I_O, I_F, R_O, R_F}{\text{maximize}} \quad & \mathrm{E}[u(\tilde{R}_E)] \\ \text{subject to} \quad & \mathrm{E}[u(\tilde{R}_E)] \geq \mathrm{E}[u(\tilde{B})] \\ & \mathrm{E}[u(W + \tilde{R}_F - I_F)] \geq u(W) \\ & \mathrm{E}[u(W + \tilde{R}_O - I_O)] \geq u(W) \\ & R - R_{ext} \geq 0 \\ & I_{ext} \geq I \end{aligned}$$

where the constraints are (from top to bottom) E's incentive compatibility constraint, the investors' participation constraints, limited liability, and the funding requirement. Our first

result describes the optimal financing choice in this baseline model.[8]

Proposition 1. *Under purely selfish preferences, both investors demand the same interest rate and the entrepreneur is indifferent between the financing sources. The project is funded if and only if*

$$B \leq B_f \equiv R - I/q, \tag{1}$$

and conditional on funding, risk is efficiently allocated if and only if

$$B \leq B_r \tag{2}$$

where $B_r = \frac{qR-I-\underline{x}}{q}$ *for* $qR - I \geq \underline{x}$*, but otherwise* $B_r = \frac{qR+I-\underline{x}}{q-1}$.

A key implication of Proposition 1 is that there are three cases to consider with respect to the moral hazard problem. First, when (1) is violated, we refer to E as *capital-constrained*: the project cannot be financed. Second, conditional on the project being financed, when (2) is violated, E is *risk-constrained*: she must retain so much project risk that her distribution of consumption outcomes encloses the "kink" at $u(\underline{x})$. It is only when neither (1) nor (2) is violated that E is *unconstrained*. Note that, for $qR - I \geq \underline{x}$, each case occupies a distinct, non-empty interval since $0 < B_r = R - I/q - \underline{x}/q < B_f$. This is the situation depicted in Figure 2.

Note also that we set up our benchmark model with selfish preferences in such a way that it is irrelevant which investor is chosen to finance the project. This is intuitive, since F and O are identical in all aspects. In what follows, we explore how the introduction of certain social preferences between E and F changes the choice, pricing, and feasibility of financing relative to this benchmark outcome.

3 Financing and altruism

Suppose E and F, instead of being purely selfish, "care" for each other. Specifically, we use a common formulation of altruistic utility as the weighted average of an individual's selfish utility and the selfish utilities of those she is altruistic towards, and assume that

$$U_E = U(x_E, x_F) = (1 - \phi)u(x_E) + \phi u(x_F)$$

and vice versa for F, where $\phi \in [0, 1/2)$ reflects the intensity of altruism and $1 - \phi$ is the weight on one's own consumption utility. For simplicity, we assume the altruistic bond to be mutual and symmetric (i.e., of equal intensity in both directions). Assuming O has no such

[8] Throughout our analysis, (parts of) proofs not fully derived in the text are relegated to the Appendix.

social relationship, as in the baseline model, the investors now differ in their "relationship" to E, but remain identical in all other aspects. The benchmark model is the special case $\phi = 0$.

The basic effect of altruism is that it induces charitable behavior. To see this, suppose F allocates a total budget Π for consumption:

$$\begin{aligned} \underset{x_E, x_O \geq 0}{\text{maximize}} \quad & (1-\phi)u\left(\Pi - x_E - x_O\right) + \phi u\left(x_E\right) \\ \text{subject to} \quad & x_E + x_O \leq \Pi \end{aligned}$$

Clearly, F sets x_O to zero, but the first-order derivative with respect to x_E is

$$-(1-\phi)k_F + \phi k_E \equiv \gamma$$

where k_i denotes i's marginal consumption utility. F shifts consumption to E as long as γ is positive. Since $\phi < 1/2$, this is possible only for $k_E > k_F$, and hence only when E is needy ($k_E = 1$) while F is not ($k_F = m$), in which case the condition that γ be positive is

$$\frac{1}{m} > \frac{1-\phi}{\phi}. \tag{3}$$

(3) compares the ratio of marginal consumption utilities to that of the utility weights in F's social preferences. If the difference in their marginal consumption utilities is sufficiently large compared to the weight F puts on her own consumption relative to E's, F shows charity towards E: She transfers a unit of consumption from herself to E *as long as she is wealthy and E is needy.*

Because such transfers protect the receiver against low consumption, condition (3) captures that, when altruism is strong enough (i.e., ϕ is high enough for a given m), it generates intra-family insurance. We refer to (3) as the *familial insurance* condition.

Lemma 1. *A wealthy family member transfers consumption units to a needy one iff their relationship satisfies the familial insurance condition.*

Lemma (1) implies that familial insurance provides a lower bound on consumption.

Corollary 1. *If the joint wealth* Π *of two agents whose relationship satisfies the familial insurance condition exceeds* $\underline{x}$*, their individual consumption cannot fall below* $\min\{\underline{x}, \Pi - \underline{x}\}$.

It should be noted that the familial insurance condition (3) is not a necessary condition for charitable behavior. Even when it does not hold, a family member may sacrifice a unit of consumption if it translates into *more* than one unit of consumption for the receiver. Rather, the familial insurance condition (3) defines a particularly high level of charity at which one

agent sacrifices a unit of consumption even if it increases the receiver's merely by *one unit* (or even less). Still, in the subsequent analysis, it will be important to distinguish whether or not condition (3) holds.

We return attention to the entrepreneur's *financing* problem, which must now be written as

$$\begin{aligned} \underset{I_O, I_F, R_O, R_F}{\text{maximize}} \quad & \mathrm{E}(U_E \,|\text{work}\,) \equiv \mathcal{F} \\ \text{subject to} \quad & \mathrm{E}(U_E \,|\text{work}\,) \geq \mathrm{E}(U_E \,|\text{shirk}\,) \\ & \mathrm{E}(U_F \,|\text{work}\,) \geq \mathrm{E}(\overline{U}_F) \\ & \mathrm{E}[u(W + \tilde{R}_O - I_O)] \geq u(W) \\ & R - R_{ext} \geq 0 \\ & I_{ext} \geq I. \end{aligned}$$

There are three important differences between this optimization program and the one under purely selfish preferences. First, social utility functions replace purely selfish ones in the maximand, E's incentive compatibility constraint, and F's participation constraint. Second, F's reservation utility depends now on whether or not E receives funding from O instead, and is denoted above by $\overline{U}_F$. Last, F may make provisions for charitable transfers, which depend on project outcome and may interact with financing.

We are ultimately interested in the solution to the financing problem for the case where the capital constraint (1) is violated and the familial insurance condition (3) is satisfied. In Figure 2, which illustrates the parameter space (B, ϕ), this region of interest is the upper-right area, where B is high enough to render E capital-constrained and ϕ is high enough to sustain familial insurance. However, we build intuition by analyzing the other cases first.

3.1 Financing without familial insurance

In this section, we assume that the familial insurance condition (3) is violated. We establish two results. First, when the entrepreneur is unconstrained, altruism is irrelevant to the financing decision: as in the benchmark model, the entrepreneur is entirely indifferent between the financing sources. Second, when the entrepreneur is risk- or capital-constrained, she strictly prefers to use some family finance. Conditional on achieving an efficient risk allocation, though, the source of funding is again irrelevant. These two cases are represented by the lower-left and lower-right areas in Figure 2.

The overall conclusion in this section is that family finance based on altruism mitigates financing constraints. Moreover, altruism makes family finance cheaper than, and preferred to, outside finance – though this is the case *only* when the entrepreneur's access to outside

finance is constrained. Still, outside finance in this setting is always weakly dominated.

3.1.1 Unconstrained financing without familial insurance: indifference

We begin with the case where the entrepreneur is unconstrained, that is, where B is so low that both the capital constraint (1) and the risk constraint (2) are satisfied. Absent any constraints, the solution to E's optimization problem highlights which financing source she uses if the choice is purely a matter of preference: Does E prefer "family finance" from F, whom she has an altruistic relationship with, or "outside finance" from O, whom she does not care for and who does not care for her?

When neither constraint is binding, the incentive compatibility constraint is slack not only under pure outside finance, but as we will show in the proof of Lemma 2 below, also under any optimal co-financing arrangement. We can therefore ignore the incentive compatibility constraint in deriving the optimal contract.

Another implication is that, even in the event that F does not contribute any financing, E can still fund the project and sell enough risk to O to ensure that her consumption levels are always above or always below $\underline{x}$. Since $R_O = {}^{I_O}/_{q}$, as is straightforward to show, E's consumption utility in that case is $qu(I_O - I + R - R_O) + (1-q)u(I_O - I) = u(qR - I)$.

Thus, we are looking for the solution to the above optimization program excluding the incentive compatibility constraint, with the objective function given by

$$\mathcal{F} = (1-\phi)\, E[u(I_{ext} - I + \tilde{R} - \tilde{R}_{ext})] + \phi E[u(W - I_F + \tilde{R}_F)], \tag{4}$$

and F's participation constraint given by

$$(1-\phi)\, E[u(W - I_F + \tilde{R}_F)] + \phi E[u(I_{ext} - I + \tilde{R} - \tilde{R}_{ext})] \geq (1-\phi)u(W) + \phi u(qR - I) \tag{5}$$

where the right-hand side (F's reservation utility) reflects that O is on standby to efficiently finance the project.

Lemma 2. *Suppose the entrepreneur is unconstrained and the familial insurance condition is violated. Then the entrepreneur is indifferent between the financing sources and both investors demand the same interest rate.*

In Figure 2, Lemma 2 pertains to the lower-left area where E enjoys no familial insurance but is financially unconstrained. In spite of altruism, the financing source is irrelevant here, as in the benchmark model. Not even the prices change. This means that whatever effect ϕ has on the optimization program, they all cancel out. It is instructive to highlight where this occurs, in view of two conjectures one may entertain about the effects of altruism.

One common conjecture is that altruism leads to cheap finance. To examine this, let F's participation constraint (5) bind[9] and collect the $(1-\phi)$-terms and ϕ-terms:

$$(1-\phi)\,\Delta_F^{PC} + \phi\Delta_E^{PC} = 0.$$

Δ_i^{PC} denotes the change in i's expected consumption utility as a result of F's participation. Suppose F's reservation price, contrary to the conjecture, equals O's. By definition, this price sets $\Delta_F^{PC} = 0$ (because O "breaks even"). Moreover, if both investors set prices identically, E's consumption is independent of F's participation, i.e., $\Delta_E^{PC} = 0$. Then, F's participation constraint above is satisfied, refuting the conjecture that altruism leads to cheap financing. The reason that F's altruism towards E does not affect the financing terms here is that F is "happy" for E also if O buys the project, as captured by $\phi u(qR-I)$ in F's reservation utility in her participation constraint (5). Intuitively, F sees no reason to provide financing cheaply if E is unconstrained, i.e., if E can be efficiently funded without F's help.

Another common conjecture is that E prefers to involve F rather than O in the project, since she prefers to share cash flows with F. However, the increase in E's expected utility (4) from selling the project to F rather than to O turns out to be

$$\mathcal{F}|_{I_O=0} - \mathcal{F}|_{I_F=0} = (1-\phi)\Delta_E^{PC} + \phi\Delta_F^{PC},$$

which is zero, since $\Delta_E^{PC} = 0$ and $\Delta_F^{PC} = 0$, as discussed above. We gain intuition about the second, altruistic component by decomposing Δ_F^{PC} into its state-contingent parts:

$$\Delta_F^{PC} = q[u(W-I_F+R) - u(W)] - (1-q)[u(W) - u(W-I_F)] = 0.$$

This altruism as a *double-edged sword*: The first part reflects that E prefers repaying F rather than O when the project succeeds, while conversely, the second part reflects that E prefers losing O's rather than F's wealth when the project fails. Given $R_i = {}^{I_i}/_{q}$ for $i = F, O$, these components are equivalent. Hence, E is indifferent between raising finance from F and O.[10]

[9] The entrepreneur sets a price at which the investors' participation constraints bind. With respect to O, this is obvious. With respect to F, this obtains because E and F each place more weight on their own consumption and F, being wealthy by assumption, has a (weakly) lower marginal utility of consumption. E is therefore disposed toward a contract that extracts as much as possible from F.

[10] As mentioned previously, the chosen piecewise linear specification of $u(\cdot)$ is meant to suppress the effects of risk aversion by F and O so as to cleanly isolate the effects of altruism. With strictly concave $u(\cdot)$, E would not be indifferent to the choice of financing – she would strictly prefer a combination of both sources – but primarily for reasons little to do with altruism. That said, even with strictly concave $u(\cdot)$, a variant of the above indifference argument applies: given multiple co-investors, E would be indifferent to *replacing* a non-family investor with a family investor.

3.1.2 Constrained financing without familial insurance: family finance

When the capital constraint (1) or the risk constraint (2) is violated, the optimization program changes in two ways. First, since E can no longer efficiently finance the project solely through O, her expected consumption utility is now lower than $u(qR - I)$ if F does not participate in the financing. This in turn lowers F's reservation utility and thus relaxes his participation constraint. More specifically, the participation constraint becomes

$$(1-\phi)\,E[u(W - I_F + \tilde{R}_F)] + \phi E[u(I_{ext} - I + \tilde{R} - \tilde{R}_{ext})] \geq (1-\phi)u(W) + \phi E(\overline{u}_E)$$

where $E(\overline{u}_E) \in (0, u(qR - I))$ if only the risk constraint is violated, and $E(\overline{u}_E) = 0$ if the capital constraint (1) is violated.

Since the objective function is the same as before, it is still decreasing in R_F and R_O. Letting the participation constraint bind and expressing it as $(1-\phi)\,\Delta_F^{PC} + \phi\Delta_E^{PC} = 0$, where

$$\Delta_E^{PC} = E[u(I_{ext} - I + \tilde{R} - \tilde{R}_{ext})] - E(\overline{u}_E),$$

reveals that, if F's participation can raise E's expected consumption utility so that $\Delta_E^{PC} > 0$, then the constraint implies $\Delta_F^{PC} < 0$. Intuitively, if F is able to improve matters for E, he is willing to participate even if his own expected consumption utility thereby decreases, which means that he would finance E at a *discount*. In fact, applying the implicit function theorem to the binding constraint yields

$$\frac{\partial R_F}{\partial \phi} = \frac{\Delta_E^{PC}}{(1-\phi)\,q\gamma} < 0$$

where $\gamma = -(1-\phi)\,k_E + \phi k_F < 0$ since the familial insurance condition is violated. This, in turn, implies that the discount increases in the consumption gain Δ_E^{PC} that F can bring about for E, and in the degree ϕ to which F empathizes with E.

The second change to E's optimization program is that, when moral hazard constrains the risk allocation or even investment, the incentive compatibility constraint must be binding. Hence, if F's participation relaxes this constraint, he can indeed improve matters for E. The incentive compatibility constraint is

$$(1-\phi)\,E[u(I_{ext} - I + \tilde{R} - \tilde{R}_{ext})] + \phi E[u(W - I_F + \tilde{R}_F)] \geq (1-\phi)\,E[u(I_{ext} - I + \tilde{B})] + \phi u(W - I_F).$$

To see that the use of family finance relaxes this constraint, rewrite this inequality as

$$(1-\phi)\Delta_E^{IC} + \phi\Delta_F^{IC} \geq 0$$

where Δ_i^{IC} denotes the change in i's expected consumption utility if E chooses to work rather than shirk. Under pure outside finance, the inequality reduces to $\Delta_E^{IC} \geq 0$ with $I_{ext} = I_O$ and $R_O = {}^{I_O}/_q$. Family finance relaxes this constraint in two ways: The *direct* effect of altruism on E's incentives is that, keeping Δ_E^{IC} constant, $R_F > 0$ and hence $\Delta_F^{IC} > 0$ increases the left-hand side. This reflects that E internalizes, with intensity ϕ, that shirking decreases F's consumption utility by Δ_F^{IC}. This in turn relaxes financing constraints: Applying the implicit function theorem to the binding constraint yields

$$\frac{\partial R_F}{\partial \phi} = -\frac{\Delta_F^{IC}}{(1-\phi)\, q\gamma} > 0.$$

In words, the stronger the altruism is, the larger is the repayment R_F that F can demand of E without undermining the latter's incentives. (Recall that $\gamma < 0$ in the case without familial insurnace.) From E's perspective, this means that she is less constrained in selling off project risk, or raising capital.

In addition, there is an *indirect* effect through prices: If F provides financing at a discount, R_{ext} decreases, which in turn increases Δ_E^{IC}. This is to say that E's incentives improve because she retains a larger share of the cash flow. The starkest example of this effect is a donation by F ($I_F > 0$ with $R_F = 0$). This would shut down the direct effect, but Δ_E^{IC} would be higher than under pure outside finance since E could finance the project with $R_{ext} = (I_{ext} - I_F)/q$ rather than $R_{ext} = {}^{I_{ext}}/_q$.

Financing constraints in agency models derive from a tension between the entrepreneur's incentive compatibility constraint and the investors' participation constraint. As just shown, altruism relaxes both constraints. For the next result, recall that B_f is the largest B for which pure outside finance is still feasible.

Lemma 3. *Suppose the familial insurance condition is violated and the entrepreneur is constrained. Then the entrepreneur prefers family finance. Specifically, there is a unique $B^* > B_f$ such that the project is feasible for all $B \leq B^*$. If the project is feasible, the entrepreneur raises a threshold amount of family finance as a donation or loan at a below-market interest rate. For the remaining financing, she is indifferent between the financing sources.*

In Figure 2, Lemma 3 pertains to the lower-right area, where E cannot rely exclusively on outside finance and enjoys no familial insurance. Two insights emerge from the Lemma that are consistent with empirical data. First, family finance may be available at a discount

– though *only when it is needed*, that is, when the entrepreneur is financially constrained. Second, family finance relaxes those constraints, both in terms of risk allocation and capital supply. The reason here is that it mitigates moral hazard along two margins: The direct effect is that consideration of family investors makes the entrepreneur more reluctant to shirk. The indirect effect is that a family loan, being cheaper, leaves more cash flow to the entrepreneur and thus rewards working more.

The third insight is that "small" family contributions are given in the form of donations, which the entrepreneur in this case strictly prefers to outside finance. However, when the amount that can be obtained as a donation falls short of restoring feasibility or an efficient risk allocation, the entrepreneur instead obtains a family loan that must be repaid (only) in part, that is, is priced at a discount. Thus, in contrast to existing models of informal finance, ours can explain both gifts and loans from family members to entrepreneurs within the same framework.

How the threshold amount of family finance varies with altruism depends on the type of contribution: The size of a donation increases with altruism, whereas the amount of a family loan needed to sustain incentives decreases with altruism. This highlights the separate effects of altruism on the incentive and participation constraints. Note, however, that outside finance is always (weakly) dominated in this setting. That is, there is so far no *cost* to using (only) family finance.

3.2 Financing with familial insurance

We now solve the optimization program under the assumption that the altruism is strong (i.e., ϕ is high) enough to satisfy the familial insurance condition (3). The main insight is that this increase in altruism between family members makes *outside* finance more attractive to the entrepreneur. In fact, we show that when the entrepreneur is capital-unconstrained – though she may be risk-constrained – outside finance weakly, and sometimes strictly, dominates family finance. Moreover, when the entrepreneur is capital-constrained, she uses the smallest amount of family finance to restore feasibility, but prefers outside finance for the remaining financing (need), *even though family finance is provided at a discount.*

3.2.1 Capital-unconstrained financing with familial insurance: outside finance

With familial insurance, we must account for possibly state-contingent familial transfers. The most direct approach is to reformulate the constrained optimization program in terms of final consumption amounts instead of repayments, in which case familial transfers can be added as constraints on consumption (the lower bounds from Corollary 1). This analysis is relegated to the Online Appendix. Here, in the text, we present a more intuitive derivation of our central

result (Proposition 2).

Before doing so, we establish the following side result:

Lemma 4. *If the familial insurance condition is satisfied, pure outside finance is feasible if and only if* $B \leq \hat{B}_f$ *where* $\hat{B}_f < B_f$.

Recall that we refer to the entrepreneur as capital-unconstrained if she can undertake the project solely with outside finance. In the absence of familial insurance, this is the case when the capital constraint (1), i.e., $B \leq B_f$ is satisfied. Lemma 4 says that the presence of familial insurance tightens the constraint, making it more difficult for the entrepreneur to rely solely on outside finance. Lemma 4 holds under the assumption that F is unable to observe private benefit consumption by E before deciding on familial transfers. This exacerbates the moral hazard problem in that shirking now not only yields private benefits from the project but also allows E to fall back on a larger familial transfer since the project "failed."[11]

Hence, when the familial insurance condition holds, we hereafter refer to the entrepreneur as capital-unconstrained if $B \leq \hat{B}_f$.

Proposition 2. *Suppose the familial insurance condition is satisfied and the entrepreneur is capital-unconstrained. Then the entrepreneur prefers outside finance. Specifically, if*

$$W - I < 2\underline{x} < W - I + R, \tag{6}$$

the entrepreneur raises outside finance up to a threshold, but is otherwise indifferent between the financing sources. Both investors demand the same interest rate.

In Figure 2, Proposition 2 pertains to the upper-left area where F is willing to insure E against low consumption and E is capital-unconstrained. The essence of Proposition 2 is that the entrepreneur has a weak and sometimes strict aversion to family finance in this case. To show why, let us aggregate E's and F's utilities into a (indirect) "family utility" function U of family wealth Π_{EF} that accounts for familial insurance transfers between the two agents. Familial insurance implies that any marginal increase in family wealth Π_{EF} accrues to a needy family member as long as there is (at least) one (Lemma 1). Family utility hence takes the simple form

$$U(\Pi_{EF}) = \begin{cases} \Pi_{EF} & \text{for } \Pi_{EF} \leq 2\underline{x} \\ 2\underline{x} + m\left(\Pi_{EF} - 2\underline{x}\right) & \text{for } \Pi_{EF} > 2\underline{x} \end{cases}.$$

[11] While this assumption may be natural for some private "benefits" (e.g., reduced effort), other forms of private benefit consumption may be inconcealable to family members before they decide on familial transfers. We intentionally abstract from this possibility in order to keep a level playing field between the two investors, F and O, in terms of information. However, even if we assumed that family members cannot be fooled to provide unjustified insurance, the main conclusion in this section would hold. More precisely, it would still be true that outside finance is preferred as long as E is unconstrained (Proposition 2), whatever the parameter constellations under which E is unconstrained, i.e., irrespective of whether $\hat{B}_f < B_f$ or $\hat{B}_f = B_f$.

Now consider how the financing choice affects family wealth. With break-even pricing for O ($R_O = I_O/q$), we can express state-contingent family wealth as a function of the amount of outside finance:

$$\tilde{\Pi}_{EF}(I_O) = \begin{cases} W - I + R + (1 - 1/q)\, I_O & \text{if } \tilde{R} = R \\ W - I + I_O & \text{if } \tilde{R} = 0 \end{cases} .$$

The expected value and standard deviation of $\tilde{\Pi}_{EF}(I_O)$ are

$$\begin{aligned} \mu_{EF} &= W + qR - I \\ \sigma_{EF} &= \sqrt{q(1-q)}\,(R - I_O/q)\,. \end{aligned}$$

Obtaining outside finance thus corresponds to a mean-preserving contraction of the family wealth distribution: Increasing I_F decreases the variance of family wealth, while maintaining expected family wealth at a constant level.

With the family utility function being quasi-concave, it hence follows directly from Jensen's inequality that outside finance makes the family overall better off, or given that F's participation constraint is binding, must be weakly preferred by E. This preference is *strict* whenever the family wealth distribution encloses the kink of $U(\cdot)$ at $2\underline{x}$, which is the minimum family wealth that ensures neither E nor F is needy. Thus, the optimal amount of outside finance is strictly positive if $2\underline{x}$ lies between the lower and upper bounds of family wealth for $I_O = 0$, which is condition (6).

The familial insurance condition (3) implies that F, when wealthy, is *willing* to insure E against low consumption. That provided, condition (6) implies that undertaking the project without outside finance reduces F's *capacity* to provide such insurance, or more precisely, the insurance available if the project fails. We refer to (6) as the *constrained insurance condition.* The intuition behind Proposition 2 is therefore: The entrepreneur is averse to family finance when she prefers to preserve family wealth as an "emergency fund" for bad times. Putting it differently, even though F is willing to provide funding, E does not want to take it, because doing so would disrupt the familial insurance relationship.

Proposition 2 contrasts with the notion that altruism leads to "cheap finance." While an investor whose interest rate is exogenously reduced becomes a more attractive source of finance, his altruism towards E renders F a less attractive source of finance in this case. In fact, the presence of altruism is irrelevant to E's cost of financing: Raising outside finance exclusively, at O's selfish price, is optimal for *any* level of altruism between E and F that satisfies the familial insurance condition. Rather, the key to Proposition 2 is that altruism leads to "free insurance," which makes altruistic financing "expensive" insofar as it compromises

this insurance. We corroborate this interpretation in the Appendix by showing that optimal payoffs can be replicated without *financing* from O if F has sufficient wealth to instead both finance the project and purchase (non-familial) *insurance* from O for E.[12]

The irrelevance of the risk constraint for financing in this case further highlights the role of familial insurance. In the absence of familial insurance, family finance raises the amount of risk a constrained entrepreneur can sell, thus improving the risk allocation. This rationale disappears in the presence of familial insurance because F, to the best of his ability, already insures E against low consumption states. In other words, familial insurance already transfers as much risk to F as he can efficiently take on. This makes family finance not just redundant but, in fact, counterproductive: Selling risk to F can compromise this insurance and thereby – diametrically opposite to the case without familial insurance – *impair* the risk allocation.

We close this section by noting that the "emergency funds" motive behind E's aversion to family finance stems not from her own altruism but from her relying on F's altruism. In the Online Appendix, we present an alternative, "paternalistic" formulation of altruistic preferences under which the aversion is driven by E's altruism. In that case, the mechanism is "social risk aversion": Even though F is willing to provide funding, E may not want to take it because she internalizes financial risks imposed on a family member, but not those imposed on an outsider.

3.2.2 Capital-constrained financing with familial insurance: co-finance

We now explore the case where the new capital constraint $B \leq \hat{B}_f$ is violated, so that pure outside finance in the presence of familial insurance is no longer feasible, and analyze whether the use of family finance can potentially restore feasibility. This may, as in the case of constrained financing without familial insurance, occur through effects of altruism on both the incentive compatibility constraint and F's participation constraint, which we consider in turn.

As (explained) in (the proofs of) Lemmas 3 and 4, the payoffs that obtain if the project fails (to return private benefits or cash flows) conveniently cancel out of the incentive compatibility constraint. However, beause of familial insurance, the incentive compatibility constraint must now account for state-contingent familial transfers between F and E, denoted by t_h (t_l) if the project cash flow is R (0). The constraint, written in terms of utilities conditional on success,

[12] Insurance highlights state contingency of transfers. The optimal contract cannot be replicated through upfront transfers only.

is then

$$(1-\phi)\,u(I_{ext}-I+R-R_{ext}+t_h)]+\phi u(W-I_F+R_F-t_h)]\geq \\ (1-\phi)\,u(I_{ext}-I+B+t_l)+\phi u(W-I_F-t_l).$$

The two channels through which family finance improves E's incentives in the case without familial insurance are also in effect here: E partly internalizes losses to F and, as we will show below, F charges a lower interest rate when the entrepreneur is constrained.

But there are additional effects to be considered due to the presence of familial insurance: By Corollary 1, a familial transfer $t.$ is either just large enough to ensure that the recipient is no longer needy (i.e., consumes $\underline{x}$) or limited to the amount the donor can spare without becoming needy (i.e., consuming less than $\underline{x}$).[13] This implies that, so long as transfers occur, at least one family member's consumption is at $\underline{x}$.

With this in mind, consider now the effect of substituting an amount $\epsilon > 0$ of family finance for outside finance, $I'_F = I_F + \epsilon$ and $I'_F = I_F + \epsilon$, so that $I'_{ext} = I_{ext}$ On the left-hand side, which represents the event that the project returns cash flow R, this reduces the repayment to O by ϵ/q and hence increases family wealth by $\epsilon/q - \epsilon > 0$. This consumption gain (weakly) benefits each family member. Specifically, in our model, it accrues to one of them, with the consumption of the other fixed at $\underline{x}$. As a result, the left-hand side strictly increases.

By contrast, on the right-hand side, which represents the event that the project yields private benefit B, the change reduces family wealth by ϵ. This consumption loss (weakly) harms each family member. Specifically, it is borne by one of them, with the consumption of the other fixed at $\underline{x}$, so the right-hand side strictly decreases.[14] When the loss is borne by E, by way of a reduced transfer $t'_l < t_l$, it highlights a new, third incentive effect: family finance raises E's incentives *by reducing the amount of familial insurance she can fall back on.*[15]

We now turn to the participation constraints. Participation by E and F requires that financing the project raises expected family utility. If this is the case, F's participation constraint implies that he is willing to provide financing at a discount.[16] This does, however, not imply that F prefers to use family finance more than is necessary to maintain incentive

[13] Formally, $t_h = \min\{\underline{x} - (I_{ext} - I + R - R_{ext}), W - I_F + R_F - \underline{x}\}$ and $t_l = \min\{\underline{x} - (I_{ext} - I), W - I_F - \underline{x}\}$.

[14] If $t_h = 0$ ($t_l = 0$), it can be shown that the gain on the left-hand side (loss on the right-hand side) affects only F.

[15] Like Lemma 4, this particular effect hinges on the assumption that E's private benefit consumption is unobservable to F. It is not crucial to our main results, as family finance relaxes the incentive compatibility constraint also through other channels.

[16] The condition that the project increases expected family utility can be written as $E(u_E) + E(u_F) > E(u_E^0) + E(u_F^0)$ where $E(u_i^0)$ denotes i's expected consumption without the project. Using the same notation, F's binding participation constraint can be written as $\phi E(u_E)+(1-\phi)E(u_F) = \phi E(u_E^0)+(1-\phi)E(u_F^0)$. Solving this for $E(u_E)$ and substituting the solution into the previous inequality yields, after some simplification, $E(u_F) < E(u_F^0)$.

compatibility. In fact, taking as given the minimum incentive-compatible amount of family finance, the "residual financing" problem is isomorphic to the capital-*un*constrained financing problem with familial insurance studied in Section 3.2.1. This implies our central result:

Proposition 3. *Suppose the familial insurance condition is satisfied and the entrepreneur is capital-constrained. There is a unique* $B^{**} > \hat{B}_f$ *such that the project is feasible for all* $B \leq B^{**}$*. If the project is feasible, the entrepreneur raises a threshold amount of family finance as a donation or loan at a below-market interest rate. For the remaining financing need, she strictly prefers to raise outside finance if* $W - I < 2\underline{x} < W + R - I$*, and is indifferent otherwise.*

In Figure 2, Proposition 3 pertains to the upper-right area, where E cannot rely exclusively on outside finance and F is willing to ensure E against low consumption. When the project is feasible, the optimal contract involves co-finance. Family finance relaxes the incentive compatibility constraint, and is thereby a catalyst for outside finance. In a sense, the outside investor views family finance to some degree as quasi-equity that renders the entrepreneur more trustworthy. At the same time, outside finance decreases the risk born by the *family*, which allows the entrepreneur to preserve familial insurance (as much as possible).

In fact, the entrepreneur may not undertake the project unless she can transfer sufficient risk to outsiders, even if the incentive compatibility constraint holds. Although the project increases expected family wealth from W to $W + qR - I$, this does not necessarily raise expected family utility. Consider a set $\{R_q\} \equiv \{R \in \mathbb{R}^+ | W - I + qR = \mu_{EF}\}$ of lotteries with identical expected family wealth, where $R_{q'}$ is a mean-preserving spread of $R_{q''} < R_{q'}$. Now suppose E must undertake the project entirely with family finance. Expected family utility is then

$$E[U(\Pi_{EF})] = qU(W + R_q - I) + (1 - q)U(W - I)$$

It can be shown that, as $q \to 0$ ($R_q \to \infty$), this expression converges to the limit $U(W - I) < U(W)$. Thus, there exist risky projects that E prefers to forgo rather than realize with family finance.

Corollary 2. *Outside finance can be necessary for the entrepreneur to undertake the project if* $W - I < 2\underline{x} < W - I + R$ *and the project is sufficiently risky.*

What drives Corollary 2 is that the presence of familial insurance renders the family utility function $U(.)$ quasi-concave, and that family finance raises (i.e., outside finance lowers) the variance of family wealth. Proposition 3 and Corollary 2 together imply that both types of finance expand the financial frontier – family finance with respect to incentive problems and outside finance with respect to risk allocation (insurance). Or put differently, financing based

on altruism is a better source of *trust capital* (for mitigating moral hazard) but at the same time a worse source of *risk capital* (for bearing *exogenous* risk).

When combined with Proposition 2, Proposition 3 suggests a "pecking order" of finance in the presence of familial insurance that can be interpreted from two different vantage points: From the perspective of an unconstrained borrower, the first, preferred choice is outside finance whereas family finance stands by as a secondary, backup source of finance, i.e., a "last resort." At the same time, from the perspective of a constrained borrower, family finance has to be raised first because it is a prerequisite for obtaining outside finance. Moreover, in this case, the two types of finance are complementary in that they relax different (i.e., incentive and risk-bearing) constraints.

Finally, notice that Proposition 3 replicates the "paradox" that borrowers may express a preference for outside finance even while using family finance at a lower interest rate. The low price of family finance is merely a reflection of the family investor's overall charitable attitude toward the borrower. The real, "shadow" cost of family finance to the borrower is that it may displace another form of charity: familial insurance. This can explain seemingly counterintuitive behavior whereby parameter changes that reduce the incentive problem – such as a decrease in the investment outlay I or the private benefit B – would cause a constrained borrower to reduce her use of lower-interest family finance rather than of outside finance, or even replace the former with the latter.[17]

It is worthwhile emphasizing that all of the implications from Proposition 3 and Corollary 2 with respect to the entrepreneur's optimal financing choice – in comparison to the benchmark outcome (Proposition 1) – are exclusively driven by the introduction of a single assumption: altruism. In particular, notice that *both* the costs and benefits of family finance originate in the altruism, and that the *only* advantage of outside finance in this model is the *absence* of altruism.

4 Financing and social debt

The previous analysis focused on *unconditional* altruism, which is independent of actions and outcomes. In this section, we instead model *reciprocal* social preferences that depend on observable actions and outcomes, loosely based on Akerlof (1982)'s description of a "gift exchange" norm. In the context of labor markets, Akerlof proposed that paying above-market

[17]In practice, outside investors may be more risk tolerant than less diversified family investors. If we were to assume that F were (more) risk averse (than O), the interest rate on family finance would increase. Yet, in equilibrium, family finance may still be priced below the market. Family finance only emerges when altruism is strong enough to restore incentive compatibility, and such altruism (i) counteracts the effect of risk aversion on the family investor's participation constraint and (ii) in some cases may sufficiently relax the incentive compatibility constraint only by way of a lower interest rate.

wages can produce a sentiment or norm among workers to exert more effort than would be optimal under purely selfish preferences. Analogously, we assume that a borrower who obtains a loan from a friend (at a below-market interest rate) will go to extraordinary lengths to repay the debt in order to honor a norm and thereby preserve the positive sentiment between them. We model this through the possibility of non-contractible, costly "favors." Specifically, E can do F informal favors in the amount of g at private cost cg where $c \geq 1$. For $c > 1$, favors are costly and A would rather pay cash than commensurate favors.[18] Favors allow E to repay F even if the project fails, which is expected by F as part of the gift exchange norm. Note that there are now two sources of contracting frictions: the moral hazard in project execution and the presence of non-contractible favors.

In addition, we model the consequence of violating the gift exchange norm as a change in altruistic sentiment. Specifically, the relationship between E and F is now characterized by reciprocal altruism of the form

$$U_E = u_E + \frac{a_E + \lambda a_F}{1 + \lambda} u_F$$

and vice versa, where $a_E, a_F \in [-1, 1]$ represent "sentiments" and $\lambda \in [0, 1]$ a measure of "reciprocity" (Levine, 1998). While $a_E, a_F = a^+ > 0$ initially, a_F drops to $\alpha^- \leq 0$ if F feels unfairly treated by E. That is, E's social utility is $u_E + a^+ u_F$ if the relationship is intact, but falls to $u_E + \frac{a^+ + \lambda a^-}{1+\lambda} u_F$ if she violates the gift exchange norm vis-à-vis F. Reciprocity is embodied both in (i) that the utility one derives from a relationship depends not only on one's own but also on the other's sentiment, and in (ii) that one's sentiment is not fixed but affected by the other's conduct. In particular, if one violates the gift exchange norm, it lowers the other's sentiment and thereby the utility either derives from the relationship.[19]

Finally, to abstract from the familial insurance mechanisms studied in the previous section, we assume $m = 1$ such that the consumption consumption utility functions simplify to $u(x) = x$. Proposition 1 remains the benchmark outcome, the one that would obtain for $a_E, a_F, \lambda = 0$, except that the risk constraint is no longer relevant under the modified utility functions.

Before analyzing E's financing decision, let us highlight the impact of these assumptions on the subgame in which the project has returned no cash flow, and F consequently expects favors from E to make good on the gift exchange. In this case, we say that E owes F a *social* debt in the amount R_F. F's net benefit from receiving such favors is $R_F - a^+ c R_F$ where

[18] If $c < 1$, it would be optimal to replace cash repayments entirely with favors.

[19] Ellingsen and Johannesson (2008) and Dur (2009) model gift exchange as the outcome of games in which players with reciprocal altruism seek to signal their *fixed* altruism types by being generous. Here, altruism is not only reciprocal but altruism types may also change as a result of behavior. This means that the quality of the social relationship, rather than only perceptions of it, can be fundamentally damaged. Using Levine (1998)'s specification is not crucial for our results. Any specification of the form $U_E = u_E + f(a_E, a_F, u_F)$ with $f_{a_F} > 0$ would generate similar results.

$-a^+cR_F$ is F's altruistic disutility from internalizing that the favor is costly to E. The next assumption ensures that the net benefit is positive:

Assumption 2. $a^+ < 1/c$.

Intuitively, we assume the presence of opportunities for favors that are not so unreasonably costly that the beneficiary would not ask them of a friend.[20]

This provided, E will pay F those favors only if $(c - a^+)R_F \leq (a^+ - a^-)\frac{\lambda}{1+\lambda}(W - I)$. The left-hand side is E's disutility from repaying the social debt, which is lower than the cost cR_F of providing the favors because she partly internalizes F's utility from receiving them. The right-hand side is the utility loss of E if she violates the gift exchange norm by denying F the favors. We refer to this potential relationship damage as *social collateral*.[21] Thus, if the project returns no cash flow, E must weigh the social debt against the social collateral, a trade-off we refer to as *social tension*. Rearranging the above inequality shows that the value of the social collateral limits the social debt that can be supported by a gift exchange:

$$R_F \leq \frac{a^+ - a^-}{c - a^+}\frac{\lambda}{1+\lambda}(W - I). \tag{7}$$

The social debt capacity increases with the sensitivity $(a^+ - a^-)$ and reciprocity (λ) of the friendship, both of which scale its value as social collateral. We will henceforth refer to (7) as the *gift exchange condition*.

We now turn to the analysis of E's financing decision. The purpose of our analysis is not to show that informal lending relations can be sustained, or conceptualized, as gift exchanges. Rather, it is to study whether such a model can explain the stylized facts regarding the use of family finance. We divide our analysis into two parts: unconstrained financing (where the capital constraint (1) is satisfied) and constrained financing. In both parts, we streamline the exposition by focusing primarily on the case in which the gift exchange condition holds, and only briefly discuss the alternative case.

4.1 Optimal financing without project moral hazard

Suppose $B \leq B_f$ so that pure outside finance is feasible. As we will see later, financing from F, if anything, increases E's incentives to work rather than shirk on the project. Hence, we can ignore the incentive compatibility constraint when deriving E's optimal financing choice in this section.

[20] When this assumption is violated, the model reverts to one without potential favors and hence with de facto unconditional altruism.

[21] We borrow the term "social collateral" from Karlan et al. (2010) in whose network model links between players (relationships) play a similar role.

Since $c \geq 1$, E generally prefers to repay F in cash rather than through favors. In the case where the gift exchange condition (7) is satisfied, F is hence repaid in cash when possible and through favors otherwise. Turning to the financing decision, F's participation constraint is then

$$q[W - I_F + R_F + a^+(I_{ext} - I + R - R_{ext})] + (1-q)[W - I_F + R_F + a^+(I_{ext} - I - cR_F)] \geq W + a^+(qR - I)$$

where the right-hand side reflects that E, being unconstrained, has the option of financing the project solely through O. It is straightforward to show that O supplies funds at $R_O = I_O/q$. Using $R_O = I_O/q$ and assuming $I_O + I_F = I$, without loss of generality (as risk-sharing does not matter given the risk neutrality in this model), we can rearrange the binding participation constraint to back out the minimum repayment required by F:

$$R_F^* = \frac{1 - a^+}{1 - a^+[q + (1-q)c]} I_F. \tag{8}$$

The next result describes this function.

Lemma 5. *Suppose the entrepreneur is unconstrained and the gift exchange condition is satisfied. If the entrepreneur obtains a loan from her friend, the interest rate increases with c but is lower than the interest rate demanded by the outside investor.*

The pricing of a loan from F reflects the gift exchange in two ways. First, R_F includes no default premium since E de facto never defaults when (7) is satisfied. Indeed, for $c = 1$, the interest rate difference $\frac{R_O}{I_O} - \frac{R_F^*}{I_F}$ exactly equals the default premium under outside finance. Second, the interest rate increases with c. This is because F, while wishing to be repaid, partly internalizes any cost E bears to repay him. That this induces F to raise the interest rate may seem counterintuitive, since doing so imposes more costs on E. However, the intuition behind this "social risk premium" is that it captures F's aversion to entering a financial transaction that exposes their relationship to the risk of social tensions. Still, due to the lack of a default premium, a loan from F is priced below the interest rate charged by O for all c that satisfy Assumption 2, that is, all favors that F is willing to accept.

To E, the two premia are different in nature. The (lack of the) default premium is only a nominal change in that it does per se not affect the expected utility of E. By contrast, the social risk premium reflects deadweight losses associated with paying favors instead of cash. These losses – directly as well as indirectly through the premium – lower E's expected utility. Consequently, despite the lower interest rate, E does not prefer financing from F. On the

contrary, using $I_O + I_F = I$ and $R_O = I_O/q$, E's expected utility can be written as

$$q[R - I_O/q - R_F^* + a^+(W - I + I_O + R_F^*)] + (1-q)[a^+(W - I + I_O + R_F^*) - cR_F^*],$$

which can be shown to be strictly increasing with I_O for all $c > 1$. Thus, E strictly prefers outside finance for all $c > 1$, and weakly if $c = 1$.

Last, briefly consider what would happen if the gift exchange condition were violated. In this case, E would not repay her social debt if the project fails. While this saves her the cost of providing favors, it damages the relationship. At the financing stage, this implies that F demands a higher interest rate than O because it must include a premium not only for the possible default but also the ensuing relationship damage, neither of which F must take into account if the gift exchange condition is satisfied. Clearly, if E faces no capital constraints, outside finance dominates a financial arrangement in which F risks losing both a loan and a friend, even if $c = 1$.

Proposition 4. *Suppose the entrepreneur is unconstrained. Then the entrepreneur prefers outside finance over the gift exchange. This preference may be weak for $c = 1$ but is strict for $c > 1$.*

In Figure 3, which illustrates the parameter space over the two contracting frictions (B, c), Proposition 4 pertains to the left area, where B is low enough to render E financially unconstrained, and covers the case when the gift exchange condition holds and when it is violated. When the condition is violated, the entrepreneur prefers outside finance over the gift exchange even though it comes with a higher interest rate. The reason is that the gift exchange norm creates costly social tensions when the entrepreneur cannot repay the loan from project cash flow, but these costs are "masked" in the interest rate by the absence of the default premium. To an outside observer to whom neither social tensions nor informal favors are visible, it would appear as if the entrepreneur turns down the "cheaper" funding. But this perception ignores that debts to friends persist socially after an apparent default, and that this lack of limited liability may entail deadweight losses.

4.2 Optimal financing with project moral hazard

We now turn to the analysis of a constrained entrepreneur, for whom the capital constraint (1) is satisfied. Our analysis focuses on the case of transactions in which the gift exchange condition (8) holds, and briefly discuss the alternative case at the end. A capital-constrained entrepreneur cannot undertake the project solely with outside finance because, under the required interest rate, the incentive compatibility constraint is violated. The key question is whether raising finance partly through the gift exchange instead can relax this constraint.

In setting up E's incentive compatibility constraint, we can restrict attention to the payoffs in the success state because, as in the model with unconditional altruism, the payoffs in the failure state are independent of whether E works or shirks and hence conveniently cancel out. Assuming, without loss of generality, that $I = I_O + I_F$, the incentive compatibility constraint can be written as $R - R_O - R_F + a^+(W - I_F + R_F) \geq B + a^+(W - I_F + R_F) - cR_F$. Using O's pricing function $R_O = I_O/q$, this can further be rewritten as

$$R \geq B + I_O/q + (1 - c)\, R_F. \tag{9}$$

Note that the right-hand side is increasing in I_O and decreasing in R_F, both of which imply that increasing the share of financing from F relaxes the incentive compatibility constraint. This in turn implies that project moral hazard restricts E's financing choices only if pure outside finance becomes infeasible, which justifies that we abstracted from the incentive compatibility constraint (9) in our analysis of the gift exchange in Section 4.1.

To see how the gift exchange (condition being satisfied) overcomes moral hazard, consider a pure gift exchange ($I_O = 0$) such that the above constraint becomes $R \geq B - (c - 1)\, R_F$. This is laxer than the capital constraint $R \geq B + I/q$ (i.e., condition (1) from the benchmark model) for two reasons:

- **No limited liability**. Given that the gift exchange condition holds, E pays her social debt lest she forfeits the social collateral. In terms of financing the project, this lack of default means that E does in effect not enjoy any limited liability, which in turn eliminates any project moral hazard. Indeed, for $c = 1$, the incentive compatibility constraint reduces to the first-best condition for undertaking the project without shirking: $R \geq B$.

- **Social tension**. For $c > 1$, the constraint is even laxer than the first-best constraint $R \geq B$. That is, A's incentives to shirk are even weaker because she wants to avoid (the costs associated with) social tensions that arise if she cannot return the cash.

The de facto elimination of limited liability washes out the channels through which altruism affects incentives in the model with unconditional altruism (Section 3): First, that E partly internalizes F's consumption utility no longer affects incentives, since the gift exchange norm ensures that F receives R_F regardless of whether E works or shirks. Second, it is no longer the case that a lower R_F increases E's incentives. The exact opposite holds: Due to the cost of paying favors, E has stronger incentives (to work) to generate project cash flow, the *more* she owes F. Thus, the only incentive role of (reciprocal) altruism in this model is to provide social collateral that sustains the gift exchange, which in turn eliminates limited liability.

We now examine F's participation constraint conditional on the gift exchange condition (7) and incentive compatibility constraint (9) being both satisfied. The participation constraint in this case is the same as in the absence of project moral hazard (Section 4.1), except that E's consumption utility without the project now is 0, so that the right-hand side reduces to W. Backing out the minimum repayment required by F now yields

$$R_F^{**} = \frac{1 - a^+(1 + r_{EF})}{1 - a^+ [q + (1 - q)c]} I_F$$

where $r_{EF} \equiv \frac{qR-I}{I_F}$. It is instructive to compare R_F^{**} to R_F^*, the interest rate charged by F if E is unconstrained (see (8)). The only difference is the term r_{EF}, which is the joint expected return to E and F on F's investment. Since $r_{EF} > 0$, $R_F^{**} < R_F^*$. That is, as in the model with unconditional altruism (Section 3), F is willing to offer a discount because he derives altruistic utility from (making it possible for E to capture) the project surplus. Moreover, since $\lim_{I_F \to 0} r_{EF} = \infty$, $R_F^{**} < 0$ for small enough I_F, which means F is willing to donate small amounts if it helps to realize the project. By setting $R_F^{**} = 0$, one can show that the maximum amount I_F^d that F is willing to donate equates his net loss from the donation to his "altruistic share" of the project surplus: $(1 - a^+)I_F^d = a^+(qR - I)$.

Beyond the amount I_F^d, F demands *full* repayment on every *marginal* unit of financing. To see this, one can verify that R_F^{**} is equal to the total repayment required on a financing package that combines a donation I_F^d and a loan $I_F - I_F^d$ priced without generosity: $R_F^{**} = \left(I_F - I_F^d\right) \frac{R_F^*}{I_F}$. This also explains why the interest rate R_F^{**}/I_F on (the *average* unit of) total funding from F is strictly increasing in I_F for $I_F \geq I_F^d$ (from negative to positive values), though it remains below O's interest rate for all c that satisfy Assumption 2.

The denominator in R_F^{**} being the same as in R_F^*, it remains true that the interest rate increases in c, because F partly internalizes the costs E bears to repay social debt. An increase in a^+ therefore has countervailing effects on R_F^{**}: On one hand, F more strongly internalizes E's potential gains from the project (numerator decreases). On the other hand, the same is true of the costs that social debt imposes on E in the event of failure (denominator decreases). This reflects F's ambivalence about lending to E: Much as F likes helping E realize the project due to their friendship, he also frets about the social tensions and burdens imposed on them if the project fails.

Proposition 5. *Suppose the entrepreneur is constrained and the gift exchange condition is satisfied. There are $\{a^+, a^-, \lambda, c\}$ for which the project is feasible. If the project is feasible, the entrepreneur raises part of the financing from a friend as a donation or as a loan at a below-market interest rate, and for $c > 1$, the remaining part through outside finance.*

In Figure 3, Proposition 5 pertains to the lower-right area, where B is high enough to

render E financially unconstrained, and the gift exchange condition holds. The intuition behind Proposition 5 is as follows. There always exist (social preference) parameters such that the gift exchange norm is strong enough for the entrepreneur to undertake the project with some funding from a friend even if it cannot be undertaken with outside finance alone. The friend will donate the capital if the amount is sufficiently small, accepting which is strictly optimal for the entrepreneur. However, beyond the amount the friend is willing to donate, every marginal unit of capital must be repaid and comes with "strings attached": the social debt owed if the project fails. The entrepreneur may nevertheless have to rely on this loan because of her financial constraints, but conditional on incentive compatibility, she raises any residual capital through outside finance in order to minimize the expected social tensions.

Proposition 5 implies that a gift exchange is sometimes necessary for the project to be realized. There also exist parameter constellations for which outside finance is necessary. To see this, consider E and F's joint expected utility assuming their relationship is unharmed: $U_E + U_F = (1 + a^+)(u_E + u_F)$. In the absence of outside finance, the two friends are jointly better off from undertaking the project only if

$$\left(1 + a^+\right)\left[W + qR - I - (1 - q)(c - 1)R_F^{**}\right] \geq \left(1 + a^+\right)W, \tag{10}$$

The left-hand side is their joint utility from their initial wealth, expected surplus from the project, and deadweight loss from settling the debt through favors if the project fails. This is larger than the right-hand side – i.e., the project is undertaken – only if the expected gains from the project exceed the expected costs of social tensions: $qR - I \geq (1-q)(c-1)R_F^{**}$. This condition need not always hold, and is more likely to be violated for higher c or, as we show in the proof of Corollary 3 below, a mean-preserving spread on the cash flow distribution of the project.[22] Access to outside finance would relax the joint participation constraint (10), as it would allow E to lower R_F^{**} and hence the expected costs of social tensions. Indeed, for $R_F^{**} \to 0$, (10) converges to the first-best rule $qR - I \geq 0$.

Corollary 3. *Outside finance can be necessary for the entrepreneur to undertake the project if c is sufficiently high and the project is sufficiently risky.*

While the underlying mechanisms are different, the gift exchange model yields predictions similar to those of the model with unconditional altruism. First, the same pecking orders arise: Constrained borrowers must rely on loans from friends in order to secure capital from outsiders. At the same time, borrowers generally prefer outside finance and use loans from friends as a last resort, that is, only if they are constrained. Second, co-financing is optimal for

[22] We focus here on the case where the gift exchange condition (7) is violated. An analogous argument applies to the alternative case, where expected costs of social tensions derive from potential relationship damage.

a constrained borrower. Loans from friends serve as a catalyst for outside finance because the outside investor views them as quasi-equity insofar as the social collateral at stake improves the borrower's incentives. For the borrower and her friends, being able to raise capital from outside their social circle is attractive because it reduces potential social tensions among them. Third, moral hazard necessitates financing from friends (trust capital), while exogenous cash flow risk makes outside finance attractive (risk capital). Both forms of financing can be necessary for the project. Fourth, the model can produce the "paradox" that if the borrower could marginally lower her financial liabilities without violating incentive compatibility, she would borrow less from friends although they charge lower, possibly negative interest rates.

In the Appendix, we briefly cover the case in which the gift exchange condition does not hold (the upper-right area in Figure 3). Relative to the case analyzed above, the interest rate rises: Since the entrepreneur may "default" even on the friend and such a default leads to a damaged relationship – a social "bankruptcy cost" that harms both – the interest rate includes a default premium and accounts for these costs.[23] Still, financing from friends can mitigate moral hazard, though through the threat of a damaged relationship rather than costly favors. Thus, even when the gift exchange condition does not hold, E raises only as much as necessary from F but any remaining capital from O. The main difference to Proposition 5 is that F's interest rate need not be lower than O's.

In either case, the gift exchange norm creates a "social" variant of the trade-off between ex ante and ex post efficiency familiar from financing models with incomplete contracting (e.g., Bolton and Scharfstein, 1990): It creates ex ante commitment by way of potential ex post frictions (costly favors or relationship damage). This raises the issue of renegotiability. In particular, violation of the norm induces a decrease in sentiment that is detrimental to the entrepreneur and her friend, which begs the question why they do not suppress such negative emotions after the fact. We discuss this issue in Section 5.3.

4.3 Formal contracts and social relations

The above analysis assumes that the division of project cash flows is governed by a formal contract, that is, enforceable by court. However, in the presence of a gift exchange norm, formal contracts are not necessarily needed to enforce cash repayments.

To analyze a setting where the terms of financing among friends are agreed upon by "handshake," suppose no contracts can be enforced by a third party. While this assumption rules out financing from O, financing from F may still be feasible since E would honor the

[23]For this reason, models in which informal contracts are enforced only through a loss in the value of a relationship – without altruism or favors – can never generate loans with interest rates that imply negative expected returns, not to mention gifts.

debt so long as R_F satisfies the inequality

$$(1-a^+)\min\{R_F,\widetilde{R}\}+(c-a^+)\max\{R_F-\widetilde{R},0\}\leq(a^+-a^-)\frac{\lambda}{1+\lambda}(W-I). \tag{11}$$

The left-hand side again represents E's net disutility from settling her social debt and comprises two cases, stemming from the fact that the realization of $\widetilde{R}$ can be high or low: If the realized value of the (uncertain) project cash flow $\tilde{R}$ exceeds R_F, she settles the entire debt in cash so that the left-hand side reduces to $(1-a^+)R_F$. Otherwise, she only pays part of her debt in cash and must make up for the difference through favors so that the left-hand side becomes $(1-a^+)\widetilde{R}+(c-a^+)(R_F-\widetilde{R})$. As before, the right-hand side is the value of the social collateral that E loses if she chooses to not settle her social debt.

Whether the thus modified gift exchange condition holds is, unlike before, contingent on the cash flow realization $\tilde{R}$ because the cash flow allocation is no longer enforced by law but by the gift exchange norm. In particular, for $c>1$, (11) is less likely to be satisfied when the realization of $\tilde{R}$ is low because the left-hand side is (strictly) decreasing in $\tilde{R}$ (for $\tilde{R}<R_F$). The intuition is that, with less cash flow, E must resort to costlier favors to settle her debt, which in turn makes her more inclined to instead forfeit the social collateral.

Lemma 6. *In the absence of formal contracts, there exists a unique R^c for every R_F such that the gift exchange condition (11) is satisfied if and only if the realization of $\tilde{R}$ weakly exceeds R^c. Furthermore, R^c increases in R_F.*

The prediction that the relationship is more likely to be damaged if the realization of $\tilde{R}$ is low emphasizes the role of costly favors. In a model without favors, the entrepreneur's incentives to divert cash even though it hurts the relationship would be (weakly) stronger for *higher* cash flow realizations.[24] By contrast, in our gift exchange model with favors, the relationship is more prone to damage if the project fares poorly. That the likelihood of a relationship damage increases with R_F reflects the earlier insight that social debt capacity is limited by the value of the social collateral.

We now turn to E's financing choice. To more fully illustrate the impact of introducing formal contracts later, we assume temporarily that the project cash flow in the failure state is strictly positive (but may be too low to satisfy the gift exchange condition). More precisely, let $\tilde{R}=R^h$ with probability q and R^l otherwise with $R^h>R^l>0$. In deriving the optimal financing decision, we can abstract from project moral hazard, since working turns out to be the strictly dominant strategy in this setting. On one hand, since E can simply divert cash

[24]For example, suppose the gift exchange norm is such that relationship remains intact so long as the entrepreneur does her "best" by using any available cash flow to repay her friend, even if the amount falls short of the total required repayment. In this case, the entrepreneur is more tempted to sacrifice the friendship if the amount of available cash that she can divert is higher.

without legal consequences, she need no longer resort to inefficient private benefit extraction to expropriate investors. On the other hand, if she does want to repay F, she prefers to pay as much as possible in cash as opposed to costly favors. Thus, it is optimal for E to generate cash flow rather than private benefits, irrespective of her repayment decision.

Therefore, the equilibrium is pinned down by the gift exchange condition (11) and F's participation constraint. (11) can be used to express E's default probability as a function of R_F, denoted by $p(R_F)$. Conversely, F's participation constraint can be used to derive R_F as a function of the default probability, denoted by $R_F(p)$. Any intersection of $p(R_F)$ and $R_F(p)$ constitutes a Nash equilibrium. There are potentially multiple Nash equilibria as both functions are increasing: A high (low) interest rate can sustain a high (low) default probability, and vice versa. The Nash equilibrium with the lowest interest rate is Pareto-dominant and therefore the unique subgame perfect equilibrium (selected by E at the financing stage).

Lemma 7. *There is a unique subgame perfect equilibrium in which the entrepreneur either (i) always repays, or (ii) sometimes defaults in which case the relationship is damaged, or (iii) does not finance the project.*

The fact that the entrepreneur may be able to obtain a loan (not a donation) even in the absence of formal contracts raises the question of how formal contract enforcement affects the equilibrium outcome. If claims on project cash flows can be enforced by law, the first term on the left-hand side of the gift exchange condition (11) drops out, which relaxes the condition. The implied default probability function $\hat{p}(.)$ hence lies weakly below $p(.)$, and strictly so for some R_F. Intuitively, E's temptation to violate the gift exchange norm is decreased when she cannot divert the cash flow. At the same time, F's participation constraint is relaxed because F recovers some cash flow even in states where E violates the gift exchange norm. Thus, the implied interest rate function $\hat{R}_F(.)$ also lies below $R_F(.)$, and strictly so for $p < 1$. As the set of intersections of $\hat{R}_F(.)$ and $\hat{p}(.)$ differs from those of $R_F(.)$ and $p(.)$, so may the Pareto-dominant Nash equilibrium.

Proposition 6. *Formal contracts can decrease the cost and increase the amount of financing from friends.*

Consider the three cases in Lemma 7. In case (i), where the gift exchange norm is sufficiently strong for both the project to be financed and the friend to always be repaid (in cash or through favors), the introduction of formal contracts is irrelevant. It can neither improve repayment incentives further nor increase loan recovery.

In case (ii), where the entrepreneur does not always fully repay the loan so that the relationship is sometimes damaged, a formal contract improves incentives both by excluding project cash flow from the repayment decision and by reducing the interest rate. As a result,

the entrepreneur may be less likely to violate the gift exchange norm, which makes the debt safe(r) and reduces the risk of relationship damage. In other words, the formal contract protects the social relationship.

In case (*iii*), financing breaks down in the absence of formal contracts because the potential investor expects to lose "both money and friend" on the off-equilibrium path, i.e., if she made the loan. On the equilibrium path, the relationship remains intact because no loan is made. Here, the fact that formal contracts increase incentives as well as recovery in some cash-flow states can render financing feasible, and as a result, expose the relationship to possible damage. However, this is not to say that formal contracts harm relationships. Rather, they make parties more willing to take the risk because, *conditional on financing*, formal contracts protect relationships better.

Finally, note that formal contract enforcement does not only mitigate financing frictions between friends but further raises welfare by allowing the entrepreneur to approach outside investors with whom she has no social relationships (Proposition 5 and Corollary 3).

5 Discussion

In this section, we discuss how our model helps us better understand several real-world phenomena related to informal lending; moreover, we discuss further empirical evidence.

5.1 Social intermediation

According to the theories in this paper, institutions that want to harness social relations for financial transactions should, to maximize impact, also limit direct exposure to close acquaintances in order to reduce the shadow costs of family finance.

There are numerous real-world examples of such social lending intermediaries. So-called *community loan funds* pool money invested or donated by local individuals and organizations and then target loans to, for example, non-profit organizations for community improvement, micro enterprises for business development, and individuals for home ownership and repair. The ties to the community elicit social incentives, but the formal intermediation avoids the social tension that more direct financial interactions between members of the community may provoke.[25]

[25]Relatedly, *Gemachs*, also referred to as Jewish or Hebrew Free Loan Societies, collect money from donors in a community and dispense interest-free loans to borrowers from the same community. This induces generosity, because the donors know that the loans benefit their community, and improves incentives because the borrowers know they are repaying their community. Importantly, gemachs usually operate on the basis of *anonymity*: with the fund run by third parties (such as rabbis), borrowers and donors know little of each other than that they are members of the same community. This reduces social tensions relative to direct or non-anonymous lending relations. Still, gemachs are a last recourse rather than a regular financing source (as our models

Also, a growing number of firms administers loans between relatives or friends.[26] Since they neither screen, match, nor search for counterparties, and provide neither capital nor risk diversification, they are difficult to explain with traditional theories of intermediation. As the following quote illustrates, the basic premise of this business is that the formalization and third-party enforcement of financial transactions between relatives or friends safeguards those relationships:

> Raising money from friends and family seems attractive: potentially good rates, lenient credit standards, and a chance for your friends and family to share in the wealth you create. Just make sure to manage the downside, and find any way you can to keep the love and affection firmly separated from the business transactions (Robbins, 2001).

Similarly, crowdfunding platforms often also mix formal intermediation with social relations. Agrawal et al. (2014) empirically study financing patterns on a crowdfunding platform. They find that early contributions often come from family and friends. Given that the crowdfunding platform is remunerated in proportion to the total amount raised, this begs the question why this family finance is provided "online" rather than "offline." Our model suggests that the platform, by formalizing the terms and introducing third-party enforcement, allows friends and relatives to finance the artist at lesser social frictions.

5.2 Microfinance

In their survey of financial management practices among the poor, Collins et al. (2010) find that "almost every household borrowed informally from family and friends" though many of the households report that "they found informal transactions unpleasant but unavoidable." One of their central findings is that the poor use such financing primarily to ensure dependable cash flows and to manage risks, rather than to take risks. Banerjee and Duflo (2011) emphasize that one way the poor deal with the high risks and anxiety that they (already) face is to be conservative; and such conservatism deters risky endeavors (in their case, the adoption of a productivity-enhancing technology).

Our theory suggest that this conservatism applies not only to one's own money but extends to money from family and friends. If this is indeed the case, family finance should primarily serve safe purposes, such as consumption smoothing or insurance (e.g., Udry, 1996; Ambrus et al., 2010) rather than for taking on *additional* risks. Recent evidence indeed suggests that

predict), typically experiencing revivals when formal credit dries up, such as in the US during the late financial crisis (Freedman, 2011).

[26] These include, for example, LendFriend, Lending Karma, LoanBack, One2One Lending, WikiLoan, ZimpleMoney, Prosper, Bainco, CircleLending, and National Family Mortgage.

microfinance is commonly used for safe business purposes, such as working capital rather than capital expenditure, or even non-business purposes, such as lump-sum consumption (Collins et al. ,2011), and less for risk taking and business growth. According to Banerjee and Duflo (2010), part of the explanation is that microlending is designed to minimize default, that is, it makes "zero default" imperative. Consider, for example, joint-liability group lending, the idea behind which is that social pressure induces group members to repay each loan. But inasmuch as it ensures "zero default," it also induces risk avoidance, as members will be reluctant to take risks lest they could default and harvest the anger of the others. As Ghatak and Guinnane (1999: 225) write,

> When things go wrong, such as when an entire group is denied future loans, bitterness and recrimination among group members may have far-reaching consequences for village life. This risk is inherent in the system and needs to be viewed as a potential cost.

Such social tensions, as intended, deter default. But intolerance of default is antithetical to providing *risk* capital. Consistent with this, a recent wave of rigorous experimental evaluations of microfinance have found modest average impacts of microfinance on entrepreneurial profits or growth (Crépon et al., 2011; Tarozzi et al., 2013; Banerjee et al., 2014, 2015a,b).

5.3 Legal liability vs. social debt

In the gift exchange model, the shadow cost of family finance is that the debt is, even if not legally, socially persistent. The key strength of formal outside finance is therefore that it can implement limited liability; a 'clean slate' does not always require paying all one's dues.

Historically, the social and legal norm for debt used to be personal liability. But bankruptcy law has since evolved away from personal bondage to limited liability.[27] This evolution essentially distinguishes formal finance from family finance. Legal liability is specified in contracts and enforced by courts, while social obligations are governed by emotions, norms, and social pressure. Formal outside finance can thus limit liability where social obligations would persist, thereby avoiding shadow costs that make family finance unattractive.

This presumes that social obligations, unlike contractual liabilities, cannot be finetuned ex ante; if this were possible, social obligations would dominate formal contracts in our model. One justification for this assumption is that social tensions arise from norm violations that elicit emotional responses, such as disappointment, anger, or indignation, that are hard – perhaps impossible – to suppress ex post. But rather than being only a disadvantage, this rigidity has purpose. If emotional reactions were contractible, they would – like contractual liabilities

[27] See Lee and Persson (2013) for a discussion.

– be renegotiable. This would render the threat of ex post (inefficient) social tensions an empty one, undermining their positive ex ante effects. In other words, the willfulness of emotions is the *source* of commitment. This is consistent with the emotions-as-commitment theory in evolutionary psychology, according to which certain emotions evolved as commitment devices (see Haselton and Ketelaar (2006) and the references therein).

5.4 Further empirical evidence

As we discussed in the introduction, there is broad-brush evidence on interest-free family loans. Here, we review further empirical evidence in favor of the two other main novel predictions.

Pecking order. Collins et al. (2010) and Guerin et al. (2011) provide anecdotal and survey evidence, respectively, that borrowers avoid family finance. Robb and Robinson (2012) find that the startups in the Kauffman Firm Survey rely less on funding from family and friends than expected, and more on bank financing. Petersen and Rajan (1994) report evidence suggesting that firms follow a dynamic "pecking order," borrowing first from family and friends and then progressively switching to more arm's length sources. Similarly, using the World Bank Enterprise Surveys of about 70,000 firms – primarily SMEs – in 104 countries, Chavis et al. (2010, 2011) find that, while young firms use more family finance than formal (bank) finance, this financing pattern reverses over time: as the firms age, they replace family finance with bank finance. These patterns are consistent with the hypothesis that entrepreneurs, while often dependant on family finance, prefer formal finance especially for risky investments and growth.[28]

Risk taking. Studying a large sample of private firms across Europe, Belenzon and Zarutskie (2012) show that family firms are more stable and liquid but also tend to grow more slowly. Moreover, these characteristics especially distinguish family firms that are at early stages of their life cycle and jointly owned by a married couple.[29] The authors suggest that family ties lead to higher operating efficiency and more conservative liquidity management, which reduces failure but also dampens investment and growth. Romano et al. (2000) find that small firms are less likely to utilize family finance when pursuing growth through new products or new process development. Saidi (2015) provides evidence from Amazonian foraging-farming societies that loans within mating networks are designed to provide each other with insurance

[28] One way to obtain further evidence on this hypothesis would be to verify whether entrepreneurs that start out with family finance later – once they are able to – use high-interest formal loans to *settle*, rather than add to, low-interest family loans. Another test would be to identify an exogenous positive shock to the availability of formal finance and to examine how it affects the use of low-interest family finance.

[29] Some other studies on family firms discuss more generally the idea that family involvement can have a "dark side" (Schulze et al., 2001; Bertrand and Schoar, 2006; Bertrand et al., 2008). Bertrand and Schoar (2006) report empirical patterns consistent with the idea that "family values" negatively affect firm value, while evidence in Bertrand et al. (2008) suggests that conflicts between multiple heirs damage family firms.

against consumption shocks. Similarly, Guerin et al. (2011) find in their survey among rural Indian households that family finance serves mainly consumption and insurance ("ceremonies, health, and housing maintenance"), while investment ("investments, house purchases, ... and cattle purchase") is financed mainly through banks.

Allen et al. (2005) argue that, in the absence of a well-developed formal financial system, China's private sector growth must have substantially relied on informal finance. However, probing into survey data of 2,400 Chinese firms, Ayyagari et al. (2010) find growth to be concentrated among the (minority of) firms that use bank finance. When they address endogeneity problems—more promising and larger firms may have better access to bank finance—the positive relationship between formal finance and growth survives several of their instrumental variable specifications. The implied causal interpretation is that, aside from access to finance, the *type* of finance—formal or informal—can per se matter for business growth.

6 Conclusion

In both developed and developing countries, an overwhelming share of all informal finance is raised within the social circle, from family and friends. Existing "information/cost" theories of informal finance posit that informal lenders have a monitoring or cost (dis)advantage. While these models capture many essential features of informal finance, they provide a better characterization of "informal moneylenders" than of family lenders as they predict that informal finance is expensive and in limited supply. Financing from family and friends, in contrast, tends to be cheap; moreover, despite this discount, informal finance is often in limited *demand* when formal funding is available.

This paper proposes a novel model of external finance where informal (lending) relationships are characterized by social preferences. The social relationship between the entrepreneur and the informal lender is the only assumed difference between the informal and formal lenders; in particular, neither lender has a monitoring or cost (dis)advantage. We show that such preferences can account for both below-market (negative) rates of return of informal finance and the borrower's aversion to informal finance.

Intuitively, social preferences make family finance cheap but also generate shadow costs that nevertheless discourage its use. If the relationship between the informal lender and the entrepreneur is characterized by mutual altruism, the shadow cost of family finance stems from the fact that altruism generates intra-family insurance, so that committing family funds to a risky (though ex ante profitable) investment undermines the entrepreneur's own insurance payout in case the investment fails. Raising risk capital from family and friends thus disrupts familial insurance relationships. A reluctance to use family finance can also be reconciled with family investors accepting below-market (negative) rates of return if the altruistic relationship

is vulnerable to default. In this model, the shadow cost stems from a lack of "limited liability" vis-à-vis family members that arises from the relationship (quality) acting as collateral, again making the entrepreneur prefer outside finance even as family finance comes at a discount.

In a nutshell, the very characteristics that make families an excellent source of insurance and "lender of last resort" can make family finance a poor source of risk capital. So even though family finance increases a capital-constrained entrepreneur's access to funds, this comes at the price of reduced risk taking and, ultimately, stifled investment. This central insight emphasizes the value of *im*personal transactions, such as channeling risk out of the borrower's social circle and immunity to social tensions.

While many information/cost theories advocate contractual innovations that harness or emulate the power of social relations, our theory thus advertises the opposite: the use of formal contracts and neutral third parties to mitigate the drawbacks of mixing financial transactions with social relationships. In particular, even in contexts where contracts must harness social relations to overcome capital constraints, our findings suggest that third-party intermediation and semi-formalization may be crucial for bringing about risky investment. This is pertinent to the limited success of group-based microfinance in generating entrepreneurial growth, and to the emergence of social lending intermediaries and crowdfunding.

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Proofs

Proof of Proposition 1. See Online Appendix, Section I. □

Proof of Lemma 2. Differentiating the objective function with respect to R_F yields

$$\frac{\partial \mathcal{F}}{\partial R_F} = q\left[\phi u'(x_F^h) - (1-\phi)u'(x_E^h)\right]$$

where x_i^s denotes the consumption of $i = F, O$ depending on whether the project delivers a "high" or "low" cash flow, which we denote by the state variable $s = h, l$. When the familial insurance condition (3) is violated, in which case family members prioritize their own consumption irrespective of any difference in their marginal utilities from consumption, the term in the brackets is negative. E's expected utility is hence decreasing in R_F. The same is obviously true for R_O.

It follows that the participation constraints will be binding at the optimum. In the case of O, this implies $R_O = {}^{I_O}/_{q}$. In the case of F, the participation constraint (5), when binding and with the expected consumption utilities written out, becomes

$$(1-\phi)\left[qu(W-I_F+R_F)+(1-q)u(W-I_F)\right]+\phi[qu(I_{ext}-I+R-R_{ext})+(1-q)u(I_{ext}-I)] = (1-\phi)u(W)+\phi u(qR-I).$$

We conjecture an efficient risk allocation, where all agents are risk-neutral over their residual consumption risk. (We will consider the alternative below.) Under this conjecture, the marginal consumption utility for both F and E under the optimal contract is constant across cash flow realizations. The above equality can then be rewritten as

$$(1-\phi)\,u(W-I_F+qR_F)+\phi u(I_{ext}-I+qR-qR_{ext})] = (1-\phi)u(W)+\phi u(qR-I),$$

and further, by consolidating the ϕ-terms and $(1-\phi)$-terms, as

$$(1-\phi)\,u(qR_F-I_F)+\phi u(I_{ext}-qR_{ext}) = 0.$$

Since $\phi < 1-\phi$ by assumption, this holds only if the (arguments in the) utilities are both 0. Given $R_O = {}^{I_O}/_{q}$, this immediately implies $R_F = {}^{I_F}/_{q}$, i.e., that F and O demand the same interest rate.

Plugging these prices into the objective function (4) and writing out the expected consumption utilities yields

$$(1-\phi)\left[qu(I_{ext}-I+R-R_{ext})+(1-q)u(I_{ext}-I)\right]+\phi[qu(W-I_F+R_F)+(1-q)u(W-I_F)].$$

After consolidating the terms in the second bracket and using $R_F = {}^{I_F}/_q$, this becomes

$$(1-\phi)\left[qu(I_{ext}-I+R-R_{ext})+(1-q)u(I_{ext}-I)\right]+\phi u(W),$$

which depends on I_F and I_O only through I_{ext}. Thus, E is indifferent between the financing sources.

It remains to be shown that under the optimal contract (i) the marginal consumption utility for any of the players does not vary with the cash flow realization, and that in deriving the optimal contract (ii) we can indeed ignore the incentive compatibility constraint.

As regards (i), note that family utility

$$U_E + U_F = u(x_E) + u(x_F)$$

and thus aggregate welfare $u(x_O) + U_E + U_F$ are independent of ϕ for a given consumption allocation. Consumption allocations under which (i) is violated imply a less efficient risk allocation and thus a lower expected consumption utility in aggregate, compared to the optimal consumption allocations derived above. Since both F and O break even under any feasible arrangement, such allocations cannot be optimal for E.

As regards (ii), the incentive compatibility constraint under co-financing is given by

$$(1-\phi)E\left[u(I_{ext}-I+\tilde{R}-\tilde{R}_{ext})\right]+\phi E[u(W-I_F+\tilde{R}_F)]\geq (1-\phi)E\left[u(I_{ext}-I+\tilde{B})\right]+\phi u(W-I_F).$$

Collecting the ϕ-terms and $(1-\phi)$-terms on separate sides yields

$$(1-\phi)\left\{E\left[u(I_{ext}-I+\tilde{R}-\tilde{R}_{ext})\right]-E\left[u(I_{ext}-I+\tilde{B})\right]\right\}\geq \phi\left\{u(W-I_F)-\phi E[u(W-I_F+\tilde{R}_F)]\right\}.$$

Since $R_i = {}^{I_i}/_q$ for $i = F, O$, the left-hand side is constant across all optimal co-financing arrangements. By contrast, the right-hand side is decreasing in R_F and hence I_F. Thus, if the incentive compatibility constraint is slack under pure outside finance, it is also slack under optimal co-financing. □

Proof of Lemma 3. See Online Appendix, Section I. □

Proof of Lemma 4. Consider the feasibility of $I_O = I$ and $I_F = 0$ (i.e., pure outside finance). Under this financing arrangement, irrespective of whether E works or shirks, if the project fails (to return cash flow or private benefits), E's payoff from undertaking the project is

0. Since the familial insurance condition is satisfied, a familial transfer of F would in this event bring E's consumption to $t_l = \min\{\underline{x}, W - \underline{x}\}$ (Corollary 1), and hence E's utility in the event of a failure to $(1-\phi)u(\underline{x}_E) + \phi(W - \underline{x}_E)$. Since failure occurs with probability $1-q$ irrespective of whether she works or shirks, these payoffs cancel out of the incentive compatibility constraint, as before, so that only the payoffs conditional on success matter.

Since we assume that private benefits are unobservable, we must specify F's beliefs about E's consumption in the event that the cash flow is 0. In Perfect Bayesian Equilibrium, F must believe that E's consumption in that event is 0 and would hence offer a familial transfer of t_l. Finally, we must distinguish between the cases where E's consumption in the success state, in the absence of familial transfers, is above and below $\underline{x}$. Clearly, if $R - I/q \geq \underline{x}$, there is no familial transfer in the success state, so that the incentive compatibility constraint becomes

$$(1-\phi)\, u(R - I/q) + \phi u(W) \geq (1-\phi)u(B + t_l) + \phi u(W - t_l).$$

The right-hand side is increasing in t_l because E's marginal consumption utility is weakly larger than F's and $1 - \phi > \phi$. Thus, this constraint is stricter than the corresponding constraint in the absence of familial insurance where $t_l = 0$.

If $R - I/q < \underline{x}$, there is a familial transfer $t_h \leq t_l$ in the success state. The incentive compatibility constraint is then

$$(1-\phi)\, u(R - I/q + t_h) + \phi u(W - t_h) \geq (1-\phi)u(B + t_l) + \phi u(W - t_l).$$

This constraint is likeliest to hold for the largest possible t_h, i.e., $t_h = t_l$, in which case it reduces to $(1-\phi)\, u(R - I/q + t_l) \geq (1-\phi)u(B + t_l)$ and hence $R - I/q \geq B$, as in the case without familial insurance (or the benchmark model). Thus, for any $t_h < t_l$, the incentive compatibility constraint is tightened by the presence of familial insurance.

The conclusion in either case is that, in the presence of familial insurance, pure outside finance is feasible if and only if $B \leq \hat{B}_f$, where $\hat{B}_f \leq B_f$ and the latter inequality is strict for $R - I/q > 0$. □

Proof of Proposition 2. See main text after the proposition. □

Proof of Proposition 3. Consider parameters such that there exist feasible financing arrangements. Let $\hat{I}_F < I$ denote an amount of family finance that ensures incentive compatibility. Start with any feasible financing arrangement with $I_F \geq \hat{I}_F$, such that the family wealth is $W - I_F$ with probability q and $W + (R - I_O/q) - I_F$ otherwise.

Now consider a change in financing such that $I'_F = I_F + \epsilon$ and $I'_O = I_O - \epsilon$ with $\epsilon > 0$ infinitesimal. The change ϵ is a mean-preserving spread of the family wealth distribution:

Under the new financing arrangement, the possible realizations of family wealth are $W - I_F - \epsilon$ and $W + (R - {}^{I_O}/_q) - I_F + {}^{\epsilon}/_q - \epsilon$. As regards the impact on family utility, there are two possibilities: If $W - I_F < 2\underline{x} < W + (R - {}^{I_O}/_q) - I_F$, the change strictly reduces family utility. With F's participation constraint binding, E is hence worse off. Otherwise, the change leaves family utility unaffected, and E is indifferent to the change. □

Proof of Corollary 2. Substituting for R_q using its definition $W - I + qR_q = \mu_{EF}$, we can rewrite expected family utility under pure family finance as

$$E[U(\Pi_{EF})] = qU\left(W - I + \frac{\mu_{EF} - W + I}{q}\right) + (1-q)U(W - I)$$

Differentiating with respect to q yields

$$\frac{\partial E[U(\Pi_{EF})]}{\partial q} = U\left(W - I + \frac{\mu_{EF} - W + I}{q}\right) - m\frac{\mu_{EF} - W + I}{q} - U(W - I)$$

Using

$$U(\Pi_{EF}) = \begin{cases} \Pi_{EF} & \text{for } \Pi_{EF} \leq 2\underline{x} \\ 2\underline{x} + m\left(\Pi_{EF} - 2\underline{x}\right) & \text{for } \Pi_{EF} > 2\underline{x} \end{cases}$$

and considering q so small that $W - I + \frac{\mu_{EF} - W + I}{q} > 2\underline{x}$,

$$\frac{\partial E[U(\Pi_{EF})]}{\partial q} = 2\underline{x} + m\left(W - I\right) - m2\underline{x} - U(W - I).$$

For $W - I \geq 2\underline{x}$, this collapses to 0. That is, when the choice of financing is irrelevant, so is the mean-preserving spread. However, for $W - I < 2\underline{x}$, the derivative becomes

$$(1 - m)\left(2\underline{x} - (W - I)\right) > 0.$$

In this case, expected family utility *strictly* decreases as $q \to 0$, and by the first expression for $E[U(\Pi_{EF})]$ above, converges to $U(W - I)$ in the limit. □

Proof of Corollary 3. First, to see that there exist parameters such that

$$qR - I \geq (1 - q)(c - 1)R_F^{**}$$

is violated even though $qR - I > 0$, write out R_F^{**} for $I_F = I$, which yields

$$qR - I \geq (1 - q)(c - 1)\frac{1 - a^+(1 + \frac{qR - I}{I})}{1 - a^+\left[q + (1 - q)c\right]}I.$$

For $q > 0$, the right-hand side strictly increases with c and there exist values for c such that the inequality is violated. (One can keep the gift exchange condition (7) satisfied by choosing sufficiently low values for α^- and high values for W.) Moreover, for $c > 1$, the right-hand side strictly decreases in q even if we keep qR constant.

Second, the joint participation constraint in the presence of outside finance is

$$\left(1 + a^+\right)\left[W + qR - I + I_O - qR_O - (1-q)(c-1)R_F^{**}\right] \geq \left(1 + a^+\right)W,$$

which reduces to (10) since $R_O = I_O/q$. Thus, outside finance affects the joint participation constraint only through R_F^{**}, which increases in I_F and hence decreases in $I_O = I - I_F$. □

Proof of Lemma 6. See Online Appendix, Section I. □

Proof of Lemma 7. We proceed by proving three different claims:

Claim 1. The incentive compatibility constraint associated with moral hazard in project execution is slack.

Proof of Claim 1. Consider outcomes in which E defaults and loses her social collateral. Her expected gain from shirking in the project would then be $qB - (a^+ - a^-)\frac{\lambda}{1+\lambda}(W - I)$ where qB is her private benefit from shirking and $(a^+ - a^-)\frac{\lambda}{1+\lambda}(W - I)$ is the value of the social collateral she loses by not repaying F. By contrast, her expected gain from working would be $qR - (a^+ - a^-)\frac{\lambda}{1+\lambda}(W - I)$, which is larger since $R > B$ by assumption. Alternatively, consider outcomes in which E repays F. Her expected gain from shirking would then be $qB - cR_F$, whereas her expected gain from working would be $qR - cR_F > qB - cR_F$ *in the worst case* (i.e., if she were to repay her entire social debt through costly favors). Altogether, E is better off working than shirking irrespective of whether she repays F or not. □

This implies that we can restrict attention to the gift exchange condition and F's participation constraint.

Claim 2. There exists at least one Nash equilibrium. When there are multiple Nash equilibria, the one with the lowest interest rate is strictly Pareto-dominant and hence the unique subgame perfect equilibrium.

Proof of Claim 2. Consider the gift exchange condition (11). Recall Lemma 6. We know from the expression for R^c in the proof of Lemma 6 that $R^c = 0$ for some $R_F \geq 0$ and $\lim_{R_F \to \infty} R^c = \infty$. Thus, (11) is always satisfied for some R_F low enough and always violated for some R_F large enough. We also know from Lemma 6 that R^c is strictly increasing in R_F. Taken together, this implies that there exists a unique non-empty interval $(\dot{R}_F, \ddot{R}_F)$ such that

E's ex ante default probability p is given by

$$p(R_F) = \begin{cases} 0 & \text{for } R_F < \dot{R}_F \\ [0, 1-q] & \text{for } R_F = \dot{R}_F \\ 1-q & \text{for } \dot{R}_F < R_F \leq \ddot{R}_F \\ [1-q, 1] & \text{for } R_F = \ddot{R}_F \\ 1 & \text{for } R_F > \ddot{R}_F \end{cases},$$

Next consider F's binding participation constraint for a fixed repayment strategy. Consistent with Lemma 6, we only admit repayment strategies in which E's default probability decreases with the cash flow realization $\tilde{R}$. Thus, under any admissible repayment strategy, $E(\tilde{R}|\text{no default}) \geq E(\tilde{R}|\text{default})$. Denote the ex ante default probability under the given repayment strategy by p. F's binding participation constraint is

$$(1-p)[W-I+R_F+a^+(E(\tilde{R}|\text{no default})-R_F)]+p\left[W-I+\frac{a^-+\lambda a^+}{1+\lambda}E(\tilde{R}|\text{default})\right]=W.$$

The left-hand side is increasing in R_F since $a^+ < 1$. At the same time, it is decreasing in p since $(1-a^+)R_F + a^+E(\tilde{R}|\text{no default}) > \frac{a^-+\lambda a^+}{1+\lambda}E(\tilde{R}|\text{default})$. By the implicit function theorem, the constraint hence pins down an increasing function $R_F(p)$.

Intersections of $R_F(p)$ and $p(R_F)$ are Nash equilibria. Note that $\lim_{p\to 1} R_F(p) = \infty$. Thus, if $R_F(0) > \dot{R}_F$ and $R_F(1-q) > \ddot{R}_F$, then the unique Nash equilibrium is no financing. Otherwise, the project is financed. Moreover, if $R_F(0) < \dot{R}_F$, there must exist multiple Nash equilibria.

Finally, when there are multiple Nash equilbria, the ones with a higher interest rate involve a larger deadweight loss (either because more favors are required, or as a result, E prefers to damage the relationship). Given F always breaks even in equilibrium, these costs are borne by E. Thus, the Nash equilibrium with the lower interest rate strictly Pareto-dominates all others, and is hence the unique subgame perfect equilibrium of this game. □

Claim 3. There exist parameters for each of the following outcomes to be the unique equilibrium: the project is financed with safe debt, the project is financed with risky debt, and the project is not financed.

Proof of Claim 3. We demonstrate that there are parameter constellations for each of the three cases.

Case 1: Safe debt. By F's binding participation constraint, $R_F(0) = \frac{I-a^+E(\tilde{R})}{1-a^+}$. If $p(R_F(0)) = 0$, the unique subgame perfect equilibrium is one in which E never defaults. For this to be the case, the gift exchange condition (11) must hold for $R_F = R_F(0)$ and

$\tilde{R} = R^l$:

$$(1-a^+)\min\{R_F(0), R^l\} + (c-a^+)\max\{R_F(0) - R^l, 0\} \leq (a^+ - a^-)\frac{\lambda}{1+\lambda}(W-I).$$

For example, if we choose parameters such that $E(\tilde{R}) \to I/a^+$, then $R_F(0) \to 0$, in which case the left-hand side of the above inequality is 0.

Case 2: Risky debt. Suppose E repays F only if $\tilde{R} = R^h$. Then F's binding participation constraint becomes

$$q[W - I + R_F + a^+(R^h - R_F)] + (1-q)\left[W - I + \frac{a^- + \lambda a^+}{1+\lambda}R^l\right] = W,$$

which yields

$$R_F(1-q) = \frac{I - (1-q)\left[\frac{a^- + \lambda a^+}{1+\lambda}R^l\right] - qa^+R^h}{q(1-a^+)}.$$

For this to constitute the equilibrium interest rate, the gift exchange condition (11) must satisfy two conditions: (i) it must be violated for $\tilde{R} = R^l$ and $R_F = R_F(0)$ to rule out safe debt in equilibrium, and (ii) it must hold for $\tilde{R} = R^h$ and $R_F = R_F(1-q)$. Note that (i) implies that the gift exchange condition is violated for $\tilde{R} = R^l$ and $R_F = R_F(1-q)$. Conditional on (i), it is hence sufficient to verify that (ii) holds to show that risky debt constitutes an equilibrium.

Now consider the following example. Suppose $R^h > R(1-q)$. We will verify this below. Consider (i) and (ii) as $R^l \to 0$. In the limit, the two conditions then converge to

$$(c-a^+)\frac{I - a^+E(\tilde{R})}{1-a^+} \leq \left(a^+ - a^-\right)\frac{\lambda}{1+\lambda}(W-I)$$

and

$$(1-a^+)\frac{I - a^+qR^h}{q(1-a^+)} \leq \left(a^+ - a^-\right)\frac{\lambda}{1+\lambda}(W-I),$$

respectively. Now, take the limit $q \to 1$. The fraction on the left-hand sides converges to $\frac{I-a^+qR^h}{1-a^+}$ in *both* inequalities. Clearly, there are then values of (c, a^+, a^-, λ) such that the first inequality is violated but the second one satisfied. Note also that, as $q \to 1$, we have $R^h > I > R(1-q)$ in the limit. By continuity, therefore, we can construct examples with high q and low R^l such that risky debt is the equilibrium.

Case 3: No financing. Consider the gift exchange condition (11) with $R_F = R_F(0)$ and $\tilde{R} = R^h$, i.e., when it is the most lax for a given parameter constellation:

$$(1-a^+)\frac{I - a^+E(\tilde{R})}{1-a^+} \leq \left(a^+ - a^-\right)\frac{\lambda}{1+\lambda}(W-I).$$

This presumes that $R^h \geq R_F(0)$; otherwise the project never returns enough cash flow to repay F (despite assuming the lowest possible interest rate). Clearly, there exist parameters (a^+, a^-, λ) such that this is violated. □

Proof of Proposition 6. Define $f(.) \equiv p(.) \circ R_F(.)$ and $\hat{f}(.) \equiv \hat{p}(.) \circ \hat{R}_F(.)$, each of which is a mapping $[0,1] \to [0,1]$. Note that because, as discussed in the text, $\hat{p}(.) \leq p(.)$ and $\hat{R}_F(.) \leq R_F(.)$, we have that $\hat{f}(.) \leq f(.)$.

Consider now the three different cases that correspond to the possible equilibrium outcomes in the absence of formal contracts:

Case 1: Safe debt. In this case, $f(0) = 0$. Since $\hat{f}(p) \leq f(p)$ for all $p \in [0,1]$, it must be that $\hat{f}(0) = 0$ as well. Here, the introduction of formal contracts has no effect on the equilibrium outcome.

Case 2: Risky debt. In this case, $f(0) > 0$ and $f(1-q) = 1-q$. Since $f(0) > 0$, the smallest fixed point of f intersects the 45-degree line $g(p) = p$ from "above" so that $f(p) > g(p)$ for all $p < 1-q$. If there was a downward shift of f everywhere, the smallest intersection of f and g would therefore lie somewhere in $[0, 1-q)$. Thus, the intersection of $\hat{f}$ and g lies in $[0, 1-q]$.

We now construct an example in which the introduction of formal contracts renders debt safe. Consider parameters such that the gift exchange condition is violated for $R_F = R_F(0)$ and all $R^l \in [0, R_F(0)]$:

$$(1-a^+)R^l + (c-a^+)[R_F(0) - R^l] \leq (a^+ - a^-)\frac{\lambda}{1+\lambda}(W-I).$$

After the introduction of formal contracts, the first term on the left-hand side drops out. The inequality is then satisfied for sufficiently large R^l, as the left-hand side converges to 0 for $R^l \to R_F(0)$.

Case 3: No financing. In this case, $f(0) > 0$ and $f(1-q) > 1-q$. The only intersection of f and g occurs at $f(1)$, which represents the outcome with no financing. For all $p < 1$, $f(p) > g(p)$. If there was a downward shift of f everywhere, the smallest intersection of f and g would therefore lie somewhere in $[0, 1)$.

We now construct an example in which the introduction of formal contracts shifts the equilibrium outcome from no financing to risky debt. Consider parameters such that $R^h \geq R_F(1-q)$ but financing is not feasible. In particular, the gift exchange condition is violated for $R_F = R_F(1-q)$ and R^h:

$$(1-a^+)R_F(1-q) \leq (a^+ - a^-)\frac{\lambda}{1+\lambda}(W-I).$$

After the introduction of formal contracts, the first term on the left-hand side drops out so

that the inequality is then satisfied. At the same time, the gift exchange condition for R^l does not change for any realization of $\tilde{R}$ if we let $R^l \to 0$. Moreover, if it was violated for $R_F(0)$, it will be violated for any $\hat{R}_F(.)$ as $\hat{R}_F(p) \geq R_F(0)$ for all p. $\square$

Figures

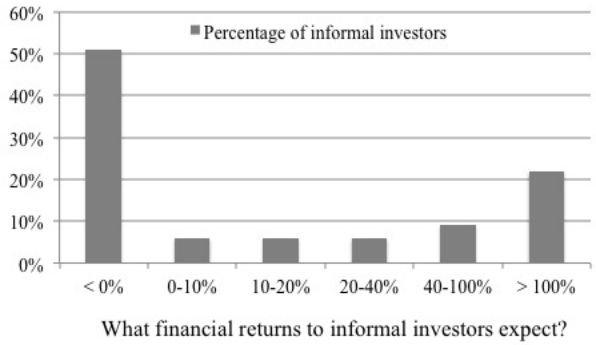
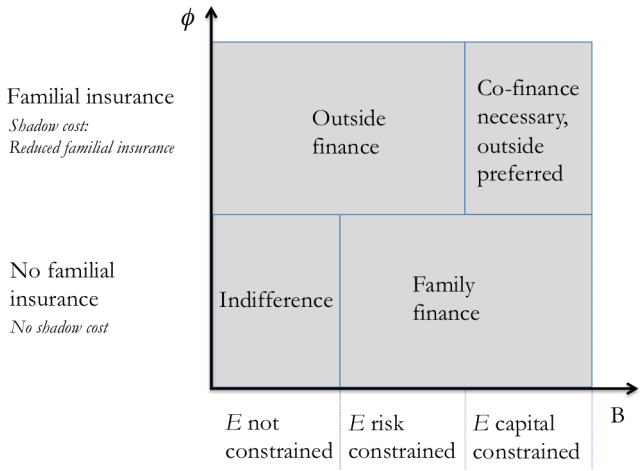


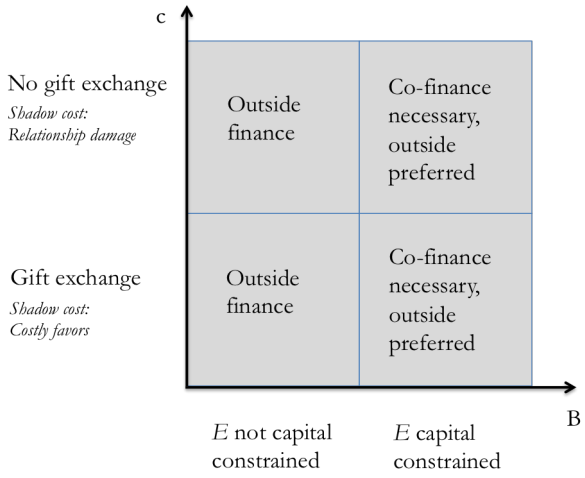
Figure 1: Expected returns reported by the informal investors in Bygrave and Hunt (2004).

Figure 2: Financing and altruism



The area plot illustrates the outcomes of the financing game with altruism for different regions of the parameter space (B, ϕ). The different areas are defined by the following conditions: The charitable insurance condition (3) yields a threshold for ϕ above which a familial insurance arrangement can be sustained. The capital and risk constraints (1) and (2) yield thresholds for B above which E is financially constrained in the absence of familial insurance. Last, in the presence of familial insurance, E is capital-constrained if B exceeds the threshold $\hat{B}_f$.

Figure 3: Financing and social debt



The area plot illustrates the outcomes of the financing game with social debt for different regions of the contracting frictions parameter space, (B, c). The different areas are defined by two conditions: The capital constraint (1) yields a threshold for B above which E is financially constrained. The gift exchange condition (7) yields a threshold for c below which E is willing to repay F in costly favors if the project fails.

Tables

Relationship to entrepreneur	Percent total	Mean amount US$	Median payback time	Median times return
Close family	49.4%	23,190	2 years	1x
Other relative	9.4%	12,345	2 years	1x
Friend, neighbor	26.4%	15,548	2 years	1x
Work colleague	7.9%	39,032	2 years	1x
Stranger	6.9%	67,672	2-5 years	1.5x
Total	100%	24,202	2 years	1x

Table 1: Between 60 to 85 percent of the informal investors surveyed in the 2004 GEM study were relatives or friends of the entrepreneur they financed, and the median informal investor (in every category other than "stranger") merely recovered the investment, implying that half of the informal investors earned negative returns (Bygrave and Hunt, 2004).