Indirect Microcredit Models:
The use and potential of guarantees in microcredit

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ABSTRACT

The aim of the paper is to introduce and clarify the financial and non-financial characteristics of the microcredit programs based on a credit guarantee scheme, i.e. Indirect Microcredit Models (IMMs). IMMs are emerging models of microcredit in high-income countries able to combine the contribution of the public sector, non-profit sector or socially responsible companies, and the mainstream banking and financial sector in promoting a social inclusion policy. We discuss the differences of IMMs with respect to traditional direct microcredit models (i.e. Grameen Bank) and credit guarantee schemes for SMEs. We identify and discuss the key financial variables of IMMs, which are the guarantee fund amount, the coverage ratio, and the multiplier between the guarantee fund and the amount of loans that the banks participating in the program agree to disburse. IMMs are schemes which rely on the provision of a guarantee fund which runs out in the course of disbursement of loans, because of defaults of the borrowers. Therefore, we introduce a theoretical model, based on the analysis of the cash flows, with the aim of clarifying the factors determining it, the relationships between the key financial variables of IMMs, and in particular the role of the multiplier. With this model, we draw some clear indications for the design and management of microcredit programs based on an IMM. The guarantee fund amount, the coverage ratio, and the default rate determine the maximum amount of loans that an IMM can disburse. Higher multipliers accelerate the loan disbursements but do not increase the maximum amount of loans an IMM can disburse. However, the multiplier can be important for two reasons. It is the tool with which the IMM can accelerate the loan disbursements when they are to be delivered as quickly as possible or by a certain date. It is a way to increase the real value of the loan disbursements. The definition of the optimal multiplier for a given IMM is therefore an activity that has to be performed throughout the microcredit program in consideration of its objectives and its results in terms of the insolvency rate.

KEYWORDS

Indirect Microcredit Models; Microfinance; Credit guarantee schemes; Developed countries.

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G21, G28.

INTRODUCTION

All over the world, both in low-income countries and in high-income countries, the poor do not have access to bank lending.

This exclusion is mainly associated with the high administrative costs of small-scale lending, the high risk perception attributed to the poor, their lack of adequate collateral and the high costs of enforcing contracts with them (Fernando, 2006; Hermes & Lensink, 2007; Rosenberg, Gonzalez, & Narain, 2009a, 2009b).

Microcredit - collateral-free small loans for income-generating activities by the poor (Yunus, 2004) - has gained significant importance in recent years as a mainstream development policy tool (e.g. Aagaard, 2011; Guinnane, 2011). The idea that poverty can be alleviated by providing easy and affordable access to credit and to other financial services to poor families has been widely supported in the literature (e.g. Bauer, Chytilová, & Morduch, 2012; Evans, Adams, Mohammed, & Norris, 1999; Morduch, 1999a) even if doubts on its impact persist (e.g. Banerjee, Karlan, & Zinman, 2015; Copestake, 2007; Hermes & Lensink, 2011; Imai, Gaiha, Thapa, & Annim, 2012; Karlan & Zinman, 2011).

Microfinance has developed since the 1970s in low-income countries as a set of financial practices designed to serve the poor excluded from access to bank lending (Armendáriz de Aghion & Labie, 2011), with the microfinance institutions (MFIs) directly providing microcredit to the "unbankable" clients.

The transfer of the technology of microcredit from low-income to high-income countries took place since the 1990s (Morduch, 1999a; Yunus, 2004) with the adoption of a different model, for several reasons.

On one side, the market for microcredit more limited than in the low-income countries, due to the higher average income and wealth of the population; the higher costs of delivery, due for instance to the higher costs of personnel; the ceilings on interest rates widely diffused, limiting the possibility of supplying small collateral-free loans achieving financial sustainability [1]; the strict legal and regulatory requirements for the banking sector and financial intermediaries both prevented MFIs in the high-income countries from adopting a model similar to Grameen Bank, and limited the interest of the banking sector in microcredit.

On the other side, it has been usually applied a methodology, that of the credit guarantee schemes (CGSs), already used for small and medium enterprises (SMEs). Indeed, the factors leading to exclusion from access to bank lending for the poor people are similar to those limiting access to bank lending for SMEs.

Microcredit sector has thus evolved in high-income countries mainly through hundreds of mostly small-scale microcredit programs based on credit guarantee schemes in which the MFIs play the role of guarantor (Di Castri, 2010). Examples of these microcredit programs can be found in many European countries (Dayson, Jayo Carboni, Kickul, Lacalle Calderón, & Rico Garrido, 2010).

The importance of these microcredit programs consists in the fact that they are able to combine the contribution of the non-profit sector (Dayson, 2010), public sector or socially responsible companies and the mainstream banking and financial sector in promoting a social inclusion policy. Furthermore, they regard the roles played by microfinance and mainstream finance in tackling poverty as complementary and overlapping rather than as competing alternatives, as advocated by Honohan (2004).

However, microcredit programs based on a credit guarantee scheme have distinctive features that distinguish them not only from the microcredit models developed in low-income countries but also from the credit guarantee schemes for SMEs.

The aim of the paper is to introduce and clarify the financial and non-financial aspects of the microcredit programs based on a credit guarantee scheme, i.e. Indirect Microcredit Models (IMMs), in order to fill a void in the literature on microcredit and help the institutions who wish to promote an IMM to better plan and manage it.

What it seems to be missing in the literature, as well as a description of the non-financial characteristics of the IMMs, is an examination of their financial characteristics. In particular, it seems to be missing a careful consideration of the function of the multiplier.

The key financial variables of IMMs are indeed three: the guarantee fund amount, the coverage ratio and the multiplier between the guarantee fund and the amount of loans that the banks participating in the program agree to disburse. The MFI that promotes an IMM usually defines the value of these variables in the planning phase together with the banks or other financial intermediaries involved in the program. Among these financial variables, the multiplier is particularly important, even in the public debate on microcredit programs. Indeed, public bodies and various levels of government and other actors often promote IMMs based on a large multiplier. A large multiplier is usually considered as a multiplier of the ability of an IMM to provide loans; i.e. a multiplier of the loans that the IMM can grant, given the guarantee fund and the coverage ratio. As we will see, this is a mistake.

In the *first section*, we discuss the differences of IMMs with respect to traditional direct microcredit models (i.e. Grameen Bank) and credit guarantee schemes for SMEs. In the *second section*, we discuss the key financial variables of IMMs. In the *third section*, we introduce a model, based on the analysis of the cash flows, to estimate the value of an IMM in terms of loan disbursements with the aim of clarifying the factors determining it, the relationships between the key financial variables of IMMs, and in particular the role of the multiplier.

1. INDIRECT MICROCREDIT MODEL BASED ON A CREDIT GUARANTEE SCHEME (IMM)

To serve the unbanked poor, microfinance institutions can i) directly provide microcredit to them, or ii) try to lessen the financing constraints faced by them.

The first model of intervention is the traditional direct microcredit, well exemplified by the Grameen Bank, where the MFI directly disburses loans to the poor without collateral.

The second model is an emerging one that relies on a partnership between MFIs and the mainstream banking and financial sector organizations. In this model, MFIs can be either associations, non-governmental organizations, public bodies or various levels of government, but also socially responsible companies, financial intermediaries or even banks. MFIs try to lessen financing constraints on the poor by providing the collateral that they cannot furnish and assuming responsibility for screening and monitoring the activities of the poor, thereby reducing the operating expenses for the mainstream financial institutions that disburse the loans. In an indirect microcredit model based on a credit guarantee scheme (IMM), the collateral offered by the MFI takes the form of a guarantee fund [2].

Figure 1 and 2 show these differences between the direct lending model and the indirect. Figure 1 illustrates the traditional direct microcredit model and Figure 2 the indirect microcredit model based on a credit guarantee scheme (IMM). In the direct microcredit model, the MFI raises funds through donations, and the capital markets (both equity and debt), and by collecting client deposits. In the indirect microcredit model, the MFI raises the funds to make up the guarantee fund through donations, or uses its own funds, while the lender raises the funds needed to finance the loans from the capital markets and by collecting client deposits. In a direct microcredit model the MFI disburses the loans; in an indirect microcredit model it is the lender, that is a mainstream bank or financial intermediary, that grants the loans.

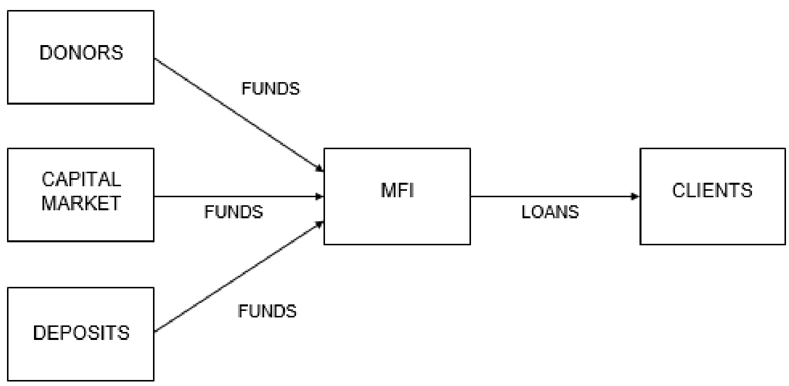

Figure 1 - Traditional direct microcredit model

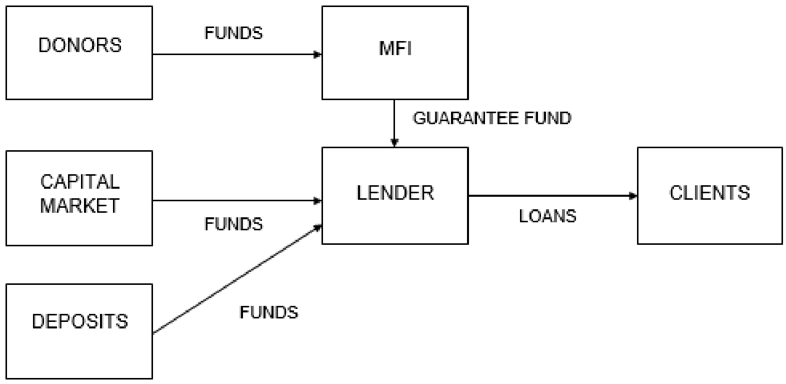

Figure 2 - Indirect Microcredit Model based on a credit guarantee scheme (IMM)

IMMs have two limitations that direct microcredit models do not have. Since they rely upon a partnership of an MFI with the mainstream banking and financial sector, IMMs cannot finance people excluded from access to bank lending due to past defaults (black lists of loan defaulters). Furthermore, in an IMM, fiduciary relationships develop mainly between the MFI and the borrower, at least initially, and not between the lender and the borrower. However, the fiduciary relationships involved in the lender-borrower relationship have a great impact on the repayment of collateral-free loans (Pelligra, 2011). This is a very important difference with respect to the direct microcredit models, where the MFI is the lender. Therefore, the promoter of an IMM should carefully plan the frame of the IMM so that fiduciary relationships develop also between the borrower and the lender. Besides the repayment of loans, the development of fiduciary relationships between the borrowers and the lenders, which are mainstream financial institutions, is usually an objective *per se* of the IMMs, since it may lead to the financial inclusion of those previously excluded.

The indirect microcredit model based on a credit guarantee scheme (IMM) shares some characteristics of the credit guarantee schemes for SMEs (CGSs) (Beck, Klapper, & Mendoza, 2008; Honohan, 2010; OECD, 2010).

In an IMM, as in a CGS, the guarantor guarantees to the lender the repayment of part or all of the loan loss upon default by the borrower. In an IMM, the guarantor is an MFI and the lenders are usually banks or other financial intermediaries.

The MFI promoting the IMM usually finances the guarantee fund; but sometimes also the banks or the financial intermediaries involved in the scheme contribute to the fund. This contribution can be both a philanthropic donation and an investment to improve the corporate image and to explore the potential profitability of a market not served. The amount of the guarantee fund is the maximum amount of losses that the guarantor may repay to the lender.

A first difference with respect to the usual CGS, is that in an IMM both the guarantor (MFI) and the lender make the credit risk assessment of the loan request, in a two-step process. In the first step, the MFI reviews the eligibility of the borrower and her risk profile. The MFI does the pre-scoring of new borrowers; evaluates the proposed projects, and the collaterals, if any; helps the clients drawing up the business plan, and establishes fiduciary relations with them (Di Castri, 2010). In the second step of the credit risk assessment, once the guarantor has approved the loan request, the lender makes a more formal assessment of the borrower's creditworthiness based on the information collected by the MFI and the credit history of the borrower, if available. The lender takes the final decision upon the loan, but normally the process ends only with the issue of the guarantee on the loan by the guarantor.

The lender usually has responsibility for monitoring the loan repayment, while the guarantor has responsibility for trying to solve any problem that may arise during the loan reimbursement. The guarantor also decides any appropriate change to the loan terms, i.e. a longer maturity. The guarantor has also the responsibility for deciding the activation of the loan recovery actions after a default event, but these actions are normally not taken against the defaulter borrower (opposite of what happens in CGSs).

The IMMs commonly have a minimum and a maximum loan amount, a minimum and a maximum maturity and grace periods, while CGS are normally more flexible.

Interest rates in the IMMs are generally subsidized and therefore below the market interest rates paid for similar loans - a rationale for a subsidized interest rate is given by Morduch (1999b). This is one of the two most significant differences with CGSs, which usually provide market interest rates. The other main difference is that, in the IMMs, the borrower does not pay any fee to the guarantor, while in the CGSs a fee is commonly paid by the client to enter the program. Since the lender retains the interests paid by the borrower and the guarantor does not collect any fee, the IMMs do not have a financial sustainability and rely on public and/or private subsidies and volunteer work.

The IMMs are therefore schemes which rely on the provision of an initial fund, the guarantee fund, which runs out in the course of the disbursement of loans, because of defaults of the borrowers. Not being financially sustainable, the IMMs have a limited lifetime, unless new funds are made available. This feature distinguishes the IMMs not only from CGSs but also from traditional microcredit based on a direct lending model which employs funds raised not only with donations but also by borrowing them and by collecting customers savings.

The best known of these traditional lending models, Grameen Bank, for instance started with donor funds and loans taken from internal and external sources; but already in 2004 almost 90 per cent of its outstanding loans were financed with its own funds and with the deposits of the clients so that there was no need for more donor money or new loans (Yunus, 2004).

Given the presence of a fund that will deplete over time and usually the absence of other income in addition to donations, the financial assessment of the IMMs must be based on the volume of loans disbursed over the planned time horizon given the available fund, as will be further explored in the next sections.

2. INDIRECT MICROCREDIT MODELS KEY FINANCIAL VARIABLES

In an IMM, lender and guarantor each absorb a predetermined fixed fraction of any loan loss, but the guarantor pays out all of its fraction of the losses up to the limit given by the *guarantee fund* amount (F).

Usually loan losses covered by the guarantee fund include the principal, accrued interests, and other costs incurred by the lender in an attempt to recover the amount owed by the borrower. However, since the lender declares the default of the borrower soon after the debtor fails to pay, both the accrued interest and the expenses are generally negligible.

The *guarantee ratio or coverage ratio* (C) is the fixed fraction of any loss absorbed by the guarantor, i.e. the ratio between the repayment by the guarantor to the lender and the loan loss amount. Thus for any given loan loss, the guarantee fund loses a share of the loan loss equal to C and the lender loses a share of the loan loss equal to ($1-C$), until the guarantee fund is exhausted. Any additional loan loss is entirely borne by the lender.

With a coverage ratio equal to 100 per cent, the lender bears no risk as long as the amount of the outstanding loans is less than the amount of the guarantee fund. A guarantee ratio below 100 per cent means that the lender retains part of the risk and therefore has an incentive to assess properly and monitor borrowers and thus reduce loan losses (Beck et al., 2008). At the same time, a coverage ratio below 100 per cent implies the risk that the lender will exclude potential borrowers from access to financing, because of their lack of collateral (Pelligra, 2011).

Given that the IMMs target people lacking collateral, we can consider any loan granted by the lender, with a guarantee ratio below 100 per cent, as an implicit contribution of the lender to the scheme. This contribution is equal to the potential loss that the lender may have to bear, i.e. a share ($1-C$) of each outstanding loan.

A lender can thus contribute to an IMM both *directly* by financing the guarantee fund (explicit contribution), and *indirectly* by agreeing upon a coverage ratio below 100 per cent (implicit contribution).

Given a guarantee fund amount F and a coverage ratio C, the amount of *grantable guaranteed loans* (G) is $G=F/C$ (e.g. if C=100 per cent then $G=F$, if C=10 per cent then $G=10F$).

Given the guarantee fund made available by the guarantor, F^G, a direct contribution of the lender to the guarantee fund, F^L, so that the total guarantee fund is $F^T=F^G+F^L$, is equivalent to a coverage ratio C such that $F^L=(1/C-1)F^G$ or $C=F^G/F^T$.

For instance, if the guarantee fund made available by the guarantor is 100, the grantable guaranteed loans are equal to 200 both if the lender adds 100 to the guarantee fund, with a coverage ratio equal to 100 per cent, and if it agrees on a coverage ratio equal to 50 per cent, without contributing to the guarantee fund.

Another very important variable in the IMMs is the *multiplier* (*M*). Often, the lender is committed to granting loans of an amount equal to a multiple *M* of the grantable guaranteed loans *G*, i.e. to granting loans up to a disbursement amount $D=MG$. The lender can concede a multiplier at no additional cost, if the interest rate paid by the borrowers on the disbursed loans is greater than the interest rate paid by the lender for the funds.

Table 1 shows the key financial variables of three Italian IMMs (amounts are in euros).

Table 1 – Three Italian microcredit programs based on a credit guarantee scheme (IMMs)

IMM	*Fragili Orizzonti (2011)*	*Granello di Senape (2011)*	*Prestito della Speranza (2010)*
MFI	*Provincia di Torino*	*Servitium Emiliani Onlus*	*Conferenza Episcopale Italiana*
Lender	*Banca Popolare Etica*	*Banche di Credito Cooperativo*	*Associazione Bancaria Italiana*
Contribution of the MFI to the guarantee fund	392,000	141,000	5,000,000
Contribution of the lender to the guarantee fund	0	189,000	0
Guarantee fund amount	392,000	330,000	5,000,000
Coverage ratio	100%	100%	50%
Indirect contribution of the lender to the IMM	0	0	5,000,000
Grantable guaranteed loans	392,000	330,000	10,000,000
Multiplier	2	1	2
Grantable loans	784,000	330,000	20,000,000

3 VALUE OF AN INDIRECT MICROCREDIT MODEL

In this section, we introduce a model to estimate the value of an IMM, i.e. the amount of loans that an IMM can disburse. With this model, we aim to clarify the factors determining the amount of loans that an IMM can disburse, the relationships between the key financial variables of IMMs, and in particular the role of the multiplier. We will gradually modify the initial assumptions to clarify the different aspects of the matter.

3.1 VALUE OF AN IMM WITHOUT INFLATION AND OVER AN INDEFINITE TIME HORIZON

Assume that:

1) the guarantee fund established at the start of the program is not subsequently increased by additional contributions;
2) the default rate is constant and equal to I;
3) the IMM has an indefinite time horizon, i.e. it continues to provide loans without time constraints until full use of the guarantee fund;
4) the indefinite time horizon can be split into time periods of the same duration;
5) each loan has a maturity of one period;
6) the loan disbursements occur at the beginning of each period and the loan repayments occur at the end of each period;
7) in each period the IMM disburses an amount of loans equal to the credit limit D_t, where D_t is equal to a multiple M of the amount of guaranteed loans grantable at the beginning of that period G_t; with the multiplier M being positive, i.e. $M>0$; usually a new IMM requires a certain period of time before it can really disburse all the loans grantable: this assumption, and therefore the model, can be thought of as referring to the full operations of an IMM [3];
8) we can directly compare the cash flows related to different time instants, i.e. we do not take inflation into account.

Given the assumptions made, at the beginning of each period an IMM disburses an amount of loans equal to

(1) $D_t = MG_t$

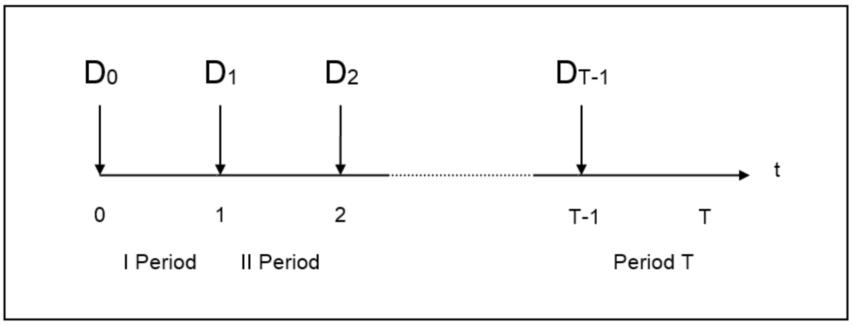

Figure 3 - Disbursements of an IMM over a time horizon of T periods

The disbursements decrease over time due to the loan losses. Each loan loss decreases the amount of the grantable guaranteed loans of an equal amount. Therefore at the beginning of the second period it is

(2) $G_1 = G - ID_0$

where G is the initial amount of grantable guaranteed loans and ID_0 are the loan losses at the end of the first period.

Since by (1) it is $D_0=MG$, then by (2) it is

(3) $G_1 = G - IMG = (1-IM)G$

At the beginning of the third period, it is

(4) $G_2 = G_1 - ID_1 = G_1 - IMG_1 = (1 - IM)G_1 = (1 - IM)^2 G$

In general, in each period the amount of the grantable guaranteed loans is

(5) $G_t = (1-IM)^t G$

Therefore, using (1) and (5), in each period, the disbursements are:

(6) $D_t = MG_t = MG(1-IM)^t$

The value of an IMM without inflation and over an indefinite time horizon (V), i.e. the sum of the loans that it can disburse, is therefore

(7) $$\begin{aligned} V &= \sum_{t=0}^{\infty} D_t = \sum_{t=0}^{\infty} MG(1-IM)^t = \\ &= MG + MG(1-IM) + MG(1-IM)^2 + \dots \end{aligned}$$

Usually, IMMs define a maximum level of the default rate that stops the program, and normally this threshold is $I<1/M$, so that if $IM\geq1$ then the program ceases to lend. This threshold prevents the lender from suffering loan losses greater than those agreed upon accepting the coverage ratio C. Therefore [4] the value of an IMM without inflation and over an indefinite time horizon given by (7) is

(8) $V = \frac{G}{I}$

The value of an IMM depends on the initial amount of grantable guaranteed loans and on the insolvency rate I. The lever effect is greater the lower the default rate. The multiplier does not affect the value of the IMM.

3.2 VALUE OF AN IMM CONSIDERING INFLATION

Now let us see how things change when inflation is considered. The value of an IMM considering inflation (V_i), its real value, is the sum of the disbursements at the beginning of each period, discounted by the rate of inflation i of each period, assumed constant and non-negative. It is

(9) $$\begin{aligned} V_i &= \sum_{t=0}^{\infty} \frac{D_t}{(1+i)^t} = \sum_{t=0}^{\infty} \frac{MG(1-IM)^t}{(1+i)^t} = \sum_{t=0}^{\infty} \left(\frac{1-IM}{1+i}\right)^t MG = \\ &= MG + \frac{(1-IM)}{(1+i)} MG + \left(\frac{1-IM}{1+i}\right)^t MG + \dots \end{aligned}$$

Therefore [5] it is

(10) $V_i = \left(\frac{1 + i}{IM + i} \right) MG$

A multiplier greater than 1 increases the real value of an IMM [6].

Table 2 shows, with an inflation rate equal to 10 per cent, the real value of the disbursements of the first ten periods of an IMM with an initial amount of grantable guaranteed loans G equal to 50,000 and a default rate I equal to 10 per cent for three different multipliers M.

Table 2 – Real value of the disbursements in each period (G=50,000, I=10%, i=10%)

	Period									
M	*I*	*II*	*III*	*IV*	*V*	*IV*	*VII*	*VIII*	*IX*	*X*
1	50,000	42,857	36,735	31,487	26,989	23,133	19,828	16,996	14,568	12,487
2	100,000	76,190	58,050	44,228	33,698	25,675	19,562	14,904	11,355	8,652
5	250,000	119,048	56,689	26,995	12,855	6,121	2,915	1,388	661	315

Table 3 and Figure 4 show the corresponding cumulative disbursements for each period.

Table 3 – Cumulative disbursements in each period

	Period									
M	*I*	*II*	*III*	*IV*	*V*	*IV*	*VII*	*VIII*	*IX*	*X*
1	50,000	92,857	129,592	161,079	188,067	211,201	231,029	248,025	262,593	275,080
2	100,000	176,190	234,240	278,469	312,167	337,841	357,403	372,307	383,662	392,314
5	250,000	369,048	425,737	452,732	465,587	471,708	474,623	476,011	476,672	476,987

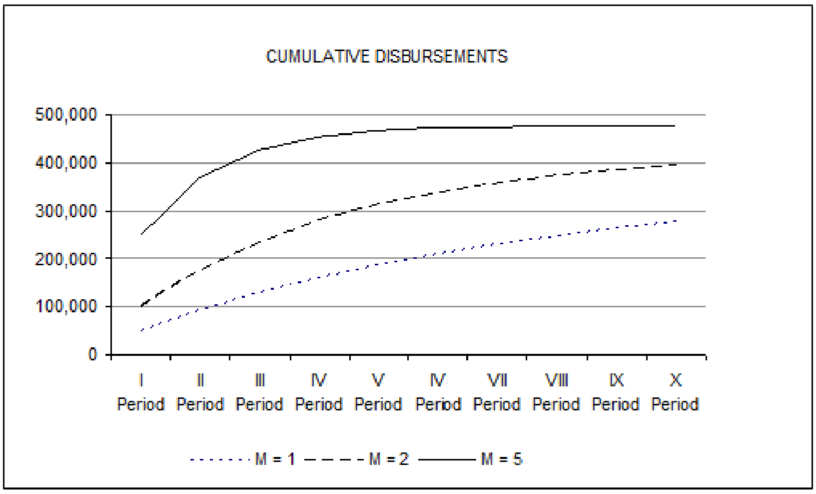

Figure 4 - Cumulative disbursements of an IMM for three multipliers

Table 4 shows the cumulative disbursements of each period as a percentage of the IMM value considering inflation V_i determined with the formula (10).

Table 4 – Cumulative disbursements in each period as a percentage of the real value

		Period									
M	V_i	*I*	*II*	*III*	*IV*	*V*	*IV*	*VII*	*VIII*	*IX*	*X*
1	*350,000*	14	27	37	46	54	60	66	71	75	79
2	*420,000*	24	42	56	66	74	80	85	89	91	93
5	*477,273*	52	77	89	95	98	99	99	100	100	100

A higher multiplier, anticipating the disbursements, increases the real value of the IMM for the beneficiaries of the microcredit program.

3.3 VALUE OF AN IMM CONSIDERING INFLATION AND OVER A TIME HORIZON

Now let us see how things change when, in addition to inflation, a predefined duration of the IMM is considered.

Assume that the IMM has a time horizon of T periods, i.e. that it lends from time instant 0 to time instant $T\!-\!1$.

The value of this IMM, considering inflation and over a time horizon T ($V^T{}_i$), [7] is

$$(11)\quad V^T{}_i = \left[1-\left(\frac{1-IM}{1+i}\right)^T\right]\left(\frac{1+i}{IM+i}\right)MG\,.$$

To understand the effect of a multiplier greater than one on the IMM value, considering inflation and a time horizon, we can compare two IMMs which have the same characteristics except that the former has a multiplier equal to one, and the second a multiplier greater than one. The increase in the value of an IMM due to a multiplier greater than one, as a percentage of the value of the same IMM with a multiplier equal to one, is

$$\Delta\%V^T{}_i = \frac{V^T{}_{i,\,M>1} - V^T{}_{i,\,M=1}}{V^T{}_{i,\,M=1}}\cdot 100\% =$$

$$(12)\quad = \frac{\left[1-\left(\frac{1-IM}{1+i}\right)^T\right]\left(\frac{1+i}{IM+i}\right)M - \left[1-\left(\frac{1-I}{1+i}\right)^T\right]\left(\frac{1+i}{I+i}\right)}{\left[1-\left(\frac{1-I}{1+i}\right)^T\right]\left(\frac{1+i}{I+i}\right)}\cdot 100\%$$

A multiplier *M* greater than one increases the first addendum of the numerator and therefore the value of an IMM.

Table 5 shows, with reference to different default rates *I*, how the value of an IMM increases for increasing values of the multiplier *M*, using the percentage increase given by the formula (12), in the case of an inflation rate equal to 5 per cent and over a time horizon of 5 periods ($V_{i=5\%}^{T=5}$).

Table 5 – Percentage increase of the real value of an IMM (%) (i=5%, T=5)

		M								
		2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
I	*2%*	93	178	257	330	397	458	515	566	613
	5%	82	149	202	245	278	304	324	339	350
	10%	66	108	133	148	156	160	163	164	-
	15%	52	77	87	91	94	-	-	-	-
	20%	40	54	58	-	-	-	-	-	-
	30%	23	27	-	-	-	-	-	-	-
	49%	8	-	-	-	-	-	-	-	-

For instance, with a default rate *I* equal to 5 per cent, a multiplier *M* equal to 4 increases the IMM's real value by 202 per cent compared with the value of the same IMM with a multiplier equal to 1. This means that, with a multiplier equal to 4, the IMM disburses in the same duration of 5 periods a real value 3 times higher than the real value disbursed by an IMM with a multiplier equal to 1. It is also noteworthy that the percentage increase given by each multiplier is greater for lower default rates.

3.4 DURATION OF AN IMM

Now let us see what the duration of an IMM is when, instead of a fixed duration, it ceases once the amount of the grantable guaranteed loans reaches a threshold percentage of its starting value.

The duration of an IMM ending when the amount of the grantable guaranteed loans reaches a threshold percentage *m* of its starting value *G* [8] is

$$(13)\quad T = \frac{\ln(m)}{\ln\left(1-IM\right)}$$

Given the threshold percentage *m* and the default rate *I*, a greater multiplier *M*, with $0<IM<1$, approaches the argument to the denominator logarithm to zero increasing the denominator absolute value. Therefore, the duration of an IMM decreases with greater multipliers.

To understand the effect of a multiplier greater than one on the duration of an IMM, we can compare two IMMs with the same characteristics except that the former has a multiplier equal to one, and the second a greater multiplier. To compare them, we express the decrease in the duration of an IMM due to a multiplier greater than one as a percentage of the duration of the same IMM with a multiplier equal to one. It is

$$\Delta\%T = -\frac{T_{M>1} - T_{M=1}}{T_{M=1}} =$$

$$(14) \qquad = -\frac{\dfrac{\ln(m)}{\ln(1-IM)} - \dfrac{\ln(m)}{\ln(1-I)}}{\dfrac{\ln(m)}{\ln(1-I)}} \cdot 100\% = \left[1 - \frac{\ln(1-I)}{\ln(1-IM)}\right] \cdot 100\%$$

Given the default rate *I*, a greater multiplier *M*, with $0<IM<1$, approaches the argument to the denominator logarithm to zero increasing the denominator absolute value. Therefore, the percentage decrease is greater the greater is the multiplier.

Because the percentage decrease of the duration of an IMM given by (14) is independent by the threshold percentage *m*, it can also be viewed as an indicator of how a greater multiplier accelerates the loan disbursements.

Table 6 shows, with reference to different default rates *I*, how the duration *T* of an IMM decreases for increasing values of the multiplier *M*, using the percentage decrease given by (14).

Table 6 – Percentage decrease of the duration of an IMM (%)

		M								
		2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
I	*2%*	51	67	76	81	84	87	88	90	91
	5%	51	68	77	82	86	88	90	91	93
	10%	53	70	79	85	89	91	93	95	-
	15%	54	73	82	88	93	-	-	-	-
	20%	56	76	86	-	-	-	-	-	-
	30%	61	85	-	-	-	-	-	-	-
	49%	83	-	-	-	-	-	-	-	-

For instance, with a default rate equal to 10 per cent, a multiplier equal to 4 gives to an IMM a duration equal to 21 per cent of the duration of the same IMM but with a multiplier equal to 1. This means that loan disbursements with a multiplier equal to 4 are five time faster.

3.5 TWO EXAMPLES

Table 7 shows the values of an IMM discussed above, considering inflation (i=3%) or not, over a time horizon (T=5) or not, for two Italian microcredit programs. *Granello di Senape* has a higher value over an indefinite time horizon because it has a lower insolvency rate. *Fragili Orizzonti* has a higher value over 5 years because it has a multiplier equal to 2.

Table 7 – Two examples: Fragili Orizzonti and Granello di Senape

	Fragili Orizzonti	*Granello di Senape*
Guarantee fund amount (euro)	392,000	330,000
Coverage ratio (%)	100	100
Multiplier	2	1
Insolvency rate (%)	14	4
IMM Value (euro)	2,800,000	8,250,000
IMM Value (i=3%) (euro)	2,604,903	4,855,714
IMM Value (T=5) (euro)	2,258,223	1,523,175
IMM Value (i=3%T=5) (euro)	2,170,125	1,440,459

DISCUSSION AND CONCLUSIONS

We developed a model, based on the analysis of the cash flows, to estimate the value of an IMM in terms of loan disbursements with the aim of clarifying the factors determining it, the relationships between the key financial variables of IMMs, and in particular the role of the multiplier.

The model has three main limitations. The first limitation is that it assumes that in every period an IMM is able to provide all the loans of which it is capable, but this is not always the case in particular during the start-up phase. The second limitation of the model is that it assumes that the borrowers receive loans at the beginning of each period and repay them at the end of the same period. The third limitation is that it assumes that the insolvency rate is constant over time.

These limitations would be important if the model were used to predict the actual disbursements of an IMM, but they do not seem important given our purpose. However, they indicate the direction in which the model may be refined, improving the realism of the assumptions with an analysis based on real data. The collection of data on microcredit programs is thus a possibility of extension of the research. The general lack of willingness on the part of the microcredit programs to provide data on delinquencies, however, limits this possibility.

The model allows us to draw some clear indications. The guarantee fund amount, the coverage ratio, and the default rate determine the maximum amount of loans that an IMM can disburse. Higher multipliers accelerate the loan disbursements but they do not increase the maximum amount of loans that an IMM can disburse.

Given the guarantee fund amount and the coverage ratio, the amount of loans that an IMM can disburse depends only on the insolvency rate: it does not depend on the multiplier. Therefore, it is not true, as frequently assumed, that the multiplier “multiplies” the loans that the IMM can grant. Policy makers are frequently misled on the impact of the multipliers and wrongly assume that it is on the amount disbursed: it is true that with credit guarantee schemes relatively small cash outlays can leverage large numbers of loans and high volumes of lending (Honohan, 2010), but this can happen only when the insolvency rate is low. It is the default rate, and not a high multiplier, which determines a scheme's volume of lending of.

However, the multiplier, a multiplier greater than one, accelerates the loan disbursements. Therefore, the multiplier can be important for two reasons. It is the tool with which the IMM can accelerate the loan disbursements when they are to be delivered as quickly as possible or by a certain date. It is a way to increase the real value of the loan disbursements. As we have seen, accelerating loan disbursements is particularly effective when the default rates are low. For any given guarantee fund amount and coverage ratio, accelerating loan disbursements with a multiplier means fully deploying in a shorter time the benefits that a microcredit program can produce for its recipients. In this sense, by using properly multipliers an IMM can be much more efficient and effective. Indeed, since the microcredit programs usually provide a maximum amount payable for each loan, the amount of loans that an IMM can disburse is a proxy of its outreach.

These results may allow the better planning and management of a microcredit program based on a credit guarantee scheme. In the design phase of a new IMM, the guarantor and the lender could determine the value of the guarantee fund, the coverage ratio, and the multiplier, i.e. their contribution to the scheme, adapting them to the objectives of the program. For instance, given the guarantee fund, a guarantor that wants higher disbursements in a shorter period could give the lender a higher coverage ratio in exchange for a higher multiplier. However, in the start of a microcredit program, it is not important to obtain a high multiplier from banks until it is clear which the default rate of the program is. Once known the default rate, the institutions involved in the microcredit program can agree accordingly a higher multiplier in order to speed up the disbursements. In the course of an IMM, the guarantor and the lender could evaluate whether it is appropriate to make changes to its three main variables. For instance, if the default rate is low and if the creditworthy loan requests exceed the amount of the loans that the scheme can grant, a higher multiplier could be agreed upon by the guarantor and the lender. This could be an alternative more convenient for both the guarantor and the lender than an increase in the guarantee fund or a decrease in the coverage ratio.

The definition of the optimal multiplier for a given IMM is therefore an activity that has to be performed throughout the program in consideration of its objectives and its results in terms of the insolvency rate .

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ENDNOTES

[1] Interest charged on loans is the main source of income for the microfinance institutions providing microcredit. With the interest rate an MFI wanting to be financially sustainable must cover: 1) the cost of funds, 2) the operating expenses, 3) the loan losses, 4) the expected profits and those needed to expand its capital base and to fund expected future growth, also considering inflation, and 5) taxes (Fernando, 2006; Rosenberg et al., 2009a, 2009b).
The smaller the loan is, the higher the interest rate must be to cover the operating expenses related to the single loan, because the transaction costs are greater than those for larger loans on a per unit basis. The smaller and less enforceable the collaterals that the client can offer are, the higher the interest rate must be to cover the risk of the loan.
Thus ceiling interest rates, by imposing a cap on the interest rate, reduce the supply of loans of small amounts not secured by adequate collateral.

[2] We are focusing on a specific type of indirect microcredit model, i.e. the one based on a credit guarantee scheme. This choice is due to the fact that this is the emerging and most widespread model of indirect microcredit. Other indirect microcredit models could be found or devised. For instance the MFI could provide a mainstream financial institutions with a fund for

the microcredit provision, cover all its operating expenses and provide a remuneration for the service, thus using the financial institution as an agent acting on its behalf.

[3] The assumption made that in any period the IMM can disburse an amount of loans equal to the credit limit could be replaced by assuming that in each period the IMM can disburse a fraction of the credit limit which increases with time, for instance

$$D_t = \left[1 - \frac{1}{(a+t)} \right]^b MG_t$$

where the regime value of the loan disbursements is equal to the credit limit but is reached with a speed given by the parameter b.

[4] The value of an IMM given by (7) is the sum of a series of cash flows, the disbursements at the beginning of each period, i.e. a geometric series which can be proved to converges to G/I if its common ratio $(1-IM)$ has an absolute value less than 1. This is true if $|1-IM|<1$ or if $-1<1-IM<1$ and thus if $0<IM<2$.
Having assumed $M>0$, and assuming that $0<I\leq 1$, with $I>0$ meaning that there is at least a loan loss, we have that the condition $IM>0$ is satisfied.
Also the condition $IM<2$ can be considered satisfied because we can consider $IM<1$.
In fact, if $IM>1$ then loan losses $ID=IMG>G$ are greater than the amount of the grantable guaranteed loans, and the lender has to bear loan losses $(1-C)ID>(1-C)G$ greater than those agreed upon accepting the coverage ratio C. In order to prevent these unwanted losses for the lender, the IMMs usually define a maximum level of default rate that stops the program. This threshold is normally $I<1/M$, so that if $IM\geq 1$ then the program ceases to lend. For instance, with a multiplier equal to 2 the default rate has to be lower than 50 per cent.

[5] The value of an IMM with inflation given by (9) is the sum of a series of cash flows that is a geometric series which can be proved to converge to $\left(\frac{1+i}{IM+i}\right)MG$ if its common ratio $\left(\frac{1-IM}{1+i}\right)$ has an absolute value less than 1, that is if $\left|\frac{1-IM}{1+i}\right|<1$.
The condition $\left|\frac{1-IM}{1+i}\right|<1$ is satisfied if $-1<\left(\frac{1-IM}{1+i}\right)<1$. The condition $\left(\frac{1-IM}{1+i}\right)<1$ is satisfied having assumed that $IM>0$ and with $i\geq 0$, because the denominator is greater that the numerator.

The condition $\left(\frac{1-IM}{1+i}\right) > -1$, i.e. $(1-\mathrm{IM}) > -(1+\mathrm{i})$, is satisfied having assumed in the previous paragraph that $IM \leq 1$.

[6] A multiplier greater than 1 increases the value of an IMM with inflation V_i because if M>1 then $\left(\frac{1\ +\ i}{IM+i}\right)MG > \left(\frac{1\ +\ i}{I+i}\right)G$.

[7] We can determine the value of an IMM considering inflation and over a time horizon T ($V^T{}_i$), following Brealey and Myers (1990, pp. 35–37), as the difference between the values V_i of two IMMs. The first starting in t=0 with an amount of grantable guaranteed loans G. The second starting in t=T with an amount of grantable guaranteed loans $G_T=(1-IM)^T G$, that is

$$V^T{}_i = V_i - V^{T-\infty}{}_i = \left(\frac{1\ +\ i}{IM+i}\right)MG - \left(\frac{1\ +\ i}{IM+i}\right)\frac{MG_T}{(1\ +\ i)^T} =$$

(15) $$= \left(\frac{1\ +\ i}{IM+i}\right)MG - \left(\frac{1\ +\ i}{IM+i}\right)\left(\frac{1-IM}{1\ +\ i}\right)^T MG =$$

$$= \left[1-\left(\frac{1-IM}{1\ +\ i}\right)^T\right]\left(\frac{1\ +\ i}{IM+i}\right)MG$$

[8] For an IMM which ends when the amount of the grantable guaranteed loans reaches a threshold percentage m of its starting value G, the duration T is such that

(16) $$G(T) = (1-IM)^T G = mG$$

Because we are looking for the duration corresponding to a given amount of loan losses, or to a given decrease of the grantable guaranteed loans amount, inflation is not relevant here.

Applying the natural logarithm to (16), we have

(17) $$\ln(1-IM)^T = \ln(m)$$

And therefore

(18) $$T\ln(1-IM) = \ln(m)$$