Microcredit in Developed Countries: Unexpected Consequences of Loan Ceilings

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Abstract

In most developed countries, regulators have imposed loan ceilings to subsidized microfinance institutions (MFIs). Micro-entrepreneurs in need of above-ceiling loans are left with the co-financing option, which means securing the above-ceiling share of the loan with a regular bank, and getting a ceiling-high loan from the MFI. Co-financing is attractive to MFIs because it allows them to free-ride on the regular banks' screening process. Therefore, loan ceilings can have the perverse effect of facilitating the co-financing of large projects at the expense of micro-entrepreneurs who need below-ceiling loans only. This is the gist of our theoretical model. We test the predictions of this model by exploiting the natural experiment of a French MFI that became subject to the French EUR 10,000 loan ceiling in April 2009. Difference-in-differences probit estimations confirm that imposing loan ceilings to MFIs can have unexpected and socially harmful consequences.

1 Introduction

To favor financial services to poor entrepreneurs, US and European regulators have set upper limits to the size of the loans that subsidized microfinance institutions (MFIs) grant. By means of a theoretical model and empirical evidence, this paper shows that loan ceilings may paradoxically result in holders of small business projects being crowded out from the microcredit market. This perverse effect is linked to the possibility of co-financing. More precisely, micro-entrepreneurs holding large business projects requiring above-ceiling loans can secure the above-ceiling share of the loans with a regular bank, and then apply for ceiling-high loans from the MFI. The co-financing option is attractive to MFIs since it allows them to free-ride on the banks' screening of applicants.

The issue addressed in this paper is specific to microfinance in developed countries where MFIs remain niche institutions. This situation contrasts with the rapid expansion of microfinance in developing countries (Armendariz and Morduch, 2010).[2] MFIs in developing countries typically supply standardized products–predominantly small loans–to a large number of unbanked people. Due to existence of both banking coverage and social safety nets, MFIs in developed countries target a limited number of micro-entrepreneurs disregarded by commercial banks (Johnson, 1998). These MFIs are meant to address a market failure and facilitate self-employment. According to Bendig *et al.* (2012), the five main objectives of European microfinance are: job creation, promotion of micro-enterprises, financial and social inclusion, and empowerment of the specific target groups. In 2011, the MFIs active in the European Union (EU) have granted more than 204,080 loans amounting EUR 1,047 million in total.[3]

[2] According to Lalwani and Kubzansky (2009), the sector serves 200 million customers worldwide.

[3] The figures largely underestimate the reality since they are based on responses from 108 MFIs among the 376 contacted. Bendig *et al.* (2012) estimate that 500 to 700 MFIs are currently active in the EU, excluding credit unions

In Europe, most MFIs benefit from subsidies provided by local and/or national governments (Bendig *et al.*, 2012). Some are also financed by commercial banks in the framework of their socially-responsible investment policy. Subsidies come in various forms, direct and indirect. Indirect subsidies include: protection against default risk, tax incentives, loans at preferential rates, and provision of business development services. As stressed by Hudon and Traça (2011), subsidies are instrumental to MFIs, especially during their start-up phase. Subsidized microfinance can even reveal profitable to public finance (Evers *et al.*, 2007; Brabant *et al.*, 2009). Indeed, MFIs serve the poor and the unemployed, promote job creation, and so reduce the financial burden of social welfare.

The literature on microfinance in developed countries is scarce, likely because the sector is still young and poorly delimited (European Commission, 2012).[4] The division between microcredit and small business financing remains unclear. Depending on the provider, similar loans are classified as micro-loans, conventional loans, consumer loans, or SME loans.

In developing countries, small-business finance and microcredit act as complements rather than substitutes (Bauchet and Morduch, 2013). In developed countries, the situation is trickier. The division between businesses served by regular banks and MFIs is blurred, and some MFIs serve clients who can borrow from banks. The reaction of the banking sector to the development of microcredit activities has been mixed. On the one hand, some banks have climbed the microfinance bandwagon

and commercial banks.

[4]The European Commission has launched several initiatives to foster the development of the sector. For instance, the Joint European Resources for Micro to Medium Enterprises (JEREMIE) program allocates structural funds to European MFIs. The Joint Action to Support Microfinance Institutions in Europe (JASMINE) program offers them technical assistance.

by creating MFIs[5] and/or by developing collaborations with MFIs. On the other hand, the banking sector has been asking for better market delimitation and strict supervision of microfinance activities.

If offered the choice, most micro-entrepreneurs would prefer microcredit to a regular bank loan. This is because socially-oriented and subsidized MFIs manage to screen their applicants less severely than regular banks. MFIs also offer attractive credit conditions, and some provide business guidance. Therefore, many banks consider subsidized MFIs as a threat. At the request of the banking sector, new rules have come into force (European Microfinance Network, 2012).[6] The key features of existing regulatory frameworks concern access to data from credit bureaus, interest-rate caps, access to financial markets, and loan ceilings.

As far as loan ceilings are concerned, France has one of the most restrictive rules in the developed world. The French Monetary and Financial Code (2007) stipulates that licensed MFIs are forbidden to grant loans above EUR 10,000. In contrast, the U.S Small Business Administration, a federal agency promoting the creation and development of small businesses, has set a USD 50,000 cap to microcredit (Lieberman *et al.*, 2012). The European Union recommends the use of a EUR 25,000 ceiling (European Commission, 2007). In practice, however, EU member states fix their own ceilings. For instance, Hungary, Portugal, Slovakia, and the UK allow MFIs to grant loans exceeding EUR 25,000 (European Commission, 2007).[7]

[5]For example, Fundació Un Sol Món in Spain was established by the savings bank Caixa Catalunya in 2000, and CSDL a non-bank MFI in France was established by a joint initiative by Crédit Municipal de Bordeaux and local authorities

[6]In Germany, only banks are allowed to grant credit, and MFIs act as simple intermediaries within a tight collaboration with banks. For instance, the GLS bank delegates small-loan granting to local MFIs.

[7]In Europe, microcredit is provided by both banks and non-bank financial institutions. The European Commission (2007) provides a detailed overview of microcredit regulations in Europe. Microcredit provision falls either under the

The official report on microcredit in France released by the General Inspection of Finances (Brabant *et al.* 2009, p. 4) explains that the ceiling is imposed for–yet unspecified–"cautionary reasons" and that it is meant to keep mainstream banks finance small businesses. In addition, the French authorities encourage bank-MFI cooperation. For instance, not-for-profit MFIs such as ADIE (*Association pour le Droit à l'Initiative Economique*), CREASOL (*Contraction de Crédit Accompagnement Solidarité*) and CSDL (*Caisse Sociale de Dévelopement Local*) have received the public license for refinancing their microcredit activity with bank loans (Valentin *et al.*, 2011).

The microfinance literature provides mixed evidence on the impact of regulation on performances of MFIs. Armendariz and Morduch (2010) content that the existing regulations are poorly adapted to this young industry.[8] Using data for 114 MFIs from 62 countries, Hartarska and Nadolnyak (2007) find that regulations do not directly affect operational self-sustainability and outreach. Cull *et al.* (2009) emphasize that complying with regulations is costly to MFIs and may result in the exclusion of potential borrowers. The pros and cons of loan ceilings are discussed in a CGAP report (CGAP, 2012). The report states that ceilings constrain MFIs to focus on poor clients but prevent holders of large projects from gaining access to finance. Ceilings also reduce cross-subsidization opportunities.[9] Our findings challenge these statements.

The contribution of this paper is twofold. First, it proposes a theoretical framework for discussing

harmonized banking-sector regulations, or under the far more heterogeneous laws governing non-bank institutions. Only Romania and France have adopted rules specific to microcredit, referred to as "special windows" (CGAP, 2012). A special window adopted in Romania in 2005 imposes a EUR 25,000 loan ceiling. In 2010, Italy has enforced two distinct ceilings: a EUR 25,000 one for business lending, and a EUR 10,000 one for social lending.

[8] Acclassato (2008) argues that capping microfinance interest rates is inefficient.

[9] MFIs use cross-subsidization when they partly cover the costs associated with serving the very poor by lending to wealthier, and hence more profitable, clients.

the consequences of loan ceilings, a key component in microfinance regulation. Inspired from Armendariz and Szafarz (2011), our model describes the loan allocation of a subsidized socially-oriented MFI. It rests upon the realistic assumption that micro-entrepreneurs holding large projects–i.e. projects requiring above-ceiling loans–have access to co-funding (Jain, 1999). Co-funding implies combining credit from a bank charging the market interest rate and from a subsidized MFI charging a below-market rate. The bank's approval comes first.[10] Hence, the MFI has the opportunity to free ride on the bank's screening process. This opportunity drives the MFI's preference for pre-screened applicants, i.e. holders of large projects, at the expense of applicants holding smaller projects. In the microfinance literature, such shift in clientele is referred to as "mission drift".[11] In sum, our model stresses that loan ceilings can have perverse effects and trigger mission drift.

Second, we test the predictions of our theoretical model on real-life data. We exploit a natural experiment, namely the conversion of a French unregulated NGO supplying microcredit into a regulated MFI. This conversion occurred in April 2009 and implied immediate compliance with the French EUR 10,000 ceiling. Interestingly, the unregulated institution did grant as many as 70% of above-ceiling loans. As expected, the conversion affected its loan allocation dramatically. More precisely, difference-in-differences probit estimation shows that the change in status is associated with a rise in the MFI's approval rate. This result is consistent with the presence of free-riding in the screening process. Moreover, the projects financed by the MFI became significantly larger after the enforcement of the ceiling. Overall, the empirical results are in line with the predictions of the theoretical model.

[10] Typically, banks give conditional approvals.

[11] Mission drift means that MFIs serve wealthier clients at the expense of poor ones (Ghosh and Van Tassel, 2008; Mersland and Strøm, 2010; Armendariz and Szafarz, 2011).

The rest of this paper is structured as follows. Section 2 presents the theoretical model. Section 3 describes the context and the data. Section 4 outlines the empirical results. Robustness checks are performed in Section 5. Section 6 concludes.

2 Theoretical Model

In this section, we build a simple one-period model inspired from Armendariz and Szafarz (2011). The aim is to derive the impact of a loan ceiling on the loan allocation of a socially-oriented MFI. The pool of applicants is composed of two groups of micro-entrepreneurs. The members of the first group hold small projects and demand small loans. The members of the second group hold large projects and demand relatively larger loans. The risk-neutral subsidized MFI maximizes its outreach, i.e. its number of borrowers, under the budget constraint. Subsidies allow the MFI to supply credit at below-market conditions. We assume cross-subsidization away by imposing that both types of loans are costly to the MFI. We proceed in three steps. First, we present the basic model without loan ceiling. Second, we add the ceiling to the picture and solve the model again. Third, we compare the optimal loan allocations in the two situations. This comparison will guide the empirical exercise in Section 4.

2.1 Loan Allocation without Ceiling

We consider a risk-neutral socially-oriented MFI supplying loans at below-market conditions to micro-entrepreneurs. To fulfill its social mission the MFI benefits from subsidy K. The MFI max-

imizes its number of borrowers under the budget constraint. The pool of the applicants is made of type-1 micro-entrepreneurs holding small projects and demanding loan size P_1 and type-2 entrepreneurs holding large projects and demanding loan size P_2 with $P_1 < P_2$. For the MFI, granting a loan to a type-1, respectively type-2, applicant entails a total cost of γ_1, respectively γ_2. Costs are additive.[12] The costs should be understood as the MFI's net cash-out flows associated with granting the loans. Actually, they aggregate cash-flows of both signs. Positive costs include the standard business costs associated with the loan granting activity. Negative costs (or benefits) result from the expected returns on loan reimbursement. The net costs also account for any other borrower-specific cash-flows. For instance, if the MFI receives specific subsidies for, say, serving–typically poorer– type-1 applicants, this extra budget is interpreted as a negative component of γ_1. To acknowledge that the MFI operates in a competitive environment and offers below-market conditions, we assume that $P_1 + \gamma_1 > 0$ and $P_2 + \gamma_2 > 0$. This assumption means that microcredit granting is costly and requires subsidization. In this way we also rule out cross-subsidization opportunities, which are unrealistic in a competitive environment.

The program of the MFI writes:

$$\max_{0 \leq n_1, 0 \leq n_2} \{n_1 + n_2\} \tag{1}$$

$$s.t. \quad K = (P_1 + \gamma_1)n_1 + (P_2 + \gamma_2)n_2$$

In this simple linear set-up, the optimal loan allocation is a corner solution. To maximize outreach, the MFI finances a single type of projects. More precisely, the optimal numbers of granted loans

[12] We rely on this simplifying assumption for tractability. More realistic representations of the costs would make the model more complex without affecting much its qualitative outcome.

are:

$$n_1^* = \begin{cases} \frac{K}{P_1+\gamma_1} & if \quad P_1+\gamma_1 \leq P_2+\gamma_2 \\ 0 & if \quad P_1+\gamma_1 > P_2+\gamma_2 \end{cases} \tag{2}$$

and

$$n_2^* = \begin{cases} 0 & if \quad P_1+\gamma_1 \leq P_2+\gamma_2 \\ \frac{K}{P_2+\gamma_2} & if \quad P_1+\gamma_1 > P_2+\gamma_2 \end{cases} \tag{3}$$

In a ceiling-free environment, the MFI operates on its own. Its optimal loan allocation only depends on loan sizes and costs. In particular, if the overall financial burden of serving type-1 applicants is lower than that of serving type-2 applicants ($P_1+\gamma_1 \leq P_2+\gamma_2$), Eqs. (3) and (4) show that the MFI will choose type-1 borrowers exclusively. This is the typical situation of non-profit MFIs worldwide. When cross-subsidization is not a possibility, MFIs that do not drift away from their mission offer small loans only.

2.2 Loan Allocation with Ceiling

Let us now assume that the same MFI is constrained by loan ceiling S, where $P_1 < S < P_2$. The MFI can still serve type-1 applicants in full. However, its type-2 applicants need external financing to complement the maximal loan size, i.e. S, the MFI is allowed to supply. Since the MFI proposes below-market conditions, the type-2 applicants are still interested in getting as much credit as possible from the MFI. But before applying for microcredit, type-2 entrepreneurs must secure a loan amounting $P_2 - S$ from a regular bank. We assume that the regular credit market is competitive and entails credit-rationing (Stiglitz and Weiss, 1981). Hence, regular banks screen their credit applicants selectively.[13]

[13] Modeling the bank's screening process would allow us to quantify further the MFI's loan allocation.

The MFI examines type-2 applications once a complementary loan has been secured. Inevitably, the screening process implemented by the bank reduces the number of type-2 project holders who manage to apply for microcredit. Let us denote N_2 the number of type-2 applicants surviving the bank's screening process. The others are rejected by the bank and disappear from the microcredit market.[14]

Importantly, the surviving type-2 applicants to microcredit are pre-screened by the bank. In this way, the loan ceiling reduces the informational asymmetry associated with type-2 applicants. As a result, these applicants incur smaller costs than the unscreened type-2 applicants in the ceiling-free environment. In other words, granting loans to type-2 applicants gives the MFI an opportunity to free ride on the bank's screening process. Let us denote $\gamma_2^{'} < \gamma_2$ the cost associated with type-2 pre-screened applicants. Ruling out cross-subsidization implies that $S + \gamma_2^{'} > 0$. The program of the MFI now writes:

$$\max_{0 \leq n_1, 0 \leq n_2 \leq N_2} \{n_1 + n_2\} \tag{4}$$

$$s.t. \quad K = (P_1 + \gamma_1)n_1 + (S + \gamma_2^{'})n_2$$

Again, the objective function is linear leading to corner solutions. However, the solution is somewhat heavier to write down due to the restriction in type-2 applicants. The optimal numbers of loans

[14] In the ceiling-free environment, we have implicitly assumed that the composition of the pool of applicants is never binding for the MFI. Put differently, the MFI may find as many applicants of each type as its optimal loan allocation dictates. Lifting away this assumption would affect much the impact of a loan ceiling. The only thing that really matters here is that the need for co-funding makes the MFI type-2 applicants strictly less numerous than otherwise.

granted by the ceiling-constrained MFI are:

$$n_1^{**} = \begin{cases} \frac{K}{P_1+\gamma_1} & if \quad P_1+\gamma_1 \leq S+\gamma_2^{'} \\ \max\left\{0, \frac{K-(S+\gamma_2^{'})N_2}{P_1+\gamma_1}\right\} & if \quad P_1+\gamma_1 > S+\gamma_2^{'} \end{cases} \tag{5}$$

and

$$n_2^{**} = \begin{cases} 0 & if \quad P_1+\gamma_1 \leq S+\gamma_2^{'} \\ \min\left\{\frac{K}{S+\gamma_2^{'}}, N_2\right\} & if \quad P_1+\gamma_1 > S+\gamma_2^{'} \end{cases} \tag{6}$$

Eq. (5) and (6) reveal that the MFI's optimal allocation can include both types of borrowers. If $P_1+\gamma_1 \leq S+\gamma_2^{'}$, the MFI serves small project holders only. In contrast, when $P_1+\gamma_1 > S+\gamma_2^{'}$, the constraint on the number of pre-screened type-2 borrowers ($n_2 \leq N_2$) can bite. In this case, the MFI serves the N_2 available large project holders, and it is left with no other choice but supplying loans to type-1 applicants with the remaining budget. Alternatively, when constraint $n_2 \leq N_2$ does not bite, the MFI serves type-2 borrowers only. As a result, the MFI's optimal loan allocation depends on the severity of the bank's screening process.

Evidently, this model makes sense only in an environment where commercial banks are interested in co-financing micro-entrepreneurial projects with MFIs.[15] In fact, banks may find co-financing attractive since this is a way to share credit risks with the MFI. Given that many MFI applicants hold start-up projects, the credit risks at stake may be high. Hence, imposing a loan ceiling to the microcredit industry might ultimately ease financing large start-up projects.[16] On the other hand,

[15] Otherwise $N_2 = 0$ and type-2 applicants are unable to apply for microcredit. However, if banks are not willing to fund type-2 projects partially, they should be even less keen to fund them in full. Type-2 applicants would then find no way to finance their projects. This market-failure situation is unlikely–but not excluded–in a competitive credit market.

[16] Typically, entrepreneurs find it difficult to gather sufficient funding for start-up project because of their informational opacity (Berger and Udell, 1998). In this paper, however, we disregard the indirect spillover effects of microcredit loan ceilings on bank lending and focus on the direct effect on MFIs.

banks that co-finance projects with MFIs push the latter toward mission drift by inciting them to disregard holders of small projects.

2.3 Comparison

Starting from the previous results, we now compare the optimal loan allocations without and with a loan ceiling of level S. Since $S < P_2$ and $\gamma_2 > \gamma_2^{'}$, we have:

$$P_2 + \gamma_2 > S + \gamma_2^{'} \tag{7}$$

This inequality means that serving type-2 applicants is more affordable for the ceiling-constrained MFI than for the ceiling-free one. Consequently, there are three possible cases (see Table 1). In case I ($P_1 + \gamma_1 > P_2 + \gamma_2 > S + \gamma_2^{'}$), the ceiling-free MFI finds type-1 projects costlier than type-2 ones. As a consequence, it only finances type-2 projects. Introducing a loan ceiling cannot make the situation worse for type-1 applicants, so that $n_1^* \leq n_1^{**}$. Moreover, if the bank's screening is severe enough to make constraint $n_2 \leq N_2$ bite, then the inequality is strict. This would mean that the ceiling-constrained MFI would serve some type-1 applicants even though the type-2 ones have become less costly. This result is attributable to a bank-driven rationing effect. Case I is probably the situation regulators have in mind when imposing loan ceilings. The increase in the number of small projects financed appears as the consequence of imposing a tough prerequisite to holders of large projects.

<Table 1>

Two polar subcases of case I stress the role of the spillover effect of the bank screening process on the MFI optimal strategy. First, if the bank's screening has maximal severity ($N_2 = 0$), all type-2 applicants are rejected by the bank. As a result, the ceiling-constrained MFI serves type-1 applicants only. This situation would correspond not only to a full segmentation of the credit market, but also to a market failure. Indeed, type-2 applicants fail to obtain credit from any source. The bank finds them too risky while their demanded loan sizes are too high for the MFI. Second, if the bank's screening is very soft $\left(N_2 \geq \frac{K}{S+\gamma_2'}\right)$, the rationing effect disappears and the MFI serves more type-2 applicants than in the ceiling-free situation ($n_2^* < n_2^{**}$). This is a consequence of the cost reduction associated with co-financing.

In case II ($P_2 + \gamma_2 \geq P_1 + \gamma_1 > S + \gamma_2'$), the ceiling-free MFI serves type-1 applicants only while the ceiling-constrained MFI prefers type-2 applicants. The bank's screening reduces the MFI's cost enough to reverse the MFI's preferences. Imposing a loan ceiling renders MFIs less social in the sense of serving a smaller number of small project holders ($n_1^* \geq n_1^{**}$). However, the severity of the bank's screening has a strong influence on the optimal allocation of the ceiling-constrained MFI. If the screening is soft $\left(N_2 \geq \frac{K}{S+\gamma_2'}\right)$, the MFI allocates its full budget to type-2 projects. In contrast, when the screening is tough $\left(N_2 < \frac{K}{S+\gamma_2'}\right)$, the surviving type-2 projects are rationed. Once the MFI has exhausted this limited set of projects, it uses its remaining budget to finance type-1 projects. Either way, the outcome is detrimental to small project holders. Case II illustrates the perverse effect of capping loan size. When case II applies, instead of forcing the MFI to finance small projects, the loan ceiling pushes the MFI toward co-financing large projects with banks.

In case III ($P_2 + \gamma_2 > S + \gamma_2' \geq P_1 + \gamma_1$), the loan ceiling has no impact on the MFI's loan allocation. The MFI prefers type-1 projects to both screened and unscreened type-2 ones. Hence,

the MFI is insensitive to the bank's presence and serves type-1 applicants only.[17]

In sum, in case I the loan ceiling works in line with the regulator's intention. In case II, the ceiling creates a perverse incentive to the MFI. In case III, the ceiling is useless. In practice, predicting the precise reactions of MFIs to a given loan ceiling is complicated for several reasons. First, same-jurisdiction MFIs exhibit substantial heterogeneity and attract different groups of applicants. Second, the impact of a loan ceiling crucially depends on the interaction of three parameters: the level of the ceiling, the cost reduction associated with the bank's screening, and the severity of this screening. Possibly, any reasonable loan ceiling will have the desired impact on some MFIs but the perverse effect on others.

Still, the level of the ceiling matters. All other things equal, low ceilings reduce the prevalence of case III, and make the MFI's optimal strategy more dependent on banks.[18] For regulators, identifying the ceiling that best fits their objective is not an easy task. When imposed to MFIs that spontaneously serve holders of small projects, ceilings may create mission drift. In contrast, ceilings may restore the social orientation of MFIs that are targeting more ambitious borrowers. Our empirical results will demonstrate that the risk of mission drift is a real one.

[17] This is not necessarily a market failure. Indeed, the bank could find type-2 projects attractive. Simply, capping the MFI's loan size is irrelevant to loan allocation. This is the typical situation where the regulation imposes a very high ceiling.

[18] In addition, the bank's screening severity could depend on the level of the loan ceiling. The lower the ceiling, the higher is the bank's exposure to credit risk.

3 Data and Context

In 2001, France adopted a regulatory "special window" devoted to non-bank financial institutions providing credit for small start-ups, business developments, and buy-outs. The notable advantage of complying with this regulation is the possibility of accessing funds on financial markets. Funds accessibility reduces the MFIs' dependency on subsidies. In 2007, the special window has been completed by The French Monetary and Financial Code (2007) allowing non-bank MFIs to supply microcredit provided that they comply to the EUR 10,000 loan ceiling.[19]

This French EUR 10,000 ceiling is significantly lower than the EUR 25,000 ceiling suggested by the European Commission. The French regulators justify this choice by restricting the target pool of borrowers of regulated MFIs to micro-businesses having no more than three employees.[20] Interestingly, the regulators do not mention any other characteristics of the borrowers. The regulators' motivations contrast with the narrative of the microfinance sector, which presents itself as favoring self-employment for the unemployed and disadvantaged-group members. Currently, France counts only three regulated non-bank MFIs: ADIE, CREASOL, and CSDL.[21]

To investigate the consequences of the French regulatory loan ceiling, we have hand collected ex-

[19] Some French commercial banks and cooperatives also supply microcredit. These institutions fall under the Banking Law, and not the special window (European Commission, 2007).

[20] The regulation also allows MFIs to grant consumer loans caped at EUR 3,000. However, there is no such loan in our sample.

[21] ADIE is the largest regulated MFI. In 2012, ADIE supplied 10,914 business microloans. Its year-end outstanding amount was EUR 58,010,000 (Adie Annual Report, 2012). In 2012, CREASOL supplied 648 business microloans. Its year-end outstanding amount was EUR 3,526,000 (CREASOL Annual Report, 2012). CSDL has not released its 2012 figures yet. In 2010, it supplied 285 business microloans for a total amount of EUR 1,542,000. (CSDL Annual Report, 2010).

haustive data on the applicants and borrowers of CREASOL, an NGO that turned itself into a regulated MFI in April 2009. Our database covers the 2008 - 2012 period, allowing us to observe the loan allocation process under both statuses. We view the change in status as a natural experiment representing a unique opportunity to scrutinize the impact of the French loan ceiling.

CREASOL was created in 2006 by a mainstream bank in the framework of its social responsibility policy. Until April 2009, CREASOL operated under the unregulated NGO status. It was subsidized by its parent bank and benefited from loan guarantees provided by the French Government. The board of the legally independent NGO included a CEO, an executive director, members of the parent bank, and independent members. As a non-regulated institution CREASOL had no access to financing means other than subsidies.

In April 2009, CREASOL decided to become a regulated MFI in order to gain access to funds at preferential rates. This transformation also resulted in a decrease of the dependence on its parent bank. Since April 2009, the loan ceiling of EUR 10,000 is enforced. At the time, the implementation of the new ceiling represented a real challenge for the managers and the customers of CREASOL.[22] Importantly, despite its statutory transformation the institution kept its social mission unchanged. The target clientele is primarily composed of two types of borrowers: unemployed individuals seeking self-employment, and start-ups lacking collateral.

Since its creation, CREASOL operates in line with the microcredit tradition and charges the same interest rate to all its clients. The average loan duration is 51 months. Loans are repaid in monthly installments. The annual interest rate is adjusted every two years to market conditions. Over the

[22] Interview with Daniel Boccardi and Christian Fara, the CEO and executive director of CREASOL, respectively. The interview was realized on the 27th of November 2013.

sample period, it ranges between 4% and 5%, which is low considering the credit risk associated with the financing of start-ups. In particular, the borrowers who managed to obtain co-financing from CREASOL and a bank were charged a lower rate by CREASOL than by the bank.

Until 2010, CREASOL had six employees. In 2010, it experienced a significant growth of its lending activity, which resulted in the opening of two new branches and the hiring of four additional employees. The loan granting process goes as follows. For each application, a loan officer collects all the relevant information about the business, the financing structure, and the applicant's individual and household characteristics. The loan officer makes a recommendation to the credit committee, which has the final say. Typically, the decision boils down to approval or denial of the demanded loan. Only in a small fraction of cases (7.6% in our sample) the granted loan size is smaller than the demanded amount. Although the decision-making process has two stages, we only recorded the final outcomes. Agier and Szafarz (2013) show that the loan officer's recommendation is mostly followed by the credit committee.

Overall, our database includes exhaustive information on 1,097 credit applicants. The sample period is split into two sub-periods, each one characterized by a specific regulatory status. During the first sub-period (April 2008-March 2009), CREASOL was an unregulated NGO operating in a ceiling-free environment. It treated 226 application files. During the second sub-period (April 2009-June 2012), CREASOL was a regulated MFI constrained by the EUR 10,000 loan ceiling. It received 871 loan applications.

Table 2 summarizes the characteristics of applicants and borrowers before and after the enforcement of the loan ceiling. These characteristics are split into three categories: financial, business-related,

and individual ones. The financial characteristics include the project size, the demanded loan size, the actual loan size,[23] and the existing sources of funds.

<Table 2>

Interestingly, the applicants' average project size does not vary across periods, staying slightly above EUR 30,000. This stability seems to indicate that there is a critical amount of cash needed to start a micro-business in France. If so, our data would suggest that the EUR 25,000 ceiling proposed by the European Commission is better adapted to the field than the French EUR 10,000 ceiling.

Despite the stability of the demanded loan sizes, we observe a significant increase in the actual loan size, which passed from EUR 26,550 to EUR 35,080. The increase is in line with the case II outcome of our theoretical model where the bank's screening pushed the MFI toward funding larger projects.

As a mechanical consequence of the loan ceiling, in the second period the demanded loan size dropped dramatically (from EUR 18,380 to EUR 7,010). Likewise, the average loan size passed from EUR 15,740 to EUR 6,890. In the ceiling-free context, 70% of the demanded loans surpass EUR 10,000. This is additional evidence that the French ceiling is binding. It seems very low compared to the needs of micro-entrepreneurs. In the second period, only 29% of the demanded loans are equal to the ceiling value. This sharp drop in ceiling-high demands gives credence to the assumption that the bank's screening process reduces the number of applicants holding large

[23] Evidently the two average loan sizes are not measured from the same sample, which explains the discrepancies observed despite the fact that CREASOL typically grants the demanded amounts.

projects. This explanation is also consistent with the fact that 27% of the second-period applicants have previously secured a bank loan. Note that 54% of the applicants requesting an amount higher or equal to EUR 10,000 held a bank loan.

Interestingly, in the ceiling-free situation, the few applicants with bank loans were all denied micro-credit.[24] In the ceiling-constrained situation, the share of holders of a bank loan is higher among borrowers (33%) than among applicants (27%). Holding a bank loan has moved from being a liability to being an asset.

The ceiling seems to have no influence on the proportion of applicants/borrowers having a personal investment (around 82%).[25] However, in the second period the size of the personal investment rose significantly among borrowers, and not among applicants. This suggests that the regulated MFI prefers applicants with higher personal investments.

The proportion of applicants/borrowers having funds from other sources also increased significantly after the enforcement of the ceiling. The loan cap seems to have incited micro-entrepreneurs put effort in seeking additional funds rather than downsizing their projects.[26]

[24]Precisely, there are six such applicants in our database. However, their average project size (EUR 114,000) makes them be potential outliers.

[25]Financial support from family and friends is here considered as personal investment.

[26]The main contributions to "other funds" come from subsidized loans (76%) or direct subsidies (19%) to micro-enterprises. For instance, *Initiative France* is a state-funded institution offering zero-interest loans to individuals willing to start, develop or buy-out a business. The 2012 average loan size released by Initiative France is EUR 8,340. (See http://www.initiative-france.fr/Creer/Pret-d-honneur). *Nouvel Accompagnement à la Création et la Reprise d'Entreprise* (NACRE) is another public program supplying to entrepreneurs business development services and zero-interest loans capped at EUR 10,000. Last, the unemployed seeking self-employment have access to grants from the national employment agency.

Fig.1 depicts the average financing plans submitted by CREASOL's applicants in the two periods. It shows that the share of project size demanded to CREASOL dropped from 67% to 41%. In contrast, the share of the bank loan passed from 1% to 14%. Logically, the enforcement of the loan ceiling coincided with applicants exhibiting a higher diversification of funding sources, but perhaps with the disappearance too of some applicants who would need above-ceiling loans from CREASOL but failed to secure bank loans.

<Figure 1>

The business characteristics in Table 2 show that start-ups constitute the lion's share of CREASOL's loan portfolio. Their proportion remains stable over time (around 82%). Likewise, there is not substantial change in sector representation, except for the trade sector, which gained 9% in the second period, but only among applicants. Among the individual characteristics, the two–possibly interlinked–significant changes concern an increase in the average household income and a decrease in the proportion of single applicants. The regression analysis will control for all these variables.

Fig. 2 features the relationship between project size and loan size.[27] We represent the two period-specific scattered plots and the corresponding regression lines. As expected, the relationship is positive. However, the scatter-plots exhibit strong differences. Under regulation CREASOL financed larger projects than it did when unregulated. Moreover, Fig. 2 illustrates the impact of the loan ceiling. For the second sub-period, there is indeed an accumulation of points hitting the upper limit for loan size of EUR 10,000.[28] As expected, due to the loan ceiling, when the project

[27] Only actual loans are taken into account.

[28] Actually, before the change CREASOL had imposed to itself a maximal loan size of EUR 40,000. However, this limitation was hardly binding.

size increases, the share financed by CREASOL mechanically decreases.

<Figure 2>

To test the implications of our model, we need to identify the empirical counterparts of the theoretical notions of type-1 and type-2 applicants. In other words, we must find a size threshold to categorize projects as "small" (type-1) or "large" (type-2). At first glance, the loan ceiling, EUR 10,000, might seem an appealing candidate for this threshold. However, we are seeking a size threshold whereas the ceiling is on loans. As descriptive statistics amply document, the loan ceiling does not cap project size, because entrepreneurs do not seek full debt financing.[29] For this reason, determining a meaningful size threshold is not easy.[30]

To separate small and large projects in our sample, we combine two approaches. In line with the theory, the first approach considers that type-1 projects are small enough to be financeable in full by a combination of personal investment, a loan from the MFI and the so-called "funds from other sources," thus excluding bank loans. For each applicant, we compute the total amount of money previously collected from all sources but bank loans. The average amount, computed over the whole sample, is added to the loan ceiling to obtain a first proxy for the size threshold equal to EUR 22,048. The second approach uses data from the ceiling-constrained period only, it considers as type-1 projects those for which fewer than 50% of the applicants hold a bank loan. Table 3 places the second proxy for the size threshold between EUR 25,000 and EUR 30,000. Equipped

[29] To deal with moral hazard and adverse selection issues, financial institutions favor entrepreneurial projects with already secured partial funding coming from personal money or funds provided by friends and family (Manigart and Struyf, 1997; Berger and Udell, 1998).

[30] Undeniably, choosing this threshold is somewhat endogenous, and robustness checks will be required to examine the sensitivity of our results with respect to the threshold.

with these two complementary approaches, we have decided to use the middle-of-the-road EUR 25,000 threshold in the baseline regressions, while keeping a large spectrum of other possibilities (between EUR 10,000 and EUR 40,000) for the purpose of robustness checks.

<Table 3>

The aim of our empirical exercise is to test the prediction of case II in the theoretical model according to which a loan ceiling can trigger mission drift. More precisely, we will study how the MFI's approval process changed after the enforcement of the loan ceiling. Did the MFI favor loans to holders of large projects (i.e. type-2 applicants)? Did the MFI prefer holders of bank loans? To offer a first hint, Table 4 reports approval rates over the two periods, broken down by project size. The approval rates over the two periods are compared by means of two-sided t-tests.

<Table 4>

The overall approval rate is significantly higher after the enforcement of the loan ceiling (60% against 44%). However, the significance of the increase is not uniform across project sizes.[31] We observe significant differences (at the 5% level at least) for projects surpassing EUR 30,000, while a 10% significance level is obtained for the EUR 25,000-EUR 30,000 class. For smaller projects, the approval rates do not significantly change in the presence of the ceiling.[32] This suggests that the enforcement of the ceiling was followed by more favorable treatment for large loans, which is

[31] The only class of projects for which the approval rate decreased includes those sized between EUR 15,000 and EUR 20,000. The difference (49% against 65%) is significant at the 10% level only.

[32] The difference in significance levels is not linked to statistical precision since the numbers of observations are higher in small-size project classes.

consistent with case II in the theoretical model. In the next section, we use probit difference-in-differences (diff-in-diff) estimation to further investigate how the loan ceiling has affected the approval process.

4 Regression Analysis

Our theoretical model predicts that the impact of microfinance loan ceilings depends on the severity of the credit rationing exerted by regular banks. When rationing is strong (case I in Table 1), the ceiling-constrained MFI is more social than its ceiling-free counterpart, insofar as it finances smaller projects. In contrast, when rationing is mild (case II), the ceiling-constrained MFI finances larger projects than its ceiling-free counterpart. This is because free-riding reduces the MFI's screening costs of larger projects. Last, when the ceiling is high enough to be non-binding, the MFI is insensitive to credit rationing by regular banks (case III).

Regarding CREASOL, the MFI under study, the descriptive statistics show that the ceiling is strongly binding, so that case III is excluded. When CREASOL was unregulated, more than 50% of its loans were sized above the ceiling. Likewise, case I seems unlikely since the enforcement of the ceiling coincided with an increase in the proportion of large projects financed. To test the model predictions in case II while controlling for applicants' characteristics, we now turn to regression analysis.

Regulatory changes can be viewed as natural experiments, the consequences of which can be ex-

plored econometrically by means of diff-in-diff estimation.[33] Here, we aim to test the two predictions obtained in case II, provided in the last column of Table 1. These theoretical results concern outreach, i.e. the number of loans granted by the MFI.[34] The first prediction ($n_1^* \geq n_1^{**}$) states that the total number of type-1 projects granted by the MFI is not larger in the ceiling period than in the ceiling-free period. The second prediction ($n_2^* \leq n_2^{**}$) reverses the inequality for type-2 projects. Together, the two inequalities describe the ceiling-driven mission drift in case II. They are not, however, equivalent since the total number of projects financed by the MFI is period specific, so that: $(n_1^* + n_2^*) \neq (n_1^{**} + n_2^{**})$.

To build the empirical counterparts of the two theoretical predictions, we use probabilities of approval. The first testable hypothesis, H_1 in Table 5, states that the approval probability of type-1 projects is not larger in the ceiling period than in ceiling-free period. Similarly, H_2 in Table 5 claims that the approval probability of type-2 projects is not smaller in the ceiling period than in the ceiling-free period.

<Table 5>

To implement the tests in Table 5, we estimate a diff-in-diff probit model explaining loan approval as a function of the project type, the period, and control variables. Along with the results in Section

[33] Previous papers have studied in this way the impact of regulatory shifts on firm financing. Using non-linear diff-in-diff estimation Kamar *et al.* (2008) show that the 2002 Sarbanes-Oxley Act decreased small business financing on capital markets. Using a linear probability model (OLS and fixed-effect model), Quinn (2012) finds that the 2001 Moroccan corporate law harmed access to bank financing and made it harder for firms to reach limited-company status.

[34] Each prediction compares the success of type-i (i = 1, 2) applicants across the two periods. In the model, all type-i projects have the same size, which makes the results easier to outline.

3, we use the EUR 25,000 threshold to delimitate type-1 (small) and type-2 (large) projects. In the regressions, project type is captured by the dummy variable *Large Project*, which takes value 1 for projects above EUR 25,000, and 0 otherwise. The presence of the loan ceiling is represented by the dummy variable, *Ceiling*, which takes value 1 in April 2009 and after, and 0 in March 2009 and before.

The estimated model is written:

$$E[Approval|Large\ Project, Ceiling, X] =$$

$$\Phi(\beta Large\ Project + \delta Ceiling + \gamma Ceiling * Large\ Project + \theta X) \tag{8}$$

where X is a vector of control variables including the constant term; β, δ, γ, and vector θ represent the parameters to be estimated; and $\Phi(\cdot)$ is the normal cumulative distribution function.

Coefficients β and δ capture the effects of project size and period, respectively (Puhani, 2012). Our first hypothesis to be tested, H_1, is about the impact of the ceiling on the approval probability of type-1 projects. From Eq. (8), we have:

$$\frac{\Delta E[Approval|Large\ Project = 0, Ceiling, X]}{\Delta Ceiling} = \Phi(\delta + \theta X) - \Phi(\theta X) \tag{9}$$

As $\Phi(\cdot)$ is strictly monotonic, δ and $[\Phi(\delta + \theta X) - \Phi(\theta X)]$ have the same sign. Hence, H_1 can be reformulated as: $\delta \leq 0$.

Similarly, we have:

$$\frac{\Delta E[Approval|Large\ Project = 1, Ceiling, X]}{\Delta Ceiling} = \Phi(\delta + \gamma + \theta X) - \Phi(\theta X) \tag{10}$$

The sum $\delta+\gamma$ captures the effect of the loan ceiling on type-2 projects, so that H_2 can be rephrased as $\delta+\gamma \geq 0$. The parameter inequalities associated with H_1 and H_2 are provided in the last column of Table 5.

The theoretical predictions we seek to test compare the approval probabilities of fixed-type projects before and after the ceiling is enforced. In addition, diff-in-diff estimation provides fruitful comparisons between the treatments of same-period type-1 and type-2 projects. Indeed, Eq. (8) implies that:

$$\frac{\Delta E[Approval|Large\ Project, Ceiling = 0, X]}{\Delta Large\ Project} = \Phi(\beta + \theta X) - \Phi(\theta X) \tag{11}$$

and:

$$\frac{\Delta E[Approval|Large\ Project, Ceiling = 1, X]}{\Delta Large\ Project} = \Phi(\beta + \delta + \gamma + \theta X) - \Phi(\delta + \theta X) \tag{12}$$

For instance, a negative β (resp. a positive $\beta+\gamma$) indicates that the first-period (resp. second-period) loan approval of type-2 projects is tougher (resp. looser) than for type-1 ones.

Table 6 presents the estimation results. In Panel A, columns (1) to (4) report the estimates obtained for four specifications of Eq. (8) corresponding to the progressive inclusion of control variables. Panel B summarizes the results regarding our coefficients of interest. The first two lines in Panel B are designed to test hypotheses H_1 and H_2. The next two lines compare approval

probabilities of the two types of projects granted in the same-period.

<Table 6>

The first specification (column (1)) excludes any control variable. The second specification (column (2)) controls for the sources of funding (personal investment and funds from other sources). To avoid multicollinearity, we exclude variables related to bank loans.[35] The third specification (column (3)) also includes sector characteristics. The last one (column (4)) adds borrowers' individual characteristics.

Overall, the results are remarkably consistent across specifications.[36] The coefficient of the *Large Project* dummy is significantly negative. The coefficient of the *Ceiling* dummy is insignificant, but the loading of the interaction term $Ceiling * Large\ Project$, is significantly positive.

Panel B provides evidence on the relevance of case II in our model. Since δ is not significantly different from zero, one cannot reject the hypothesis that type-1 projects have similar approval rates in both periods. However, $(\delta+\gamma)$ being significantly positive suggests that type-2 projects are treated more favorably by the ceiling-constrained MFI than by the ceiling-free one. In theoretical terms, our results support the following statements: $n_1^* = n_1^{**}$ and $n_2^* < n_2^{**}$. These expressions are special cases of the two inequalities characterizing case II in our model, namely: $n_1^* \geq n_1^{**}$ and $n_2^* \leq n_2^{**}$.

[35] The dummy variable "Having a bank loan" and the size of the bank loan are both highly correlated with project size. These statistically inconvenient features corroborate our argument on the importance of co-financing.

[36] Adding controls marginally increase both the significance of the *Large Project* dummy and its (absolute) value. However, we interpret signs only, since the non-linearity of the model makes amplitudes irrelevant.

The last two lines in Table 6 deliver two additional insights. First, β is significantly negative, which indicates that the ceiling-free MFI favors small projects to large ones, all else equal. This result confirms that the MFI fulfils its social mission faithfully, at least in the ceiling-free period. Second, $(\beta + \gamma)$ is significantly positive. Thus, the bias toward small projects is reverted after the enforcement of the loan ceiling. In the second period, the MFI grants loans to large projects more easily than to their small counterparts. Although we fail to observe any change in the approval of small projects, these figures confirm that large projects experience a major upward shift in their approval rate. Regardless of the underlying mechanism, our results confirm that introducing a loan ceiling makes the MFI prefer to finance large projects. This is the typical stigma of mission drift in microfinance (Armendariz and Szafarz, 2011).

The evidence of mission drift is however mitigated by the fact that, in absolute terms, people with small projects do not endure harsher loan approval after the enforcement of the ceiling than before it ($n_1^* = n_1^{**}$). The harm exists only relative to applicants with large projects, who enjoy significantly better approval conditions once the loan ceiling comes into force. Thus, relatively speaking, small projects are disadvantaged in the second period. With loan approval becoming easier for large projects, but not for small ones, the share of small projects financed by the MFI mechanically decreases. Put differently, the introduction of the ceiling has benefited to the holders of large projects only. This can be interpreted as a mild form of mission drift.

Contrasting with standard applications of diff-in-diff estimation, our econometric design is meant to explore the impact of the regime change on an institutional variable, namely the MFI's approval probability, and not on the treatment of individuals, here the MFI's borrowers. This design makes

our estimates immune to the violation of the so-called "stable unit treatment value assumption" (SUTVA), which states that the treatment of an individual has no spillover effect on that of other individuals (Wooldridge 2002, pp. 629).[37]

In line with the prediction of case II in our theoretical model, the diff-in-diff regressions demonstrate that the French loan ceiling pushed CREASOL to deviate from its social mission, which consists in serving poor entrepreneurs disregarded by mainstream banks. This outcome sharply contrasts with the regulators' expected scenario featured in case I of the model. The results, however, are contingent on the level of the French ceiling, which is particularly low by developed-country standards.

Generally speaking, determining a loan ceiling that prevents mission drift is difficult, if not impossible, for several reasons. While high ceilings are useless (case III), the difference between case I (desired case) and case II (mission drift) is subtle. Case II can emerge when two conditions are met. First, the ceiling needs to be low enough to be binding: the ceiling-constrained MFI is unable to serve applicants who would be welcome otherwise. The lower the ceiling, the higher is the probability for this situation to occur. The second condition relates to the presence of mainstream banks willing to co-finance projects with the MFI. If no such bank exists or if the existing ones ultimately reject all the applicants, mission drift is impossible. In contrast, when banks are willing to co-finance projects, the MFI has the opportunity to free-ride on their screening process. Free-riding makes larger projects less costly to handle and monitor. This effect is mitigated by the severity of the bank screening process. Applications denied by banks cannot reach the MFI anymore. As a

[37] Unarguably, our study is incompatible with SUTVA. Imposing a loan ceiling affects the whole pool of applicants, as our descriptive statistics confirm. For type-2 applicants, the impact is direct since they need to find new sources of funds. Changes in the pool of type-1 applicants may result from downscaling. Self-selection can push otherwise ambitious applicants to spontaneously down-scale their projects in order to become admissible by the MFI. Alternatively, project downscaling can follow on from loan denial by banks.

result, the MFI can be rationed in large projects and keep serving holders of below-ceiling projects, though in a reduced proportion. Our empirical exercise shows that the combination of the two conditions for the emergence of mission drift is realistic. Loan ceilings make perfect sense to counteract on mission drift in developing countries where the credit market is highly segmented. In developed countries, things are different. Regulators of the microfinance industry should take the risk of loan-ceiling-driven mission drift seriously.

5 Robustness Checks

In this section, we check the robustness of our regression results along two dimensions. First, a key value set in the analysis is the threshold used to separate large projects from small ones. Although the EUR 25,000 threshold was carefully justified in Section 3, this value remains somewhat arbitrary from the theoretical standpoint. We therefore test whether our empirical results resist changes in this threshold. Section 5.1 runs the diff-in-diff regressions with six different values for the threshold. The second check concerns the length of the observation period that followed enforcement of the loan ceiling. Possibly, the changes in loan approval detected in the baseline regressions are, at least partly, due to events that occurred in this period and had nothing to do with microfinance regulation. To test this possibility, we reduce the time span after the introduction of the ceiling, and rerun the regressions.

5.1 Specification of Project Size

Table 7 presents the diff-in-diff estimates for specification (4) in Table 6 (Panel B) using six different size thresholds, including the one used in the baseline regression, which serves as a reference. Specifically, we consider the following cut-offs to define the *Large Project* dummy variable: EUR 10,000, EUR 15,000, EUR 20,000, EUR 25,000 (reference), EUR 30,000, and EUR 40,000.

The first two lines of Table 7 suggest that the theoretical predictions of case II are confirmed for all the size thresholds used here. In the last two lines, the coefficients lose significance for the thresholds of EUR 10,000 and EUR 15,000. This suggests that applicants with projects below EUR 15,000 are not credit constrained with below-ceiling loans from the MFI.[38] These results not only confirm the robustness of our previous results; they also confirm the findings in Section 3 that a size threshold smaller than or equal to EUR 15,000 makes little sense.

<Table 7>

5.2 Reducing the Observation Period

Our database covers the May 2008-June 2012 period, and the loan ceiling was enforced in April 2009. The baseline regressions exploit the full database in order to gain on precision. As a result we are dealing with a one-year first period and an over-three-year second period. However, using a

[38] In our sample, only 3% of the applicants with projects below EUR 15,000 have a bank loan.

relatively long second period increases the probability that the explained variable is influenced by events not linked to the regulatory change under scrutiny.

To check whether this issue affects our empirical findings, we run the regressions with a reduced time-span stopping in June 2010. The reduced sample is made up of 226 observations for the first period and 268 observations for the second. Table 9 in the Appendix provides the descriptive statistics. It suggests that enforcement of the loan ceiling resulted in the short run in a sharp drop in the size of financed projects, from above EUR 30,000 to below EUR 20,000. The project size stabilized later, apparently after more than one year, once the applicants started realizing that co-financing was a feasible option. Likewise, the proportion of start-ups increased significantly in the short run. This is not surprising, as development projects typically require more funding than start-ups. Interestingly, the proportion of long-term unemployed individuals increased in the short run.

Table 8 features the estimation results for the reduced period. Apart from some lower significance levels attributable to the smaller sample size, the figures appear to be remarkably close to those of the baseline regressions.

<Table 8>

Overall, the robustness checks suggest that the mission-drift outcome resists changes in both the size threshold and the period delimitation. In this way, the checks reinforce the empirical validity of case II in our theoretical model.

6 Conclusion

This paper addresses the impact of loan ceilings on the microcredit market, both theoretically and empirically. Our theoretical model applies to an MFI operating in a competitive credit market, which is the case in most developed economies. The MFI is subsidized and offers loans at below-market conditions. The presence of mainstream banks willing to co-finance projects with the MFI is a distinctive feature of our model, which also makes it specific to developed economies. Relying on these assumptions, we show that imposing a low loan ceiling can trigger mission drift. The MFI can be tempted to opt for a cost-reducing strategy including co-financing above-ceiling projects with banks. This strategy is at the expense of holders of small projects, who need below-ceiling loans. As a consequence, the ceiling-constrained MFI might end up granting larger loans and attracting wealthier clients, a phenomenon called "mission drift" in the microfinance literature.

The second part of this paper tests the prediction of our model by exploiting a natural experiment. We benefited from detailed information on the applicants of a French MFI before and after the enforcement of the French EUR 10,000 loan ceiling. The descriptive statistics shows that in the ceiling-constrained MFI initiated co-financing large projects with banks. At the same time, our diff-in-diff probit regressions confirm that loan approval became significantly easier for holders of large projects. Mission drift is thus a real threat associated with the enforcement of a loan ceiling. Therefore, regulators should pay attention to this possible outcome when imposing loan ceilings to the microfinance industry.

Binding loan ceilings encourage bank-MFI co-financing schemes and diffuse the benefits of subsidization across a pool of borrowers that goes beyond the typical target pool of MFIs. Actually,

co-financing schemes have both advantages and drawbacks. The very existence of subsidized MFIs represents an opportunity for mainstream banks to find partners to share risks with. This is especially relevant when it comes to finance start-ups that would otherwise be denied from access to the credit market. However, co-financing makes MFIs dependent on the screening processes of mainstream banks. Eventually, banks can significantly modify the pool of project holders who end up applying for microcredit. In addition, this can perversely affect the credit allocation of MFIs. In line with our theoretical model, our empirical analysis provides evidence of this perverse effect. Incidentally, it confirms that average loan size is a poor indicator of mission fulfillment (Dunford, 2002; Armendariz and Szafarz, 2011). The size of a single leg of a two-leg funding arrangement makes little sense. In our empirical study, the average loan size of the MFI mechanically decreased after the enforcement of the loan ceiling, although the MFI started (co-)financing larger projects.

The prevalence of bank-MFI co-financing schemes might also harm the disadvantaged segments of the population who are typically targeted by MFIs. Notably, these segments include unemployed persons, women, and migrants who seek financial empowerment through self-employment. When finding a paid job is difficult for reasons pertaining to lack of diploma and/or discrimination in the job market, self-employment remains one of the few possibilities left for escaping poverty. Further research is needed to investigate whether–regulated or not–MFIs in developed countries are able to efficiently address the key issue of poverty alleviation.

Our theoretical model suffers from several limitations. First, it assumes that the MFI maximizes outreach, i.e. its number of borrowers. While this assumption is frequently used, the literature has not yet met a consensus on the way to formalize the objective function of MFIs. In fact, there are reasons to believe that the objective of MFIs is complex and institution-specific (Molenaar, 2009;

Hudon and Sandberg, 2013). Second, we use a one-period model and consider two project sizes only. These simplifications help deriving a three-case comparative analysis contrasting the situations of the MFI with and without a loan ceiling. More sophisticated specifications could deliver a more nuanced picture. In particular, the empirical analysis has shown that the personal investment of the applicants matters.

Our database is remarkably detailed but still limited to a single institution, CREASOL. In addition, the change of status of this institution was not randomly assigned. We cannot rule out that the decision of the managers to opt for the MFI status was, at least partly, driven by their intention to serve holders of larger projects and become more profitable. This however would contradict the public statements according to which the status change was motivated by gaining access to funds at preferential rates while keeping the social mission unaltered. In any case, the loan ceiling made it possible to deviate–intentionally or not–from serving holders of small projects.

This paper emphasizes that regulations imposing loan ceilings on microcredit activities can have unexpected and perverse consequences. From that perspective, working with a single institution is sufficient to make our point. Admittedly, the French ceiling is very low. It is even the lowest loan ceiling found in developed countries. Addressing the reasons for this French peculiarity goes beyond the scope of this paper. But, whatever the reason, we hope that our conclusions will raise concern among regulators of microcredit in developed countries.

Our main message to regulators is the following. Due to the pervasive diversity in the microfinance industry, it is very difficult, if not impossible, to find an optimal loan ceiling that would be low enough to make a difference, but at the same time high enough to avoid mission drift. In view of

this problem, other regulation designs could be envisaged. Our case study emphasizes that project size matters more than loan size when it comes to defining social lending. Therefore, a regulatory route could be to impose ceilings to project size rather than loan size. Such a rule could, however, be easily circumvented by artificially splitting large projects into smaller ones.

Alternatively, regulators could try delimiting the target pool of borrowers of subsidized institutions. For instance, women and discriminated-against minorities could be targeted more specifically. In this way, microfinance in developed countries would meet its original principle of serving poor and disadvantaged populations. This is of utmost importance since the microfinance sector in developed countries is still very young. Regulations have a key role to play in shaping its future.

Appendix

<Table 9>

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Tables and Figures

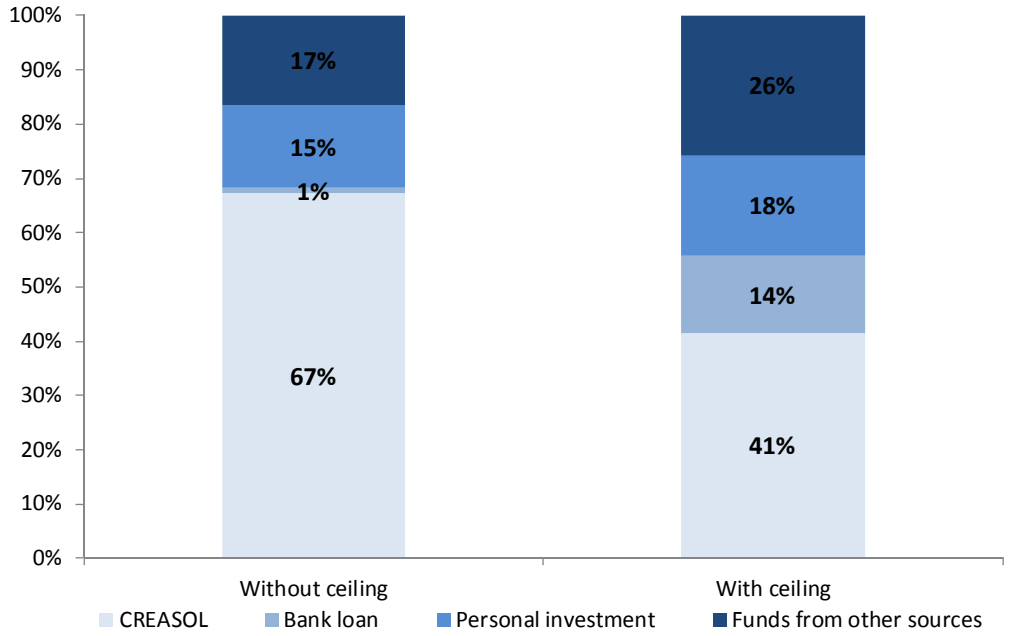

Figure 1: **Applicants' project financing without and with ceiling**

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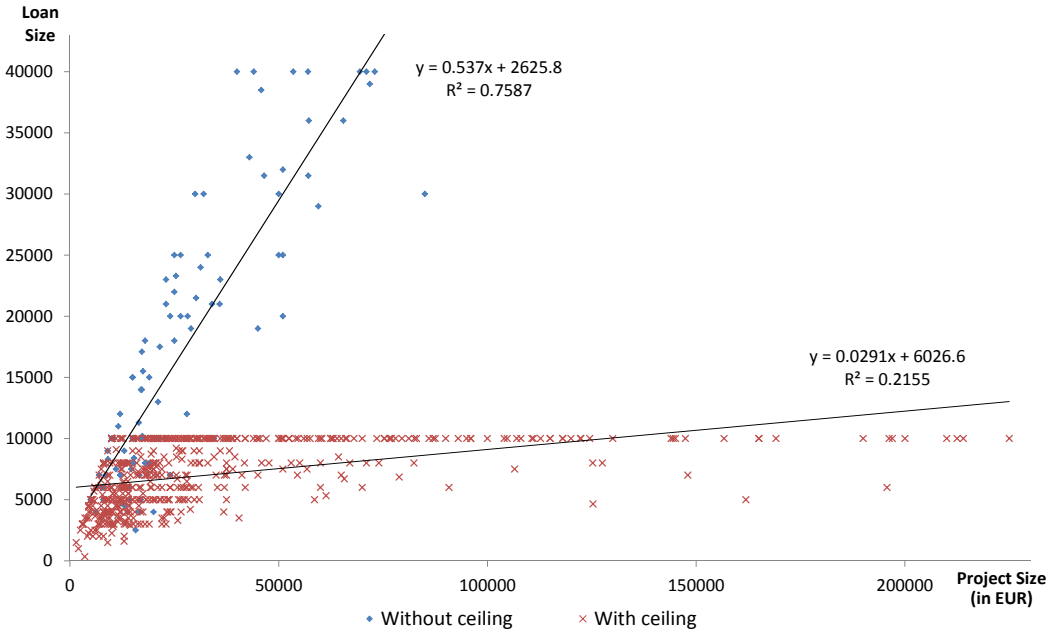

Figure 2: **Loan Size as a Function of Project Size**

Table 1: **Comparison of optimal loan allocations without and with ceiling**

Case	Without ceiling		With ceiling		Outreach	
	n_1^*	n_2^*	n_1^{**}	n_2^{**}	Small projects	Large projects
I. $P_1+\gamma_1 > P_2+\gamma_2 > S+\gamma_2^{'}$	0	$\frac{K}{P_2+\gamma_2}$	$\max\left\{0, \frac{K-(S+\gamma_2^{'})N_2}{P_1+\gamma_1}\right\}$	$\min\left\{\frac{K}{S+\gamma_2^{'}}, N_2\right\}$	$n_1^* \leq n_1^{**}$	$n_2^* \lesseqgtr n_2^{**}$
II. $P_2+\gamma_2 \geq P_1+\gamma_1 > S+\gamma_2^{'}$	$\frac{K}{P_1+\gamma_1}$	0	$\max\left\{0, \frac{K-(S+\gamma_2^{'})N_2}{P_1+\gamma_1}\right\}$	$\min\left\{\frac{K}{S+\gamma_2^{'}}, N_2\right\}$	$n_1^* \geq n_1^{**}$	$n_2^* \leq n_2^{**}$
III. $P_2+\gamma_2 > S+\gamma_2^{'} \geq P_1+\gamma_1$	$\frac{K}{P_1+\gamma_1}$	0	$\frac{K}{P_1+\gamma_1}$	0	$n_1^* = n_1^{**}$	$n_2^* = n_2^{**}$

Table 2: **Descriptive Statistics: Characteristics of Applicants and Borrowers**[a]

	Applicants			Borrowers		
	Without Ceiling	**With Ceiling**	**t-test**	**Without Ceiling**	**With Ceiling**	**t-test**
Financial Characteristics						
Project size (kEUR)	30.22	30.62	0.40	26.55	35.08	8.53**
Demanded loan size (kEUR)	18.38	7.01	-11.36***	16.62	7.05	-9.57***
Demanded loan size $\geq$ 10000 (%)	0.70	0.29	-0.41***	0.65	0.31	-0.34***
Granted loan size				15.74	6.89	-8.84***
Having a bank loan (%)	0.03	0.27	0.25***	-	0.33	-
Bank loan (kEUR)[b]	46.53	40.87	-5.66	-	43.04	-
Having personal investment (%)	0.81	0.83	0.02	0.83	0.87	0.04
Personal investment (kEUR)[b]	6.85	7.08	0.2	6.00	8.21	2.21*
Having funds from other sources (%)	0.55	0.69	0.14***	0.51	0.71	0.20***
Funds from other sources (kEUR)[b]	9.02	9.49	0.47	9.19	9.69	0.50
Business Characteristics						
Start-up (%)	0.80	0.84	0.04	0.79	0.81	0.02
Services (%)	0.28	0.30	0.02	0.28	0.30	0.03
Trade (%)	0.22	0.31	0.08**	0.24	0.29	0.05
Accommodation and food service activities (%)	0.16	0.13	-0.04	0.13	0.11	-0.01
Construction (%)	0.09	0.11	0.02	0.11	0.11	0.01
Arts, entertainment and recreation (%)	0.07	0.04	-0.02	0.05	0.04	-0.01
Other sectors	0.18	0.12	-0.06**	0.19	0.14	-0.05
Individual Characteristics						
Unemployed for more than six months (%)	0.55	0.59	0.04	0.49	0.55	0.06
Female applicant (%)	0.38	0.41	0.02	0.34	0.40	0.06
Single (%)	0.59	0.51	-0.08**	0.63	0.45	-0.18***
Education (nb. of achieved diplomas)	2.74	2.77	0.04	2.84	2.91	0.07
Average monthly household income (kEUR)	1.10	1.47	0.37***	1.20	1.64	0.43***
Nb. of observations	226	871		100	521	

[a]The table gives mean values and t-test for equal means between the two sub-periods (without and with loan ceiling).
[b]The mean value is computed using only non zero data points.
Significance: *** p<0.01, ** p<0.05, * p<0.1

Table 3: **Descriptive Statistics: Bank Loan and Approval Rate, with Ceiling only**

Project Size Range (EUR)	**Without bank loan**		**With bank loan**		**% applicants with bank loan**	**% borrowers with bank loan**
	Applicants	**Borrowers**	**Applicants**	**Borrowers**		
0-10,000	2	1	170	94	1%	1%
10,000-15,000	8	4	178	93	4%	4%
15,000-20,000	7	5	111	53	6%	9%
20,000-25,000	18	8	80	50	18%	14%
25,000-30,000	14	12	50	33	22%	27%
30,000-40,000	39	28	28	18	58%	61%
40,000-60,000	42	29	11	7	79%	81%
60,000-80,000	40	28	3	3	93%	90%
80,000-291,400	68	55	2	0	97%	100%
Total	**238**	**170**	**633**	**351**	**27%**	**33%**

Table 4: **Descriptive Statistics: Project Sizes and Approval Rates without and with Ceiling**

Project Size Range (EUR)	**Without ceiling**			**With ceiling**		
	Applicants	**Borrowers**	**Approval rate**	**Applicants**	**Borrowers**	**Approval rate**
0-10,000	31	14	45%	172	95	55%
10,000-15,000	31	14	45%	186	97	52%
15,000-20,000	32	21	65%	118	58	49%*
20,000-25,000	23	10	43%	98	58	59%
type-1 projects	**117**	**59**	**50%**	**574**	**308**	**54%**
25,000-30,000	20	10	50%	64	45	70%*
30,000-40,000	26	9	35%	67	46	69%***
40,000-60,000	44	16	36%	53	36	68%***
60,000-80,000	12	5	42%	43	31	72%**
80,000-291,400	7	1	14%	70	55	79%***
type-2 projects	**109**	**41**	**38%**	**297**	**213**	**72%*** **
Total	**226**	**100**	**44%**	**871**	**521**	**60%*** **

Stars report the significance levels of the t-tests for equal approval rates without and with ceiling.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: **Hypotheses to be Tested**

Hypothesis	Theoretical prediction	Empirical test
H_1: The approval probability of type-1 projects is not larger in the ceiling period than in the ceiling-free period.	$n_1^* \geq n_1^{**}$	$\delta \leq 0$
H_2: The approval probability of type-2 projects is not smaller in the ceiling period than in the ceiling-free period.	$n_2^* \leq n_2^{**}$	$\delta + \gamma \geq 0$

Table 6: **Probability of Approval**

Panel A: Coefficient estimates (standard errors in parentheses)								
	(1)		(2)		(3)		(4)	
Ceiling ($\hat{\delta}$)	0.05	(0.13)	0.04	(0.13)	0.04	(0.13)	-0.01	(0.14)
Large Project ($\hat{\beta}$)	-0.40**	(0.17)	-0.45***	(0.17)	-0.52***	(0.18)	-0.56***	(0.19)
Ceiling*Large Project ($\hat{\gamma}$)	0.89***	(0.19)	0.89***	(0.19)	0.97***	(0.20)	0.93***	(0.21)
Having personal investment			0.26**	(0.11)	0.29**	(0.12)	0.27**	(0.12)
Having funds from other sources			-0.02	(0.09)	-0.02	(0.09)	0.03	(0.09)
Start-up					-0.38***	(0.12)	-0.27**	(0.13)
Services					-0.21	(0.14)	-0.19	(0.14)
Trade					-0.38***	(0.14)	-0.34**	(0.14)
Food and accommodation					-0.61***	(0.16)	-0.48***	(0.17)
Construction					-0.12	(0.17)	-0.05	(0.17)
Arts and entertainment					-0.43**	(0.21)	-0.32	(0.23)
Unemployed for more than 6 months							-0.23***	(0.09)
Female							0.01	(0.09)
Single							-0.08	(0.09)
Education (nb. of achieved diplomas)							0.06**	(0.03)
Household income							0.09**	(0.04)
Constant	0.04	(0.11)	-0.14	(0.14)	0.48**	(0.20)	0.30	(0.23)
Nb. of observations	1,097		1,097		1,056		1,016	
Panel B: Diff-in-diff estimates (p-values in parentheses)								
	(1)		(2)		(3)		(4)	
$\hat{\delta}$	0.05	(0.68)	0.04	(0.75)	0.04	(0.75)	-0.01	(0.97)
$\hat{\delta}+\hat{\gamma}$	0.94***	(0.00)	0.93***	(0.00)	1.01***	(0.00)	0.92***	(0.00)
$\hat{\beta}$	-0.40**	(0.02)	-0.45***	(0.01)	-0.52***	(0.00)	-0.56***	(0.00)
$\hat{\beta}+\hat{\gamma}$	0.48***	(0.00)	0.44***	(0.00)	0.46***	(0.00)	0.37***	(0.00)

This table reports the results of estimating a probit model in which the dependent variable is being granted a loan by the MFI. Panel A reports coefficient estimates and, in parentheses, standard errors. Panel B reports diff-in-diff estimates, and in parentheses, p-values based on Wald tests. *Large Project* is an indicator for projects larger than 25,000. *Ceiling* is the indicator for the period after the introduction of the loan ceiling (April 2009). Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 7: **Probability of Approval: Different Specifications for Project Size**

Threshold for Large Project dummy	10,000	15,000	20,000	25,000	30,000	40,000
$\hat{\delta}$	0.09	0.10	-0.07	-0.01	0.10	0.19
	(0.73)	(0.60)	(0.65)	(0.97)	(0.45)	(0.11)
$\hat{\delta}+\hat{\gamma}$	0.44***	0.52***	0.80***	0.92***	0.95***	1.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\hat{\beta}$	-0.27	-0.30	-0.56***	-0.56***	-0.53***	-0.51**
	(0.33)	(0.16)	(0.00)	(0.00)	(0.01)	(0.02)
$\hat{\beta}+\hat{\gamma}$	0.08	0.12	0.30***	0.37***	0.33***	0.31**
	(0.49)	(0.24)	(0.00)	(0.00)	(0.01)	(0.02)
Nb. of observations	1,016	1,016	1,016	1,016	1,016	1,016

This table reports diff-in-diff estimates for the probit model estimated in Table 6, specification (4), with several cut-offs for *Large Project* dummy. In parentheses we present the p-values based on Wald tests. *Ceiling* is the indicator for the period after the introduction of the loan ceiling (April 2009). Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: **Probability of Approval: Reduced Period**

Panel A: Coefficient estimates (standard errors in parentheses)								
	(1)		(2)		(3)		(4)	
Ceiling ($\hat{\delta}$)	-0.17	(0.14)	-0.19	(0.15)	-0.16	(0.16)	-0.17	(0.16)
Large Project ($\hat{\beta}$)	-0.40**	(0.17)	-0.50***	(0.17)	-0.48**	(0.19)	-0.52***	(0.20)
Ceiling*Large Project ($\hat{\gamma}$)	0.87***	(0.25)	0.88***	(0.26)	1.02***	(0.27)	1.03***	(0.29)
Having personal investment			0.45***	(0.16)	0.37**	(0.18)	0.37**	(0.19)
Having funds from other sources			0.02	(0.13)	0.00	(0.14)	0.02	(0.14)
Start-up					-0.29	(0.19)	-0.17	(0.21)
Services					-0.11	(0.19)	-0.07	(0.19)
Trade					-0.20	(0.19)	-0.06	(0.20)
Food and accommodation					-0.77***	(0.23)	-0.69***	(0.24)
Construction					-0.13	(0.23)	-0.10	(0.24)
Arts and entertainment					-0.45	(0.32)	-0.42	(0.34)
Unemployed for more than 6 months							-0.31**	(0.14)
Female							-0.03	(0.14)
Single							0.06	(0.14)
Education (nb. of achieved diplomas)							0.07*	(0.04)
Household income							0.11*	(0.06)
Constant	0.04	(0.11)	-0.29*	(0.16)	0.27	(0.26)	-0.03	(0.33)
Nb. of observations	494		494		458		431	
Panel B: Diff-in-diff estimates (p-values in parentheses)								
	(1)		(2)		(3)		(4)	
$\hat{\delta}$	-0.17	(0.25)	-0.19	(0.19)	-0.16	(0.32)	-0.17	(0.30)
$\hat{\delta}+\hat{\gamma}$	0.70***	(0.00)	0.69***	(0.00)	0.86***	(0.00)	0.86***	(0.00)
$\hat{\beta}$	-0.40**	(0.02)	-0.50***	(0.00)	-0.48**	(0.01)	-0.52***	(0.01)
$\hat{\beta}+\hat{\gamma}$	0.46**	(0.02)	0.38*	(0.05)	0.54**	(0.01)	0.51**	(0.03)

This table reports the results of estimating a probit model in which the dependent variable is being granted a microcredit. The time span covers the period corresponding to one year before and one year after the enforcement of the loan ceiling. Panel A reports coefficient estimates and, in parentheses, standard errors. Panel B reports diff-in-diff estimates, and in parentheses, the significance (p-value) of these estimates based on Wald tests. *Large Project* is an indicator for projects larger than 25,000. *Ceiling* is the indicator for the period after the introduction of the ceiling (April 2009). Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 9: **Descriptive Statistics: Reduced Observation Period**[a]

	Applicants			Borrowers		
	Without Ceiling	**With Ceiling**	**t-test**	**Without Ceiling**	**With Ceiling**	**t-test**
Financial Characteristics						
Project size (kEUR)	30,22	19,62	-10,60***	26,55	21,26	-5,29**
Demanded loan size (kEUR)	18,38	6,53	-11,85***	16,62	6,11	-10,51***
Demanded loan size >=10000 (%)	0,70	0,21	-0,49***	0,65	0,19	-0,46***
Granted loan size				15,74	5,96	-9,78***
Having a bank loan (%)	0,03	0,11	0,08***	-	0,11	-
Bank loan (kEUR)[b]	46,53	27,08	-19,45*	-	30,07	-
Having personal investment (%)	0,81	0,79	-0,01	0,83	0,88	0,05
Personal investment (kEUR)[b]	6,85	4,80	-2,06**	6,00	5,37	-0,63
Having funds from other sources (%)	0,55	0,71	0,16***	0,51	0,78	0,27***
Funds from other sources (kEUR)[b]	9,02	8,83	-0,19	9,19	8,99	-0,20
Business Characteristics						
Start-up (%)	0,80	0,91	0,11***	0,79	0,92	0,13***
Services (%)	0,28	0,31	0,03	0,28	0,35	0,07
Trade (%)	0,22	0,25	0,03	0,24	0,25	0,01
Accommodation and food service activities (%)	0,16	0,12	-0,04	0,13	0,06	-0,07*
Construction (%)	0,09	0,14	0,05	0,11	0,13	0,02
Arts, entertainment and recreation (%)	0,07	0,03	-0,04**	0,05	0,02	-0,03
Other sectors	0,18	0,15	-0,03	0,19	0,18	-0,01
Individual Characteristics						
Unemployed for more than 6 months (%)	0,55	0,66	0,11**	0,49	0,65	0,16**
Female applicant (%)	0,38	0,34	-0,04	0,34	0,34	0,00
Single (%)	0,59	0,56	-0,03	0,63	0,52	-0,11*
Education	2,74	2,48	-0,26*	2,84	2,69	-0,15
Average monthly household income (kEUR)	1,10	1,26	0,16*	1,20	1,48	0,28*
Nb. of observations	226	268		100	130	

[a]The table gives mean values and t-test for equal means between the two sub-periods
[b]The mean value is computed on the non-zero data points only.
Significance: *** p<0.01, ** p<0.05, * p<0.1