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Can Warm Glow Alleviate Credit Market Failures? Evidence from Online Peer-to-Peer Lenders

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Abstract:
This paper looks at an institutional innovation in which Western investors lend peer-to-peer to poor country enterprises. Using a unique dataset from an online lending platform called MyC4, we find that MyC4's Western lenders grant lower interest rates to pro-poor, socially responsible (SR), and pro-female African projects, thus internalizing positive externalities. Using novel instrumental variables to account for interest rates' endogeneity, we find that these lower interest rates substantially improve the repayment performance of borrowers, and do not reflect profit-maximizing behavior. This new way to organize finance improves credit market efficiency and the success rate of poor country enterprises.

Keywords: Credit markets imperfections, externalities, warm glow

JEL Classification: O16, G21, D82, D62, D64

I Introduction

Between 50 and 80 percent of adults in many developing countries still have inadequate access to financial services (Demirguc-Kunt et al., 2007), which translates into approximately 3 billion individuals worldwide. Because credit markets suffer from asymmetric information and limited liability (Stiglitz and Weiss, 1981), potential entrepreneurs with low collateral may not be able to borrow funds for start-up capital or to increase the liquidity of their businesses, or can only do so at very high interest rates. As a consequence, they are left to opt for other less rewarding occupations or operate their businesses at inefficiently low levels, thus creating "poverty traps" (Banerjee et al., 1993).

To overcome these information and liability constraints, banks and microfinance institutions (MFIs) have traditionally focused on a variety of instruments ranging from down payments and joint liability lending to reliance on credit agencies. This paper focuses on the existence of a different phenomenon that may increase outreach: the value that lenders attach to externalities generated by poor country entrepreneurs as they carry out their businesses. Examples of externalities generated by poor country businesses may include the reduction of poverty and child mortality, the promotion of gender equality, or spillovers for the community in the case of projects that focus on things such as education or health. If lenders value these outcomes as positive externalities and are able to internalize them, they should then be willing to decrease interest rates for these pro-poor, "socially responsible" (subsequently SR), and pro-female projects, thus increasing the outreach of credit markets.

In practice, however, even if lenders value these externalities, they are typically difficult to internalize. Traditional banks have a profit-only motivation, while aid agencies, which do explicitly value these externalities, generally incur very high transaction costs in reaching small-scale entrepreneurs. Further, MFIs, which face lower transaction costs due to their proximity and scale, are moving towards an increasingly competitive model of for-profit lending as policy makers and donors encourage them to reduce their reliance on subsidies (Morduch, 2000). As of 2006, MFIs had reached 113 million clients[1], much less than the billions of individuals still without access to banking services.

To determine whether some investors value potential positive externalities, we turn to an institutional innovation, a new online Danish lending platform called MyC4[2], whose peer-to-peer feature should enable investors to internalize positive externalities generated by poor country entrepreneurs through a "warm glow" effect. We collected a unique dataset of 8,163 individual investors bidding to invest small amounts with varying interest rates on 4,057 different business projects in six African countries. On any given day, MyC4 investors are given a menu of potential loans. Some projects are pro-poor (i.e. ,they are small, lack collateral, or are recently launched), some others are SR (i.e.,

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[1]State of the Microcredit Summit Campaign Report 2006,
http://www.microcreditsummit.org/pubs/reports/socr/2006/SOCR06.pdf
[2]www.MyC4.com

they provide employee training or are deemed by MyC4 to address the United Nations Millennium Development Goals), and/or some are pro-female (e.g. undertaken by a female). Multiple investors can provide financing to one loan, with the final interest rate a weighted average of the successful bids, which are determined through a competitive Dutch auction bidding process. Investors must decide carefully how to allocate their loan portfolio: in the case of default, MyC4 clearly states that MyC4 investors may lose their investments[3].

We collect and codify all the information that is available to investors, including text descriptions and pictures, and carry out a two-step procedure to test whether some investors value these potential positive externalities. First, we explore which business characteristics command lower interest rates through the bidding process. The unique set-up of the MyC4 platform allows us to circumvent common identification difficulties. In particular, omitted variables in the determination of interest rates are unlikely a concern since we observe the same information as the investors on the website platform. Holding everything else equal, we find that pro-poor, SR, or pro-female projects command significantly lower interest rates on the MyC4 platform.

Second, we estimate loan repayment rates as a function of these characteristics conditional on the interest rate. As interest rates and repayments rates are jointly determined, we use exogenous changes in the supply of investors (caused by newspaper articles featuring the website, Danish holidays, technical difficulties on the website, and weather shocks) to isolate the causal impact of variations in interest rates on loan repayments by African entrepreneurs. This approach is unique in the sense that it is the first to use the peer-to-peer features to identify the impact of interest rates on repayment. Consistent with a moral hazard model whereby lower interest rates allow the entrepreneur to appropriate more of the business' profits, and thus increase effort and chances of success, we find relatively large repayment elasticities with respect to the (instrumented) interest rate. As a result, the impact of these interest rate reductions on the success of the businesses is substantial. The sample average default rate is 8.3 percent; however, the default rate for businesses with discounted interest rates were drastically reduced. For example, default rates of starting businesses, businesses providing employee training, and businesses related to maternal health are reduced by 94, 27, and 93 percent, respectively. Conditional on the interest rate, these projects do not have better repayment. The net effect on return for lenders of decreased interest rates and increased repayment is negative, indicating that these discounts do not reflect profit-maximizing behavior. We thus conclude that investors are also pro-social, and internalize a range of positive externalities. As such, this feature of peer-to-peer lending increases the chances of success for pro-poor, SR, and pro-female entrepreneurs, while borrowing from a profit-maximizing lender would not.

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[3] "What is my guarantee that I will see a return on my loan investment?
All investments are potentially risky, and there is no guarantee that you will see a return on your investment." http://myc4.com/Portal/WebForms/About/Default.aspx?NameKey=MAIN_FAQ

The overall potential of this institutional innovation is an open question. However, there are some indications that it is large. As shown in Figure 1, MyC4 has experienced rapid growth (an average of a 15 percent per month increase in the number of investors on the platform in 2008), and while nearly three quarters of its investors still come from Denmark, 88 nationalities are already represented. Individuals may also find it an attractive alternative to more traditional aid agencies, a market which in 2007 totaled $18.51 billion US (an increase of 26 percent over 2006)[4].

Section 2 reviews the literature. Section 3 presents the implications of the canonical moral hazard model applied to credit markets, with the added assumption that projects generate a positive externality that is internalized by lenders. Section 4 summarizes the MyC4 data. Section 5 analyzes the determinants of interest rates. Section 6 relates project characteristics and interest rates to repayment. Section 7 concludes.

II   Literature

This analysis contributes to the growing literature that seeks to understand the motivations underlying pro-social behavior, which is difficult to reconcile with the precept of self-interested behavior that underlies much of economic theory (Andreoni, 2006). Andreoni (2006) defines warm glow as the added utility from the mere fact of giving . As such, it is complementary to altruism[5]. Laboratory experiments have found strong evidence in support of a warm glow term in preferences (Andreoni, 1993, Andreoni, 1995, Palfrey and Prisbrey, 1997, and Andreoni and Miller, 2002). However, Andreoni (2006) argues that warm-glow giving only provides a partial answer to the question: why do people give? In this paper, we fine-tune this model by providing a reason as to why investors make a gift (in the form of discounted interest rates) to only some projects: the presence of positive externalities generated by certain aspects of these projects. Our findings also lend support to other recent evidence that people are willing to pay more for private goods if there is a public goods component added (so-called impure public goods). For example, Elfenbein and McManus (2009) compare items sold on eBay's Giving Works charity auction program with similar objects offered contemporaneously in non-charity eBay auctions, and find that consumers pay about 6 percent more, on average, for items when some or all of their payment goes to a charitable auction.

Our paper also relates to several recent papers using a US online peer-to-peer lending website called Prosper.com that focuses mainly on consumer loans. For example, Duarte et al. (2009) find that people perceived as trustworthy on the basis of their appearance in a photograph receive lower interest rates conditional on funding of the

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[4]OECD Stat. 2009. Organization for Economic Coorporation and Development, ODA Flows 2006, 2007, Tables 12 and 13.

[5]Unlike altruism, giving is not crowded out by involuntary government giving financed by taxation. Using a regression discontinuity approach on the bid level data with loan fixed effects, we do not find evidence that investments by the Danish Ministry of Foreign Affairs crowd out bidding by private investors (results available on request)

loan, and have lower default rates, also accounting for credit scores. While they do not seek to disentangle investors' profit motives from their pro-social motives, their findings do support the idea that private investors will use other signals besides business characteristics to make their decision. More closely related is the paper by Pope et al. (2008), which also relies on Prosper.com and finds some evidence that would be consistent with pro-social behavior by investors toward blacks. In particular, while they find that black entrepreneurs' projects fetch higher interest rates than white entrepreneurs with similar credit profiles, and indeed have higher default rates, the higher interest rate does not sufficiently offset the greater default (i.e., a lower overall return relative to whites). The authors interpret these findings as evidence of a combination of accurate statistical discrimination against blacks coupled with taste-based discrimination against whites. However, unlike MyC4, where 93 percent of the loans get funded and disbursed (an even higher percentage gets funded but not everyone takes up the loan), only 8 percent of loans on Prosper.com get funded, raising an obvious concern of sample selection when analyzing repayment data. In addition, as Prosper.com borrowers and lenders reside in the same geographical location (the US), it is difficult to identify instruments for the interest rate that would provide the exogenous source of variation needed in order to test whether signals, such as race or trustworthiness, affect repayment. In contrast to the purely reduced-form approach of the existing literature, we analyze the mechanisms through which project characteristics that likely reflect the presence of positive externalities affect interest rates, which in turn affect repayment rates.

Lastly, our paper relates to the literature analyzing the impact of interest rates on repayment for poor individuals. Due to the endogeneity of the interest rate to repayment, this literature is very small. In a randomized experiment with a for-profit South African lender focusing on consumer loans among a pool of 50,000 former clients, Karlan and Zinman (2008) find that higher interest rates decrease take-up and repayment rates. Further, Dehejia et al. (2005) exploit quasi-experimental evidence from a traditional microlender operating in the slums of Dhaka, which increased the interest rate at a later time in two of its three branches to equal that offered at a newly opened third branch. Their difference-in-differences approach finds that the increase in interest rates resulted in borrowers taking smaller, more frequent loans, and repay more quickly. We are not aware of any other developing country evidence. Our paper differs from this literature in two major ways. First, we focus on the investors' perspective, as opposed to the borrowers' perspective. Thus, we extend the analysis by endogeneizing interest rates and focusing on the positive externalities of the projects that might explain lower interest rates, which in turn affect repayment. Second, we use an instrumental variable strategy to identify the causal impact of interest rates on repayment. While this strategy has a potentially lower internal validity than randomized experiments, it nonetheless has greater external validity as our results apply to the many countries (six in total) currently served by MyC4.

III Theory

The possibility for investors to internalize a potential positive externality generated by a certain project may have three basic effects: changing the interest rates, changing the nature of the projects proposed by entrepreneurs, and reaching previously unfunded entrepreneurs. First, to understand more clearly the effect of the presence of a positive externality E generated by a certain project on the interest rate r offered, we turn to the canonical moral hazard model in a partial equilibrium setting. Second, we analyze the choice of projects of entrepreneurs with respect to E. Finally, we look at access to credit for previously unfunded entrepreneurs.

III.1 Impact on the interest rate

Suppose a borrower chooses $e \in [0, 1]$ ("effort"), which costs him $c(e) = \frac{1}{2}ce^2$. A project return can take on two values, R ("high" or "success") and 0 ("low" or "failure") with probability e and $1 - e$ respectively. The opportunity cost of funds is ρ on the principal plus interest rate. The opportunity cost of labor is u. The borrower has no cash, but some illiquid assets worth w. The lender faces a limited liability constraint, and obtains a return r when the project return is high, w when the project return is low. The borrower's payoff π^b is thus:

$$\pi^b = e(R - r) - (1 - e)w - \frac{1}{2}ce^2 - u$$

While the lender's expected payoff π^l is:

$$\pi^l = er + (1 - e)w - \rho + E$$

Effort e is unobservable. The borrower chooses e so as to maximize his private payoff. The incentive-compatibility constraint (ICC) is thus:

$$e = \arg \max_{e \in [0,1]} \left\{ e(R - r) - (1 - e)w - \frac{1}{2}ce^2 - u \right\}$$

Which yields $e = \frac{R - r + w}{c} \in [0, 1]$. The incentive-compatibility constraint can be rewritten as:

$$r = w + R - ce$$

The underlying environment is that of competition: lenders compete for borrowers, which drive their profits towards zero. The optimal contracting problem is:

$$\max_{e, r} \left\{ e(R - r) - (1 - e)w - \frac{1}{2}ce^2 - u \right\}$$

subject to:

$$er + (1-e)w - \rho + E \geq 0$$

$$r = w + R - ce$$

Combining the ICC and the zero profit constraint yields: $er + (1-e)w - \rho + E = e(R - ce) + w - \rho + E = 0$. This yields a quadratic equation in e: $ce^2 - eR + (\rho - w - E) = 0$. The solution is the bigger root, $e^* = \frac{R + \sqrt{R^2 - 4c(\rho - w - E)}}{2c}$. Corresponding to e^*, the equilibrium interest rate is $r^* = w + \frac{R - \sqrt{R^2 - 4c(\rho - w - E)}}{2}$. The borrower's equilibrium payoff is $\pi^{b*} = \frac{\left(R + \sqrt{R^2 - 4c(\rho - w - E)}\right)^2}{8c} - w - u$.

Two testable predictions may be derived from this model. First, $\frac{\partial r^*}{\partial E} < 0$; lenders lower the equilibrium interest rates for projects generating a positive externality. The intuition of this prediction is that the presence of an externality loosens the zero-profit constraint. Lenders benefit from this externality E, and are thus willing to lower interest rates. For the same reason, $\frac{\partial r^*}{\partial R} < 0$; the standard prediction that projects that have a higher return fetch a lower interest rate. Second, $\frac{\partial e^*}{\partial E} > 0$; borrowers whose projects generate a positive externality E will, in equilibrium, exert greater effort. This is an immediate consequence of a moral hazard situation in which the presence of an externality lowers the interest rate. As borrowers feel confident that they will retain more of their profits, they exert more effort. We will test the two predictions of this model using the investment and repayment data from MyC4.

III.2   Impact on the nature of the projects

This partial equilibrium setting assumes that the externality E is exogenous. However, entrepreneurs may choose their projects from many business plans with differing levels of externalities E. Thus, the MyC4 platform may influence the choice of the projects. For example, assume that an entrepreneur has the choice between a profit-focused project with return R, with no positive externalities generated, and a SR project with lower return R_{SR} (as a positive externality might be costly to produce), and a positive externality E. The comparison of the profits π^{b*} generated with the profit-focused or SR projects yields the following condition on E for a SR project to be chosen: $E > \frac{R^2 - R_{SR}^2}{4c}$. This means that if the returns R_{SR} of a SR project are significantly lower than a profit-focused project, it will take a relatively high externality E (translating into a high interest rate cut) for the entrepreneur to choose a SR project over a profit-focused project. The distribution of the externalities E in the market will have an impact on the number of SR projects, and thus the behavior of investors, in a general equilibrium setting. Besley and Ghatak (2007) explicitly prove the existence of an equilibrium in a market where neutral and caring agents interact with neutral and SR firms. While they develop the analysis in terms of the product market, the basic tenet of their model also applies to capital markets (p.1659).

A testable implication of this theory is that the nature of the projects may change over time, as entrepreneurs realize that they get discounted interest rates associated with SR projects. However, in the data that we will later describe, we see no significant change in the nature of the projects over time. This might be due to the small time frame in which MyC4 has been operating (since May 2007). It will be interesting to look at the changing nature of the projects in the future.

III.3 Impact on the previously unfunded entrepreneurs

A further result from the model is that the externality E is observationally equivalent to the collateral w in the above equations. In other words, it is as if the presence of externalities enjoyed by the lenders brings a social collateral to the borrower, which increases the equilibrium effort level. Also note that there exists a solution to the quadratic equation if and only if the discriminant is positive (i.e., $R^2 - 4c(\rho - w - E) \geq 0$). In the absence of a positive externality E and a low collateral w, a solution might not exist if potential returns are low, and the cost of effort, as well as the opportunity cost of funds, is high. In other words, investors might not fund projects with low collateral, as the losses associated with default are too high. The presence of a positive externality E may modify this conclusion. This indicates that projects which may not be funded by traditional financial service providers, will be funded by peer-to-peer lending if lenders benefit from the positive externalities generated by the project. In this way, the internalization of positive externalities may extend the reach of credit markets.

We will now describe the data and attempt to test the two predictions of this model, concerning the impact of positive externalities on interest rates and repayment.

IV MyC4

To participate as a borrower, an entrepreneur must first apply to a designated "provider" in his/her respective country. Following an initial screening, this provider will upload the loan application to the MyC4 website. After being granted approval by the MyC4 staff, this submission will then be posted in the public domain as a loan application for lenders to bid on. To inform their investment decisions, investors are provided with information about each business plan, including the business' profitability and risk, a description of the business activities, estimates of revenue generation, number of employees, and the presence of different kinds of collateral. In addition, each business description contains information on a number of direct and subtle indicators of potential positive externalities. For example, MyC4 and its local country partner organizations can assign different icons to business plans which indicate whether the business will contribute to one or more of the United Nations Millennium Development Goals. More subtle clues may include a text description which mentions that the profits will be used to provide children with schooling or a picture which shows that the employees are predominantly female.

We collected all the information on business plans, bids, interest rates, and repayment histories, which is publicly available on the MyC4 website[6]. Table 1 shows descriptive statistics on MyC4 borrowers, loans, and bids. There are a total of 4,057 business plans on the website[7], originating equally from men and women. The predominant activity is to open or develop a shop. Most of the borrowers are self-employed (52 percent), and have an address. MyC4 borrowers are relatively rich, with average previous year earnings equal to 16,602 Euros (although it is not clear what the net earnings are). Earnings are 6,545 Euros at the median, and 1,800 Euros at the first quartile ($6/day).

Loans can range from 100 Euros to 25,000 Euros, with a mean of 1,885 Euros. Loans are generally repaid over 12 months, and almost all of the MyC4 borrowers provide collateral that, in theory, covers a large part of the loan. Overall, more than 93 percent of the projects are ultimately funded and taken up. A higher percentage is fully funded but MyC4, the provider, or the borrower can deny taking up the loan, even if it is fully funded. Investors are then reimbursed.

MyC4 investors, in a Dutch Auction system, bid to invest and compete on how low of an interest rate they are prepared to accept. For example, suppose Investor A bids 10 Euros at 20 percent, and Investor B bids 10 Euros at 10 percent. The overall interest rate will thus be a weighted average of the two interest rates, in this case 15 percent. However, if the loan amount desired by the entrepreneur was only 10 Euros, Investor B will outbid Investor A and fund the opportunity at an interest rate of 10 percent. The final loan is often a combination of several investors.

Bids range from 0.01 Euros to 21,866.65 Euros, with an average of 57.56 Euros. On average, it takes 16 days and 72 bids to gather the required loan amount. As investors outbid each other, the final interest rate is often lower than the borrower's desired interest rate. The average final interest rate is 12.6 percent, lower than the average 13.7 percent requested. Once a loan is fully funded, MyC4 has the discretion to stop the auction at any time. Once the auction is closed, MyC4 coordinates with the local lender, a microfinance institution in charge of channeling the funds and collecting repayments (usually the same institution as the provider). Investors can then track the repayments of their loans on the MyC4 website.

The agents involved in this transaction (MyC4, provider, lender) get interest commissions and loan closing fees, which increase transaction costs. For comparability purposes, MyC4 publishes the Annual Percentage Rate (APR) for each loan, which represents the "true" cost of borrowing. As seen in Table 1, the average APR is 43.8 percent.

In the case that a borrower does not fulfill the payback agreement with MyC4, the local lender contacts the business. In general, text messages reminders will first be sent to the business before calling or personal visits. Borrowers that default are not permitted to apply for new loans. Providers also have a strong incentive to seek repayments and

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[6]www.MyC4.com

[7]As of January 6th, 2009

maintain a reputation since they compete with other providers. In certain circumstances the collateral can be seized.

V   Determinants of interest rates

V.1   Methodology

In the empirical section, we follow the theoretical model explained in section III.1. We found that the equilibrium interest rate is $r^* = w + \frac{R - \sqrt{R^2 - 4c(\rho - w - E)}}{2}$. Thus, we will relate the interest rate given by MyC4 investors to a proxy of the potential positive externality generated by the project, and also to other characteristics of the business plans that may influence the interest rate. We perform regressions of the following form:

$$interest\_rate_i = X_i'\alpha + \epsilon_i$$

where i denotes a particular business plan. $interest\_rate_i$ is the interest rate given by investors to project i. We will use the total bid time necessary to fully fund project i as another dependent variable measuring investors reaction. X_i are characteristics of the business plans. We go to great lengths to collect all of the information about these business plans present on the MyC4 website. There are four kinds of information controlled for in the estimations. First, we include standard business characteristics, such as the amount of the loan, income in the previous year, size of business, value of collateral, type of business (shop, school, etc.), and the desired interest rate. Second, information is gathered from a text that is provided by entrepreneurs which describes their businesses. We develop a algorithm that searches for keywords corresponding to the MyC4 "Triple Bottom Line" ("We strive to be economically viable (profit), socially responsible (people), and environmentally sound (planet)")[8]. Third, small icons describing the accordance of the business plan with United Nations Millennium Development Goals are also quantitatively coded according to the number of icons present. Fourth, each business plan is allowed a maximum of three pictures on the MyC4 site, which are analyzed and coded by research assistants along ten dimensions[9]. These ten

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[8]Words such as: "business" "income" "expenditure" "records" "documentation" "log" "pay slip" "profit" "sale" "sell" "buy" "purchase" "trade" and "retail" are searched for to quantify the profit bottom line. Words like those included in the United Nations Millennium Development Goals are searched for to quantify the SR bottom line (i.e., "poverty" "hunger" "primary" "education" "gender" "equality" "empower" "women" "woman" "child" "mortality" "maternal" "health" "HIV" "AIDS" "malaria" "diseases" "global" "partnership" "development" "school" "secondary" "education" "training" "health" "clinic" "hospital" "herbal" "pharmacy" "medical" "nurse" "chemist" "drug". Words such as "environment" "sustainable" "sustainability" "tree" "green" are looked after to quantify the environment bottom line.

[9]One dimension is a yes/no answer ("Is there a woman on the pictures?"), while the nine other dimensions are rated on a 1 to 5 scale, with 1 indicating less, and 5 indicating more. These dimensions are assessed by the following questions: "Do the people on the pictures appear rich?"; "Are the people on the pictures dressed in a professional manner?"; "Is the project traditional or modern?"; "Is the business plan self-explanatory (i.e., do I understand what the project is about by only looking at the

dimensions include business characteristics (e.g., "Are the people on the pictures pro-fessionally dressed?") and elements likely to capture positive externalities (e.g., "Is the project good for the environment?"), as well as certain stereotypes that have been found to be important determinants of performance in the literature. For example, in a field experiment, Landry et al. (2006) find that a one-standard deviation increase in physical attractiveness among women solicitors increases the average gift substantially. Similarly, in a public goods experiment, Andreoni and Petrie (2005) find that in the absence of information on actual contributions, beauty carries a premium, even though beautiful people do not contribute more on average. To capture these phenomenons, we include, for example: "Is the entrepreneur attractive?". Moreover, to capture the impact of skin color as in Pope et al. (2008), we include "Is the entrepreneur less or more black?".

Finally, country dummies are included to control for the potentially diverse nature of projects and economic conditions in different countries. Basic characteristics are also included to compare similar business plans (e.g., the size of the loan, the payback period), and as are year fixed effects to control for common macroeconomic shocks. The average number of opportunities over the bidding days is included, and controls for the supply of business plans, which may affect investors' reaction. ϵ_i is the disturbance term. Robust standard errors are presented in brackets in the regression results.

The strategy presented in this paper allows us to capture most of the information that is accessible to investors on the MyC4 website. Thus, we are able to create a unique position in which we (the econometricians) have exactly as much information as the MyC4 investor taking a decision on the interest rate. Although it could be argued that an investor may "read between the lines" and judge the quality of a business plan on unobserved variables, we will test our identification strategy by examining the explanatory power of the regressions performed.

V.2   Results

We first test whether business characteristics that likely generate positive externalities command lower interest rates. Table 2 presents the results and includes the interest rate in Column (1), and the total bid time in Column (2). Below we discuss the most relevant findings from this table.

The first indication that investors may be giving interest discounts motivated by warm glow, rather than profit maximization in a competitive market, is that relative to farming business plans, health- and school-based business plans attract lower interest rates, by 69 and 76 hundredth of a percentage point, i.e. basis points. In turn, farming

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pictures)?"; "Is the project serious?"; "Does the entrepreneur on the pictures smile?"; "Is the project good for women?"; "Is the project good for the environment?"; "Does the entrepreneur seem friendly?"; "Is the entrepreneur attractive?"; "Is the entrepreneur more or less black?"). Some business plans were randomly asked to be coded twice by different research assistants to obtain a measure of inter-rater reliability. The correlation between the ratings of the research assistants is 0.8, which confirms the homogeneity of the codings.

attracts a lower interest rate than shops, hotels, restaurants, and manufacturing. Our model predicts that these results either reflect the fact that health- and school-based business plans acquire lower interest rates because of their higher returns R, or because of the greater positive externality E they generate. A priori, one would expect that health- and school-related businesses to generate lower returns than farming-, retail-, manufacturing-, and hospitality-related businesses. The repayment analysis will investigate this in detail.

In terms of basic business characteristics, larger loans are assigned higher interest rates, suggesting that either the returns to larger loans are smaller or that smaller loans generate positive externalities. A surprising result that exemplifies the presence of warm glow in this type of lending, is that previous-year income is not associated with lower interest rates, which typical loaning institutions would certainly take into consideration.

An even more surprising result, relative to the practices of typical banking, concerns the collateral, whose presence actually *increases* the interest rate. However, this result may be qualified depending on the type of collateral. Having as collateral a guarantee by an individual, by a "provider", or by a "lender" institution decreases the interest rate, while more typical collateral, such as personal or business assets, have no effects.

Unexpectedly, variables measuring the quality of the project have a limited impact on interest rates. Some variables indicating project quality even have a negative impact on interest rate. For example, the length of the text description, the presence of a business website, being a profit- focused or established business, and appearing to be a serious business (estimated from the pictures) all increase the interest rate. These businesses pay an interest premium of between 3 basis points (for a profit-focused business) and 312 basis points (for an established business).

We further examine variables that capture the SR nature of the project. For example, the fact that the project includes a training dimension appears to be important for MyC4 investors, as it reduces the interest rate by 44 basis points. We also include dichotomous variables indicating the presence of icons related to the United Nations Millennium Development Goals. While each icon is not individually significant, when grouping these variables they become highly significant (F-test statistic=4.12). This might indicate a problem of multicollinearity, which we will address below.

Variables measuring the extent to which a project is geared towards women are also included in the regressions and find positive effects. For example, the presence of an icon that indicates that the project will improve maternal health significantly reduces the interest rate by 292 basis points, while each female employee in the business reduces the interest rate by 3 basis points.

Findings regarding environmental variables are mixed. On the one hand, business plans indicating that the project is good for the environment decreases the interest rate by 22 basis points. On the other hand, the mention of the environment in the project description raises the interest rate by 19 basis points. However, these discrepancies may

be attributable to a problem of multicollinearity.

Variables measuring the size of the firm show that MyC4 investors act more favorably towards smaller firms. Dichotomous variables measuring the nature of MyC4 borrowers are also included in the regressions. For example, a dummy indicates if a large organization (e.g., the Danish Ministry) invests in a particular opportunity. The presence of a large organization increases the interest rate by 1.5 percentage points. This likely reflects that these large organizations offer significantly higher interest rates since, as mentioned above, there is no evidence that these investments crowd out the investment of private investors.

Finally, four variables are included that may reflect the previously mentioned possible stereotypes. A smile on the pictures is correlated with lower interest rates, with results showing that a business with pictures indicating people who are "5 = smiling a lot" having a decreased interest rate by almost 19 basis points compared to a business with pictures of individuals who are "1 = not at all smiling" Looking more friendly or being attractive do not seem to have an impact on interest rates. However, having darker skinned color does decrease the interest rate; with results showing that a business with pictures indicating people who are "5 = dark skin color" having a decreased interest rate by 39 basis points compared to a business with pictures of individuals who are "1 = light skin color". This might be evidence of positive discrimination in favor of darker skinned people, unless darker skinned people have better repayment rates.

Thus far, results suggest that MyC4 investors derive positive externalities from various business characteristics such as being pro-poor, SR, and pro-women. Furthermore, the high R-squared of the regressions (0.71 and 0.45 in Columns (1) and (2)) indicate that our identification strategy, based on capturing most of the information on the MyC4 website to avoid the problem of omitted variable bias, is valid.

However, these results are subject to multicollinearity. As multicollinearity reduces the significance of coefficients, the insignificant effect of most variables on interest rates might mean that they are truly insignificant, or that they are collinear with other variables. For example, the correlation between the sex of the entrepreneur and the fact that there is a woman on the picture is -0.73. For this reason, we aggregate the variables that are classified as being in the same category. Our method of aggregation is a principal components analysis (PCA). A PCA reduces the number of dimensions (variables), without losing much information, by diagonalizing the variance-covariance matrix of the variables in each category, and selecting the eigenvector associated with the highest eigenvalue, as the first principal component accounts for as much of the variability in the data as possible. However, this reduction in dimensionality comes at a cost of interpretation, as an eigenvector does not have a natural interpretation.

We construct a score for each of the seven variable categories: socially responsible investment, gender, environment, collateral, quality of project, size of firm, and signal

from other investors. In Table 3, we present regressions of the following form:

$$interest\_rate_i = \alpha_1 score\_SRI_i + \alpha_2 score\_gender_i + \alpha_3 score\_green_i + X_i'\alpha + \epsilon_i$$

Column (1) of Table 3 presents the results. The scores for SR investment, and gender (a higher score indicates pro-female) are significantly related to lower interest rates. One may interpret the results using the standard deviation of the scores. The standard deviation of the SR score is 1.44, while the coefficient is -0.108. Thus, a project two standard deviations "more SR" (moving from the mean to the top two percent of the distribution of the SR score) will get a 31 basis point reduction in the interest rate. Similarly, Column (2) shows that the standard deviation of the gender score is 1.77, while the coefficient is -0.071. Thus, a project two standard deviations "more female" (moving from the mean to the top two percent of the distribution of the gender score) will get a 25 basis point reduction in interest rate. No significant effect of the environment score is found in Column (3).

A concern might be that these three scores are also collinear. For instance, a SR project might also be more likely to be undertaken by a woman. Column (4) addresses this concern by including the three scores together. The magnitude of the coefficients, as well as their significance, remains stable, indicating that the identification of the impact of these scores are not affected by multicollinearity. As additional robustness checks, we then include incrementally more control variables. In Column (5), we include the full set of control variables from Table 2. In Column (6), instead of including each variable one by one, we include the other scores. The coefficients of the SR and gender score remain significant, and of the same magnitude, independently of the set of controls used. Column (6) presents the preferred parsimonious specification, and still explains much of the variation in the interest rate. Column (7) repeats the exercise with the total bid time as a dependent variable and finds similar results for the coefficients of the SR and gender score. Lastly, note in Column (6) that collateralized projects, high quality projects, and projects carried out by larger businesses all command higher interest rates.

The results presented in this section indicate that projects which are pro-poor, SR, and pro-female get a significant reduction in the interest rate. We now turn to repayment and test whether these reductions reflect the fact that these projects generate higher returns, or that investors experience a warm glow as they internalize the externality generated by these projects.

VI Determinants of repayment

VI.1 Methodology

We turn to the determinants of repayment. We estimate the incentive compatibility constraint $e = \frac{1}{c}(r - R - w)$, where e is effort and, in this particular model, the prob-

ability of repayment. We thus relate the repayment probability to the interest rate. Note that the positive externality E does not enter as a direct determinant e, as it is internalized through the determination of r^{10}. We include the scores from Table 3 to proxy for potentially heterogeneous returns R across projects. This model will measure the elasticity of repayment to interest rates of different projects, as well as repayment performance, net of the interest rate.

We will perform regressions of the following form:

$$repayment_i = \beta_0 + \beta_1 interest\_rate_i + \delta_1 score\_SRI_i + \delta_2 score\_gender_i + \delta_3 score\_green_i + X_i'\gamma + \epsilon_i$$

We will use two measures of repayment. The first measure of repayment that will be used is the amount that the borrower is in *arrears* as a proportion of the total amount that was owed (principal and interest) when the loan was signed. This enables us to include the approximately two-thirds (67%) of borrowers in our sample which are still in the process of repaying. The second measure will be the *default* among the borrowers whose loan cycle was complete. The average proportion owed for the full sample (including defaulters and borrowers still in their repayment cycle) was 0.093, with the lowest value being -0.91 (someone who was repaying early) and the highest value 1.16^{11}. In the sample of completed loans, the average figure was similar: 0.097. Default, as decided upon by MyC4 and the local partners, stood at 8.33%.

X_i includes the full set of controls from Table 3. As the interest rate is endogenous to the repayment performance, we use instrumental variables to isolate the causal impact of the interest rates on repayment. Specifically, we look for events that cause exogenous shocks to the level of competition between investors and/or investment decision-making. Given that MyC4 is a new organization that started to offer loans in 2007 through primarily Danish investors, we identify five possible sources of exogenous variation in the supply of investors. The first is whether MyC4 is mentioned in one of Denmark's main daily newspapers. Between November 2007 and December 2008, we found 38 newspaper articles (an average of approximately one article every three weeks) in seven mainstream Danish newspapers, which may increase the number of investors on the MyC4 website. The second exogenous source of variation is the proportion of bidding days which fell on a Danish holiday, which number 12 per year. One may hypothesize that Danish investors are less likely to browse the MyC4 website on a holiday, as they might be disconnected from the internet. On the other hand, investors might have more time to visit the website on such a day. The third is the proportion of bidding days during which MyC4 reported technical difficulties on their website. There were eight such occurrences in 2008. It is technically impossible to visit the website on such a day, one may thus expect a lower number of investors on business plans which bidding days coincide with technical

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[10]$r^* = w + \frac{R - \sqrt{R^2 - 4c(\rho - w - E)}}{2}$

[11]because of interest accrual on the late amount it is possible to have a value greater than 1.

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difficulties. The fourth is the proportion of bidding days during which a weather event was reported at Kastrup Airport, just outside Copenhagen[12]. A weather event is either the reporting of "rain (or drizzle)", "fog", "snow (or ice pellets)", or "thunder". For the average business plan, there was a weather event reported for exactly half of all bidding days. Finally, the fifth instrumental variable is actual precipitation in millimeters (mm). The average business plan experienced 1.55 mm of precipitation during each of the bidding days. These "adverse weather" days might be correlated with more investors on the website, as investors stay home on such days, and have more time to visit the MyC4 website.

Theoretically, it is possible for these instrumental variables to have an effect on the number of investors on the MyC4 website. However, it is unclear how an increased number of investors may impact interest rates. A standard argument predicts that more investors would increase the funds available, and result in higher competition and lower interest rates. However, according to the law of large numbers, an increase in investors should also more accurately predict the true default rate. Thus, if the business plans' risks are overestimated by a small number of investors, then interest rates will fall when more investors join. If, on the other hand, the business plans' risks are underestimated, interest rates will increase with more investors. As it is impossible to disentangle these mechanisms, we can only measure the net effect in practice. Finally, the instruments may also affect the interest rates differently on different projects. For example, a newspaper article may attract certain types of investors to the MyC4 website, which may benefit some projects but not others.

VI.2 Results

Table 4 presents the results pertaining to the determinants of repayment. Column (1) estimates repayment as a function of the instrumented interest rate, as well as of the variables included in the preferred specification from Column (6) of Table 3 with two instrumental variables: "Average number of bidding days in which MyC4 appeared in a newspaper article", and "Average number of bidding days which were Danish holidays". These two variables are significantly related to the interest rate. For example, the interest rate significantly lowers for plans with bidding days coinciding with the presence of a newspaper article mentioning MyC4. This is consistent with the hypothesis that more investors are attracted to the MyC4 website when it received publicity, which in turn increases competition and reduces the interest rates. Similarly, the interest rate significantly increases for plans with bidding days coinciding with a Danish holiday. This result is consistent with the hypothesis that there are less investors connected to the internet during vacation periods, which in turn decreases competition on the MyC4 website, and increases the interest rates.

Column (2) presents the instrumental variable regressions, where the interest rate is

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[12]http://freemeteo.com/default.asp?pid=155&la=1&gid=2621951&monthFrom=1&yearFrom=2008&sid=061800

instrumented with the two instrumental variables described above. The interest rate is positively related to the probability of repayment, confirming the theoretical predictions. Column (3) includes the full set of controls. As shown in Column (3), a one percentage point increase in the interest rate is associated with a 4.2 percentage point increase in the arrears as proportion of the total loan amount that was due at the signing of the loan. This increase is very large considering that the average arrears stood at 9.3 percent. Statistical tests of the validity of the identification strategy are shown at the bottom of Table 4. The Hansen test is a test of over-identifying restrictions, typically calculated as an R-squared from a regression of the instrumental variable residuals on the full set of instruments, and is consistent in the presence of heteroskedasticity (as opposed to Sargan's test). Under the null hypothesis, the statistic is distributed as a chi-squared in the number of over-identifying restrictions, and a rejection of the test casts doubt on the validity of the instruments. Results indicate that the p-value is 0.90 in Column (3), confirming the validity of the instruments. The Cragg-Donald F statistic tests for the presence of weak instruments, and is equivalent to a test of the partial correlation between the excluded instruments and the endogenous regressors in question. In Columns (2) and (3), the instrumental variables are significantly related to the interest rate and thus cannot be considered weak instruments.

The size of the coefficient estimate suggests that moral hazard is a serious concern. Another theory, based on negative shocks received by entrepreneurs, could explain a positive relationship between interest rates and worse repayment. If projects with differing interest rates are compared, projects with higher interest rates might be closer to their break-even rates. A negative shock received by these projects might negate profits, and lead to involuntary default. More precisely, suppose that there are two projects with a break-even rate of 13.5%. Project 1 receives a loan at 13%, while Project 2 receives a loan at 12%. A negative shock of 1% in project returns will make Project 1 default, whereas Project 2 can still repay. Thus, a higher interest rate may be correlated with higher rates of default due solely to shocks. First note that in a large sample, shocks will be distributed evenly and independently from the interest rate. Thus, there should be no reason why Project 1 would experience more shocks than Project 2. There is still an issue if the break-even rate is close to the interest rate. Thus, the analysis performed in Table 4 might measure moral hazard, or the differential effect of the same shocks on projects with differing interest rate.

To explore this alternative "shock" explanation, in Column (4) we restrict the sample to projects for which the difference between the "desired" interest and final interest rate is greater than 3 percentage points in favor of the borrower, which applies to 25% of the sample. The underlying assumption is that the desired interest rate is close to the break-even rate. Thus, projects with a high difference between the desired and final interest rate are less likely to suffer from negative shocks. This regression tests for the presence of moral hazard when the occurrence of shocks leading to default is less likely. We find

that the coefficient on the interest rate is still significantly positive, even for projects further from their break-even rate, casting doubt on this alternative explanation[13].

The results presented in Table 4 might be sensitive to the definition of repayment used. To test this hypothesis, we use another measure of repayment. Column (5) restricts the sample to loans fully repaid or classified as defaulted (no further repayments are expected). The dependent variable is a dichotomous variable, taking the value "1" if the loan is in default, or "0" if it is fully repaid. The estimation is an instrumental variable probit regression[14]. Results are similar when using this alternate measure of repayment. Again, default is very sensitive to exogenous increases in the interest rate; a 1 percentage point increase raises the default probability (evaluated at the average estimated default of 11.3%) by 8.7 percentage points.

To test whether characteristics that commanded lower rates in the bidding reflect improved repayment, we must look at the other explanatory variables, which measure the potentially different returns across projects, net of the interest rate. As shown in Column (3), the coefficients on the scores for SR investment, and gender (developed in Table 3) are insignificantly positive and the coefficient on score for the project quality is insignificantly negative. This shows that SR, pro-poor, and gender focused projects do not have greater returns. Table 3 shows that these projects command lower interest rates. MyC4 investors do not offer lower interest rates to these projects because they repay more, but because they generate positive externalities that MyC4 investors internalize. Similarly, darker-skinned borrowers are no less likely to have arrears. Women are more likely to default than men. The one exception to this is the variable "smile", which commands both a lower interest rate and is significantly less likely to be associated with either arrears or default. However, since a smile, unlike the other variables, is unlikely to generate a positive externality, this result shows that MyC4 investors are correct in asserting that the person is smiling for a reason; s/he must be generating a higher return.

VI.3   Robustness checks

Table 5 presents the repayment estimations that also include the other instrumental variables. Deaton (2009) criticizes the instrumental variables approach for evaluating causal impacts, based on the argument that if heterogeneity is present, the probability limit of the IV estimator will depend on the choice of instrument (Heckman, 1997). As such, it sheds light on a very particular sample of the data, which, in this case, includes business plans with differing exposure in their bidding period to newspaper articles about MyC4 or to Danish holidays. Thus, we attempt to use other instrumental variables to show the robustness of our results to the choice of the instrumental variables.

In Column (1), we use the "Average number of bidding days in which the MyC4

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[13]Results hold for a difference of 1, 2, or 4 percentage point between the desired interest rate and the final interest rate.

[14]Marginal effects at the mean are presented.

website had a technical problem" as an instrumental variable. This might also be linked to the number of investors, but not to the repayment performance of entrepreneurs other than through the interest rate. Indeed, more technical problems are associated with an increased interest rate, although not significantly. The Cragg-Donald F statistic of the first stage is 35.0, indicating that the instruments are significantly correlated with the interest rate, and the over-identification test is not rejected. Column (2) shows the instrumental variable regression, with a remarkably stable coefficient of the interest rate. Columns (4) and (6) include incrementally the "Average number of bidding days with a weather event", and "Average number of bidding days with high precipitations", with little change in the coefficient. The results are therefore robust to the choice of instruments.

Column (7) looks at the possibility that SR projects might be disproportionately affected by moral hazard. It may be possible that some untalented entrepreneurs may know about the lower interest rates granted for SR projects, and act strategically by labeling themselves SR to benefit from a loan. Although claiming to be socially responsible, strategic default may be more prevalent among these so-called SR projects. Thus, we interact the interest rate with the SR score to test for a differential impact of the interest rate on SR projects. As seen in Column (7), it is not the case that SR projects strategically default more than other projects.

Table 6 uses the same set of instrumental variables, but focuses solely on their values during the last day of bidding. Indeed, it might be the case that the undercutting in interest rates occurs near the end of the bidding process. As shown in Column (1), the instruments are both significant and not rejected by the over-identification test. Also, the results are very similar to those above, indicating that our results are not sensitive to the particular instrumental variable used.

VI.4 Discussion

Our results indicate that lenders value potential positive externalities. However, an important question that remains is by how much. As our analysis translates characteristics into interest rate reductions, and variations in interest rates into repayment performance, we can measure the value of different business characteristics.

Recall that the lender's expected payoff π^l is:$\pi^l = er + (1-e)w - \rho + E$. Therefore, if it is not possible to retrieve the collateral, $w = 0$, then the expected payoff is $er - \rho + E$.

Now, take an individual investor i considering to raise the interest rate offered on loan j by 1 percentage point. To determine whether the return to the investor will be positive, let e_j be the proportion of the loan j that will be repaid (which stands at 90.7% since arrears are 9.3%) and $r_{i,j}$ be the interest rate this investor charges; then $\pi^l_{i,j} = e_j r_{i,j}$. Further, let $\omega_{i,j}$ be the weight (proportion) that investor i contributes to loan j and $\bar{r}_j$ be the final interest rate that the borrower j must pay; then $\bar{r}_j = \sum_i^n \omega_{i,j} r_{i,j}$. Recall that the average final interest rate $\bar{r}_j$ was 12.6%, and since there are on average 72 bids

that fund a loan, the average weight per loan is $\overline{\omega_j} = (1/72)$. Finally, because repayment e_j depends on the final interest rate, not the individual one, the relationship between repayment and an *individual* interest charge is $e_j = f(\overline{r_j}) = f(\sum_i^n \omega_{i,j} r_{i,j})$, where f' gives us the elasticity of repayment with respect to the final interest rate, which is -4.2 as shown in Column (3) of Table 4.

Under the assumption that investors do not behave cooperatively, the marginal benefit (in percentage terms) for an investor considering charging loan j a 1 percentage point higher interest rate than the average rate is given by: $\frac{\partial \pi_{i,j}^l}{\partial r_{i,j}} = r_{i,j} \frac{\partial e_j}{\partial r_{i,j}} + e_j = r_{i,j} * f' * \omega_{i,j} + e_j = (1.126) * (1/72) * -4.2 + 0.907 = 0.841 > 0$. In other words, each 1 percentage point increase in the interest rate charged translates into a 0.84 percentage increase in the return received. Hence, the observation that pro-poor, SR, or pro-female projects receive interest rate *discounts* reflects a negative return to the average investor and is not consistent with profit-maximizing behavior [15].

We can use this same calculation to estimate the overall warm glow *value* of a given externality for a given project j. If, for the average investor an increase by 1 percentage point in the interest rate raises the effective return by 0.84 percentage points, and the average loan size is Euro 1885, then this 1 percent increase has a value to this investor of Euro 0.0084*(1/72)*1885 = 0.22. Since there are 72 such investment bids per loan, the combined value of a 1 percentage point change for a given project is Euro 72*0.22 = 15.86. We find that a project two standard deviations more SR (moving from the mean to the top 2 percent of the distribution of the SR score) will get a 31 basis point reduction in the interest rate, and a 25 basis point reduction in the case of female focus. Hence, this reflects a value of Euro 4.92 and 3.97, respectively. Similarly, the results from Table 3 suggest that MyC4 investors value a school project at Euro 18.30 and a health project at Euro 17.30 relative to hotels or restaurants. Lending to a business that MyC4 indicates will improve maternal health is valued by as much as Euro 46.30, and the warm glow value of a starting business is Euro 49.50. In light of average incomes in these countries, these represent substantial amounts and show that there are large efficiency gains being generated through the peer-to-peer concept which enables investors to internalize the positive externalities.

Based on the results from Column (5) in Table 4, we can also evaluate the impact of these interest rate discounts on the success of the projects. Recall that the sample average default rate is 8.33 percent. Due to the interest rate discounts given by investors, default rates of businesses focusing on education or health are reduced by 43% and 40%, respectively, and of a business providing training by 27 percent. Compared to the lightest skinned entrepreneurs, the most dark skinned entrepreneurs are 25 percent less likely

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[15]Note that if $\frac{\partial e_j}{\partial r_{i,j}} \simeq 0$ because $\omega_{i,j} \simeq 0$ or $f' \simeq 0$, then an individual investor is always strictly better off seeking the highest possible interest rate while still remaining part of the group of succesful bidders. However, given the empirically large repayment elasticity with respect to the interest rate, f', investors whose share $\omega_{i,j}$ of a given loan is larger than 19.3% will see a negative marginal benefit to raising interest rates; their optimal strategy should be to reduce interest rates until the repayment level will statistically be equal to 100%.

to default due to their interest rate. The largest impacts are found among businesses in which MyC4 indicates they will benefit maternal health and new businesses; their discounts reduce the likelihood of default by 93 and 94 percent, respectively. This suggests that the internalization of positive externalities is a key determinant enabling pro-poor, SR, and pro-female projects to succeed.

The total potential for the global efficiency gains is difficult to estimate and depends on the size of the market, both in terms of the overall size of the supply of these characteristics by entrepreneurs in poor countries, and the potential size of the group of MyC4 investors. We perform three tests to determine whether the current pool of MyC4 investors provides any indication of the constraints on the size of the market. These tests use the individual bid level information merged in with the business characteristics. First, we investigate whether there are types of investors (with certain types investing in certain types of projects), or whether investors bid on all types of projects but give interest rate discounts to projects that are pro-poor, SR, or pro-female. We thus consider the decision to invest or not on a particular business plan. In Column (1) of Table 7, the dependent variable is a dummy variable equal to "1" if the investor is bidding a positive amount on a certain business plan, "0" otherwise. Thus, the observations for a certain investor, on a certain day, are the menu of projects open for funding. Controlling for investor fixed-effects, we still find a significant positive impact of SR and pro-female projects, and a negative impact of collateral on the decision to invest. Thus, it does not appear that there are different types of investors; instead these results indicate that investors bid on many projects, and prefer projects that generate a warm glow. Second, we provide an additional test to determine whether the sample of investors can be split into a profit-maximizing group and a pro-social group, which would provide some indication that not every investor that joins MyC4 indeed values these externalities. We do so by splitting the investors into two groups: those investors whose average interest rate offered is above the median and those investors whose offered average interest rate is below the median. We estimate the same model as in Table 4, but this time use the individual bid level information merged in with the business characteristics. Results are presented in Table 7, Columns (2) and (3), and show that the bid-level analysis generates very similar results. These results also show that both groups of investors value SR and gender nearly the same on the margin. Finally, we test whether new investors are driven more by profit motives than the earlier investors , as one might expect if the pro-social group is more likely to select in first. We test for this by including a variable that indicates the order in which the investors first participated on the MyC4 website, with higher values representing more recent investors. We then interact this variable with the different controls, and similarly add a time trend and interactions between the time trend and the controls. Results are reported in Column (4). We find no evidence that newer investors value these positive externalities less. In fact, new investors are more likely to give interest rate discounts to SR projects, gender

projects, environmental projects, and higher interest rates to more established projects.

VII   Conclusion

In this paper, we seek to answer a very basic question: do people value potential positive externalities, net of loan repayments, when they lend to poor country enterprises? We find that MyC4 investors do, and that the MyC4 peer-to-peer lending platform enables these investors to internalize the positive externalities, leading to substantial efficiency gains.

To establish this, we use the unique features of this lending platform to follow a two-step procedure. First, we relate project characteristics to interest rates offered. The crucial feature of this analysis is that we are privy to the exact same information as the online investors. Thus, we develop a methodology that captures all of the information present in the business plans (quantitative data, text, icons, pictures) in order to minimize omitted variable bias. We find that pro-poor, SR, and pro-female projects receive significant interest rate discounts from investors. Second, we verify whether these projects are also performing better, on purely financial grounds, in order to explore the profit-maximizing behavior of MyC4 investors. We do this by relating project characteristics and interest rates to loan repayment. In addition, we exploit the unique online feature of MyC4 to develop five novel instrumental variables likely to influence interest rates, but not the repayment performance of entrepreneurs (other than through their impact on interest rates). These instrumental variables are: the presence of newspaper articles featuring the website, Danish holidays, technical difficulties on the website, weather shocks, and precipitation. Consistent with a moral hazard model, we find relatively large repayment elasticities with respect to the (instrumented) interest rate. The net effect on return for lenders of decreased interest rates and increased repayment is negative, indicating that these discounts do not reflect profit-maximizing behavior. This feature of peer-to-peer lending increases the chances of success for pro-poor, SR, and pro-female entrepreneurs, while borrowing from a profit-maximizing lender would not. The policy implication of this paper is straightforward: there exist investors willing to subsidize projects which generate a positive externality. The presence of "warm glow" helps credit markets reach projects that would maybe not be funded by more traditional banks and enables these projects to succeed.

There are two caveats to these otherwise positive findings. First, while the investors offer relatively higher interest rates to, for example, established enterprises or modern businesses, these may in fact, be greater drivers of employment than small scale traditional enterprises such as chicken rearing. This investment behavior therefore provides an incentive for such more established entrepreneurs to either (1) move into more traditional enterprises, or (2) pretend that their businesses are actually less established, less modern, more pro-female, and pro-SR than they really are. The former may hurt

overall economic growth performance, the latter will most likely dilute the ability of real pro-poor, SR, and female-focused projects to signal these characteristics effectively and command lower interest rates. Whether this will happen will depend primarily on the availability of credit alternatives for such established and modern enterprises. In a market where there is competition between formal banks, such enterprises are likely to have access to alternative sources of credit at favorable rates, thus pushing these borrowers into this market rather than undertaking alternative "traditional" enterprises or cheating on the signals given. In fact, to avoid an influx of established businesses cheating on signals and reducing the ability of investors to internalize the positive externalities, pro-poor, SR, and female-focused projects may actually benefit from a certain interest rate buffer between formal banks and rates offered on the MyC4 website. Finally, whether peer-to-peer microfinance lending will extend outreach depends on the presence of substitution effects between traditional avenues for charitable giving that, in turn, provide loans to the poor (perhaps even at lower interest rates), and peer-to-peer lending. This empirical question is beyond the scope of this paper but an important one to answer in considering its impact on outreach.

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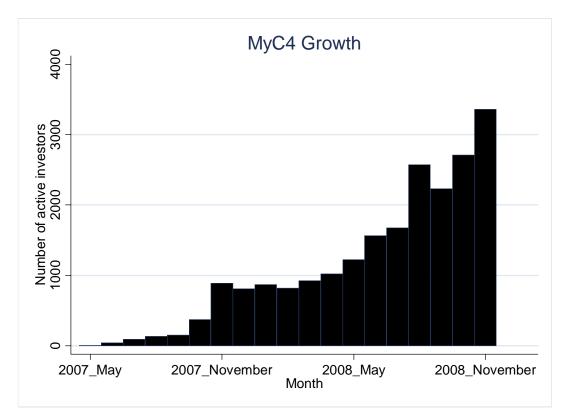
Figure 1: Number of active investors per month on the MyC4 website platform

Table 1: Descriptive statistics of MyC4 borrowers, loans, and bids
(Source: MyC4.com)

MyC4 borrowers

Variable		Observations	Mean	Standard Error	Minimum	Maximum
Sex (0=female, 1=male)		4057	0.46	0.55	0	1
	Farming	4057	0.14	0.35	0	1
	Shop	4057	0.38	0.49	0	1
	Salon	4057	0.05	0.21	0	1
Activity	Hotel, restaurant	4057	0.09	0.29	0	1
	Manufacturing	4057	0.08	0.28	0	1
	Health	4057	0.09	0.28	0	1
	School	4057	0.02	0.13	0	1
	Other	4057	0.22	0.41	0	1
Number of employees		3940	2.71	3.37	0	53
Address (0=no, 1=yes)		4057	0.97	0.17	0	1
Income previous year (Euros)		3925	16602.80	39429.30	4	1057896

Median: 6545 Euros

First quartile: 1800 Euros (6$/day).

Variable	Observations	Mean	Standard Error	Minimum	Maximum
Uganda	4057	0.53	0.50	0	1
Kenya	4057	0.32	0.47	0	1
Ivory Coast	4057	0.14	0.35	0	1
Senegal	4057	0.005	0.07	0	1
Rwanda	4057	0.004	0.06	0	1
Ghana	4057	0.003	0.05	0	1

MyC4 loans

Variable	Observations	Mean	Standard Error	Minimum	Maximum
Loan amount (Euros)	4057	1884.70	2450.59	100	25000
Wanted interest rate (%)	4057	13.66	2.29	8	24
Payback period (months)	4057	11.43	4.10	3	36
Collateral (0=no, 1=yes)	4055	0.93	0.26	0	1
Value collateral (% of loan)	4055	83.56	58.84	0	1600
Current interest rate (%)	4057	11.52	2.73	0	22.78
Transactions costs rate (%)	4056	32.31	12.88	4.42	75.29
APR (%)	4056	43.83	11.94	13.53	79.59

MyC4 investors

Variable	Observations	Mean	Standard Error	Minimum	Maximum
Amount of bid (euros)	130227	57.56	211.62	0.01	21866.65
Interest rate (%)	130227	12.56	3.14	0	50
Bidding time (days)	130227	16.03	11.96	0	45
Number of bids per plan	130227	72.25	71.04	1	241
Number of bids per plan on final day	130227	12.06	15.19	1	116

Table 2: Determinants of investors' reactions

	(1) Interest rate	(2) Total bid time
ACTIVITY		
Farming		
Shop	0.270	1.871
	(0.078)***	(0.418)***
Salon	0.079	1.759
	(0.163)	(0.786)**
Hotel restaurant	0.403	2.391
	(0.108)***	(0.645)***
Manufacturing	0.190	0.910
	(0.112)*	(0.591)
Health	-0.692	-1.042
	(0.290)**	(1.006)
School	-0.756	-1.326
	(0.264)***	(1.211)
Other	0.073	0.447
	(0.089)	(0.464)
COUNTRY		
Ivory Coast	3.872	4.217
	(0.622)***	(3.544)
Ghana	0.000	0.000
	(0.000)	(0.000)
Kenya	3.131	-2.641
	(0.601)***	(3.430)
Rwanda	3.478	2.950
	(0.826)***	(4.246)
Senegal	2.394	-15.586
	(0.684)***	(4.818)***
Uganda	2.636	-0.722
	(0.605)***	(3.375)

	(1) Interest rate	(2) Total bid time
BASIC CHARACTERISTICS		
Loan amount (in thousand Euros)	0.332	4.383
	(0.046)***	(0.532)***
Wanted interest rate	0.756	-0.521
	(0.025)***	(0.115)***
Transaction costs percent	0.060	-0.049
	(0.005)***	(0.021)**
Transaction costs amount	-0.001	-0.009
	(0.000)***	(0.001)***
Payback period	0.151	0.478
	(0.019)***	(0.090)***
Income previous year (in million Euros)	0.851	4.535
	(0.784)	(5.221)
2007 year fixed effect		
2008 year fixed effect	0.339	-0.920
	(0.133)**	(0.600)
2009 year fixed effect	1.350	0.702
	(0.306)***	(1.240)
Average number of opportunities over the bidding days	0.010	0.084
	(0.001)***	(0.006)***

Table 2 continued

COLLATERAL

	(1) Interest rate	(2) Total bid time
Collateral (0=no, 1=yes)	0.866 (0.210)***	-1.783 (1.087)
Collateral: Guarantor	-0.348 (0.165)**	0.190 (1.164)
Collateral: Land	-0.109 (0.153)	-2.781 (1.204)**
Collateral: Personal assets (car, house, furniture)	-0.183 (0.160)	-3.166 (1.200)***
Collateral: Business assets (stock, equipment)	0.008 (0.161)	-2.614 (1.167)**
Collateral: Organisation collateral (provider or lender)	-0.623 (0.205)***	-1.887 (1.500)
Collateral: Log books	0.000 (0.000)	0.000 (0.000)
Collateral: Other	0.107 (0.227)	-3.525 (1.474)**
Value collateral	-0.002 (0.001)***	-0.001 (0.002)
Collateral more than 100 percent of the loan (0=no, 1=yes)	0.400 (0.197)**	-4.091 (1.081)***
Will the borrower agree to let the bank use loan funds to pay suppliers directly	-0.046 (0.095)	0.767 (0.526)
If yes, what share of the loan can the bank use to pay suppliers directly (percent)	0.001 (0.002)	-0.010 (0.009)
Icon: Low risk	-2.014 (1.590)	0.817 (5.529)

QUALITY PROJECT

	(1) Interest rate	(2) Total bid time
Length of summary	-0.002 (0.001)***	0.001 (0.004)
Length text (in thousand characters)	0.587 (0.123)***	1.822 (0.655)***
Local currency (0=Euros, 1=Local Currency)	-0.094 (0.097)	3.472 (0.733)***
Address (0=no, 1=yes)	0.171 (0.335)	-0.516 (1.859)
Email (0=no, 1=yes)	-0.018 (0.055)	-0.388 (0.341)
Website (0=no, 1=yes)	0.169 (0.102)*	-0.022 (0.533)
Name of the business (0=no, 1=yes)	-0.054 (0.039)	-0.772 (0.237)***
Access to internet (0=no, 1=yes)	0.004 (0.075)	-0.499 (0.588)
Icon: Established business	3.123 (0.532)***	-9.505 (3.214)***
Icon: Growth	0.147 (0.278)	5.826 (2.052)***
Icon: Focus on economic profit	0.657 (1.624)	4.279 (3.966)
Keyword from the text: Profit	0.030 (0.010)***	0.014 (0.052)
Pictures: Self explanatory (1-5)	-0.012 (0.025)	-0.024 (0.144)
Pictures: Serious (1-5)	0.078 (0.035)**	0.862 (0.200)***
Pictures: Professionnal dressing (1-5)	-0.027 (0.040)	-0.018 (0.248)
Pictures: Traditional modern (1-5)	0.080 (0.037)**	0.230 (0.216)

Table 2 continued

SR INVESTMENT

	(1) Interest rate	(2) Total bid time
Training (0=no, 1=yes)	-0.439 (0.168)***	-2.240 (1.010)**
number of icons on MyC4 website	0.011 (0.211)	-1.794 (1.282)
Icon: Eradicate extreme poverty	0.196 (0.294)	3.497 (1.677)**
Icon: Achieve universal primary	0.095 (0.257)	2.212 (1.561)
Icon: Develop a global partnership	-0.120 (0.261)	-0.535 (1.633)
Icon: Reduce child mortality	0.893 (0.630)	-0.339 (2.768)
Icon: Combat hivaids malaria	-0.373 (0.422)	-1.700 (1.908)
Icon: Freedom of association	-1.946 (1.072)*	4.419 (4.399)
Icon: Irresponsible working conditions	-0.858 (1.875)	-5.335 (5.121)
Icon: rresponsible health and sanitation conditions	1.675 (0.846)**	6.074 (4.267)
Icon: Forced labour	0.000 (0.000)	0.000 (0.000)
Keyword from text: SR investment	0.029 (0.011)***	-0.047 (0.067)
Pictures: Rich (1-5)	0.069 (0.033)**	0.216 (0.198)

GENDER

	(1) Interest rate	(2) Total bid time
Sex (0=female, 1=male)	0.083 (0.073)	0.937 (0.481)*
Female employees	-0.029 (0.018)*	-0.084 (0.068)
Icon: Promote gender equality	-0.144 (0.255)	1.392 (1.565)
Improve-maternal-health	-2.924 (0.565)***	2.184 (2.787)
Pictures: Woman (0=no, 1=yes)	-0.060 (0.098)	-0.137 (0.567)
Pictures: Good for women (1-5)	0.117 (0.073)	0.122 (0.389)

ENVIRONMENT

	(1) Interest rate	(2) Total bid time
Keyword from the text: Environment	0.194 (0.059)***	-0.028 (0.315)
Icon: Ensure environmental sustainability	-0.310 (0.286)	0.661 (1.679)
Icon: Environmental damages	-0.235 (0.520)	0.741 (2.480)
Pictures: Good for the environment (1-5)	-0.220 (0.070)***	-1.137 (0.416)***

Table 2 continued

SIZE OF FIRM	(1) Interest rate	(2) Total bid time
Employees	0.026	0.006
	(0.013)*	(0.079)
Payroll (in thousand Euros)	0.002	0.017
	(0.001)	(0.009)**
Icon: Number of employees: 0	-0.399	5.296
	(0.587)	(3.005)*
Icon: Number of employees: 1-10	-0.600	5.194
	(0.555)	(2.788)*
Icon: Number of employees: 11-50	-1.257	2.915
	(0.609)**	(3.046)
Icon: Number of employees: 51-100	0.385	9.594
	(0.847)	(4.774)**
Icon: Number of employees: 201-500	-0.160	0.940
	(0.735)	(3.146)
Icon: Micro-investment opportunity	0.094	-1.098
	(0.310)	(2.076)
Icon: Macro-investment opportunity	0.294	-3.071
	(0.446)	(2.664)

SIGNAL FROM OTHER INVESTORS	(1) Interest rate	(2) Total bid time
Presence of large organization: MyC4 holder's family, Danish ministry	1.484	2.432
	(0.052)***	(0.310)***
Presence of frequent private investor	0.491	2.134
	(0.055)***	(0.325)***
Presence of a big private investor: > 2000 Euros	-0.194	-3.247
	(0.120)	(0.961)***
Presence of a medium investor: >1000 Euros, <2000 Euros	-0.069	0.849
	(0.080)	(0.655)

UNCLASSIFIABLE	(1) Interest rate	(2) Total bid time
Pictures: Smile (1-5)	-0.037	0.273
	(0.020)*	(0.124)**
Pictures: Sympathique (1-5)	0.027	-0.028
	(0.031)	(0.183)
Pictures: Degrees of blackness (1-5)	-0.078	-0.325
	(0.034)**	(0.189)*
Pictures: Attractiveness (1-5)	-0.039	-0.518
	(0.053)	(0.336)

	(1) Interest rate	(2) Total bid time
Constant	-12.109	9.849
	(1.304)***	(7.029)
Observations	3673	3673
R-squared	0.71	0.45

OLS regressions. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Determinants of investors' reaction using principal components analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Interest rate						Total bid time
Score socially responsible investment	-0.108			-0.094	-0.080	-0.084	-0.465
(SD=1.44)	(0.026)***			(0.026)***	(0.027)***	(0.030)***	(0.108)***
Score gender		-0.071		-0.057	-0.063	-0.081	-0.411
(SD=1.77)		(0.016)***			(0.015)***	(0.016)***	(0.087)***
Score environment			0.034	0.042	-0.005	0.018	-0.345
(SD=1.12)			(0.024)	(0.024)*	(0.024)	(0.024)	(0.123)***
Basic loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Collateral variables	No	No	No	No	Yes	No	No
Quality of the project variables	No	No	No	No	Yes	No	No
Size of the business variables	No	No	No	No	Yes	No	No
Signal from other investors variables	No	No	No	No	Yes	No	No
Unclassifiable variables	No	No	No	No	Yes	Yes	Yes
Score collateral						0.098	0.693
(SD=1.57)						(0.023)***	(0.100)***
Score quality project						0.041	-0.162
(SD=1.55)						(0.021)*	(0.125)
Score size of firm						0.668	0.764
(SD=1.50)						(0.028)***	(0.188)***
Score signal other investors						-0.007	-0.176
(SD=1.17)						(0.023)	(0.126)
Observations	4030	4025	4054	4024	3673	3673	3673
R-squared	0.55	0.55	0.54	0.52	0.67	0.60	0.38

OLS regressions. Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. In Columns (1) to (6), the dependent variable is the interest rate, and in Column (7), the total bid time. The explanatory variable in Column (1) is a score coming from the principal component analysis. "Score socially responsible investment" is the eigenvector associated with the highest eigenvalue of the diagonalized variance-covariance matrix of the variables related to SR investments. The other scores (for gender, environment, collateral, quality of project, and signal other investors) are built similarly. Basic loan characteristics include Loan amount (in thousand euros), Wanted interest rate, Transaction costs amount, Payback period, year fixed effects, and average number of opportunities over the bidding days. Country dummies include dummies for Ivory Coast, Ghana, Kenya, Rwanda, Senegal, and Uganda. Collateral variables include Income previous year (in million Euros), Collateral (0=no, 1=yes), dummies for the collateral type (Guarantor, Land, Personal assets (car, house, furniture), Business assets (stock, equipment), Organisation collateral (provider or lender), Log books, Other), Value collateral, Collateral more than 100 percent of the loan (0=no, 1=yes), Will the borrower agree to let the bank use loan funds to pay suppliers directly, If yes, what share of the loan can the bank use to pay suppliers directly (%), Icon: Low risk. Quality of the project variables include Length of summary, Local currency (0=Euros, 1=Local Currency), Address (0=no, 1=yes), Email (0=no, 1=yes), Website (0=no, 1=yes), Name of the business (0=no, 1=yes), Access to internet (0=no, 1=yes), Keyword from the text: Profit, Icon: Established business, Icon: Growth, Icon: Focus on economic profit, Keyword from the text: Profit, Pictures: Self explanatory (1-5), Pictures: Serious (1-5), Pictures: Professional dressing (1-5), Pictures: Traditional modern (1-5). Size of the business variables include Employees, Payroll (in thousand Euros), Icon: Number of employees: 0, Icon: Number of employees: 1-10, Icon: Number of employees: 11-50, Icon: Number of employees: 51-100, Icon: Number of employees: 201-500, Icon: Micro-investment opportunity, Icon: Macro-investment opportunity. Signal from other investors variables Presence of large organization in the investors pool: MyC4 holder's family, Danish ministry; Presence of frequent private investor in the investors pool, Presence of a big investor in the investors pool: more than 2000 Euros, Presence of a medium investor in the investors pool: >1000 Euros, <2000 Euros. Unclassifiable variables include Pictures: Smile (1-5), Pictures: Friendly (1-5), Pictures: Degrees of blackness (1-5), Pictures: Attractiveness (1-5).

Table 4: Effects of interest rates, and project characteristics, on repayment

	(1)	(2)	(3)	(4)	(5)
	Interest rate			Arrears as % of total loan		Default (1 or 0)
Sample	Full	Full	Full	Wanted interest rate-final interest rate>=3%	Loans fully repaid or defaulted
Interest Rate		0.074	0.042	0.074	0.087
		(0.017)***	(0.013)***	(0.037)**	(0.204)**
Average number of bidding days in which MyC4 appeared in a newspaper article	-2.340				
	(0.343)***				
Average number of bidding days which were Danish holidays	1.407				
	(0.242)***				
Score socially responsible investment	-0.091		0.002	0.013	0.004
	(0.031)***		(0.003)	(0.007)*	(0.041)
Score gender	-0.080		0.002	0.001	0.014
	(0.016)***		(0.002)	(0.006)	(0.035)**
Score environment	0.014		-0.003	-0.005	-0.077
	(0.024)		(0.003)	(0.005)	(0.159)**
Score collateral	0.080		0.000	-0.009	-0.001
	(0.022)***		(0.002)	(0.006)	(0.088)
Score quality project	0.036		-0.004	-0.014	-0.019
	(0.020)*		(0.003)	(0.007)**	(0.070)
Pictures: Smile (1-5)	-0.028		-0.011	-0.016	-0.035
	(0.023)		(0.004)***	(0.008)*	(0.070)**
Other control var. from col.(6) Table 3	Yes	No	Yes	Yes	Yes
Observations	3673	3779	3417	861	1008
Hansen J statistic		12.69	0.02	0.00	2.30
p-value of Hansen J statistic		0.00	0.90	0.96	0.10
Cragg-Donald F statistic		23.35	52.50	8.33	6.00
p-value of Cragg-Donald chi-sq statistic		0.00	0.00	0.00	0.00

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. OLS regression in Column (1). Instrumental variables (IV) regressions in Columns (2) to (4). IV probit regression in Column (5) (marginal effects at the mean are reported). Column (1) is the first stage of the IV strategy. "Average number of bidding days in which MyC4 appeared in a newspaper article", and "Average number of bidding days which were holidays" are the two IVs. Column (2) presents the IV results, where the interest rate is instrumented with the two IVs. The Hansen test is a test of over-identifying restrictions, typically calculated as an R-squared from a regression of the instrumental variable residuals on the full set of instruments, and is consistent in the presence of heteroskedasticity (as opposed to Sargan's test). Under the null hypothesis, the statistic is distributed as a chi-squared in the number of over-identifying restrictions, and a rejection of the test casts doubt on the validity of the instruments. The Cragg-Donald F statistic tests for the presence of weak instruments, and is equivalent to a test of the partial correlation between the excluded instruments and the endogenous regressors in question. Column (3) includes control variables from the preferred specification in Column (6) of Table3. Column (4) restricts the sample to projects where the spread between the wanted interest rate and the final interest rate is more than 3 percentage points. Column (5) restricts the sample to loans fully repaid or classified as defaulted (no further repayments are expected). The dependent variable is thus a dichotomous variable, taking the value 1 if the loan is in default, 0 if it is fully repaid. As the Hansen J-statistics and Cragg-Donald F-statistic are not available for ivprobit, we simply report an overidentification test and an F-test of the first stage.

Table 5: Robustness checks with other instruments

Average number of bidding days in which:	(1) Interest rate	(2) Arrears as % of loan	(3) Interest rate	(4) Arrears as % of loan	(5) Interest rate	(6) Arrears as % of loan	(7) Arrears as % of loan
MyC4 appeared in a newspaper article	-2.288		-2.047		-1.952		
	(0.351)***		(0.356)***		(0.357)***		
Danish holidays	1.393		1.373		1.434		
	(0.242)***		(0.241)***		(0.262)***		
MyC4 website had a technical problem	-0.847		-1.041		0.510		
	(0.691)		(0.693)		(0.596)		
Weather event			0.373		0.562		
			(0.089)***		(0.090)***		
Precipitation					-0.132		
					(0.018)***		
Interest Rate		0.042		0.055		0.037	0.045
		(0.012)***		(0.012)***		(0.010)***	(0.012)***
Interest Rate*score SRI							-0.028
							(0.017)
Score socially responsible investment	-0.092	0.002	-0.100	0.004	-0.097	0.002	0.273
	(0.031)***	(0.003)	(0.031)***	(0.003)	(0.028)***	(0.003)	(0.180)
Score gender	-0.079	0.002	-0.077	0.003	-0.079	0.001	0.004
	(0.016)***	(0.002)	(0.016)***	(0.003)	(0.016)***	(0.002)	(0.003)
Score environment	0.015	-0.003	0.003	-0.003	0.004	-0.002	0.001
	(0.024)	(0.003)	(0.024)	(0.003)	(0.023)	(0.003)	(0.004)
Other control variables of col.(6) Table 3	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3673	3417	3673	3417	3651	3395	3395
Hansen J statistic		0.56		6.28		11.57	4.66
p-value of Hansen J statistic		0.75		0.10		0.02	0.20
Cragg-Donald F statistic		35.00		31.55		40.80	4.80
p-value of Cragg-Donald chi-sq statistic		0.00		0.00		0.00	0.00

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is always the arrears, as a percent of the total loan, as in Table 4. Column (1) is the first-stage with the additional IV "Average number of bidding days in which MyC4 website has a technical problem". Column (2) presents the second-stage. Columns (3) and (4) include the additional IV "Average number of bidding days with a weather event". Columns (5) and (6) include the additional IV "Average number of bidding days with precipitation". Column (7) adds the interaction between the Interest Rate and the "score socially responsible investment" as an endogenous variable.

Table 6: Instrumental variables on the last day of bidding

On the last day of bidding:	(1) Interest rate	(2) Arrears as percent of total loan
MyC4 appeared in a newspaper article	-0.235	
	(0.146)	
Danish holidays	0.606	
	(0.113)***	
MyC4 website had a technical problem	0.153	
	(0.188)	
Weather event	0.290	
	(0.054)***	
Total daily precipitation (mm)	-0.029	
	(0.009)***	
Interest Rate		0.055
		(0.020)***
Score socially responsible investment	-0.093	0.003
	(0.031)***	(0.003)
Score gender	-0.075	0.003
	(0.016)***	(0.003)
Score environment	0.020	-0.003
	(0.024)	(0.003)
Other control variables from the preferred specification (Col.(6) of Table 3)	Yes	Yes
Observations	3619	3366
Hansen J statistic		1.00
p-value of Hansen J statistic		0.91
Cragg-Donald F statistic		10.12
p-value of Cragg-Donald chi-sq statistic		0.00

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. OLS regression in Column (1), IV regression in Column (2).

Table 7: Types of investors

	(1)	(2)	(3)	(4)
	Invest? (0=no, 1=yes)	Interest rate bid (high rate investors)	Interest rate bid (low rate investors)	Interest rate bid (full sample)
Score socially responsible investment	0.0017	-0.078	-0.081	0.000
	(0.00023)***	(0.024)***	(0.029)***	(0.030)
Score gender	0.0004	-0.082	-0.094	-0.061
	(0.000067)***	(0.019)***	(0.020)***	(0.026)**
Score environment	0.002	-0.027	-0.005	0.014
	(0.00019)***	(0.026)	(0.025)	(0.028)
Score collateral	-0.00033	0.024	0.083	0.013
	(0.00014)**	(0.022)	(0.028)***	(0.030)
Score quality project	0.0007	0.073	0.096	0.007
	(0.000096)***	(0.022)***	(0.026)***	(0.032)
New investor trend				-0.054
				(0.004)***
Score SRI*New investor trend				-0.013
				(0.005)**
Score gender*New investor trend				-0.012
				(0.002)***
Score environment*New investor trend				-0.017
				(0.004)***
Score collateral*New investor trend				-0.001
				(0.002)
Score quality*New investor trend				0.009
				(0.003)***
Control variables of Col.(6) Table 3	Yes	Yes	Yes	Yes
Observations		79603	39357	118960
R-squared		0.73	0.59	0.71

* significant at 10%; ** significant at 5%; *** significant at 1%. In Column (1), the dependent variable is a dummy variable equal to "1" if the investor is bidding a positive amount on a certain business plan, "0" otherwise. Thus, the observations for a certain investor, on a certain day, are the menu of projects open for funding. As the size of the full sample is too large to be handled computationally, we performed 100 OLS regressions on a random sample of 500 investors, with replacement. The reported coefficient is the average of the coefficients obtained in each regression. The significance level is obtained by counting the number of regressions in which the coefficient was of the opposite sign as the average coefficient. The explanatory variables in Column (1) are the scores from Table 3. Other control variables from the preferred specification of Column (6) of Table 3 are included. In Columns (2), (3), and (4), the database is the individual bid level information merged in with the business characteristics. OLS regressions are performed in Columns (2), (3), and (4), with robust standard errors in parentheses (clustered on project loan). In Column (2), the sample is restricted to the group of investors whose average interest rate offered is above the median. In Column (3), the sample is restricted to the group of investors whose average interest rate offered is below the median. In Column (4), "New investor trend" is a variable that indicates the order at which the investors first started participating on MyC4, with higher values representing more recent investors. We also interact this variable with the different controls, and similarly add a time trends and interactions between the time trend and the controls.

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