

# **On the trade-off between size, sustainability and Social outcome of the Microfinance Institutions: A two Stages Bootstrapped DEA approach**

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## **Abstract**

The article aims at measuring the performance of MFIs in MENA region by using the nonparametric Data Envelopment Analysis (DEA) technique in order to calculate both Pure Technical Efficiency and Scale Efficiency. Bootstrapping is used in order to correct the Efficiency scores from their bias and to retrieve the correct inference when it comes to perform the second stage estimation. Data used are a non-balanced panel of 1677 MFIs from 105 countries covering the period from 2006 to 2015. The main aim of taking all the operating MFIs, for which, data are available. In a second stage, a double censored multilevel regression is performed to assess the determinants of scale efficiency in the MFIs. The results show, among others, that financial performances enhance the possibility to operate under the optimal scale weather the MFI is too small or too big while social performances are reached more by too large MFIs.

## **1. Introduction:**

In order to reach a national prosperity and achieve wealth, the poor and low income households must contribute to « the pursuit of happiness ». However, the lack of finance prevents the poor from achieving such ambitions. One of the goals of the IMF is to empower the most economically vulnerable people (jobless and the have-not's) by making financial resources available for them so they become active in the economy and therefore self-sufficient.

Supportive of IMFs say that their institutions aim at combating poverty. Their methods of target is the provision of micro credits, a kind of credits that enable people short of liquidity to setup small projects known these days start up. IMF become a creditor dealing with individuals and communities that want to change their life for the better. As a consequence, a higher income, thanks to the microfinance lending policy, people precarious economic condition can have access to education, decent housing and a better food diet also infrastructure. While ordinary banks deliberately exclude poor people from their services, because of the shortage of collateral requirements to secure their loan, IMF enable those marginalized people to access credit, savings and insurance. This would help them to lead a more comfortable life . To sum up this, the microfinance oil clogged the miner human machine ignored by the ordinary banks.

However, IMF's role does not only consist in boosting the poor's standard of living but also in making financial profits. Despite the claim that microfinance institutions aim at salvaging the poor from poverty and loss, their seeking of profit cannot be denied.

However, microfinance institutions concepts and practices are at the center of a controversy among contending the economic schools. In his article, Joseph Nzongang (2011) defined microfinance as the essence of financial services offered to those who are excluded from the traditional financial system. It has the aim of accomplishing a social mission but not at the expense of its basic mission, which is no different from traditional banks.

Two structures are depicted: a large one whose efficiency depends on the cost and scale, and a small one whose strength lies in the flexibility it offers. The large size structure has the advantage of obtaining a minimized cost that leads to a maximized gain at the expense of the quality of services it provides. Large size-institutions demand longer periods to

process the client's documents and to fulfill their needs. The large size IMF has a low pace quality service, this is the opposite case when speaking about the small size MFI's that assume very important costs which minimize the profits, but provide a best service quality.

The fact that both structures have strong points and shortcomings explains the controversy opposing issue. However, no paper has had clearly focalized this dilemma .Some papers dealt with the IMF's efficiency, social efficiency and scale but none was written about the system in its self. This is why in this article we will have to look more closely at the optimal size of the institution and how this factor contributes to its efficiency.

In spite of reaching the double goal financial and social by numerous IMF are unable to respond efficiently to financial services seeked for by their clients in the market Yaron,1994,Hermas & Lensink,2011. In this frame, the decision makers are gathered to acknowledge that the size affect the efficiency.

The methods of frontiers have become one of the most sophisticated tools, and more powerful for comparing companies (Berger et Humphrey, 1997). The SFA and DEA are considered to be the most used frontier, techniques that allow the measurement of microfinance institution efficiency. In our research, we are using an approach for a sample of MFI working around the world, and to put the light on the MENA region from 2006 to 2012 using 3 inputs assets: operating costs and number of employees and four outputs : the portfolio of gross financial loans and income, financial revenues, the number of women borrowers and one an indicator that measures the weight in which the activities of the MFI institution can benefit the poorest, operating under the production approach.

The remainder of this article is structured as follows : the study begins with a brief literature review on efficiency, scale and the application of non-parametric method to measure the efficiency of MFI's. Section 3 is dedicated to the methodology. Section 4 discusses the empirical results. Section 5 concludes.

## **2. Brief review of the literature on efficiency and scale efficiency measurement of microfinance institutions**

Microfinance is a relatively new concept in the economic jargon, and has emerged to fill a gap in the economic space. It is considered as an efficient means to reduce poverty and support people who are economically active but lack the financial resources that would enable them to reap the best returns from their force of work (Morduch and Haley 2002; Japonica Intersectoral 2003). This concept is an umbrella term for a wide range of financial services including loans, deposits and insurance to assist poor households in setting in motion their microenterprise. In the literature of "persuasive research" there is a wealth of evidence pointing to the positive role played by the micro-finance institutions in improving the lives of dispossessed communities in several countries. It should be noted that it is in developing countries that MFIs have particularly proliferated. They have so proliferated as non-lucrative organizations with the primary aim to provide with access to financial services those people traditionally banned from ordinary banks. They are said to have a social face since their funds come from deposits and donations. Donors are special people with an acute sense of altruism, one may call them "Socio-economic Samaritans". The twin orientation\_ financial and social\_ of MFIs wins it the nickname "The double button line". This topic has engendered a debate called by Morduch(2000) "The schism of microfinance". This term refers to two large axes of microfinance called approaches .There is the welfarists' approach (Carroll 1979, Servet 2007). It is an approach that insures to eradicate poverty in order to achieve social welfare and well-being. The second approach which sets itself an exclusively financial target, viability and perennity. MFIs are recognized by MIX Market into five categories: Non-Governmental Organization, Non-Bank Financial Institution (NBFI), Commercial Bank, Rural Bank, Coopertave. NGOs are defined and classified as non-governmental organizations with non-lucrative objectives. Their basic activity is the granting of credits to the poor so as they have a better purchasing power and a minimum of well-being. Some NGOs provide credits, in addition to basic health and education services like literacy programs. ONGs are not subject to authorities reglementation or to bank supervision. Yet they have to abide by the civil and commercial laws of the country where they are based (United Nations, 2006). Dichter(1996) consider most of MFIs are ONG which have a comparative advantage to reach the poor. These categories of MFIs should be socially and financially efficient.

According to Koopmans (1951), the concept of efficiency is a fundamental concept in the economic theory. Also, total efficiency is defined as the achievement or the accomplishment

of Parito's Optimum. The efficiency returns the quality degree with which the economic unities accomplish their goals. This causes problems with efficiency rate. These questions have been discussed and there has been an agreement throughout literature (Charnes & Cooper, 1978) according to which the modern measurement of the economic efficiency was introduced by Farell (1957) and Koopmans (1951) who was inspired from works of Debreu (1951) in order to define a simple measurement of the company's efficiency. He proposed that economic efficiency of a company is a combination of its technological capacity which reflects its capacity to obtain the maximized results out of a given quality of inputs and its allocative efficiency. This enlightens us to the capacity to use the inputs optimally. Mouzas (2006), the success of an organization is characterized by efficiency rather than effectiveness. Hence, efficiency is not a measure of success and market success, but rather a measure of productivity as well as operational excellence, which ultimately proves that efficiency, is linked to cost reduction and the consolidation of operating margins.

In the context of efficiency, several previous works have been mentioned by several researchers. Ben Soltane (2008) asserts that an IMF can only be declared efficient when it optimizes the resources available to it in order to meet the stated social objectives as well as financial ones. Several studies have analyzed efficiency in several countries. Among these studies we mention Nghiem (2004), Gutierrez-Nieto et al. (2005), Abdul Qayyum Ahmad (2006), and Sufian (2006) who used data from Vietnam, Latin America, South Asia, and Malaysia respectively. Gutierrez-Nieto et al. (2005) studied the efficiency of 30 microfinance institutions from Latin America and concluded that their efficiency can be explained by means of four main constituents of the efficiency, they showed that the efficiency is affected on the one hand by localization or the country effect and on the other hand by the status of the IMF. In the same way Ben Abdelkader, Ben Jemaa, Hathroubi (2015) prove also in their study that the status of IMF is one of the determinants of efficiency.

In their article, Mahindra et al. (2017) analyzed the efficiency of IMFs and more specifically they studied the impact of age and size on the financial and social efficiency of IMFs. They found that older IMFs behave better than young people in terms of achieving financial goals. Mamiza, Michael and Shams (2010) analyzed the cost efficiency of a sample of thirty-nine IMFs in Africa and Latin America. The results show that non-governmental IMFs are the most efficient. Baumann (2005) establish a relationship between IMF efficiency and productivity. Thus, after an elaborate analysis Lafourcade et al (2005) show that the staff of

African MFIs are highly productive. This elevated productivity is an indication of their intensive use of group loans as a means of realizing economies of scale.

On the topic of microfinance performance, a lot of studies show that numerous MFIs have enhanced their efficiency and become self-sufficient (United Nations 2011). One of the solutions that help the MFI to ameliorate its efficiency is changing its size. ( phrase )

First, in the theory of market, failure gives rise to the differences between large and small firms; no loan agreement can take place without costs, and guarantees are demanded while risks are disliked (Arrow 1996). The bigger the firm size, the higher the risk and costs. This theory can be explained as follows: between large and small firms, there are measurable differences in capital intensity. These differences affect scale such as total assets (Rajan et Zingales, 1998), equity, employees (Rosen, 1982), sales and ROA (Roberts 1977). Large firms pay lower interest rates for long-term debts, while small firms pay higher interest rates for short-term ones. In fact, Smith (1776) concludes that scale of operation is limited by market size.

Secondly, unit cost is reduced parallel to an increase of the size and volume of output. It means the more expanded the business (translated into higher sales), the lower the costs when sales go up. It is the economics of scale theory. (Hodgson 2010) says that a number of benefits result from the efficiency related to scale in competitive markets. According to this theory, customers will go to the best providers who can give them the best products and services at the most attractive costs. Besides, some firms are immune to failure because of their large size and they play a leading role in the national economy and if they happen to fail, they would jeopardize the whole economy (Sorkin 2010). That's why the central bank rushes to salvage these large firms, for example the US Federal Reserve pumps large amounts in State banks to leverage them. The geological concept of 'seismic waves' is often applied to the economic field as individual economies are interrelated, waves crises move from their epicenter and start propagating farther out (Benston 1965). Large firms can be a promoter of the economic prosperity but if they happen to fail, the effect can be felt in many sectors in many parts of the world. So the impact of failure of large firms can be detrimental to other economies while smaller one will have a limited effect (Krugman 2010). Trong V r Ngo, Andrew W. Mullineux, Anh Hoang Ly (2014) judge larger MFIs as more efficient and more profitable than small and medium sized MFIs. Their judgment is based on statistical data collected for the period extending between 1996 and 2009. The small MFIs scored poorly in matter of sustainability. Larger MFIs supplied significantly larger loans than small MFIs.

These loans were of 2.5 to 5 times bigger in size. This large IMFs efficiency and profitability isn't without implications: cost per borrower was 1.2 -2 times higher (MIX Market 2013). A 2002 MicroBanking Bulletin survey yielded important results: large IMFs particularly in Latin America accessed more funds and achieved higher financial leveraging than small ones. Funding by large IMFs counts for a greater proportion of commercial debts, which means that large IMFs are more deeply integrated than smaller ones (WWB 2004). Understanding the differences between large and small IMFs is of primary importance if one has to choose the optimal scale, which scale is the most suitable one for their operations and regulations in order to maintain profitability self-sufficiency and viability.(Beck et al (2008), Sudhir and Tripathy,2011, Gur 2012, Microrates 2013) claim that it refers to speed, the extend of growth and the target size for the expansion of IMFs. Berger and Humphrey (1997) establish sound measurement criteria for identifying optimal size by understanding the relation existing between inputs and outputs. In this context, to determine whether large IMFs are more financially and socially efficient than small ones, Gonzalez (2007) considers that size is the fundamental driver of the efficiency of IMFs, compared to the different possible ingredients. The study of Ben Soltan (2008) shows that IMFs size negatively impacts their efficiency and at the same time it shows that IMFs of medium size are more efficient. A somewhat hasty conclusion might be that "the key point in these organizations resides in their capacity to establish confidence with the borrowers thanks to their size reverberates positively by a decrease of transaction costs". Several studies on the efficiency of the IMFs and their determinants have been carried out. Yet scarcity of information on the potential of size on the efficiency of IMFs leaves us unable to have clear picture of the financial sustainability and the extent of poverty reduction.

Cull and Al (2011) must be recognized as having done the few theoretical and empirical studies pertaining to this particular issue. There is abundant literature on the efficiency of banks and IMFs which attests to the fact that size is a decisive factor in banks efficiency, size being the physical expression of firms to compete with contenders in the global market space (Gonzalez, 2007), as well as firm's market awareness.Previous empirical studies lead us to draw the conclusion that it is very important to look deeply at how size influences the social and financial efficiency of IMFs. This was stated by (Trong Vi Ngo; Adrew W.Mullineux,2014) that downscaling as well as upscaling fuel the growth of IMFs with the preset objectives of achieving their social mission and preventing a macroeconomic setback. To evaluate the efficiency scale of IMFs and specify the different determinants influencing

efficiency, authors used the method DEA which is considered as the most relevant for the evaluation of efficiency of IMFs. DEA literature following (Gutiérrez Nieto et al 2009) and others. Based on the article by (Mamiza, Michael, and Shams,2009) , the study looked for identifying the most efficient type of IMF using DEA model. In the case of IMFs, the results show that non-governmental IMFs are the most efficient under the production approach, with the maintenance of both objectives that are the financial sustainability and the fight against poverty.

Contrary to previous empirical studies using DEA model which bears a number of disadvantages. (Simar and Wilson 1998, 2000) noted that traditional DEA methodology evaluation may reveal a bias and uncertainty about the validity of the sample, which puts the whole argument in a vicious circle. Our study contributes to the existing literature on microfinance by suggesting the use of a two-stage double bootstrap approach (Simar and Wilson, 2000). From the empirical studies which are treated with reference to this method we cite (Mahindra Wijestiri, Laura Vigano, Michele Meoli, 2015). This study examines technical efficiency and its determinants of a sample consisting of 36 Sri Lankan IMFs. The results of the regression show that age, assets are determinants of financial efficiency age, type of the institution and ROA are the central determinants of social efficiency.

### **3. Two-stages Data Envelopment Analysis**

The DEA approach seems the most relevant to measure the MFI performance because insofar as the financial and non financial information can be considered in the same model to calculate the efficiency scores. The DEA (Data Envelopment Analysis) method appeared with the works of Charnes and al (1978). It is based on the linear programming and its purpose is to identify the empirical functions of productions. DEA compares all the similar unities in a given population by taking into consideration several dimensions simultaneously. Each unit is considered as a decision-making unit (DMU) permitting the transformation of inputs into outputs.

Among the numerous models DEA, we used the two models the more frequently used: CCR-model (Charnes et al. 1978) and the BCC-model (Banker et al. 1984).

Two orientations are possible: orientation inputs or orientation outputs. A DEA model can be oriented towards inputs or outputs. Concerning the input orientation, the DEA model will minimize inputs for a fixed amount of outputs; it indicates how much an institution can reduce

its inputs although maintaining the same output level. For the output orientation, the DEA model will maximize outputs for a clear and determined level of inputs; it shows how much an institution can make higher its outputs with the equivalent quantity of inputs.

The sweeping statement of the DEA model has been developed to support the CCR model (Charnes et al., 1978, Banker et al., 1984). The input-oriented CCR model assumes constant returns to Scale (CRS) is:

$$\mathbf{Min}_{(\theta, \lambda)} \theta \tag{1}$$

**Subject to**

$$\theta_0 x_{ij0} - \sum_j \lambda_j x_{ij} \geq 0, i = 1, \dots, m$$

$$\sum_{j=1}^n \lambda_j y_{rj} \geq y_{rj0}, r = 1, \dots, s$$

$$\lambda_j \geq 0, \forall j$$

where  $y_{rj}$  is the amount of the r-th output to unit j,  $x_{ij}$  is the amount of the i-th input to unit j,  $\lambda_j$  are the weights of unit j, and  $\theta_0$  is the shrinkage factor for DMU<sub>j0</sub> under evaluation. This linear programming problem must be solved n times, once for each unit in the sample, to obtain a value of  $\theta$  for each DMU. The efficiency score is bounded between zero and 1: a technically efficient DMU will have a score of 1.

The BCC model (Banker, Charnes and Cooper, 1984) agrees with the CCR model with the adding of a convexity constraint in order to assess the the possibility of Variable Returns to Scale (VRS).

The The input-oriented BCC model, assuming variable returns to scale (VRS) is:

$$\mathbf{Min}_{(\theta, \lambda)} \theta \tag{2}$$

**Subject to**

$$\theta_0 x_{ij0} - \sum_j \lambda_j x_{ij} \geq 0, i = 1, \dots, m$$

$$\sum_{j=1}^n \lambda_j y_{rj} \geq y_{rj0}, r = 1, \dots, s$$

$$\lambda_j \geq 0, \forall j$$

$$\sum_{j=1}^n \lambda_j = 1$$

The difference between these two models is the behavior of the returns to scale. The CCR model imposes constant returns to scale leading to the estimation of efficiency scores  $\theta_{CCR}$

in which two components are embedded: Pure Efficiency and Scale Efficiency. Pure efficiency is the discrepancy between observed and potential input-output mix due to managerial and organizational failure. While Scale Efficiency is a discrepancy due to a non-optimal production scale. DMUs may operate under Increasing Returns to Scale (IRS) when their size is smaller than their optimal operating size or under Decreasing Returns to Scale (DRS) when their size is larger than their optimal operating size. BCC model, by relaxing the assumption of Constant Returns to Scale, produces Efficiency Scores  $\theta_{BCC}$  that only measure the pure efficiency. Based on both measures of technical efficiency, Färe et al. (1994) have a measure of Scale Efficiency (SE hereafter) as following:

$$SE = \frac{\theta_{CCR}}{\theta_{BCC}} \quad (3)$$

When  $SE < 1$ , the DMU is said to be non-scale efficient, ie. it operate under a non-optimal scale. The DMU is scale efficient when  $SE = 1$ .

In order to identify the type of scale inefficiency (IRS vs DRS) Technical Efficiency scores under Non Increasing Return to Scale (NIRS) have to be estimated:

$$\text{Min}_{(\theta, \lambda)} \theta \quad (4)$$

**Subject to**

$$\theta_0 x_{ij0} - \sum_j \lambda_j x_{ij} \geq 0, i = 1, \dots, m$$

$$\sum_{j=1}^n \lambda_j y_{rj} \geq y_{rj0}, r = 1, \dots, s$$

$$\lambda_j \geq 0, \forall j$$

$$\sum_{j=1}^n \lambda_j \leq 1$$

Type of scale inefficiency can be stated by comparing  $\theta_{CCR}$  and  $\theta_{NIRS}$ . Following Färe et al. (1994), the following ratio:

$$SE_2 = \frac{\theta_{CCR}}{\theta_{NIAR}} \quad (5)$$

Can be used. When  $SE < 1$ , Increasing Returns to Scale are inferred when  $SE_2 = 1$ , and Decreasing Returns to Scale are inferred when  $SE_2 < 1$ .

Our study is composed of two steps:

In the first stage bootstrap DEA approach, the three DEA models (1), (2) and (4) are run. The first stage of the analysis allows us to measure pure technical efficiency under the variable returns to scale (VRS). The resulting score goes from 0 to 1. It is claimed that the highest efficiency score is 1 according to the Benchmark. These MFIs with the scores less than 1 are judged to be inefficient and their inputs and outputs values do not allow them to reach the corresponding reference point on the production frontier. Scale Efficiency scores along with their type are retrieved based on (3) and (5).

In the first stage, we use the bootstrap technique (Efron 1979) based on the idea frequently simulating the data generating (DGP) and using the basic estimator to each simulated sample, this is how to resample estimates mimic the sampling distribution of the original estimator (Simar and Wilson 1998). Based on the algorithm proposed by Simar and Wilson (2000), we adopt the bootstrap algorithm as a first step in the analysis.

In the second stage truncated regression: Simar and Wilson (1998) have criticized the use of censored regression as a second stage of the analysis. They demonstrated as well, in their studies with Monte Carlo experiments that explanatory variables are correlated with the error term as input and output variables'. Besides, the claim that DEA efficiency correlated and therefore yield inconsistent and biased estimates in the second stage. They point out issue by proposing another double bootstrapped procedure that allows the functional inference while generating standard errors and confidence intervals for the efficiency estimates. Therefore, like Simar and Wilson (2007) we apply the double bootstrap method. The method used in this article allows us to attain more considerable conclusions since this approach takes into account bias and serial correlation of the estimates, therefore, provides a valid inference. This method is a solution to the limitations of the conventional DEA.

#### 4. Methodology

We retained for the needs of our study on the scale efficiency of the MFIs 1677 institutions. The database is issued from the data base MIX MARKET, which is the most renowned data base dealing with the collection, the analysis and dissemination of the MFIs' financial statements. In the present article, we use most recent database the Microfinance Information Exchange (MIX) available at hand which is a non-balanced panel from 2006 to 2012. MIX is a global web-based microfinance platform that provides high quality standardized information about a large number of MFIs operating in different geographic regions (Servin et al., 2012). The financial and social information available in MIX are used in a number of earlier studies (e.g. Gutierrez-Niéto et al., 2009; Nawaz, 2010; Ahlin et al., 2011; Hermes et al., 2011; Servin et al., 2012; Louis et al., 2013; Shahriar et al., 2015; Wijesiri, 2016). The choice of these institutions is justified by the fact that in the MENA region a very developed microfinance sector, experimented, and dynamic characterized by a variety of the MFIs which persuaded us to carry out this study.

In the frame of this DEA method, a debate has raised among searchers who see the financial institution as unit of intermediation (Athanasopoulos, 1997). According to production approach, the financial institution is treated as companies that use physical inputs, and employees and pay money to obtain deposits, provide loans and perceive costs in the same manner that a factory uses capital, working hand, raw material product to be sold. In the frame of intermediation, the financial institution seeks to realize profits through acting as intermediates in series of financial operations. Collecting deposits and awarding loans ( Sealy, Lindely 1977).

The selection of inputs and outputs is the key in the calculation of efficiency scores by the DEA Gutiérrez (2009). After a thorough review of the literature on DEA and microfinance institutions, we opted for three inputs and four outputs. The three inputs are standard in the literature: assets, operating costs and number of employees. For the outputs there are two of them financial which are the portfolio of gross financial loans and income, and for the two remaining are two social products, the number of women borrowers and one an indicator that measures the weight in which the activities of the MFI institution can benefit the poorest. We will describe below how this indicator was calculated :...

**Assets** : Berger and Huphrey has included the value of assets in financial efficiency models in 1997. According to MixMarket, assets is defined as ‘ ‘ The total of all net assets’ ’.

**Operating costs:** were introduced by Berger and Humphrey (1197) and Athanassopoulos (1997) and Pastor (1997).The MixMarket defines the operating costs as ‘expenses related to operations such as all personnel, rent and utilities, transformation, office supplies and depreciation’.

**Number of employees:** Athanassopoulos (1997),Serman and Gold(1985) and Berger Hamphrey(1997) proposed the number of employees as ‘the individuals who are actively employed by the MFI’.

**Number of borrowers:** Poverty goes beyond the concept of an economic issue. It is rather social aspect. This brings to the surface the issue of women empowerment. Microcredit enabled women to raise their status at home in their society (Amin et Al 1994). Microcredit contributes to the empowerment of women by emphasizing their roles and strengthening their roles within their families (Hashemi et al, 1996). So, that they can take part effectively in the development(Goetz and Gupa, 1996).The MixMarket measures the number of active women who are femal.

**Indicator of benefit to the poorest:** The ‘average loan balance per borrower’ as an indicator of outreach in poverty reduction is not appropriate because it is measured in monetary units, and the same amount of money may mean different things in different countries depending on the average per capita income. To overcome this shortcoming, we have followed Gutiérrez-Nieto et al. (2009) adopting their measure of outreach:

$$POV_i = \frac{K_i - \min(K)}{range(K)}$$

Where  $K$  is the Average loan balance per borrower divided by the Gross National Income per capita. where  $i$  is an indicator associated with a particular MFI.  $Min(K)$  is the minimum value over all  $i$ , while the  $Range(K)$  is the maximum value of  $K$  over all  $i$  minus the minimum value of  $K$  over all  $i$  for each year.

**Financial revenue:** Pastor(1999) used the financial revenue which was defined by the MixMarket as ‘ revenue generated from the gross loan portfolio and from investments’.

**Descriptive Statistics**

	Total Sample		MENA region	
	Mean	sd	Mean	Sd
Assets (in USD)	4.56e+07	1.60e+08	2.90e+07	6.06e+07

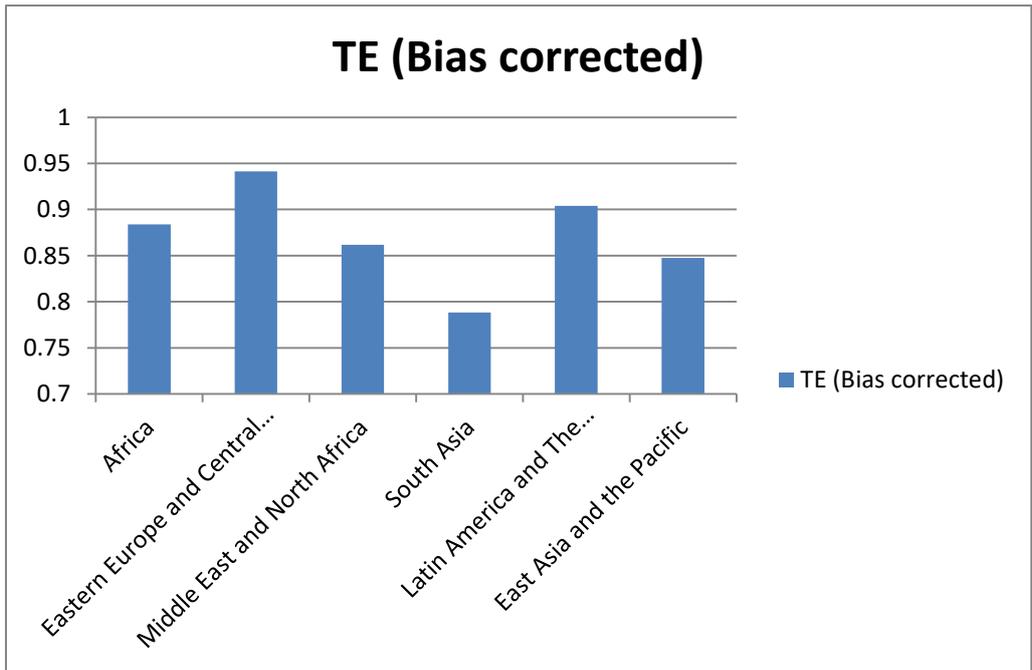
Operating Cost (in USD)	5394493	1.77e+07	3223237	5589377
Personnel (in USD)	367.2614	1454.083	287.5333	475.5946
Portfolio at risk 30 (in USD)	23177.12	132101.5	9860.113	28931.54
Percent of women borrowers (%)	63.80437	25.61034	65.436	25.97409
Average loan balance per borrower / GNI per capita	0.65467	2.466831	0.2834338	0.3767121
net Loan portfolio (in USD)	3.97e+07	1.38e+08	2.67e+07	5.78e+07
Financial revenue (in USD)	1.08e+07	4.01e+07	5908543	1.10e+07
Legal Status (categorical) :				
Bank	0,0765	0,2554	0,0048	0,2085
Credit Union / Coopertaive	0,1474	0,3273	0	0
NFBI	0,325	0,3848	0,1714	0,343
NGO	0,4354	0,3776	0,7952	0,1826
Rural Bank	0,0922	0,2756	0	0
Age				
New	0,1213	0,306	0,1238	0,3082
Young	0,1893	0,3527	0,1762	0,3457
Mature	0,6894	0,2578	0,7	0,2509
ROA	.010682	.1285419	.0223286	.1450802
Der	4.838197	52.85371	3.14119	43.90057
Gov_eff	38.38578	16.71759	39.9112	16.94129
Reg_qual	41.13857	17.67858	42.19205	15.44913
Rule_law	31.27504	16.48267	40.46001	17.56792
Cont_corr	32.66234	17.03802	35.12967	18.01401
Risk_30	.0657588	.1019495	.0566152	.1115919

## Boostrapp : Stage 1

Table : Technical efficiency scores (regional averages)

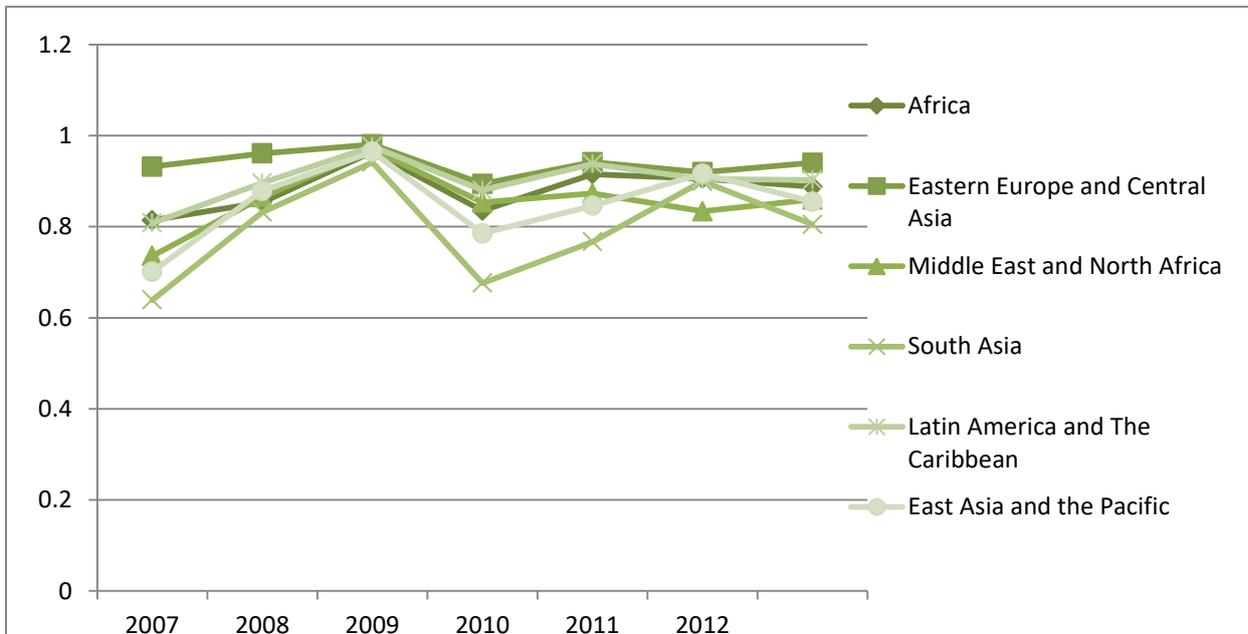
	Africa	Eastern Europe and Central Asia	Middle East and North Africa	South Asia	Latin America and The Caribbean	East Asia and the Pacific
2006	0,9259178	0,95255436	0,88566492	0,87912096	0,91742579	0,89051699
2007	0,8141971	0,93199537	0,73593886	0,63921971	0,8082093	0,70130791
2008	0,85381787	0,96112206	0,86448707	0,83202023	0,8960263	0,87859742
2009	0,96466304	0,98072663	0,9702746	0,94140116	0,9762673	0,96463561
2010	0,83508535	0,89405075	0,85350154	0,67620917	0,87999838	0,78522816
2011	0,91534172	0,94176284	0,87286842	0,76675432	0,93780152	0,84603985
2012	0,90545385	0,91950362	0,83392403	0,89978283	0,90476553	0,91666212
Regional average	0,88778239	0,94024509	0,85952278	0,80492977	0,90292773	0,85471258

In this table, the sample is split into 6 main regions: Africa (A) , Eastern Europe and Central Asia (EECA), Middle East and North of Africa (MENA), South Asia (SA), Latin America and The Caribbean (LAC), East Asia and The Pacific (EAP) to measure the rate of technical efficiency of every region from 2006 to 2012. We remark that Eastern Europe and Central Asia has the highest rate with an average of 0.9402 and South Asia the lowest rate with an average of 0.8049.

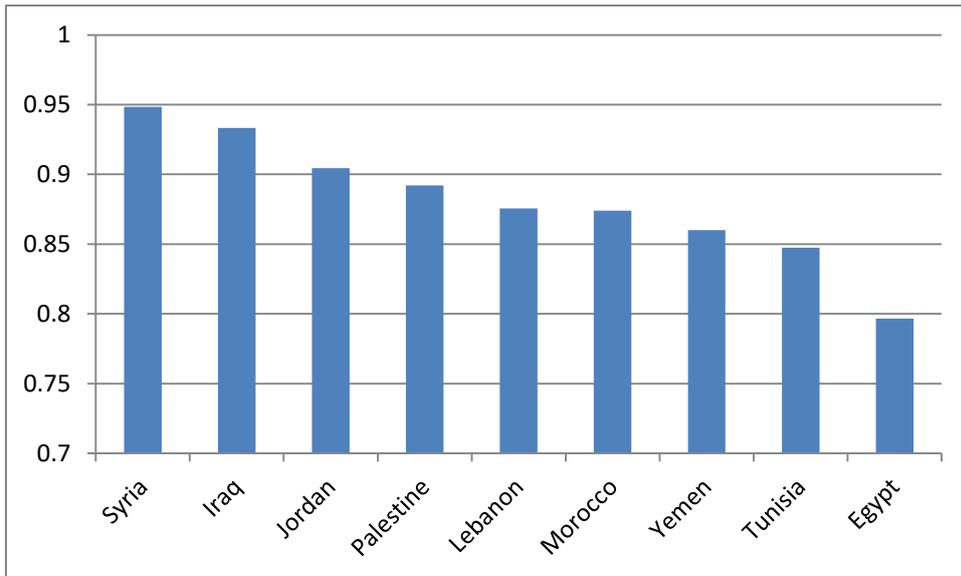


**Figure : Technical efficiency rate in 6 regions of the world**

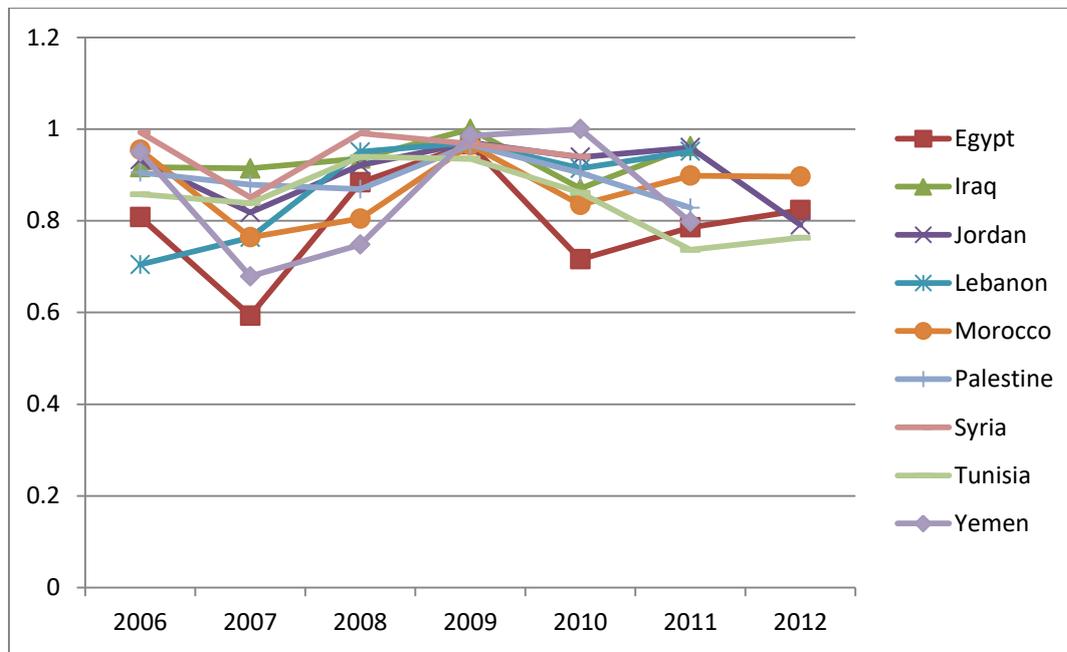
The MENA region comes in the fourth place between the 6 regions with an average of 0.8595.



**Graphic : Technical efficiency evolution**



**Figure : Technical efficiency rate in the MENA region**



**Figure: Technical efficiency of the countries of MENA region**

In fact, several factors influence the technical efficiency rate in the arena: the social, political and economic conditions make this rate either rise or fall. This histogram depicts the technical efficiency rate of some countries in the MENA region from 2006 to 2012. The 3 countries : Yemen, Tunisia and Egypt has the lowest average rates respectively 0.86 and 0,84.

The fig n shows the flows of efficiency rate of the different countries in the MENA region from 2006 to 2012. There is a dramatic fall in the rate among all the country between 2010

and 2011. In the nations :Yemen, Tunisia, and Egypt ,after the remarkable fall in the efficiency rate in 2010 and already with the lowest averages of efficiency, riots and revolutionary movements were triggered intensively. Thus, certainly the efficiency rate has an influence on the social life of the citizens and the social factor influence as well the efficiency rate: the harsh conditions and the economic quagmire in the arena with an unsatisfying performance of the IMF, triggered the Arab Spring in the region.

Erratic efficiency in the countries, where Arab Spring has been a major driving force. Up to 2011, Tunisia, Egypt experienced political and economic systems that were stable with stable economic indicators. Then, the said systems were apparently operational and the economic machine was turning despite all the drawbacks denounced by media, the political opposition and the economically marginalized social categories. From the onset of the Arab Spring till this day, score's efficiency of IMFs have experienced noticeable setbacks. Graphic data are enough evidence to support this statement.

## Second Stage Bootstrapped

### Second Stage Bootstrapped Estimation Results

	Censored Regression		LOGIT	
	IRS	DRS	IRS	DRS
(Intercept)	1.02493***	1.21454***	42.40496***	25.01921***
t2007	-0,00071	-0,00807	-0,11008	0,12459
t2008	-0,00019	0.02294***	-0,14973	0.41801*
t2009	0,00019	0.03507***	-0,21383	0.43544**
t2010	-0,00106	-0.01649*	-0,69668	-0,08904
t2011	-0.00183***	0,00198	-0,8814	0,31522
t2012	-0,00057	0,00519	-0,36066	0.57694**
EECA	0.00279***	0.01726***	0.57223*	0.86381***
MENA	0.00269***	0,00032	1.88336***	0.34621**
SA	0,0011	-0.01173**	1.14906***	0.35019**
LAC	0.0018***	0.01211***	0.50271*	0.28083**
EAP	0.00149***	-0,00051	0,1058	0,17701
CU_C	0,00081	0.01028***	0,12676	0.48036***
NBFI	-0,00016	0.00563***	-0,1343	0.1439*
RB	-0,0003	0,00545	-0,22766	-0,25733
YOUNG	-0,00024	-0,00105	0,10611	-0,03852
MATURE	-0,00043	0,00106	-0,01076	-0,01963

ROA	0.00354***	0.04244***	1.40003***	2.1717***
DER	0,00001	2,00E-05	0.00514**	0,00116
lnA	-0.00533***	-0.01617*	-6.30712***	-3.14343***
1/2lnA <sup>2</sup>	0.00038***	0,00048	0.43183***	0.18491***
POV	0.01204***	-0,0129	1.75617***	-0,59022
W	0.00004***	-0.00059***	0.03274***	-0.00355**
RISK30	-0.00525***	-0.05079***	-1.4651*	-1.84184***
reg_qual	-0.00006***	-0.00031***	-0,00702	-0.01505***
gov_eff	0.00005***	-0,00013	0.03203***	0.01436***
rule_law	0,00004	0,00014	0.02466**	0.01224**
cont_corr	0,00001	0.00021*	-0.01975*	-0,00026
logSigma	-5.30646***	-2.84095***	-	-

Coefficients are Significant at: \*\*\* 1%, \*\* 5% and \* 10%

### Contextual variables:

Every financial institution is affected directly by the economic and social environment of the country in which it is based in. For this reason, multilevel model is adopted for the second stage when a set of contextual variables is introduced at the country level. Therefore, MFIs operating in the same country share the same contextual factors. Four contextual factors are retained for the estimation and represent the four most relevant governance quality dimensions for the MFIs context. The data are gathered from the Worldwide Governance Indicators (WGI), a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms.

All the variables are measured as the percentile rank among all countries, ranges from 0 (lowest) to 100 (highest) rank, of the country in which operates the MFI at each year sample.

gov\_eff: Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

cont\_cor: This variable Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of

the state by elites and private interests. Contrary to the countries where the government plays a major role in maintaining a political and economic stability, weak government allow indirectly the spread of corruption among the different fields. This disfunctioning of the governmental institutions might affect the efficiency of MFIs.

*reg\_qual*: Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The regulation quality in a country is likely to enhance the operating efficiency of the MFIs by giving them the possibility to adjust their managerial capabilities as well as their size.

*Rule\_law*: Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The quality of legislation and the effectiveness in imposing the law is a key feature of a sane social and economic environment in which peoples and institution can operate under the same rules and with equal chances. The rule of law in a country might affect substantially the performance of the MFIs by giving them more transparency and less problems related to moral hazard and adverse selection.

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