Discrimination by Microcredit Officers: Theory and Evidence on Disability in Uganda[⊗]

Annual Meeting of the American Economic Association

Denver, Colorado, January 6-9, 2011

Marc Labie[a], Pierre-Guillaume Méon[b], Roy Mersland[c], and Ariane Szafarz[d]

November 2010

Abstract: This paper studies the relationship between a microfinance institution (MFI) and its credit officers when the latter discriminate against a group of the target population. Using survey data from Uganda, we provide evidence that credit officers are more biased against disabled borrowers than other employees. In line with the evidence, we then build an agency model of a non-profit MFI and a discriminating credit officer. Since incentive schemes are costly and the MFI's budget is limited, even a non-discriminating welfare-maximizing MFI may prefer paying smaller incentivizing compensation, and letting its credit officer discriminate to some extent.

Keywords: Microfinance; Discrimination; Credit Officers; Incentives; Disability.
JEL codes: G21, O16, J33, L3.

[⊗] The authors wish to acknowledge comments by Cécile Abramowicz, James Copestake, Simon Cornée, Bina Fernandez, Rients Galema, Andre Guettler, Niels Hermes, and participants to the Second International Research Workshop on Microfinance Management and Governance, Kristiansand and to the CERMi/Oxford Workshop "Microfinance's Contribution to Development Studies. What Interdisciplinary Approaches Add to Microfinance Understanding?", Brussels. All remaining errors and approximations must be blamed on one of the authors, on whose identity they will not agree.

[a] CERMi, Université de Mons (UMONS), Warocqué Business School, Email: marc.labie@umons.ac.be.
[b] Université libre de Bruxelles (Solvay Brussels School of Economics and Management, Centre Emile Bernheim & DULBEA), Email: pgmeon@ulb.ac.be.
[c] University of Agder, Norway, and CERMi, Email: roy.mersland@uia.no.
[d] Université libre de Bruxelles (Solvay Brussels School of Economics and Management, Centre Emile Bernheim & CERMi), Email: aszafarz@ulb.ac.be.

1. Introduction

Claiming that altruistic and benevolent organizations like microfinance institutions (MFIs) might discriminate against some of their customers may sound like an oxymoron. However, organizations are complex, and you cannot expect every single person working for an MFI to be totally impartial. Some individuals may be truly benevolent and sincerely support their institution's agenda. Others may contribute on the basis of their expected returns and be affected by the same biases as workers in other organizations. Some of them may therefore be prejudiced against parts of the population and behave according to their prejudices.

It is fair to recognize that staff in MFIs is often motivated by a genuine desire to be useful and to do good. Microfinance is advocated by international institutions and sponsored by business people and leading foundations. Their reputations would be put at risk if the institutions they support were suspected of discriminating against customers based on race, gender, or other characteristics. MFIs are therefore *prima facie* unlikely to consciously discriminate against some sub-groups of their potential clientele.

However, evidence of discrimination on the loan market abounds. The evidence goes back at least to Black *et al.* (1978), who provide survey-based evidence that race matters in mortgage loan allocation. Using information collected by the Federal Reserve Bank of Boston, Munnell *et al*. (1991, 1996) spurred a large literature by finding that non-white applicants are significantly more likely to be denied a mortgage loan than white applicants with similar profiles. In his literature survey, Ross (2005) shows that this result survives a series of refinements.

More importantly for the microfinance industry, discrimination is also detected in small business lending. Cavalluzzo and Cavalluzzo (1998) find that businesses held by Hispanics and blacks face higher loan denial rates than those owned by whites. Blanchflower *et al*. (2003) report that black-owned small businesses are about twice as likely to be denied credit as white-owned ones, holding all other factors constant. Cavalluzzo and Wolken (2005) and Blanchard et *al.* (2008) confirm those results.

Admittedly, those pieces of evidence originate in the US, but there is ground to believe that discrimination in loan granting also exists in developing countries, where populations are often ethnically heterogeneous and few legal barriers to discrimination exist. A piece of evidence from outside the US is provided by Storey (2004), who shows that, in

Trinidad and Tobago, loan applications from African small-business owners are more likely to be denied than others. In his survey on discrimination in the credit and housing markets, Dymski (2006) mentions that the lack of "cultural affinity" may hurt minority loan applicants. Ross and Yinger (2002) and Ross (2005) argue that loan officers provide more advice to applicants who belong to the same ethnic group as them. Kim and Squires (2002) observe in the US that African-Americans, and to some extent Hispanics, are significantly less likely to be denied a loan in banks where the share of respectively African-American and Hispanic employees is larger.

Moreover, studies, notably in India and Latin America, have exhibited discriminatory practices. In some cases, discrimination is direct: belonging to a given community generates social obligations and economic deprivation, as shown by Thorat (2002) with "caste discrimination". In other cases, discrimination is indirect: lower human capital endowment is associated with lower access to education, causing a part of the population to be pushed to poorly-paid "dead-end jobs" (Knight, 1985). As stated by Patrinos (2000), indigenous, ethnic, racial, and linguistic minorities tend to be in an inferior economic and social position in comparison with the rest of the population.

Discrimination is thus a disappointing but acknowledged reality worldwide. Therefore, questioning its existence in microfinance not only makes sense, but is also particularly relevant as poverty and discrimination often overlap (Patrinos, 2000), and access to credit has proven instrumental for the poor. Microfinance portfolios are known to exhibit biases in favor of some customers, such as traders and urban customers. Whether those biases originate from efficiency motivation or from bigotry among MFI staff is still mostly unexplored. Unfair loan allocation may hamper the MFIs' growth by hiding "artificial gaps" between supply and demand under efficiency claims. In that line of thought, de Janvry *et al*. (2006) show that efficiency-enhancing lending innovation hurts the weaker segments of the population and increase social differentiation.

At this stage, we need to clarify what we call discrimination. We define discrimination as denying loans with a higher probability and/or providing loans with less favorable terms on the basis of observable characteristics unrelated to the attribution criterion defined by the MFI[1]. The case of disabled people is illustrative of this trend. Although MFIs

[1] This definition extends the definition proposed by Schreiner *et al.* (1996, p.849), "*Discrimination* is defined as providing smaller loans and/or providing loans with more stringent terms to borrowers who are identical with respect to creditworthiness but who differ with respect to characteristics unrelated to creditworthiness, such as race." Indeed, in welfare-maximizing institutions, creditworthiness might not be the bottom line for loan attribution. Our definition is compatible with any kind of mission statement, whether social or commercial.

market fair lending policies, very few disabled people access their services. Cramm and Finkenflügel (2008) and Mersland *et al.* (2009) point out that discrimination by MFI staff is a major reason why disabled people are hindered in access to microfinance.

Among MFI staff, credit officers are a key channel through which discrimination may operate. Indeed, decentralization gives considerable leeway to credit officers who are difficult to control as they spend up to 75% of their working time outside of the office (McKim and Hughart, 2005). Incentives are therefore more appropriate than monitoring.[2] Over the last decade, incentive pay has become increasingly common in MFIs.[3] The share of MFIs that resort to staff incentive schemes grew from 6% in 1990 to 63% in 2003 (McKim and Hughart, 2005). Nevertheless, existing incentive schemes are associated rather to financial output than to social mission, which makes them mostly inefficient to fight discriminatory practices in welfare-maximizing institutions.[4]

Surprisingly, little academic research in microfinance takes credit officers as their main focus, let alone as a source of discrimination. This paper aims at filling this gap. It presents empirical evidence from Uganda that credit officers, more than other staff, tend to discriminate against disabled customers. Thereafter, a formal model investigates how a welfare-maximizing MFI may use incentive contracts to deter its credit officers from discriminating against minority applicants. Since incentive contracts are costly and budget is limited, the MFI faces a trade-off between fighting discrimination and raising outreach. Welfare maximization may thus not imply complete eradication of discriminatory practices. In equilibrium the MFI may be better off paying a smaller incentive premium, and letting its credit officers discriminate to some extent.

The rest of the paper is organized as follows. Section 2 presents a survey from Uganda providing evidence that credit officers discriminate more than other employees. Section 3 sets up the formal model. Section 4 concludes.

[2] Although most MFIs claim having credit committees, the actual decision is often left to the credit officer, either alone or in team with the branch manager. In cases where a supposedly more independent committee makes the decision, credit officers still have ample scope to express their prejudice, since decisions are taken based on the information they provide.

[3] Most contributions on this issue come from practitioners (*Développement International Desjardins*, 2003; Holtmann and Grammling, 2005).

[4] The costs of discrimination are not easy to assess, as they are opportunity costs for both the MFI and the unserved population. Most microfinance markets are supply-driven. Therefore, discrimination may appear cost-free to many MFIs, as it does not impede growth and fairly good returns. However, as competition is increasing (McIntosh and Wydick, 2005) discrimination may ultimately be costly for MFIs. Likewise, leaving aside ethical considerations, anti-discrimination measures in access to credit could be needed from an economic development perspective.

3. Discrimination by credit officers: evidence

In microfinance methodologies such as solidarity groups, village banking, and individual lending, credit officers play a key role in screening loan applicants.[5] They are the employees who directly interact with potential customers. They meet applicants face to face, and might therefore be inclined to discriminate against some of them. Although screening criteria are fairly standardized, credit officers' are difficult to monitor. Due to decentralization and poor supervision, credit officers can discretionarily grant loans to their preferred applicants rather than serve the whole target population of the MFI. Privileged borrowers could, for instance, belong to the officers' social network. Additionally, credit officers may be reluctant to interact with some groups, such as the disabled, women, or ethnical minorities. Although discrimination by microfinance credit officers is difficult to assess because of data availability restrictions, it is highly plausible.[6]

In the rest of this section, we use survey data collected in Uganda in 2008-2009. The employees of eight MFIs were questioned on their attitudes and beliefs about disabled customers. To argue that the disabled can be subject to taste-discrimination, we first argue that they can run viable businesses, and that their lower probability of getting a loan is not attributable to lower creditworthiness. We then describe the survey, and finally provide an econometric analysis that supports the view that credit officers "taste-discriminate", and that they do so more than other employees, thus deserving specific attention.

3.1. The disabled face taste-discrimination

According to the United Nations (2008), approximately 10% of the global population has disabilities, and 80% of the disabled live in developing countries. Moreover, among those who live on less than one dollar a day, one in five has a disability. Although only a small fraction of the disabled is unable to work, 80 to 90% of them have no formal job. As a consequence, they turn to self-employment (UN, 2008). Few have access to microfinance. In Uganda, while the incidence of disability ranges from 3.5% (Population and Housing Census, 2002) to 20% (Uganda Demographic and Health Survey, 2006), depending on the statistical method, only 0.5% of MFIs' customers are disabled (Mersland *et al*., 2009).

---

[5]On the importance of credit officers, see also Fuentes (1996), Warning and Sadoulet (1998), Armendariz and Morduch (2005), Churchill (1999), Schreiner (2000), and Dixon *et al*. (2006).

[6] Studies have nevertheless documented that women tend to be more credit-rationed than men (Buvinic and Berger, 1990 ; Baydas *et al.*, 1994 ; Agier and Szafarz, 2010)

The low incidence of disabilities among MFIs' customers cannot be explained by higher credit risk only. Indeed, Martinelli and Mersland (forthcoming) observe that the disabled in Uganda run viable small businesses even without access to external credit. More generally, researchers have repeatedly demonstrated that being disabled is associated with exclusion, similarly to race, sex, and tribal discrimination. As Neufeldt (1995) points out, disability is essentially a social construct with roots in societal attitudes. Accordingly, Johnson and Lambrino (1985) find that, correcting for possible efficiency differences, between one third and one half of wage differences between disabled and non-disabled people can be attributed to taste-discrimination. Likewise, Barnes (1994) puts forward substantial evidence of institutional discrimination in the UK. Barnes and Oliver (1995) argue that, even with the help of an anti-discrimination bill, disabled people in the UK will continue to face discriminatory actions and attitudes. In the US, evidence suggests that the recourse to law does not eliminate discriminatory actions against disabled people (Beegle and Stock, 2003). The existence of discrimination toward that group is thus well-documented.

3.2. The survey

The data were collected by the Association of Microfinance Institutions of Uganda (AMFIU) in a joint initiative with the National Union of Disabled Persons of Uganda (NUDIPU), whose aim is to increase disabled people's access to mainstream microfinance services. The Norwegian Association of the Disabled (NAD) supports AMFIU and NUDIPU in their efforts.[7] The project includes training for 750 staff members in 75 MFI branches in issues related to microfinance and disability. In 24 branches, the start-up of training, before any information was given, consisted in filling out the questionnaire of this survey. In addition to reporting personal data and their position in the branch, the respondents were asked to rate on a one-to-five scale their beliefs related to different questions about microfinance and disability. The original aim of the survey was to identify areas for joint AMFIU/NUDIPU efforts. The survey does also serve the research purpose in this paper.

Eight MFIs are represented in the database, ranging from two small Savings and Credit Cooperatives (SACCOs) to the largest MFIs in Uganda. The 24 branches are located across the country in eight of Uganda's 80 districts. The dataset consisting in 231 respondents is representative for staff working in Ugandan MFIs.

[7] One of the authors has participated as a consultant for NAD in their efforts to increase outreach of microfinance to disabled people in Uganda.

3.3. Evidence of taste-discrimination among credit officers

The study focuses on the answers to two questions of the survey addressing discrimination. The respondents were asked to rate on a one-to-five scale their agreement with the two following statements:

1. "*I believe that one of the reasons why we have few disabled customers is because we often unconsciously marginalize or discriminate them*".
2. "*I believe that in this branch we never discriminate people because of their disability*".

The ratings to those statements are going to be separately regressed on the respondents' characteristics. Since the explained variables are discrete and ordered, we resort to ordered logit models.[8] A dummy explanatory variable captures whether the respondent is a credit officer or another employee (secretary, office clerk, or branch manager). If significant, the sign of the coefficient associated to this dummy will signal whether credit officers tend to discriminate more or less than their co-workers against the disabled.

Discrimination, if any, may indeed be due either to a genuine distaste for the disabled or to the belief that the disabled are riskier customers. To disentangle those two explanations, we use the reactions (same scale) to a third statement:

3. "*I believe that being disabled is associated with higher risk of loan default*".

If an employee believes, rightly or not, that disabled customers are riskier clients, then he/she might discriminate against them even without having any aversion to them. This is the gist of the theory of statistical discrimination, which originates in Phelps (1972) and Arrow (1973). Controlling for the reactions to statement 3 allows differentiating statistical from taste-based discrimination *à la* Becker (1957).[9] If pure taste-discrimination is at work, then controlling for the reaction to statement 3 should not affect the impact of being a credit officer on the reactions to statements 1 and 2, respectively.

---

[8] We also estimated the same relationships using ordered probit, which did not affect our qualitative results. Those results are available upon request.

[9] Given the nature of our data, the argument needs to be understood in a relative way (credit officers versus the other employees).

The dataset also allows controlling for characteristics of the respondents. The estimated models include explanatory dummies for having a disabled relative, being a female, and having at least three-year work experience. Respondents with a disabled relative should be not only less prejudiced, but also better informed about what the disabled can do. Their reactions to statement 3 therefore provide some clue on the true capacity of the disabled to run a business. We have no prior on the impact of gender, but the role of women in microfinance has been emphasized (Armendariz and Morduch, 2005). Lastly, experience may affect the beliefs on disabled borrowers.

The ordered logit models are estimated with cluster-robust standard errors to control for within-branch correlations. The results are provided in tables 1 and 2. Note statements 1 and 2 are drafted oppositely. Table 1 summarizes reactions to statement 1 implying that the respondent “discriminates”. Given the coding, a positive coefficient indicates a greater agreement with the statement, meaning more discrimination. Conversely, table 2 is based on statement 2 implying that the respondent “never discriminates.” Therefore, a positive coefficient means less discrimination.

The picture that emerges from the two tables is consistent. In table 1, the baseline regression indicates that being a credit officer yields higher discrimination. The Wald Chi-squared statistic for the likelihood ratio test confirms that adding the credit officer dummy improves the fit. Regression (1.2) signals no relationship between believing that the disabled exhibit lower creditworthiness and acknowledging discrimination. Indeed, regression (1.2) is the only one for which the Wald statistic rejects explanatory power. Regression (1.3) shows that the impact of being a credit officer is robust to controlling for the respondent’s belief about credit risk, while that belief remains insignificant.[10] Regressions (1.4) to (1.6) include additional controls but leave the main result unchanged. Among additional control variables, only the dummy indicating whether the respondent has a disabled relative passes the ten-percent significance test with a negative coefficient. Accordingly, the relatives of disabled tend to discriminate less than other respondents. This lends credence to interpreting the dependent variable as a measure of discrimination intensity.

[10] Moreover, a bivariate logit regression (not reported here) in which the belief is explained by the credit officer dummy reveals no link between the two variables, meaning that the belief of credit officers is similar to that of other respondents.

Table 1: Ordered logit regression results with the explained variable being the reaction to the statement: "*I believe that one of the reasons why we have few disabled customers is because we often unconsciously marginalize or discriminate them*"

	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)
Credit officer	0.696		0.691	0.666	0.646	0.713
	(2.30)**		(2.27)**	(2.03)**	(1.89)*	(1.87)*
Higher default		0.0441	0.0665	0.113	0.0864	0.0756
		(0.34)	(0.54)	(1.00)	(0.76)	(0.61)
Disabled relative				-0.587	-0.583	-0.597
				(2.05)**	(2.15)**	(-2.33)**
Woman					-0.314	-0.278
					(1.14)	(0.93)
Years of experience						0.0836
						(0.82)
Observations	189	213	188	184	180	166
Log-pseudolikelihood	-283.76	-327.43	-281.85	-273.43	-265.08	-242.43
Wald Chi^2	5.30	0.12	5.37	10.75	11.66	16.61
Pseudo R^2	0.0109	0.000481	0.0115	0.0181	0.0206	0.0229

Cluster-robust absolute z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 2 follows the same strategy as table 1. It first considers the pairwise correlation between the dependent variable and the two main independent variables, and then takes them together. Credit officers disagree more with the statement "*we never discriminate*". The result confirms a positive relation between being a credit officer and acknowledging discrimination. Table 2 also confirms that responses about discrimination are independent from beliefs about the riskiness of disabled customers. Including additional control variables does not alter those results. The only difference with previous results is the absence of significant impact of having a disabled relative. This may be due to the fact that statement 2 relates to the branch, whereas statement 1 concerns the respondent.

Overall, our findings underline a strong correlation between acknowledging discrimination and being a credit officer. Moreover, that tendency is not due to biased beliefs, which means that the acknowledged bias is consistent with a broader taste for discrimination. In the next section, we investigate the consequences of such a bias for welfare-maximising MFIs.

Table 2: Ordered logit regression results with the explained variable being the reaction to the statement: "*I believe that in this branch we never discriminate people because of their disability*"

	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)
Credit officer	-0.612		-0.62	-0.615	-0.655	-0.744
	(2.37)**		(2.51)**	(2.24)**	(2.38)**	(2.77)***
Higher default		-0.125	-0.13	-0.136	-0.142	-0.125
		(0.87)	(0.94)	(0.91)	(0.99)	(0.77)
Disabled relative				0.0895	0.183	-0.000409
				(0.25)	(0.5)	(0.00097)
Woman					-0.303	-0.316
					(0.97)	(0.82)
Years of experience						-0.14
						(0.1)
Observations	187	210	186	182	179	165
Log pseudolikelihood	-260.60	-293.98	-257.47	-251.90	-245.34	-218.60
Wald Chi^2	5.63	0.76	7.41	8.04	21.14	25.15
Pseudo R^2	0.00833	0.00395	0.0128	0.013	0.016	0.0199

Cluster-robust absolute z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

4. A model of discrimination by a biased credit officer

In this section, we set up an agency model in which a credit officer exhibits taste-discrimination against some potential borrowers, which is at odds with the socially-oriented mission of the MFI. By solving the model, we show that aiming for optimal mission fulfillment may drive the MFI to tolerate some discrimination.

4.1. The model

Let us consider a socially-oriented MFI, i.e., a "pro-poor MFI" following Aubert *et al*. (2009), facing a credit officer's taste-discrimination against an identifiable class of loan applicants.[11] The MFI has defined its target population and delegates clientele selection to a credit officer. All members of the target population are unbanked. They are either very poor

[11] One could argue that MFIs should not hire prejudiced agents in the first place. While this is the obvious first-best solution, it is not always implementable on the field as finding good credit officers (in terms of clientele screening) may reveal arduous and costly, and prejudice may take time to reveal itself. Moreover, some prejudices (linked to caste, for instance) may be so widely spread that truly unbiased credit officers are rare. Therefore, the second best solution proposed in this paper is to hire prejudiced agents and reduce the detrimental consequences of it as much as possible.

($\kappa = P$) or less poor ($\kappa = L$), and either favored ($i = F$) or discriminated against ($i = D$) by the credit officer. Thus, any candidate has a bidimensional vector of characteristics[12]:

$$(i,\kappa),\, i \in \{D,F\},\, \kappa \in \{P,L\} \tag{1}$$

Both characteristics are observable to the credit officer. In turn, the MFI observes the *F/D* characteristic, but not the poverty level.[13] The previous section suggests that disabled people are a good example of *D* customers.

Due to its mission statement, the MFI is benevolent and group-blind. Its objective is to maximize welfare, measured by the expected social utility of its clients:

$$Max \sum_{j=1}^{n} E\left[U_j\right], \tag{2}$$

where n is the number of clients, to be determined endogenously, and $E\left[U_j\right]$ is the expected utility of client j.

All loans are identical (normalized to 1). A loan allows the borrower to seize a riskless investment opportunity that yields return r (identical for all borrowers). However, with decreasing marginal utility of income, the same return results in a larger increase in utility for a very poor than for a less poor customer. The utility brought by a loan is Δu_P when the client is very poor and Δu_L when the client is less poor, with $\Delta u_P > \Delta u_L$.The MFI therefore prefers granting loans to the very poor, because this contributes more to welfare. In other words, the MFI aims at serving the poorest of the poor.

To allocate loans, the MFI relies on a credit officer, who actually meets potential clients and decides to whom he/she grants a loan. Unlike the MFI, the credit officer is biased against the *D* group. This assumption is consistent with the evidence reported by Cavalluzzo and Cavalluzzo (1998) that minorities-owned small businesses face higher denial rate attributable to taste-based discrimination.

---

[12] Contrary to Aubert *et al*. (2008), we do not include the clients' ability as a relevant characteristic, as the MFI's objective function is purely social and sustainability is not discussed. Moreover, in our setting, only the loan allocation process is considered, not the associated credit risk.

[13] This is a typical consequence of the decentralization of MFIs. Only credit officers are able to assess poverty levels. On the other hand, the characteristics that drive discrimination are generally very easy to observe (gender, disability, race, etc.).

The credit officer's selection process is sequential. Due to obvious time constraints, he/she only meets a limited number of potential clients every period, and allocates one loan in each period. For simplicity, we assume that those choices are always to be made between two candidates[14] drawn randomly from the target population, which features the following proportions of the four categories: $\gamma_{DP}, \gamma_{FP}, \gamma_{DL}, \gamma_{FL}$, with $\gamma_{i\kappa} > 0 \left(i = D, F; \kappa = P, L \right)$ and $\sum_{i=D,F} \sum_{\kappa=P,L} \gamma_{i\kappa} = 1$. The credit officer offers the loan on the basis of the candidates' bidimensional characteristics $\left(\kappa, i \right)$.

Since the credit officer is biased against the *D* group, he/she would never spontaneously grant a loan to a *D* applicant unless both belong to that group. However, aware of the officer's bias, the MFI pays an incentive wage, that inversely relates the officer's wage to his/her discriminatory practice. The credit officer's reaction to that incentive is modeled in probabilistic terms. When facing two candidates with respective characteristics $\left(D, P \right)$ and $\left(F, L \right)$, the officer offers the loan to the $\left(D, P \right)$ candidate with probability $\lambda \in [0, 1]$. Variable λ measures the officer's propensity not to let prejudice interfere with loan attribution.

Prejudice makes the credit officer's expected utility decrease with λ. We assume the following risk-neutral expected utility function:

$$E\left[V \right] = E\left[\omega \right] - \frac{1}{2} d \, \lambda^2 \quad \left(d \geq 0 \right) \tag{3}$$

As *d* increases, the officer's expected disutility of choosing a very poor *D* applicant over of a less poor *F* applicant increases. Parameter *d* gauges the aversion to the *D* group relative to the utility of consumption. An unbiased officer is characterized by *d* = 0, but there is no upper limit on that parameter.

The distribution of outcomes of the loan attribution is summarized in table 3. The characteristics of the two candidates are displayed in the first row and the first column of table 3, respectively. Each cell of table 3 gives the characteristics of the loan beneficiary, and, whenever relevant, the associated probabilities.

[14] Although we have set this number to two for the sake of simplicity, the argument can easily be generalized to larger numbers.

Table 3: Outcomes of the loan attribution

Applicant 2 \ Applicant 1	(D,P)	(D,L)	(F,P)	(F,L)
(D,P)	(D,P)	(D,P)	(F,P)	(D,P) with prob. λ (F,P) with prob. $(1-\lambda)$
(D,L)	(D,P)	(D,L)	(F,P)	(F,L)
(F,P)	(F,P)	(F,P)	(F,P)	(F,P)
(F,L)	(D,P) with prob. λ (F,P) with prob. $(1-\lambda)$	(F,L)	(F,P)	(F,L)

The contribution to the MFI's objective depends on the beneficiary of the loan. Table 4 displays this contribution in each configuration of loan attribution.

Table 4: Welfare gains resulting from the outcomes of the loan attribution

Applicant 2 \ Applicant 1	(D,P)	(D,L)	(F,P)	(F,L)
(D,P)	Δu_P	Δu_P	Δu_P	Δu_P with prob. λ Δu_L with prob. $(1-\lambda)$
(D,L)	Δu_P	Δu_L	Δu_P	Δu_L
(F,P)	Δu_P	Δu_P	Δu_P	Δu_P
(F,L)	Δu_P with prob. λ Δu_L with prob. $(1-\lambda)$	Δu_L	Δu_P	Δu_L

Whenever the poverty levels of the two candidates are identical, the officer systematically chooses an F applicant, if any. The decision becomes less obvious when the poorest candidate belongs to the D group. The officer's distaste for that group could be great enough for him/her to give the loan to a less-poor favored candidate rather than to a very poor candidate. In such a situation, the credit officer's prejudice is detrimental to the MFI's mission and can result in mission drift.[15]

Following Agarwal and Wang (2009), we assume that the credit officer receives incentive compensation. However, in our model the incentive is inversely related to the intensity of the officer's discriminatory behavior ($1 - \lambda$), not to the number of loans. The rationale for relating incentives to discrimination is twofold. First, most socially-oriented MFIs would consider prejudice reduction as a subsidiary mission. For instance, MFIs are able to focus on women even in male-dominated societies (Morduch, 1999). Second, in our model, the MFI maximizes a utility function that depends on the poverty level of its clients, which is unobservable to the institution. Contrarily, group membership is observable to the MFI, and discriminated groups are typically poorer than the rest of the population. Therefore, even if the chosen incentive scheme is not primarily intended to fight discrimination, discrimination-based incentives may constitute a good instrument, or at least a second-best, to fulfill the MFI's mission.

Specifically, a standard linear contract with fixed component C and premium s is assumed:

$$\omega = C + s\lambda, \quad s \geq 0, \quad C > 0 \tag{4}$$

This wage contract nests the standard contract, where the officer's wage is independent from the distribution of loans across groups, when s is set to zero.

The MFI also faces a budget constraint. Its fixed budget B is to be allocated to both loans (all of unit size) and the credit officer's wage ω:

$$B = \omega + n.c\,, \tag{5}$$

where n is the number of loans to be fixed by the MFI, and c is the constant marginal cost associated to a loan, on top of the credit officer's wage. Actually, c can be positive or negative depending on the lending methodology adopted by the MFI. In financial terms, c is the net present value of a loan brought by the credit officer, excluding his/her own retribution. It

[15] The term « mission drift » usually designates the situation where the financial sustainability constraint makes the MFI move away from its poverty alleviation objective (see Gosh and Van Tassel, 2008; Armendariz and Szafarz, forthcoming). In our model, the mission drift would rather be due to discrimination by the credit officer.

includes: (negatively) the present value of the interest differential (the loan rate minus the financing rate), (positively) the operational and monitoring costs, and (positively) the expected default loss. For the sake of simplicity, we do not split c into its components and do not differentiate between types of clients, as the costs and benefits unrelated to the credit officer's wage are not our main focus.

The assumption of a fixed budget is consistent with the fact reported by Hermes and Lensink (2007) and Cull *et al.* (2009) that most institutions serving the poorest earn profits that are too small to attract profit-oriented investors. Subsidized NGOs therefore represent the bulk of social-oriented MFIs. The budget constraint also reflects that the cost of credit officers to MFIs is important, as microfinance is labor-intensive. Labor costs typically amount to 50 to 70% of total administrative costs supported by MFIs (Holtmann and Grammling, 2005).

Constraint (5) shows that the MFI faces a trade-off. Increasing the officer's incentive will augment his/her propensity to serve poorer clients, but will also raise his/her wage, hence reducing the total number of loans, n. The MFI has to trade off between serving the poorest of the poor, and serving more loans.

From table 4 and the probabilities associated to the outcomes, the social utility of one loan attribution (to client j) is the random variable defined by:

$$U_j = \begin{cases} \Delta u_L \text{ with probability}: \Omega(\lambda) = \gamma_{DL}^2 + \gamma_{FL}^2 + 2\gamma_{DL}\gamma_{FL} + 2(1-\lambda)\gamma_{FL}\gamma_{DP} \\ \Delta u_P \text{ with probability}: 1 - \Omega(\lambda) \end{cases} \tag{6}$$

where probability $\Omega(\lambda)$ is a linear function of λ:

$$\begin{aligned} \Omega(\lambda) &= \left(\gamma_{DL}^2 + \gamma_{FL}^2 + 2\gamma_{DL}\gamma_{FL} + 2\gamma_{FL}\gamma_{DP}\right) - 2\lambda\gamma_{FL}\gamma_{DP} \\ &= a - b\lambda \end{aligned}$$

with:

$$\begin{cases} a = \gamma_{DL}^2 + \gamma_{FL}^2 + 2\gamma_{DL}\gamma_{FL} + 2\gamma_{FL}\gamma_{DP} \\ b = 2\gamma_{FL}\gamma_{DP} \end{cases}$$

Thus, for one loan, the expected utility is:

$$\forall j : E\left[U_j\right] = a\Delta u_L + (1-a)\Delta u_P - b\left(\Delta u_L - \Delta u_P\right)\lambda \tag{7}$$

For *n* loans attributed along the same lines in independent processes, the expected utility to be maximized by the MFI reads:

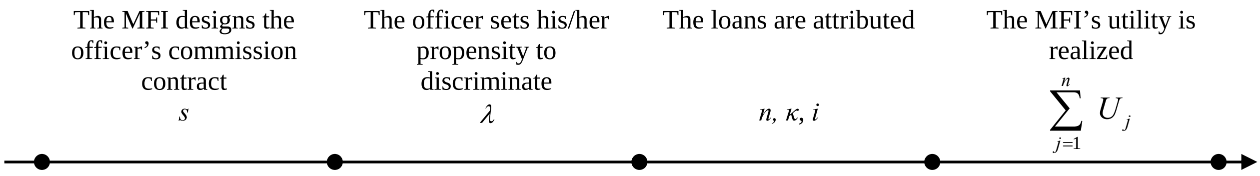
$$\sum_{j=1}^{n} E\left[U_j\right] = n\left[a\Delta u_L + (1-a)\Delta u_P - b\left(\Delta u_L - \Delta u_P\right)\lambda\right] \tag{8}$$

From (4) and (5), the budget constraint is:

$$B = C + s\lambda + nc \tag{9}$$

To close the model, we specify the timing of the game. The MFI first chooses the parameters of premium s under the participation constraint, which states that the officer's expected utility must exceed that provided by his/her outside option. The credit officer then determines the value of λ. The loans attribution subsequently takes place. Once the loans have been attributed, the MFI's utility is observed and the officer's commission paid. Finally, the MFI's total utility is determined. This timing is summarized by the timeline in figure 1.

Figure 1: Timing of the game



4.2. Equilibrium discrimination

The model is solved through backward induction. First, we describe the last player's, i.e. the credit officer's, reaction function. Then, we derive the contract offered by the MFI, which determines the outcome of the game.

The officer chooses probability λ, which represents his/her propensity not to let prejudice interfere with the hiring decision. Plugging the wage-scheme (4) in the officer's objective function (3) yields:

$$\underset{\lambda\in[0,1]}{Max}\left\{C+s\lambda-\frac{1}{2}d\ \lambda^{2}\right\}. \tag{10}$$

The first-order condition for that optimization problem is:

$$\lambda=\frac{s}{d}. \tag{11}$$

Note that λ is increasing in the MFI's incentive instrument, s. Being a probability, λ must take values between 0 and 1.[16] This restriction may in turn lead to corner solutions for some parameters configurations. One has thus:

$$\lambda^{*}=\begin{cases}\dfrac{s}{d} & \text{if} \quad s\le d\\ 1 & \text{if} \quad s>d\end{cases} \tag{12}$$

The MFI designs the performance-based contract by anticipating its effects on the officer's behavior. It maximizes expected utility, taking the officer's reaction as a constraint. Namely, the MFI's problem states:

$$\underset{n,s}{\text{Max}}\sum_{j=1}^{n}\ E\left[U_{j}\right]=n\left[a\Delta u_{L}+\left(1-a\right)\Delta u_{P}-b\left(\Delta u_{L}-\Delta u_{P}\right)\lambda\right] \tag{13}$$

s.t. $B=C+s\lambda+nc$

Let $Q=B-C$ be the MFI's net budget, $A=a\Delta u_{L}+\left(1-a\right)\Delta u_{P}$ be the part of welfare that is independent from the officer's behavior, and $\delta=\Delta u_{P}-\Delta u_{L}$ be the extra utility of granting a loan to a very poor instead of a less poor. The MFI's problem can be rewritten as:

[16] This might lead to the erroneous impression that discrimination fully disappears when the probability that the credit officer selects a very poor *D* candidate over a less poor *F* candidate is equal to one. This is not the case, because the MFI is blind to discrimination taking place within poverty classes. Indeed, when facing two candidates with the same poverty level, the credit officer systematically chooses the *F* candidate, if any. Pushing the argument to the extreme, if the population were made of very poor only, then no *D* candidate confronting an *F* candidate would ever receive a loan.

$$\underset{s}{\text{Max}}\ E\left[U\left(s\right)\right]=\left(\frac{Q-s\lambda}{c}\right)\left(A+b\,\delta\,\lambda\right) \tag{14}$$

Given the credit officer's optimal reaction function (12), the optimal value for s is either an interior point, $\tilde{s}$, or the corner value, *d.* To compute $\tilde{s}$, we rewrite the MFI's objective function for $\lambda=\frac{s}{d}$:

$$\sum_{j=1}^{n}\ E\left[U_j\right]=\frac{1}{cd^2}\left(-b\,\delta d\ s^3-A\,s^2+Q\,b\,\delta\ s+dQA\right) \tag{15}$$

which leads to the following first order condition:

$$-3bd\,\delta s^2-2As+Q\,b\,\delta=0\,. \tag{16}$$

Since $\Delta=A^2+3Q\,b^2\,\delta^2 d>0$, this second-degree equation has two real roots, but only one is non-negative (because $\Delta>A^2$), hence admissible given that s is a premium:

$$\tilde{s}=\frac{A+\sqrt{\Delta}}{3bd\delta} \tag{17}$$

Due to the sign of the first derivative (positive before $\tilde{s}$, negative after $\tilde{s}$), the MFI's objective function reaches its global maximum for $s^*=\tilde{s}$ provided that $\tilde{s}\le d$. Alternatively, if $\tilde{s}>d$, then, due to (12), the credit officer adopts the non-discriminatory behavior, $\lambda^*=1$, and the MFI has no incentive to provide a premium larger than *d*. In that case, the MFI's optimal premium is $s^*=d$. In summary, we have:

$$s^*=\min\left\{d,\tilde{s}\right\} \tag{18}$$

The corresponding optimal value for λ is given by:

$$\lambda^* = \begin{cases} \dfrac{\tilde{s}}{d} & \text{if} \quad s^* = \tilde{s} \\ 1 & \text{if} \quad s^* = d \end{cases} \tag{19}$$

Expression (19) displays our key result: the probability that the officer does not let his/her prejudice interfere with his/her decision can lie below one in equilibrium. In that situation, despite being a pure welfare-maximizer, blind to group membership, the MFI tolerates some discrimination in equilibrium. The rationale for that result is that fighting discrimination is costly, not only financially (higher wage premium required by the credit officer), but also, and more to the point, in terms of outreach (less loans). Each extra dollar devoted to paying incentives reduces the number of loans that can be granted. The MFI must then trade off two evils: discrimination and poverty. If the officer's taste for discrimination is high enough, then the social cost, in terms of foregone loans, of eradicating discriminatory behaviors would be too large. The MFI tolerates some discrimination because the marginal benefit of devoting a dollar to combating discrimination would be lower than the benefit of granting an extra loan.

Consequently, observing an MFI's loan attribution biased against a minority group does not imply that this MFI is intrinsically biased against that group. Because the MFI has to rely on biased credit officers, this might be the best that it can do. From a management and policy perspective, this result suggests that additional solutions must be found to combat discrimination, because wage incentives may be insufficient. Since our result is obtained on the premise that the MFI maximizes social welfare, a benevolent social planner would adopt exactly the same behavior.[17]

5. Concluding remarks

So far microfinance practices have been studied in terms of methodology efficiency and market segments. Those factors largely explain why some clients are served by MFIs while others remain unserved. However, other reasons might be at work, like discrimination. This paper presents evidence that credit officers taste-discriminate against disabled people more than other MFI employees do, and discusses how a benevolent MFI may mitigate that source

[17] In our setting, the MFI is hurt by discrimination only insofar as it interferes negatively with its social mission. Fighting discrimination is not the MFI's final goal. A more drastic version of our model could include fairness to the MFI's mission statement. In such case, the trade-off does not disappear but the incentives will be larger and the non-discriminatory equilibrium will become more likely.

of discrimination by offering high-powered incentives. Using a formal agency model, it argues that well-designed incentive schemes might be part of the solution. However, because incentives are costly and its budget is limited, the MFI may better fulfill its objective by not offering incentives that would eradicate discrimination. In a nutshell, a non-discriminatory institution may tolerate some discrimination because eliminating it would be too costly.

Before drawing policy-oriented conclusions from those results, several comments are in order. First, designing adequate incentives is delicate. Initially, incentive schemes used by MFIs were based on a single criterion, typically the growth of loan portfolios. Over time, it appeared that growth targets were often met at the expense of credit quality. Consequently, today's MFIs increasingly combine criteria. Even so, the adjustment of credit officers to whatever set of incentives generates new biases. As an example, Pamecas, a major network of credit unions in Senegal, set up a scheme mixing two indicators: quality of portfolio (measured by arrears) and growth (measured by debt outstanding). By not including the number of loans, Pamecas created an incentive for credit officers to focus on borrowers requiring sound but larger loans, therefore favoring a mission drift and ultimately leading Pamecas to reconsider its policy.

Second, governance issues are more complex in socially-oriented organizations than in profit-oriented firms (Labie, 2001; Hartarska, 2005; Mersland and Strøm, 2009). In particular, discrimination is harder to tackle in welfare-maximizing institutions, where the profit-seeking mindset to build adequate incentives is lacking, a point raised by Aubert *et al.* (2009). Moreover, fund providers are less likely to tolerate discrimination from social institutions than shareholders and customers from typical firms. Lastly, paying credit officers for them to serve discriminated-against groups, like the disabled, may reinforce long-term discrimination. Thus, incentives are no quick fix to discrimination.

Additionally, anti-discrimination measures might paradoxically make the MFI deviate from its mission. It has been argued, for instance by Coate and Loury (1993), that such measures may in fact hurt the very population that they aim to help, by reinforcing stereotypes. An alternative route would be to hire credit officers biased in favor of discriminated-against groups, as illustrated by Biggs *et al.* (2002), who put forward the role of ethnic networks, and d'Espallier *et al*. (2009) who show that female credit officers increase the odds of serving female clients. Identifying officers with a bias in favor of disabled customers may however prove difficult.

For all of these reasons, we believe that the subject of microcredit discrimination deserves more attention than it has received so far, and hope that this first contribution will open the way to future investigation aiming at gauging the amplitude of on-field discriminatory practices and at exploring the applicability of tools aligned with the MFIs' social mission.

References

Agarwal, S. and F.H. Wang (2009), "Perverse Incentives at the Banks? Evidence from a Natural Experiment", Available at SSRN: http://ssrn.com/abstract=1287689.

Agier, I. and A. Szafarz (2010), "Microfinance and gender: Is there a glass ceiling in loan size?", Available at SSRN: http://ssrn.com/abstract=1573872

Armendariz, B. and A. Szafarz (Forthcoming), "On mission drift in microfinance institutions", in B. Armendariz and M. Labie (Eds), *The Handbook of Microfinance*, London-Singapore: World Scientific Publishing.

Armendariz, B. and J. Morduch (2005), *The Economics of Microfinance*, Cambridge, MA: MIT Press.

Arrow, Kenneth J. (1973), "The theory of discrimination", in O. Ashenfelter and A. Rees (Eds.), *Discrimination in Labor Markets*, Princeton, NJ: Princeton University Press, 3-33.

Aubert, C., A. de Janvry, and E. Sadoulet (2009), "Designing credit agent incentives to prevent mission drift in pro-poor microfinance institutions", *Journal of Development Economics* 90 (1), 153-162.

Austin, J., R. Gutierrez, M. Labie, and E. Ogliastri (1998), "Finansol", *Harvard Business School Case* 9-398-071, Harvard University.

Barnes, C. (1994), "Institutional discrimination, disabled people and interprofessional care", *Journal of Interprofessional Care* 8 (2), 203-212.

Barnes, C. and M. Oliver (1995), "Disability rights: rhetoric and reality in the UK", *Disability and Society* 10 (1), 111-116.

Baydas, M.M., R.L. Meyer, and N. Aguilera-Alfred (1994), "Discrimination against women in formal credit markets: Reality or rhetoric?", *World Development* 22 (7), 1073-1082.

Becker, G.S. (1957), *The Economics of Discrimination*, Chicago: University of Chicago Press.

Beegle, K. and W.A. Stock (2003), "The labour market effects of disability discrimination law", *Journal of Human Resources* 38 (4), 806-859.

Besley, T.J. and M. Ghatak (2005), "Competition and incentives with motivated agents", *American Economic Review* 95 (3), 616-636.

Biggs T., M. Raturi, and P. Srivastava (2002), "Ethnic networks and access to credit: evidence from the manufacturing sector in Kenya", *Journal of Economic Behavior and Organization*, 49, 473–486.

Black, H., R.L. Schweitzer, and L. Mandell (1978), "Discrimination in Mortgage Lending", *American Economic Review* 68 (2), 186-191.

Blanchard, L., B. Zhao, and J. Yinger (2008), "Do lenders discriminate against minority and women entrepreneurs?", *Journal of Urban Economics* 63 (2), 467-497.

Blanchflower, D.G., P.B. Levine, and D.J. Zimmerman (2003), "Discrimination in the Small-Business Credit Market", *Review of Economics and Statistics* 85 (4), 930-943.

Buvinic, M and M. Berger (1990), "Sex differences in access to a small enterprise development fund in Peru", *World Development* 18 (5), 695-705.

Cavalluzzo, K.S., and J. Wolken (2005), "Small Business Loan Turndowns, Personal Wealth, and Discrimination", *Journal of Business* 78 (6), 2153-2177.

Cavalluzzo, K.S., and L.C. Cavalluzzo (1998), "Market Structure and Discrimination: The Case of Small Businesses", *Journal of Money, Credit, and Banking* 30 (4), 771-792.

Churchill, C.F. (1999), *Client-Focused Lending - The Art of Individual Lending*, Toronto and Washington, D.C.: Calmeadow.

Coate, S., and G.C. Loury (1993), "Will affirmative-action policies eliminate negative stereotypes?", *American Economic Review* 83 (5), 1220-1240.

Cramm, J.M. and H. Finkenflügel (2008), "Exclusion of disabled people from microcredit in Africa and Asia: A Literature Study, Asia Pacific Disability", *Rehabilitation Journal* 19 (2), 15-33.

Cull, R., A. Demirgüç-Kunt, and J. Morduch (2009), "Microfinance Tradeoffs: Regulation, Competition, and Financing", World Bank Policy Research Working Paper 5086.

de Janvry, A., C. McIntosh, and E. Sadoulet (2006), "The Supply and Demand Side Impacts of Credit Market Information", Department of Agricultural and Resource Economics, U.C. Berkeley.

d'Espallier, B., I. Guérin, and R. Mersland (2009), "Women and Repayment in Microfinance", RUME Working paper 2009-2.

Développement International Desjardins (2003), "Accroître la performance d'employés d'institutions de microfinance: La rémunération incitative", Outil 4, Direction principale de la systématisation et de l'instrumentalisation.

Dixon, R., J. Ritchie, and J. Siwale (2006), "Loan officers and loan "delinquency" in Microfinance: A Zambian case", Durnham Business School, UK.

Dyer, S. (2003), *The inclusion of disabled people in mainstream micro finance programmes*, London: Leonard Cheshire International.

Dymski, G.A. (2006), "Discrimination in the credit and housing markets: Findings and challenges". in W.M. Rodgers (Ed.) *Handbook on the economics of discrimination*. Cheltenham, UK: Edward Elgar, 215-259.

Fuentes, G.A. (1996), "The use of village agents in rural credit delivery", *Journal of Development Studies* 33 (1), 188-209.

Ghosh, S. and E. Van Tassel (2008), "A model of microfinance and mission drift", Department of Economics, Florida Atlantic University, December.

Hartarska, V. (2005), "Governance and performance of microfinance institutions in Central and Eastern Europe and the newly independent states", *World Development* 33 (10), 1627-1643.

Hermes, N. and R. Lensink (2007), "The Empirics of microfinance: What do we know?", *Economic Journal* 117 (517), F1-F10.

Holtmann, M. and M. Grammling (2005), "A toolkit for designing and implementing staff incentives schemes", Microfinance Network & CGAP, Nairobi.

Johnson, W.G. and J. Lambrinos (1985), "Wage discrimination against handicapped men and women", *Journal of Human Resources* 20 (2), 264-277.

Kim, S. and G.D. Squires (1998), "The Color of Money and the People Who Lend It", *Journal of Housing Research* (9) 2, 271-284.

Knight, J.B. (1985), "Caste discrimination in the Indian urban labour market", *Journal of Development Economics* 17 (3), 277-307.

Labie, M. (2001), "Corporate governance in microfinance organizations: A long and winding road", *Management Decision* 39 (4), 296-301.

Martinelli, E. and R. Mersland (Forthcoming), "Microfinance for people with disabilities", in Barron T (Ed.), *Poverty and disability*, London: Leonard Cheshire International.

McIntosh, C. and B. Wydick (2005), "Competition and Microfinance", *Journal of Development Economics* 78 (2), 271-298

McKim, A. and M. Hughart (2005), "Staff incentives schemes in practice: Findings from a global survey of microfinance institutions", Microfinance Network & CGAP, Washington, D.C.

Mersland, R., F.N. Bwire, and G. Mukasa (2009), "Access to mainstream microfinance services for persons with disabilities - lessons learned from Uganda", *Disability Studies Quarterly* 29 (1).

Mersland, R. and R.Ø. Strøm (2009), "Performance and governance in microfinance institutions", *Journal of Banking and Finance* 33 (4)**,** 662-669.

Morduch, J. (1999), "The Microfinance Promise", *Journal of Economic Literature* 37 (4), 1569-1614.

Munnell, A.G., M.B. Tootell, L.E. Browne, and J. McEneaney (1992), "Mortgage Lending in Boston: Interpreting HMDA Data", Federal Reserve Bank of Boston, working paper 92-7.

Munnell, A.G., M.B. Tootell, L.E. Browne, and J. McEneaney (1996), "Mortgage Lending in Boston: Interpreting HMDA Data", *American Economic Review* 86 (1), 25-53.

Neufeldt, A.H. (1995), "Empirical dimensions of discrimination against disabled people", *Health and Human Rights* 1 (2), 174-189

Patrinos, H.A. (2000), "The Cost of Discrimination in Latin America", *Studies in Comparative International Development* 35 (2), 3-17.

Phelps, E.S. (1972), "The statistical theory of racism and sexism", *American Economic Review* 65 (4), 659-661.

Ross, S.L. (2005), "The continuing practice and impact of discrimination", University of Connecticut, Working Paper 2005-19R.

Ross, S.L. and J. Yinger (2002), "The color of credit: Mortgage discrimination, research methodology, and fair-lending enforcement", Cambridge and London: MIT Press.

Schreiner, M. (2000), "Credit-scoring for microfinance: Can it work?", *Journal of Microfinance* 2 (2), 105-118.

Schreiner, M., M.Cortes-Fontcuberta, D.H. Graham, G. Coetzee, and N. Vink (1996), "Racial discrimination in hire/purchase lending in apartheid South Africa", *Development Southern Africa*, 13 (6), 847-860.

Storey, D.J. (2004), "Racial and gender discrimination in the micro firms credit market?: Evidence from Trinidad and Tobago", *Small Business Economics* 23 (5), 401-422.

Sukhadeo, T. (2002), "Oppression and Denial: Dalit Discrimination in the 1990s", *Economic and Political Weekly* 37 (6), 572-578.

United Nations (2008), *Convention on the rights of persons with disabilities,* United Nations, New York.

Warning, M. and E. Sadoulet (1998), “The Performance of Village Intermediaries in Rural Credit Delivery under Changing Penalty Regimes: Evidence from Senegal”, *Journal of Development Studies* 35 (1), 115-138.