

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. Using a novel instrumental variable 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.

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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: lenders’ warm glow. If lenders add to their utility by the mere fact of giving a loan to a project that may potentially reduce poverty or child mortality, promote gender equality, or generate education or health spillovers for the community, 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.

Of course, not all economic agents enjoy warm glow. Traditional banks have a profit-only motivation, while aid agencies, which may increase their utility from the mere act of giving, 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 clients¹, much less than the billions of individuals still without access to banking services.

In this paper, we turn to an institutional innovation, a new online Danish lending platform called MyC4², that may be able to exploit the warm glow enjoyed by individual investors to increase credit outreach. On any given day on the MyC4 website, individual 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., 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

¹State of the Microcredit Summit Campaign Report 2006,
<http://www.microcreditsummit.org/pubs/reports/socr/2006/SOCR06.pdf>

²www.MyC4.com

their investments³.

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. We 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 enjoy warm glow. First, we explore which business characteristics command lower interest rates through the bidding process. 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.

Several identification issues arise when relating interest rates to repayment. First, despite our best efforts to capture all the information available on the website, it might be that investors “read between the lines” and discern information from the website that cannot be easily captured by our methodology. Unobservables may drive both interest rates and repayment, and bias the results. Another possible source of simultaneity would arise if entrepreneurs realize that SR projects get more favorable interest rates and respond by changing the nature of their project (or representing it as more SR than it really is), and if this response is correlated with repayment behavior. Finally, MyC4 may strategically manipulate the bidding time to favor some projects in particular.

To address these identification issues, we use exogenous changes in the supply of investors caused by newspaper articles featuring the website to isolate the causal impact of variations in interest rates on loan repayments by African entrepreneurs. These newspaper were not prompted by the repayment performance of African entrepreneurs, but by prizes received by MyC4, or legislative delays over government foreign aid that could be given to MyC4. As such, these newspapers articles affect the supply of investors exogenously from the repayment performance of African entrepreneurs, and thus represent a valid instrumental variable. 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 11.3 percent; however, the default rate for businesses with discounted interest rates were drastically reduced. For example, default rates of businesses providing employee training, business related to health, and school, are reduced by 35, 54, and 60 percent, respectively⁴. Conditional on this effect through the interest rate, we find that pro-poor, SR,

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

⁴It is later shown that school projects get a 0.76 percentage point discount in their interest rates,

and pro-female projects do not have better repayment per se. 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. 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.

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 private charitable giving, a market which in 2010 totaled \$291 billion US in the United States alone⁵.

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 warm glow for 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. 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: their pro-poor, SR, or pro-female nature. 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.

and that a 1 percentage point decrease is associated with a 8.9 percentage point decrease in default. School projects thus enjoy a $0.76 \cdot 8.9 / 11.3 \cdot 100 = 60$ percent decrease in the default rate.

⁵Charitable giving data are from Giving USA Foundation (2011)

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 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 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 endogenizing interest rates and focusing on characteristics 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 enjoy warm glow from certain projects 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 warm glow G enjoyed by an investor when giving a loan to 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 G . 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:

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

Note that warm glow G is received from the mere act of giving a loan, whether the project succeeds or fails. 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 lenders' profits towards zero⁶. The optimal contracting problem is:

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

subject to:

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

$$r = w + R - ce$$

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

Two testable predictions may be derived from this model. First, $\frac{\partial r^*}{\partial G} < 0$; lenders lower the equilibrium interest rates for projects generating warm glow. The intuition of this prediction is that the presence of warm glow loosens the zero-profit constraint. Lenders enjoy this warm glow G , 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, $\frac{\partial e^*}{\partial G} > 0$; borrowers whose projects generate warm glow G will, in equilibrium, exert greater effort. This is an immediate consequence of a moral hazard situation in which the presence of warm glow 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 warm glow G is exogenous. However, entrepreneurs may choose their projects from many business plans with differing levels of warm glow G . 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

⁶We base this assumption on the fact that such a high share of loans are ultimately funded, competition between investors consistently drives the interest rate below the desired rate, and according to table 1 on the last day of bidding there are still an average of 6 bids per day. However, if there are still an average of 6 bids per day when the auction closes, it is possible that interest rates could go even lower as more potential lenders compete to offer the lowest interest rates. Instead of zero profit for the lenders, this premature closing of the bidding by MyC4 may generate positive profits for the lenders. The comparative statics of the model with positive profits for the lender are unchanged. It might also be that the closing time is not exogenous, but depends on the nature of the business plan. For example, if MyC4 is socially minded, "deserving" projects, ie projects that generate a high warm glow, might benefit from an extended period on the website, and fetch lower interest rates. The comparative statics of the model are also unchanged if one assumes a positive profit function decreasing with G . Results available upon request.

with return R , with no warm glow generated, and a SR project with lower return R_{SR} (as warm glow might be costly to produce), and warm glow G . The comparison of the profits π^{b*} generated with the profit-focused or SR projects yields the following condition on G for a SR project to be chosen: $G > \frac{R^2 - R_{SR}^2}{4c}$. 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 warm glow G (translating into a high interest rate cut) for the entrepreneur to choose a SR project over a profit-focused project. The distribution of warm glow G 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).

Moreover, if entrepreneurs realize that SR projects get more favorable interest rates and respond by changing the nature of their project (or representing it as more SR than it really is), and if this response is correlated with repayment behavior, then this introduces a simultaneity bias between interest rates and repayment. The bias could go either way—“savvy” entrepreneurs might respond more and have higher repayment, or “unscrupulous” entrepreneurs might respond more and have lower repayment.

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. We also adopt an instrumental variable strategy when relating interest rates to repayment to address this simultaneity bias.

III.3 Impact on the previously unfunded entrepreneurs

A further result from the model is that the warm glow G is observationally equivalent to the collateral w in the above equations. In other words, it is as if the warm glow 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., $R^2 - 4c(\rho - w - G) \geq 0$). In the absence of a warm glow G 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 warm glow G 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 enjoy warm glow from the mere act of giving discounted interest rates to some projects. In this way, warm glow 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 project characteristics, that may generate warm glow, on in-

terest 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 collateral⁷. In addition, each business description contains information on a number of direct and subtle indicators that may be valued by investors. 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 website⁸. Table 1 shows descriptive statistics on MyC4 borrowers, loans, and bids. There are a total of 4,057 business plans on the website⁹, 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). Borrowers come from Uganda (53%), Kenya (32%), Ivory Coast (14%), Senegal (0.5%), Rwanda (0.4%), and Ghana (0.3%).

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.

⁷See <http://matthieuchemin-research.mcgill.ca/> for an example of a business plan.

⁸www.MyC4.com

⁹As of January 6th, 2009

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 11 days and 32 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 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 $r^* = w + \frac{R - \sqrt{R^2 - 4c(\rho - w - G)}}{2}$. Thus, we will relate the interest rate given by MyC4 investors to a proxy of the warm glow 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)”)¹⁰. 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 dimensions¹¹. These ten dimensions include business characteristics (e.g., “Are the people on the pictures professionally dressed?”) and elements likely to be valued by investors (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?”¹².

Finally, country dummies are included to control for the potentially diverse nature of projects and economic conditions in different countries. Basic characteristics are also

¹⁰Words 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.

Of course, this classification may seem arbitrary at times. Moreover, MyC4 investors are more sophisticated than this algorithm, and can more accurately detect a profit from project types. In other words, MyC4 investors might “read between the lines”. We will address this concern in this paper by following an instrumental variable strategy, when we relate interest to repayment rates.

¹¹One 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 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.

¹²See <http://matthieuchemin-research.mcgill.ca/> for examples of pictures.

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. However, it could be that investors “read between the lines”, and judge the quality of a business plan on unobserved variables, we will test this hypothesis by examining the explanatory power of the regressions performed.

V.2 Results

We first test whether business characteristics that likely generate warm glow 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 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 warm glow G 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 warm glow. 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 warm glow 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 methodology captures most, but not all, of the information on the MyC4 website.

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. This raises the question whether MyC4 allocate funds efficiently. If investors subsidize projects with attributes that are poorly (or negatively) correlated with the project’s quality and social value, then peer-to-peer lending may cause capital to be allocated less efficiently. In fact, this investment behavior may even provide 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 collateralized, and of a lesser quality. The former may hurt overall economic growth performance, the latter will most likely dilute the ability of real pro-poor, less collateralized 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.

Overall, 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 warm glow from the mere act of giving discounted rates to 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 probability of repayment. We thus relate the repayment probability to the interest rate. Note that warm glow G does not enter as a direct determinant e , as it is internalized through the determination of r ¹³. 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:

$$repayment_i = \beta_0 + \beta_1 interest_rate_i + \delta_1 score_SRI_i + \delta_2 score_gender_i + \delta_3 score_green_i + X_i' \gamma + \epsilon_i$$

¹³ $r^* = w + \frac{R - \sqrt{R^2 - 4c(\rho - w - G)}}{2}$

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 1.16¹⁴. 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 11.3%.

X_i includes the full set of controls from Table 3. However despite our best efforts to capture all the information available on the website, it might be that investors “read between the lines” and discern information from the website that cannot be easily captured by our methodology. The bias could go either way. “Good” (on unobserved dimensions) business plans might fetch lower interest rates on the website, and have higher repayment, introducing a negative bias. On the other hand, if Danish investors are socially minded, “deserving” (on unobserved dimensions) business plans might fetch lower interest rates, but also have lower repayment, introducing a positive bias.

Moreover, if entrepreneurs realize that SR projects get more favorable interest rates and respond by changing the nature of their project (or representing it as more SR than it really is), and if this response is correlated with repayment behavior, this could also bias the results. Once again, the bias could go either way- “savvy” entrepreneurs might respond more and have higher repayment, or “unscrupulous” entrepreneurs might respond more and have lower repayment.

Another source of simultaneity arises if MyC4 strategically manipulates the bidding time for some projects. If MyC4 is socially minded, the “deserving” business plans might benefit from an extended period on the website, and fetch lower interest rates. As these projects also have lower repayment, this may introduce a positive bias.

A final identification threat comes from the fact that not all borrowers decide to take up their loans, in which case accepted interest rates may not be exogenous even if offered interest rates are. The takeup decision is likely related to the interest rate and the entrepreneur’s private information about her repayment probability.

In order to address “reading between the lines”, strategic choice of SR characteristics, manipulation of bidding time, or endogenous take up decisions, we use exogenous changes in the supply of investors caused by newspaper articles featuring the website to isolate the causal impact of variations in interest rates on loan repayments by African entrepreneurs. Between November 2007 and December 2008, we found 30 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.

¹⁴because of interest accrual on the late amount it is possible to have a value greater than 1.

Out of the 30 articles in total, 12 referred to legislative delays over government foreign aid that could be given as microloans, 11 were prompted by two prizes received by MyC4 (Liberal’s party Freedom Award, and Ivækstprisen- idealist prize for Mads Kjaer), 6 explained the government plans to give aid through microloans to MyC4, and 1 gave a general introduction on internet microfinance websites (without any quotes by MyC4 employees or mention of the repayment performance of African entrepreneurs)¹⁵.

It is unclear how an increased number of investors impacts 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, this instrument 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 interest rate, as well as of the variables included in the preferred specification from Column (6) of Table 3, in a simple OLS framework. As shown in Column (1), a one percentage point increase in the interest rate is associated with a 0.7 percentage point increase in the arrears as proportion of the total loan amount that was due at the signing of the loan.

Column (2) presents the first stage of the instrumental variable strategy. Interest rate is regressed on the proportion of bidding days in which MyC4 appeared in a newspaper article, and on the variables included in the preferred specification from Column (6) of Table 3. We find that the interest rate is significantly lower 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.

Column (3) presents the second stage of the instrumental variable strategy, where the interest rate is instrumented with the proportion of bidding days in which MyC4

¹⁵Translations of these Danish articles in english available upon request. Based on a referee’s comments, we exclude from our instrumental variable other newspaper articles that may have been directly prompted by lobbying by MyC4, and that may be directly related to the repayment performance of African entrepreneurs. We exclude one article by Mads Kjaer, MyC4’s founder, on his ideology, one article on Mads Kjaer’ life history, one article that explained how women may benefit from MyC4, and five articles that contains quotes by MyC4 employees or direct mention of the repayment performance of entrepreneurs.

appeared in a newspaper article. The interest rate is negatively related to the probability of repayment, confirming the theoretical predictions. As shown in Column (3), a one percentage point increase in the interest rate is associated with a 2.4 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.

The IV coefficient is significantly larger than the OLS coefficient. This points to the presence of endogeneity concerns, such as the ability of investors to “read between the lines”, or the strategic manipulation of SR characteristics of projects. For example, if Danish investors are socially minded and grant lower interest rates to “deserving” (on unobserved dimensions) business plans that also have lower repayment (and more arrears), then an OLS regression of arrears on interest rate is negatively biased. Moreover, if “unscrupulous” entrepreneurs change the nature of their project (or represent it as more SR than it really is) to fetch lower interest rates and have lower repayment (and more arrears), then an OLS regression of arrears on interest rate is negatively biased. The difference in OLS and IV coefficients may also be due to the fact that the IV results identify a LATE for those businesses who receive a lower interest rate in response to higher website traffic due to these articles. As a newspaper article may attract certain types of investors to the MyC4 website, which may benefit some projects but not others, this may explain why the IV estimate of the arrears-interest rate elasticity is much larger than OLS.

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 (4) 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 regression¹⁶. 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 14.2 percentage points.

Column (5) adds month fixed effects (on top of year effects) which helps eliminate any possibility that the timing of the articles was correlated with other factors that predict loan repayment (eg, perhaps businesses started in the fall tend to have the best repayment and for some reason articles about MyC4 tend to appear then). Column (5) shows that a 1 percentage point increase raises the default probability by 8.9 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

¹⁶Marginal effects at the mean are presented.

in Column (3), the coefficients on the scores for SR investment, collateral and gender (developed in Table 3) are insignificantly positive. 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 warm glow enjoyed by MyC4 investors. Similarly, darker-skinned borrowers are no less likely to have arrears. 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.

VI.3 Discussion

Our results indicate that lenders enjoy warm glow. However, an important question that remains is by how much. As our analysis translates project 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: $\pi^l = er + (1 - e)w - \rho + G$. Therefore, if it is not possible to retrieve the collateral, $w = 0$, then the expected payoff is $er - \rho + G$.

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 $\pi_{i,j}^l = e_j r_{i,j}$. 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 32 bids that fund a loan, the average weight per loan is $\bar{\omega}_j = (1/32)$. 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 $e_j = f(\bar{r}_j) = f(\sum_i^n \omega_{i,j} r_{i,j})$, where f' gives us the elasticity of repayment with respect to the final interest rate, which is -2.4 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: $\frac{\partial \pi_{i,j}^l}{\partial r_{i,j}} = r_{i,j} \frac{\partial e_j}{\partial r_{i,j}} + e_j = r_{i,j} * f' * \omega_{i,j} + e_j = (1.126) * (1/32) * -2.4 + 0.907 = 0.82 > 0$. In other words, each 1 percentage point increase in the interest rate charged translates into a 0.82 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 ¹⁷.

¹⁷Note 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 successful 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

We can use this same calculation to estimate the overall warm glow *value* of a given characteristic 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 0.82 percentage points, and the average loan size is Euro 1885, then this 1 percent increase has a value to this investor of Euro $0.0082 \cdot (1/32) \cdot 1885 = 0.48$. Since there are 32 such investment bids per loan, the combined value of a 1 percentage point change for a given project is Euro $32 \cdot 0.48 = 15.46$. 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 4.79 and 3.86, respectively. Similarly, the results from Table 3 suggest that MyC4 investors value a school project at Euro 11.69 and a health project at Euro 10.70 relative to hotels or restaurants. Lending to a business that MyC4 indicates will improve maternal health is valued by as much as Euro 45.20, and the warm glow value of a starting business is Euro 48.28. These represent substantial amounts in light of average incomes in these countries.

Based on the results from Column (4) in Table 4, we can also evaluate the impact of these interest rate discounts on the success of the projects. As school projects get a 0.76 percentage point discount in their interest rates (Column (1) of Table 2), and a 1 percentage point decrease is associated with a 8.9 percentage point decrease in default, then school projects enjoy a $0.76 \cdot 8.9 = 6.8$ percentage point decrease into their default rate. Recall that the sample average default rate is 11.3 percent. This is thus equivalent to a 60 percent decrease in the default rate. Similarly, businesses related to health, or providing employee training, experience a 54 and 35 percent decrease in the default rate¹⁸, respectively. This suggests that warm glow 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 5, 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

will statistically be equal to 100%.

¹⁸ $0.69 \cdot 8.9 / 11.3 \cdot 100$ and $0.44 \cdot 8.9 / 11.3 \cdot 100$

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 enjoys warm glow. 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 5, 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 project characteristics 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 enjoy warm glow, net of loan repayments, when they lend to poor country enterprises? We find that MyC4 investors do: they give discounted interest rates to pro-poor, SR, and pro-female projects, which we find is not a profit-maximizing strategy. However, these discounted interest rates are causally associated with better repayment from these projects, thus increasing the outreach of microfinance for these projects.

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. We develop a methodology that attempts to capture all of the information present in the business plans (quantitative data, text, icons, pictures). 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. Despite our efforts

to collect all data from the website, investors may “read between the lines”, and base their decision on unobservables. Moreover, entrepreneurs may strategically manipulate their observable characteristics to get access to loans. To estimate the causal impact of interest rates on repayment, we thus use exogenous shocks to the supply of investors (newspaper articles featuring the website) likely to influence interest rates, but not the repayment performance of African entrepreneurs.

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 pro-poor, SR, and pro-female projects. 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, 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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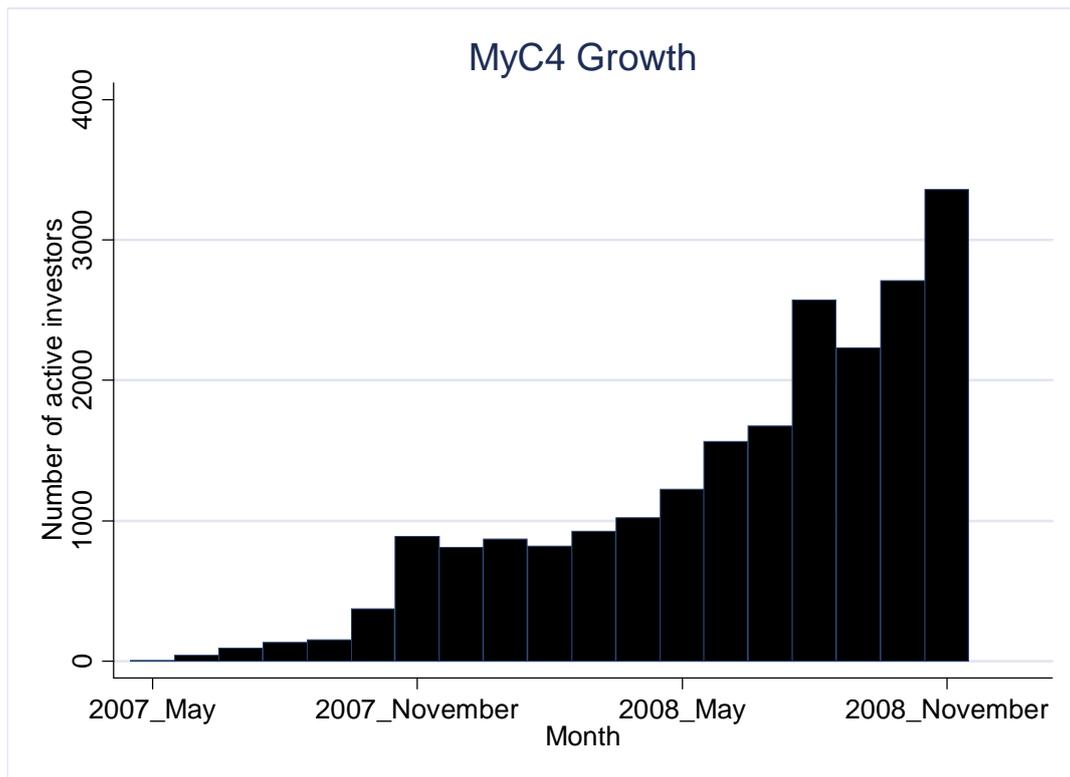


Figure 1: Number of active investors per month on the MyC4 website platform

Table 1: descriptive statistics of MyC4 borrowers, loans, and bids
(Source: MyC4 website)

| MyC4 borrowers | | Observations | Mean | Standard Error | Minimum | Maximum |
|---|------------------|--------------|-------------------|------------------|-----------------------|----------|
| Sex (0=female, 1=male) | | 4057 | 0.46 | 0.55 | 0 | 1 |
| Activity | | 4057 | 0.14 | 0.35 | 0 | 1 |
| | Farming | 4057 | 0.38 | 0.49 | 0 | 1 |
| | Shop | 4057 | 0.05 | 0.21 | 0 | 1 |
| | Salon | 4057 | 0.09 | 0.29 | 0 | 1 |
| | Hotel restaurant | 4057 | 0.08 | 0.28 | 0 | 1 |
| | Manufacturing | 4057 | 0.09 | 0.28 | 0 | 1 |
| | Health | 4057 | 0.02 | 0.13 | 0 | 1 |
| | School | 4057 | 0.22 | 0.41 | 0 | 1 |
| | Other | 4057 | 2.71 | 3.37 | 0 | 53 |
| Number of employees | | 3940 | 0.97 | 0.17 | 0 | 1 |
| Address (0=no, 1=yes) | | 4057 | 16602.8 | 39429.3 | 4 | 1057896 |
| Income previous year (euros) | | 3925 | | | | |
| Median: 6,545 Euros; First quartile: 1,800 Euros (6%/day). | | | | | | |
| Bidding time (days) | | 4057 | 11.38 | 10.68 | 0 | 45 |
| Number of bids per plan | | 4057 | 32.10 | 35.90 | 1 | 364 |
| Number of bids per plan on final day | | 4057 | 6.40 | 8.21 | 1 | 116 |
| MyC4 loans | | | | | | |
| Loan amount | | 4057 | 1884.7 | 2450.59 | 100 | 25000 |
| Wanted interest rate | | 4057 | 13.66 | 2.29 | 8 | 24 |
| Payback period | | 4057 | 11.43 | 4.1 | 3 | 36 |
| Collateral (0=no, 1=yes) | | 4055 | 0.93 | 0.26 | 0 | 1 |
| Value collateral (percent of loan) | | 4055 | 83.56 | 58.84 | 0 | 1600 |
| Current interest rate | | 4057 | 11.52 | 2.73 | 0 | 22.78 |
| Transactions costs rat | | 4056 | 32.31 | 12.88 | 4.42 | 75.29 |
| APR | | 4056 | 43.83 | 11.94 | 13.53 | 79.59 |
| MyC4 bids | | | | | | |
| Amount of bid | | 130227 | 57.56 | 211.62 | 0.01 | 21866.65 |
| Interest rate | | 130227 | 12.56 | 3.14 | 0 | 50 |
| Matrix of correlation between the project scores of SR, gender, environment, collateral, quality | | | | | | |
| | Score SR | Score gender | Score environment | Score collateral | Score quality project | |
| Score socially responsible investment | 1 | | | | | |
| Score gender | -0.0023 | 1 | | | | |
| Score environment | 0.0859 | -0.1094 | 1 | | | |
| Score collateral | -0.0089 | 0.1048 | -0.2592 | 1 | | |
| Score quality project | 0.1489 | -0.1002 | 0.1588 | -0.3196 | 1 | |

Table 2: Determinants of investors' reactions

| | (1) | (2) | (1) | (2) |
|------------------|----------------------|-----------------------|---|----------------------|
| ACTIVITY | Interest rate | Total bid time | BASIC CHARACTERISTICS | Interest rate |
| Farming | | | Loan amount (in thousand Euros) | Total bid time |
| Shop | 0.270 (0.078)*** | 1.871 (0.418)*** | Wanted interest rate | 4.383 (0.532)*** |
| Salon | 0.079 (0.163) | 1.759 (0.786)** | Transaction costs percent | -0.521 (0.115)*** |
| Hotel restaurant | 0.403 (0.108)*** | 2.391 (0.645)*** | Transaction costs amount | -0.049 (0.021)** |
| Manufacturing | 0.190 (0.112)* | 0.910 (0.591) | Income previous year (in million Euros) | -0.009 (0.001)*** |
| Health | -0.692 (0.290)** | -1.042 (1.006) | 2007 year fixed effect | 4.535 (5.221) |
| School | -0.756 (0.264)*** | -1.326 (1.211) | 2008 year fixed effect | 0.339 (0.133)** |
| Other | 0.073 (0.089) | 0.447 (0.464) | 2009 year fixed effect | 1.350 (0.306)*** |
| COUNTRY | | | Average number of opportunities over the bidding days | 0.084 (0.006)*** |
| Ivory Coast | 3.872 (0.622)*** | 4.217 (3.544) | | |
| Ghana | 0.000 (0.000) | 0.000 (0.000) | | |
| Kenya | 3.131 (0.601)*** | -2.641 (3.430) | | |
| Rwanda | 3.478 (0.826)*** | 2.950 (4.246) | | |
| Senegal | 2.394 (0.684)*** | -15.586 (4.818)*** | | |
| Uganda | 2.636 (0.605)*** | -0.722 (3.375) | | |

Table 2 continued

| | (1) | (2) | (1) | (2) |
|--|----------------------|----------------------|---|----------------------|
| COLLATERAL | Interest rate | Total bid time | QUALITY PROJECT | Interest rate |
| Collateral (0=no, 1=yes) | | | Length of summary | Total bid time |
| | 0.866 (0.210)*** | -1.783 (1.087) | | -0.002 (0.001)*** |
| Collateral: Guarantor | -0.348 (0.165)** | 0.190 (1.164) | Length text (in thousand characters) | 0.587 (0.123)*** |
| Collateral: Land | -0.109 (0.153) | -2.781 (1.204)** | Local currency (0=Euros, 1=Local Currency) | -0.094 (0.097) |
| Collateral: Personal assets (car, house, furniture) | -0.183 (0.160) | -3.166 (1.200)*** | Address (0=no, 1=yes) | 0.171 (0.335) |
| Collateral: Business assets (stock, equipment) | 0.008 (0.161) | -2.614 (1.167)** | Email (0=no, 1=yes) | -0.018 (0.055) |
| Collateral: Organisation collateral (provider or lender) | -0.623 (0.205)*** | -1.887 (1.500) | Website (0=no, 1=yes) | 0.169 (0.102)* |
| Collateral: Log books | 0.000 (0.000) | 0.000 (0.000) | Name of the business (0=no, 1=yes) | -0.054 (0.039) |
| Collateral: Other | 0.107 (0.227) | -3.525 (1.474)** | Access to internet (0=no, 1=yes) | 0.004 (0.075) |
| Value collateral | -0.002 (0.001)*** | -0.001 (0.002) | Icon: Established business | 3.123 (0.532)*** |
| Collateral more than 100 percent of the loan (0=no, 1=yes) | 0.400 (0.197)** | -4.091 (1.081)*** | Icon: Growth | 0.147 (0.278) |
| Will the borrower agree to let the bank use loan funds to pay suppliers directly | -0.046 (0.095) | 0.767 (0.526) | Icon: Focus on economic profit | 0.657 (1.624) |
| If yes, what share of the loan can the bank use to pay suppliers directly (percent) | 0.001 (0.002) | -0.010 (0.009) | Keyword from the text: Profit | 0.030 (0.010)*** |
| Icon: Low risk | -2.014 (1.590) | 0.817 (5.529) | Pictures: Self explanatory (1-5) | -0.012 (0.025) |
| | | | Pictures: Serious (1-5) | 0.078 (0.035)** |
| | | | Pictures: Professional dressing (1-5) | -0.027 (0.040) |
| | | | Pictures: Traditional modern (1-5) | 0.080 (0.037)** |
| | | | | 0.862 (0.200)*** |
| | | | | -0.018 (0.248) |
| | | | | 0.230 (0.216) |

| | (1) | (2) | (1) | (2) |
|--|---------------------|---------------------|----------------------|----------------------|
| Table 2 continued | | | | |
| SR INVESTMENT | | | | |
| Training (0=no, 1=yes) | -0.439 (0.168)** | -2.240 (1.010)** | 0.083 (0.073) | 0.937 (0.481)* |
| number of icons on MyC4 website | 0.011 (0.211) | -1.794 (1.282) | -0.029 (0.018)* | -0.084 (0.068) |
| Icon: Eradicate extreme poverty | 0.196 (0.294) | 3.497 (1.677)** | -0.144 (0.255) | 1.392 (1.565) |
| Icon: Achieve universal primary | 0.095 (0.257) | 2.212 (1.561) | -2.924 (0.565)*** | 2.184 (2.787) |
| Icon: Develop a global partnership | -0.120 (0.261) | -0.535 (1.633) | -0.060 (0.098) | -0.137 (0.567) |
| Icon: Reduce child mortality | 0.893 (0.630) | -0.339 (2.768) | 0.117 (0.073) | 0.122 (0.389) |
| Icon: Combat hivaidis 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) | 0.194 (0.059)*** | -0.028 (0.315) |
| Icon: responsible health and sanitation conditions | 1.675 (0.846)** | 6.074 (4.267) | -0.310 (0.286) | 0.661 (1.679) |
| Icon: Forced labour | 0.000 (0.000) | 0.000 (0.000) | -0.235 (0.520) | 0.741 (2.480) |
| Keyword from text: SR investment | 0.029 (0.011)** | -0.047 (0.067) | -0.220 (0.070)*** | -1.137 (0.416)*** |
| Pictures: Rich (1-5) | 0.069 (0.033)** | 0.216 (0.198) | | |
| ENVIRONMENT | | | | |
| Keyword from the text: Environment | | | | |
| Icon: Ensure environmental sustainability | | | | |
| Icon: Environmental damages | | | | |
| Pictures: Good for the environment (1-5) | | | | |

| | (1) | (2) | (1) | (2) | |
|------------------------------------|---------------------|--------------------|--|---------------------|----------------------|
| SIZE OF FIRM | Interest rate | Total bid time | SIGNAL FROM OTHER INVESTORS | Interest rate | Total bid time |
| Employees | 0.026 (0.013)* | 0.006 (0.079) | Presence of large organization | 1.484 (0.052)*** | 2.432 (0.310)*** |
| Payroll (in thousand Euros) | 0.002 (0.001) | 0.017 (0.009)** | MyC4 holder's family, Danish ministry | 0.491 (0.055)*** | 2.134 (0.325)*** |
| Icon: Number of employees: 0 | -0.399 (0.587) | 5.296 (3.005)* | Presence of frequent private investor | -0.194 (0.120) | -3.247 (0.961)*** |
| Icon: Number of employees: 1-10 | -0.600 (0.555) | 5.194 (2.788)* | Presence of a big private investor: > 2000 Euros | -0.069 (0.080) | 0.849 (0.655) |
| Icon: Number of employees: 11-50 | -1.257 (0.609)** | 2.915 (3.046) | Presence of a medium investor: >1000 Euros, <2000 Euros | | |
| Icon: Number of employees: 51-100 | 0.385 (0.847) | 9.594 (4.774)** | | | |
| Icon: Number of employees: 201-500 | -0.160 (0.735) | 0.940 (3.146) | UNCLASSIFIABLE | | |
| Icon: Micro-investment opportunity | 0.094 (0.310) | -1.098 (2.076) | Pictures: Smile (1-5) | -0.037 (0.020)* | 0.273 (0.124)** |
| Icon: Macro-investment opportunity | 0.294 (0.446) | -3.071 (2.664) | Pictures: Sympathique (1-5) | 0.027 (0.031) | -0.028 (0.183) |
| | | | Pictures: Degrees of blackness (1-5) | -0.078 (0.034)** | -0.325 (0.189)* |
| | | | Pictures: Attractiveness (1-5) | -0.039 (0.053) | -0.518 (0.336) |

| | | |
|--------------|-----------------------|------------------|
| Constant | -12.109 (1.304)*** | 9.849 (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 | | | | | | |
| Score socially responsible investment (SD=1.44) | -0.108 (0.026)*** | | | -0.094 (0.026)*** | -0.080 (0.027)*** | -0.084 (0.030)*** | -0.465 (0.108)*** |
| Score gender (SD=1.77) | | -0.071 (0.016)*** | | -0.057 (0.016)*** | -0.063 (0.015)*** | -0.081 (0.016)*** | -0.411 (0.087)*** |
| Score environment (SD=1.12) | | | 0.034 (0.024) | 0.042 (0.024)* | -0.005 (0.024) | 0.018 (0.024) | -0.345 (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 (SD=1.57) | | | | | | 0.098 (0.023)*** | 0.693 (0.100)*** |
| Score quality project (SD=1.55) | | | | | | 0.041 (0.021)* | -0.162 (0.125) |
| Score size of firm (SD=1.50) | | | | | | 0.668 (0.028)*** | 0.764 (0.188)*** |
| Score signal other investors (SD=1.17) | | | | | | -0.007 (0.023) | -0.176 (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 eigenvalue 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 modern (1-5), Size of the business variables include Employees, Payroll (in thousand Euros), 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 characteristics of projects, on repayment

| Sample | (1) | | (2) | | (3) | | (4) | | (5) | |
|--|----------------------------|--|----------------------|--|----------------------------|--|---------------------------------|--|----------------------|-----|
| | Arrears as % of Total Loan | | Interest rate | | Arrears as % of Total Loan | | Loans fully repaid or defaulted | | Default (1 or 0) | |
| | Full | | Full | | Full | | Full | | Yes | Yes |
| Interest Rate | 0.007 (0.002)*** | | | | 0.024 (0.014)* | | 0.142 (0.065)** | | 0.089 (0.044)** | |
| Proportion of bidding days in which MyC4 appeared in a newspaper article | | | -2.905 (0.377)*** | | | | | | | |
| Score socially responsible investment | -0.003 (0.003) | | -0.078 (0.029)*** | | -0.002 (0.003) | | 0.021 (0.012)* | | 0.003 (0.007) | |
| Score gender | -0.000 (0.002) | | -0.082 (0.016)*** | | 0.001 (0.002) | | 0.022 (0.01)** | | 0.014 (0.008) | |
| Score environment | -0.002 (0.003) | | 0.012 (0.023) | | -0.002 (0.003) | | -0.044 (0.021)** | | -0.100 (0.030)*** | |
| Score collateral | 0.007 (0.002)*** | | 0.068 (0.022)*** | | 0.006 (0.002)** | | 0.000 (0.022) | | 0.006 (0.017) | |
| Score quality project | -0.004 (0.003) | | 0.038 (0.021)* | | -0.004 (0.003) | | -0.037 (0.016)** | | -0.013 (0.012) | |
| Pictures: smile (1-5) | -0.011 (0.004)*** | | -0.042 (0.023)* | | -0.010 (0.004)*** | | -0.029 (0.01)** | | -0.033 (0.008)*** | |
| Pictures: friendly (1-5) | 0.003 (0.005) | | 0.018 (0.035) | | 0.002 (0.005) | | 0.011 (0.014) | | 0.008 (0.011) | |
| Pictures: Degrees of blackness (1-5) | -0.006 (0.005) | | -0.175 (0.039)*** | | -0.003 (0.006) | | 0.010 (0.017) | | 0.012 (0.015) | |
| Pictures: Attractiveness (1-5) | 0.005 (0.009) | | -0.021 (0.061) | | 0.006 (0.009) | | 0.017 (0.027) | | -0.008 (0.021) | |
| Other control var. from col.(6) Table 3 | Yes | | Yes | | Yes | | Yes | | Yes | |
| Month fixed effects | | | | | | | | | | |
| Observations | 3417 | | 3673 | | 3417 | | 1008 | | 1008 | |
| Cragg-Donald F statistic | | | | | | | | | | |
| | | | | | | | | | | |

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. OLS regression in columns (1) and (2). Instrumental variables (IV) regressions in column (3). IV Probit regression in columns (4) and (5) (marginal effects at the mean are reported). In column (1), the dependent variable 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. The explanatory variable of interest is the interest rate. Column (2) is the first stage of the IV strategy, where "Proportion of bidding days in which MyC4 appeared in a newspaper article" is the instrumental variable. Column (3) is the second stage. Column (4) 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. Column (5) adds month fixed effects.

Table 5: 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 (0.00023)*** | -0.078 (0.024)*** | -0.081 (0.029)*** | 0.000 (0.030) |
| Score gender | 0.0004 (0.000067)*** | -0.082 (0.019)*** | -0.094 (0.020)*** | -0.061 (0.026)** |
| Score environment | 0.002 (0.00019)*** | -0.027 (0.026) | -0.005 (0.025) | 0.014 (0.028) |
| Score collateral | -0.00033 (0.00014)** | 0.024 (0.022) | 0.083 (0.028)*** | 0.013 (0.030) |
| Score quality project | 0.0007 (0.000096)*** | 0.073 (0.022)*** | 0.096 (0.026)*** | 0.007 (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.