

# MICROFINANCE EFFICIENCY IN WEST AFRICAN ECONOMIC AND MONETARY UNION (WAEMU): HAVE REFORMS PROMOTED SUSTAINABILITY OR OUTREACH?

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## Abstract

*Our study aims to assess the evolution of social efficiency and financial efficiency of MFIs (microfinance institutions) in West African Economic and Monetary Union (WAEMU). Our results suggest that financial efficiency increases at the expense of social efficiency. Moreover, MFIs that take more risks in extending the distribution of credit to the most marginalised populations tend to have a strong social efficiency at the expense of financial efficiency. Outreach variables have a negative impact on the risk and profitability of MFIs, which confirms the arbitration for sustainability. If both functions (socio-financial efficiency) are considered in a composite index, then good risk management, a good asset capital ratio and subsidies allow MFIs to be both socially and financially efficient.*

**Key words:** *Efficiency, microfinance, outreach, reform programs, sustainability, WAEMU.*

**JEL:** C23, C67, G21, O16, O55.

## 1. INTRODUCTION

Micro-finance institutions (MFIs) are financial intermediaries, but also play a social role. That is financing promoters of projects who are excluded from traditional formal financial sector. Small and medium enterprises (SMEs), without minimum accounting requirements (suiting a commercial bank) can now find funding for their project investment. Microfinance Institutions will also contribute to the financing of economic agents financially marginalized: poor people without collateral or people living in rural area far from banks branches.

Given their specific role in the financial system of a developing economy

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like WAEMU (West African Economic and Monetary Union), the authorities implemented programs to strengthen this sector and enable it to be fully part of the financial system. Indeed, in the 90s, MFIs experienced unprecedented development, as WAEMU authorities promoted a legal framework for the development of alternative financial structures. Because of their specificities, WAEMU authorities found it important to promote MFIs. But in their infancy, these financial structures evolved into a legal framework ill-defined or poorly regulated. To characterize it, it was really informal. Furthermore, the micro-finance industry presented some failures such as lack of financial monitoring, mismanagement, and lack of capabilities. Enforcement programs will be especially designed to absorb those weaknesses.

The first studies made on MFIs efficiency were initially inspired by those made on banks and nonbank financial institutions. Therefore, they only take into account the financial role of MFIs, Bassem, (2008); Qayyum and Ahmad, (2006); Varman, (2008); Haq and al., (2009); Soulama, (2008). But more and more economists like Gutiérrez-Nieto et al. (2007 and 2009) and Hermes and al. (2011) will be interested in the social role (outreach) of MFIs in addition to their financial efficiency. Thus two economic school thoughts compete in the literature as to how to measure MFIs' efficiency. The first one highlights the social efficiency and completely disregards the intermediation role of MFIs. They are called the "Welfarists". The latter one emphasizes the sustainability; they are the "Institutionalists". More specifically in policy circles there is a hefty debate on the compatibility versus the arbitration between sustainability and outreach. Again, it is worth noted that more and more microfinance institutions (MFIs) behave like commercial banks (Grammeen bank, Banco solidario...). In WAEMU, MFIs are substitutes for banks by lending sometimes very huge amount to SMEs. The purpose of this study is to assess MFIs efficiency during and after the reform programs, and at the same time to assess how financial and social efficiency evolve in WAEMU after these reforms.

Therefore, in this study, we assess the level of financial and social efficiency of MFIs and investigate what explains those two types of efficiencies. Additionally, we analyse what factors push MFIs into giving up their social role. In this study, 'financial efficiency' indicates the efficiency related to the MFIs' financial intermediation and 'social efficiency' indicates the efficiency related to the MFIs' social role. Our data cover the period from 2000-2010 and come from the database Mixmarket, which has already been used in several studies. We use Data Envelopment Analysis because, unlike the Stochastic Frontier Analysis, the production function includes indicators of outreach that are not expressed in monetary value. Thus, in the production function, we integrate the percentage of women, the number of beneficiaries

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and a poverty index that takes into account the extent of the MFIs' lending to the poor.

The results from the studied period indicate that financial efficiency increases at the expense of social efficiency. These results are consistent with those of Hermes et al. 2011. However, the added value of our study is to show the negative impact of outreach variables on risk (increase) and profit (decrease). Furthermore, our study is the first study to contrast these two types of efficiency and explain the arbitration. Moreover, to the best of our knowledge, this is the first study focused on the efficiency of MFIs in WAEMU after the restructuring period. This highlights the study's interest because it allows for an assessment of the quality of regulatory programs in improving both the MFIs' financial intermediation and social role. In this study, a reflection on the capacity of authorities to solve the problem of decreasing social efficiency is provided in the conclusion.

The remainder of our paper is organised as follow: section 2 presents the sector and its evolution from 2000-2010; section 3 presents the model and the results; and finally, in section 4, we make concluding remarks and include some policy recommendations.

## **2. EVOLUTION OF THE MICROFINANCE INDUSTRY IN WAEMU**

In developing countries, the micro-finance industry expanded rapidly in recent years. It is seen as a way of deepening the financial system in those countries, Barr (2005). In WAEMU especially, the oldest MFIs were created late 60s. They then flourished late 80s and 90s. Indeed, their development was to overcome difficulties encountered by development banks to finance agriculture, small and medium enterprises and handicrafts. These alternative financial structures aimed at promoting small savings collection in rural and urban areas. For WAEMU authorities, it is a way of creating conditions for a gradual integration to the informal sector into modern economy. Therefore, monetary authorities in WAEMU found it necessary to develop the regulatory framework in order to give legal status to such institutions.

Generally, microfinance regulation intends to frame the industry, by defining the scope of microfinance financial activities and framework. It also aims to provide oversight and monitoring by prudential standards. To this end, MFIs are subject to a particular method of accounting and provisioning of nonperforming loans. They are also subject to financial ratios and prudential management, this in order to avert potential crises in the industry and ensure the protection of depositors.

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The conditions for operating as Financial Decentralized Systems (FDS) or Micro Finance Institutions (MFIs) or mutual-cooperative savings and credit Institutions (IMCEC), are defined by legal and regulatory applicable framework in all Member States (loi cadre portant réglementation des IMCEC of December 17, 1993). This law defines the legal statute of MFIs operating in the WAEMU. There are three types of MFIs in the WAEMU: those with savings and credit as principal activity (about 366), those with direct credit as principal activity (24) and those with project credit component (16). In addition, two support projects (PARMEC and PASMEC) were established in 1992 in WAEMU to foster the emergence and development of nearby financing structures.

The PARMEC (which stands for Support Project for the Regulation of Mutual institutions for Savings and Loans) was to design the specific legal framework for FDS in the Member States of WAEMU. It was intended to focus on the effective implementation of specific regulations and the strengthening of institutionalization in the industry. It lasted from 1992 to 2002.

As for PASMEC (which stands for Support Project for the Monitoring of Mutual institutions for Savings and Loans), aimed to promote a better understanding of the alternative finance industry by identifying stakeholders, their expectations and their policies intervention and information dissemination. It lasted from 1992 to 2000.

Both MFIs support projects were relayed by the PRAFIDE (Regional Program of Support to Decentralized Financial Systems) for the period 2005-2009. This program aimed to correct dysfunctions in the microfinance industry. They are: non-compliance with regulations, the failure of information system management and weak internal and external mechanisms for monitoring. The PRAFIDE was therefore designed to encourage resource protection of depositors and maintain the integrity and stability of the financial system of WAEMU. With this program, the microfinance industry is becoming more professional with organized training programs adapted to micro-finance specificities in WAEMU.

In addition to these community programs, some member states of the WAEMU are committed in connection with some development partners in a promotion and strengthening process of micro-finance through the adoption of specific national policies. They are Benin, Burkina-Faso, Mali, Niger, Senegal and Togo.

It is in this context that the micro-finance industry grew rapidly. Indeed, between 1993 and 2006, the number of MFIs was multiplied by six at 673. More than 15% of the WAEMU population has access to financial services offered by those institutions, whose loans represent 8% in 2006 of banks fi

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ancing against less than 1% in 1996. Despite the economic difficulties of the situation that struck member countries, there has been an increase in the number of branches from 2549 to 2906. With this increased proximity, the number of beneficiaries rose from 3.08 million in 2002 to about 4.87 million FCFA in 2006. The amount of deposits has almost doubled from 166.12 to 317.08 billion FCFA. Again, the amount of loans increased from 190.57 to 385.46 billion. However, regarding performance management, the share of equity to total assets fell; it decreased from 19.63 to 14.9%, indicating a decline in the capacity of MFIs financing. This was not offset by subsidies that increased in absolute terms but decreased in share of assets from 3.25 to 1.93%. Lastly, non performing loans increased from 10.15 to 18.64 billion, but declined as a share of total loans from 5.33 to 4.84%.

The evolution of total MFIs' assets relatively to that of banks in WAEMU reveals an increase from 2002 to 2006. Indeed, this ratio increased from 4.29% to 6.56%. This tendency shows that the sector is gaining ground against the banking sector. Similarly, the ratio of total assets of the banking system increased from 29.03 to 33.07% as a share of GDP in the WAEMU, while that of MFIs increased from 1.24 to 2.17%. It more than doubled during the period from about 234.34 billion CFA francs to 532.7 billion CFA francs. The total assets of microfinance institutions is a part of ever increasing economic activity, although it is still negligible compared to banks.

**Table 1: Evolution of DFS and commercial banks total assets in WAEMU, from 2002-2006.**

Years	2002	2003	2004	2005	2006	Average
<b>Total assets of banks as a share of the WAEMU GDP</b>	29.03	29.84	31.89	28.71	33.07	30.51
<b>Total assets of MFIs as a share of the WAEMU GDP</b>	1.24	1.72	1.96	2.23	2.17	1.87
<b>Ratio of MFIs' total assets to commercial banks' total assets in the WAEMU</b>	4.29	5.78	6.16	7.77	6.56	6.11

Source: author's calculations

However, if MFIs activities increased relatively to banks, they still have much to learn from the banking sector. In all countries except Ivory Coast, there is a reduction of more than one third of the number of MFIs. This is due to the merger in some large networks, as part of the restructuring program, and foreclosures of small savings and credit mutual funds cooperative groups as well as other savings and credit institutions. Besides, micro-fi-

nance products are not very diversified and don't always meet market needs. Financial products are similar; there are no many differences in conditions and forms. One of the major flaws in the microfinance sector is poor ability to assess client needs and to anticipate market developments. However, since 2007, several institutions were engaged in developing new products or improving existing products to better satisfy customers but also to meet the pressure of competition between MFIs and banks (UNDP, 2007).

Now that we have an idea of the evolution of the microfinance institution in WAEMU, we will make a literature review on studies made on this issue.

### **3. METHODOLOGY**

#### **3.1. The model for efficiency measurement**

##### *a) Model specification*

As previously indicated, we used DEA (Data Envelopment Analysis). The DEA provides an analysis based on an assessment of relative efficiency in multiple input/output situations by taking into account each MFI and measuring its performance relative to an outer surface composed of the best practice MFIs. One of the advantages of the DEA is that it does not impose any functional form to the production frontier. However, the DEA is less precise because it neither addresses noise nor envelops the data like the econometric model. Despite its flaws, the DEA is a good method for measuring the MFIs' efficiency because it takes into account outreach variables that are not expressed in monetary units. We will use the DEA because we want to grasp the financial efficiency by using variables of financial intermediation as arguments for the financial frontier function and we want to grasp the social efficiency by using variables of outreach as arguments for the social frontier function. Thus, it will be a straightforward task to compare these two types of efficiencies and their evolution throughout the period of analysis. To construct this method, we have to choose the inputs and outputs. For this purpose, we could choose between using the production or the intermediation approach. The production approach allows us to consider non-monetary variables in the production frontier function. As its name indicates, the intermediation approach is more appropriate for considering variables related to financial intermediation of MFIs (Gutiérrez-Nieto and al., 2007; 2009). We will choose the production approach.

Finally, we will have 3 models of efficiency measurement. The first model measures social efficiency; the second model measures financial efficiency;

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and the third model grasps both of the MFIs' functions. Our inputs are the following: the financial expenditures (FIEXP), which consist of interest payments on deposits and the MFIs' borrowing and other financial expenses; capital (CAP), which is measured by equity; and finally, the MFIs' workers (PERS), Bassem, (2008); Varman (2008) and Haq et al. (2009). As for outputs, we selected one output for financial efficiency: gross loan portfolio (GLP), which represents the role of credit distribution of MFIs, Qayyum and Ahmad (2006). We were not able to consider deposits because of data limitations. For social efficiency, we consider three outputs that reflect the MFIs' outreach. The number of active borrowers (NAB) allows outreach to be taken into account in the sense that an MFI makes loans to individuals who are generally excluded from the traditional banking system. The more an MFI lends to a significant number of people, the more it fills the social role vacated by the banks, Hartaska and Mersland (2012) and Gutiérrez-Nieto et al. (2009).

The third output is a poverty index. We calculated this index by using the average loan per borrower (ALB). Hermes et al., 2011, used ALB because it includes the idea that MFIs lend to the poor. Thus, if the indicator is lower, then more poor people are covered by the MFIs. These MFIs participate in financing poor people and in poverty alleviation. However, in a cross-country analysis, this indicator does not account for differences in living standards. To solve this problem, we divided ALB by GNI per capita. In particular, Gutiérrez-Nieto et al. (2009), calculate a poverty index (POV) based on this ratio.

$$POV = 1 - \frac{\frac{ALB}{GNIc} - \min\left(\frac{ALB}{GNIc}\right)}{\max\left(\frac{ALB}{GNIc}\right) - \min\left(\frac{ALB}{GNIc}\right)}$$

with ALB/GNIc equal to the average loan per borrower for MFI i divided by the per capita Gross National Income. Min(ALB/GNIc) is the minimum of this variable per year and Max(ALB/GNIc) is the maximum. This new variable does not change the statistical properties of the variable ALB/GNIc but instead allows its standardisation as a poverty index. Thus, the closer POV is to 1, the more MFI i lends to poor people. The opposite occurs when the index is closer to 0.

Finally, because women represent the portion of the population most affected by poverty, the percentage of women borrowers measures the propen-

sity of the MFIs to promote women, Gutiérrez-Nieto et al. (2009) and Hermes et al. (2011).

We measure the efficiency under the following two assumptions: variable and constant returns to scale (VRS and CRS, respectively). The first assumption corresponds better to the environment of imperfect competition in which MFIs operate, and it also prevents poor specifications. The second assumption compares the large MFIs to the small MFIs, which avoids making large MFIs appear artificially efficient. Finally, we opt for an input-oriented efficiency measurement that considers that MFIs use as few inputs as the production of outputs requires.

The linear mathematical program used to calculate efficiency scores under the assumption of constant returns to scale is as follows:

$$\begin{aligned} & \text{Max}_{u,v} (u'y_i/v'x_i), \\ & \text{St } u'y_j/v'x_j \leq 1, j=1,2,\dots,N \\ & u, v \geq 0 \end{aligned}$$

with  $x_i$  as the vector of inputs' matrix  $K \times N$  of MFI  $I$ ;  $y_i$  as the vector of the output matrix  $M \times N$  of MFI  $i$ ; and  $u'$  and  $v'$  are  $M \times 1$  and  $K \times 1$  vectors of the input and output weights, respectively.

To avoid an infinite number of solutions, the constraint  $v'x_i = 1$  is imposed, which provides the following:

$$\begin{aligned} & \text{Max}_{u,v} (u'y_i), \\ & \text{St } u'y_j - v'x_j \leq 0, j=1,2,\dots,N \\ & u, v \geq 0 \end{aligned}$$

Because solving the problem on this form will be difficult, one can use the duality in linear programming and derive an equivalent form of this problem:

$$\begin{aligned} & \text{Min}_{\theta,\lambda} \theta, \\ & \text{Sc } -y_i + Y\lambda \geq 0, \\ & \theta x_i - X\lambda \geq 0, \\ & \lambda \geq 0, \end{aligned}$$

where  $\theta$  is a scalar and  $\lambda$  is an  $N \times 1$  vector of the constants.

The value of  $\theta$  obtained will be the efficiency score for the  $i$ -th MFI.

To account for changes in scale economies, the convexity constraint  $N1' \lambda = 1$  can be added to provide the following program:



$$\begin{aligned}
& \text{Min } \theta, \\
& \text{St } -y_i + Y\lambda \geq 0, \\
& \theta x_i - X\lambda \geq 0, \\
& N1' = 1 \\
& \lambda \geq 0,
\end{aligned}$$

where  $N1$  is an  $N \times 1$  vector of 1.

The 3 estimated models will be as follows:

$(GLP) = f(FIEXP, CAP, PERS)$  for financial efficiency

$(NAB, POV, PWOB) = f(FIEXP, CAP, PERS)$  for social efficiency

$(GLP, NAB, POV, PWOB) = f(FIEXP, OPEXP, PERS)$  for the combined socio-financial efficiency.

#### *b) Data*

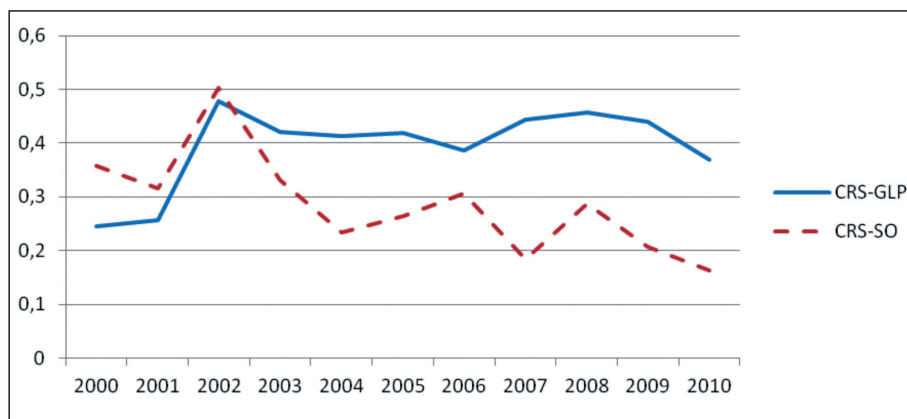
We use the MIX market database, which provides financial statements and outreach indicators for MFIs around the world. Our sample is thus composed of 104 MFIs and is representative of the 406 MFIs that provide financial statements to BCEAO. Regarding the macroeconomic variables, we will use Global Development Indicators. Table 7 presents statistics for the variables used for the DEA estimates.

#### *c) Results*

The results are presented in tables 2 and 3 below. The mean test differences indicate that there is a statistic difference between all types of efficiency. More specifically, the average financial efficiency score is superior to the average social efficiency score for every country in the WAEMU zone. In particular, figure 1 shows a decrease in social efficiency while financial efficiency is increasing over the studied period. This finding is consistent with the results of Hermes et al., 2011 as well as Gutierrez-Nieto et al., 2009 who found that MFIs make a trade off between financial efficiency and social outreach.

Concerning socio-financial efficiency, WAEMU as a whole displays a score of 50.63% under the CRS hypothesis and 63.52% under the VRS hypothesis. The minimum scores were observed in the Ivory Coast (30.68% and 39.08% under CRS and VRS, respectively), and the maximum scores are observed in Burkina Faso (63.52% and 78.22% under CRS and VRS, respectively). Despite the support and strengthening programs in the sector, the evolution over the decade shows a decrease in the socio-financial efficiency of

**Graph 1: Social efficiency versus financial efficiency of MFIs in WAEMU**



**Graph 2: The evolution of socio-financial efficiency for WAEMU**



MFIs in the region. From 2000 to 2002, socio-financial efficiency increases. This period corresponds to the end of the program PARMEC, as indicated in figure 2.

However, the subsequent drop in socio-financial efficiency shows that the program of institutionalisation, regulation and monitoring (PARMEC) was not effective. Additionally, the MFIs' financial and managing indicators dete-

riorated during this period. Indeed, outstanding debts and capitalisation deteriorated. Similarly, the amount of subsidies decreased. This decrease might have led some MFIs to seek profitability by lending less to poor people, thus abandoning their social role. Because of these poor results, BCEAO implemented PRAFIDE, which lasted from 2005 to 2009. However, the MFIs' efficiency remained virtually unchanged during this period. The socio-financial efficiency decrease is due especially to countries such as the Ivory Coast, Benin, and Senegal. The socio-financial efficiency decrease in Ivory Coast might be explained by political instability. This instability prevented MFIs from operating in rural areas affected by conflicts. The decrease in Benin and Senegal can be explained by restructuration in the sector and the closure of many MFIs because of a lack of profitability and sustainability. Hermes et al, 2011 precisely relate financial viability to efficiency. Indeed, the number of MFIs that closed between 2004 and 2006 was 65.43% in Benin and 41.03% in Senegal.

**Table 2: Average efficiency scores, CRS hypothesis, 2000-2010**

Efficiency	Benin	Burkina Faso	Ivory Coast	Mali	Niger	Senegal	Togo	WAEMU
Financial	0.3269	0.5741	0.3560	0.4403	0.4507	0.3505	0.3750	0.4105
Social	0.3290	0.2511	0.2307	0.3083	0.3066	0.3052	0.2505	0.2830
Both	0.4702	0.682	0.3068	0.4398	0.6727	0.6330	0.3555	0.5063

**Table 3: Average efficiency scores, VRS hypothesis, 2000-2010**

Efficiency	Benin	Burkina Faso	Ivory Coast	Mali	Niger	Senegal	Togo	WAEMU
Financial	0.4919	0.6340	0.4171	0.5194	0.5538	0.5433	0.4843	0.5066
Social	0.4338	0.3871	0.3683	0.4490	0.5402	0.4301	0.4081	0.4329
Both	0.5759	0.9197	0.3908	0.5629	0.7822	0.7386	0.5019	0.6352

To better understand what influences the MFIs' efficiency, we propose a second stage analysis. We relate efficiency scores to variables to help explain the influences. We consider financial variables, as we suspect they have contributed to the efficiency deterioration in countries such as the Ivory Coast, Senegal and Benin. We also look at variables specific to the MFIs and variables related to the socio-economic environment in which they operate. Our approach is to compare the effect of each variable related to financial efficiency and social efficiency and to see what conclusions we can derive from

the arbitration between those two types of efficiency. We then consider the impact of those variables on the socio-financial efficiency, as MFIs play both roles.

### **3.2. Explanatory variables for efficiency**

In this section, we will discuss the data that could impact socio-financial efficiency. However, those variables will be considered as explanations of either financial efficiency or social efficiency. Indeed, as the evolution of social efficiency and financial efficiency demonstrates, when one efficiency increases, the other efficiency decreases. This result suggests that factors that have a positive impact on social efficiency could have a negative impact on financial efficiency.

#### *a) The variables of financial management and risk*

MFIs are financial entities with an outreach objective. Both financial and social efficiencies are expected to be affected by the financial management and monitoring variables. Thus, we consider three of these variables. The capital asset ratio is measured by total equity over total assets (CAR). Indeed, our previous results show that the decreasing efficiency could be linked to the decrease in capital. Thus, we believe that CAR has a positive impact on the MFIs' efficiency. Similarly, we consider both the outstanding balance per portfolio overdue up to 30 days and the renegotiated portfolio over the gross loan portfolio (RISK). This variable is intended to take into account the MFIs' level of risk taking, which we expect to have a negative impact. The higher this ratio, the more MFIs mismanage their customer base and fail to make the best use of the surety for moral hazard and adverse selection management. The MFIs' profitability, as measured by ROA (return on assets), should have a positive impact on efficiency. As financial institutions, MFIs also look for financial efficiency when doing business. Thus, the most profitable MFIs can be the most efficient. Additionally, these MFIs contribute in the long run to the social objective of poverty alleviation through their final macroeconomic impact. Thus, we expect a positive sign.

#### *b) The variables specific to MFIs*

The variables related to the MFIs' specificities and their technology for financial product distribution should also impact their efficiency. Among these variables, we note the type of MFI. The data from the MIX market database allows us to classify the MFIs into three categories: those that are related to non-governmental organisations (NGOs), cooperatives (COOP)

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and finally, those that are subsidiaries of banks (NBFIs). We use only two dummies to avoid the problem of singularity. We also consider the variables related to the types of loans: individual lending (INDIV), solidarity lending (SOLID), both individual and solidarity lending (INDIVSOLID) and community lending (COMMUNITY).

The MFIs' size (SIZE) can lead to economies of scale in the distribution of financial products. Size is measured by the logarithm of total assets. We expect a positive sign. The number of years of experience (EXP) can also positively affect the MFIs' efficiency through the learning by doing effect. We consider a fourth variable (FORM), which is supposed to take into account the fact that MFIs provide training or consultation to their clients to promote the better use of their loan. Indeed, this type of product is supposed to increase productive loans through the development of successful "very small businesses". If these training and consultations are not too expensive, the MFIs strengthen their social role. In the event that this training and consultation costs too much, it negatively affects efficiency. The sign is therefore ambiguous for the dummy, FORM. Finally, some MFIs receive subsidies (SUB), in particular, those related to NGOs. These MFIs are supposed to make more loans to very poor individuals and therefore be less focused on financial profitability. Therefore subsidies can have both a negative and positive impact on efficiency.

#### *c) The environmental variables*

We next consider control variables. The socioeconomic environment within which the MFIs operate can have a positive or a negative impact on their efficiency. To capture the positive impact of a healthy economic environment, we introduce into the regression the level of development as measured by the GDP per capita (GDPc). The size of the rural population should have a positive impact. Indeed, we use this factor as a proxy for the population requesting microfinance products. The MFIs primarily operate in rural areas and among populations without access to banking services. We believe that the rural population is a good proxy for the importance of the population to which the MFIs' services are addressed. Therefore, the rural population can have a positive impact on efficiency through economies of scale. We expect a positive sign.

The correlations between the explanatory variables are displayed in table 10, which is in the appendix.

#### *d) The results*

We choose a double-truncated Tobit model for explaining efficiency. Effi-

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ciency scores range between 0 and 1. Using this model appears most appropriate to avoid specification errors. The results are shown in tables 4, 5 and 6.

Concerning the determinants for socio-financial efficiency, table 4 shows that capital asset ratio (CAR) has a positive impact. In contrast, RISK has a negative coefficient. Poor risk management negatively impacts the MFIs' efficiency. ROA has a positive impact on socio-financial efficiency, which indicates that the MFIs' profitability positively impacts their efficiency. Contrary to our expectations, SIZE has a positive impact under CRS and VRS. Large MFIs are less efficient than smaller ones. Thus, there is no scale economy for the MFIs operating within the WAEMU. The coefficient of FORM is negative, which indicates that the MFIs that offer training and consultation to their clients incur higher costs. Thus, these offerings ultimately have a negative impact on the MFIs' efficiency. Finally, as expected, SUB and EXP have positive coefficients. Experience increases both the MFIs' efficiency in financial services distribution and their ability to reach the poorest segments of the population. Similarly, subsidies contribute to improving the efficiency of the MFIs. The coefficient of COOP is positive and significant when the loan types are integrated into the regression. The cooperatives are more efficient when they make individual and solidarity lending as well as community lending. This result is also generally confirmed for all MFI types. Per capita GDP and the size of rural population have the expected positive signs.

In terms of the determinants of both social and financial efficiency, the only significant variables are risk, training, subsidies, the institution's type, per capita GDP, and the importance of the rural population. Training (FORM) has a negative impact on financial efficiency because of the involved costs and also because FORM does not necessarily increase the quality of intermediation. Subsidies also have a positive impact on financial efficiency, which indicates that subsidies increase the quality of the MFIs' intermediation. However, against all odds, subsidies have no significant impact on social efficiency. GDP per capita and the importance of the rural population have the expected signs when they are significant. When a microfinance institution is a cooperative, there tends to be a reduction in its social efficiency. This finding can be explained by the functioning of these types of MFIs, which lend prior to their members. Finally, one of the interesting results of the regressions in tables 5 and 6 is that the risk variable has a positive impact on social efficiency and a negative impact on financial efficiency. When one considers their intermediation role, the MFIs' risky behaviour reduces their

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efficiency. They must, therefore, make an effort in the quality of their portfolio to ensure their sustainability. On the contrary, when one considers the social role of MFIs, they tend to lend more to people without collateral who represent much higher risks. Therefore, these MFIs have a higher risk exposure and greater social efficiency, as they reach the poorest populations with higher risks. To check our reasoning, we run some regressions of the variables risk and profitability (ROA) on outreach variables. The results in Table 9 confirm the idea that outreach increases the risk and reduces the profitability of MFIs. When an MFI emphasises its social role (especially by lending more to women), there is an increased risk. Lending to the poorest individuals affects the MFIs profitability. These results confirm the idea that MFIs will intensify their intermediation role at the expense of their social role to ensure their sustainability.

**Table 4: The Tobit regression with explanatory variables for the socio-financial efficiency scores under CRS and VRS**

	CRS	VRS	CRS	VRS	CRS	VRS	CRS	VRS
CAR	0.1057***	0.0974***			0.0941***	0.0874***	-0.0560	-0.1380**
	(0.0270)	(0.0284)			(0.0257)	(0.0298)	(0.0530)	(0.0672)
ROA			0.1375***	0.1347***	0.1506***	0.1408***	0.2417***	0.1179*
			(0.0267)	(0.0305)	(0.0269)	(0.0314)	(0.0482)	(0.0611)
RISK	-0.0385	-0.0830***	-0.0360	-0.0794***	-0.0322	-0.0709	0.0175	-0.0257
	(0.0268)	(0.0281)	(0.0244)	(0.0279)	(0.0244)	(0.0284)**	(0.0384)	(0.0486)
SIZE					-0.0881***	-0.0522*	-0.1538***	-0.1787***
					(0.0252)	(0.0292)	(0.0500)	(0.0633)
FORM	-0.0600**	-0.0456	-0.0465*	-0.0320	-0.0521**	-0.0337	-0.0735	-0.0151
	(0.0271)	(0.0285)	(0.0249)	(0.0285)	(0.0247)	(0.0287)	(0.0618)	(0.0782)
EXP	0.0211	0.0551**	0.0074	0.0415	0.0504**	0.0741**	0.1188	0.1377
	(0.0270)	(0.0284)	(0.0246)	(0.0281)	(0.0255)	(0.0296)	(0.0939)	(0.1189)
SUBV	0.0635**	0.0911***	0.0729***	0.1057***	0.0574**	0.0859***	-0.0204	-0.1062
	(0.0274)	(0.0288)	(0.0247)	(0.0283)	(0.0246)	(0.0285)	(0.0566)	(0.0717)
COOP					0.0360	-0.0081	0.1435***	0.1643***
					(0.0272)	(0.0316)	(0.0504)	(0.0638)

<b>NBFI</b>					0.0650	0.0415		
					(0.0513)	(0.0596)		
<b>GDPc</b>	0.1544***	0.1612***	0.1759***	0.1897***	0.1723**	0.1846***	0.3275***	0.2373**
	(0.0427)	(0.0450)	(0.0379)	(0.0433)	(0.0400)	(0.0465)	(0.0904)	(0.1145)
<b>RURALPOP</b>	0.0985**	0.1167**	0.1332***	0.1529***	0.1118**	0.1347**	0.0313	0.0889
	(0.0446)	(0.0470)	(0.0392)	(0.0449)	(0.0420)	(0.0488)	(0.0581)	(0.0737)
<b>SOLID</b>							-1.5883*	-0.4419
							(0.8710)	(1.1031)
<b>INDIVSOLID</b>							0.1609***	0.2212***
							(0.0514)	(0.0651)
<b>COMMUNITY</b>						0.6922***	0.6304***	
							(0.1135)	(0.1437)
<b>CONSTANT</b>	0.3510***	0.4397***	0.2688***	0.3566***	0.2255***	0.3372***	0.0502	0.3662**
	(0.0467)	(0.0493)	(0.0469)	(0.0536)	(0.0495)	(0.0574)	(0.1455)	(0.1843)
<b>Prob&gt;chi 2</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Log likelihood ratio</b>	52.29	60.53	66.16	67.92	97.77	85.73	80.08	42.97
<b>Number of observations</b>	395	395	395	395	383	383	99	99

\*, \*\*, \*\*\* significant at the 10%, 5% and 1% levels, respectively



**Table 5: The Tobit regression with explanatory variables for financial efficiency scores under CRS and VRS**

	crs	vrs	crs	vrs	crs	vrs
CAR	0.0283	0.0306			0.0299	0.0278
	(0.0278)	(0.0295)			(0.0286)	(0.0318)
ROA			-0.0108	-0.0004	-0.0136	-0.0007
			(0.0292)	(0.0321)	(0.0300)	(0.0334)
RISK	-0.0384	-0.0359	-0.0458*	-0.0399	-0.0341	-0.0358
	(0.0276)	(0.0292)	(0.0266)	(0.0293)	(0.0272)	(0.0302)
SIZE					0.0287	-0.0068
					(0.0281)	(0.0313)
FORM	-0.0220	-0.0487*	-0.0248	-0.0500*	-0.0122	-0.0358
	(0.0279)	(0.0296)	(0.0271)	(0.0299)	(0.0276)	(0.0307)
EXP	-0.0243	-0.0166	-0.0250	-0.0182	-0.0313	-0.0153
	(0.0279)	(0.0295)	(0.0268)	(0.0296)	(0.0284)	(0.0316)
SUB	0.0435	0.0468	0.0441*	0.0510*	0.0407	0.0518*
	(0.0283)	(0.0299)	(0.0269)	(0.0297)	(0.0273)	(0.0304)
COOP					-0.0136	-0.0241
					(0.0303)	(0.0337)
NBFI					0.0337	-0.0269
					(0.0580)	(0.0644)
GDPc	-0.0280	0.0465	-0.0177	0.0582	-0.0176	0.0694
	(0.0441)	(0.0467)	(0.0413)	(0.0455)	(0.0446)	(0.0496)
RURALPOP	0.1036**	0.0722	0.1104**	0.0860*	0.0933*	0.0811
	(0.0461)	(0.0488)	(0.0427)	(0.0471)	(0.0467)	(0.0519)
CONSTANT	0.3822***	0.4819***	0.3966***	0.4876***	0.3709***	0.4760***
	(0.0483)	(0.0511)	(0.0511)	(0.0563)	(0.0551)	(0.0612)
Prob>chi2	0	0.08	0	0.11	0	0.32
Log likelihood ratio	29.1	12.53	28.57	11.46	27.24	12.57
Number of observations	394	394	394	394	382	382

\*, \*\*, \*\*\* significant at the 10%, 5% and 1% levels, respectively

**Table 6: The Tobit regression with explanatory variables for social efficiency scores under CRS and VRS**

	crs	vrs	crs	vrs	crs	vrs
CAR	0.0406	0.0252			0.0183	0.0140
	(0.0297)	(0.0345)			(.0308)	(0.0376)
ROA			0.0187	0.0295	0.0151	0.0227
			(0.0307)	(0.0375)	(0.0323)	(0.0395)
RISK	0.1015***	0.0872***	0.0922***	0.0876***	0.0975***	0.0902***
	(0.0294)	(0.0342)	(0.0279)	(0.0342)	(0.0293)	(0.0357)
SIZE					0.0205	0.0116
					(0.0303)	(0.0370)
FORM	- 0.0329	-0.0182	-0.0308	-0.0152	-0.0233	-0.0122
	(0.0298)	(0.0346)	(0.0286)	(0.0349)	(0.0297)	(0.0363)
EXP	0.0133	-0.0220	0.01132	-0.0250	0.0010	-0.0250
	(0.0297)	(0.0345)	(0.0282)	(0.0345)	(0.0306)	(0.0374)
SUB	-0.0051	0.0193	0.0025	0.0227	-0.0024	0.0191
	(0.0301)	(0.0350)	(0.0283)	(0.0347)	(0.0294)	(0.0359)
COOP					-0.0640**	- 0.0468
					(0.0326)	(0.0398)
NBFI					-0.0626	-0.0086
					(0.0624)	(0.0762)
GDPc	0.0713	0.0628	0.0840*	0.0705	0.0671	0.0559
	(0.0470)	(0.0546)	(0.0434)	(0.0531)	(0.0480)	(0.0586)
RURALPOP	0.0249	0.0386	0.0429	0.0481	0.0328	0.0348
	(0.0491)	(0.0571)	(0.0450)	(0.0550)	(0.0503)	(0.0614)
CONSTANT	0.2088***	0.3472***	0.1977***	0.3296***	0.2429***	0.3664***
	(0.0514)	(0.0598)	(0.0538)	(0.0657)	(0.0593)	(0.0724)
Prob>chi2	0	0.18	0.01	0.18	0.02	0.47
Log likelihood ratio	19.66	10.07	18.09	10.16	21.8	10.63
Number of observations	394	394	394	394	394	394

\*, \*\*, \*\*\* significant at the 10%, 5% and 1% levels, respectively.

#### 4. CONCLUSION

Our study aims to evaluate the evolution of social and financial efficiencies of microfinance institutions. In policy circles, there is significant debate on this issue between the welfarists, who propagate the dominance of the purpose of the outreach (Hashemi and Rosenberg, 2006, Montgomery and Weiss, 2005; Woller, 2002), and institutionalists, who emphasise sustainability and efficiency. Rhyne and Otero (2006) argue that changes in the environment in which these institutions operate (commercialisation, technological changes) might have driven MFIs to seek more financial efficiency at the expense of social efficiency. In WAEMU, there were reforms that led to a change in the environment in which these institutions operate. Thus, it is of interest to try to understand the impact of those reforms in this African region. We use the DEA to answer this question. This analysis makes it possible to calculate both financial and social efficiency. Indeed, by using the DEA, we were able to consider the arguments for the production function outreach indicators, such as poverty, the percentage of women borrowers and the number of borrowers. Our results suggest that financial efficiency increases during the studied period, while social efficiency decreases. When we try to determine the predictors of these two types of efficiency, an interesting result occurs. Risk has a positive impact on social efficiency and a negative impact on financial efficiency. This result reflects the idea that a microfinance institution that places more emphasis on outreach would have to incur more risk at the expense of financial efficiency. Indeed, by regressing the risk variable on the outreach variables, we find that outreach increases risk. Again, by regressing profitability on the outreach variables, we can see that these variables have a negative and significant impact on profitability.

To reconcile the two functions of MFIs, we calculate a composite index for both financial and social efficiency: socio-financial efficiency. This index decreases over the studied period. However, our analysis of the determinants of socio-financial efficiency indicates that good capitalisation and good risk management have a positive impact. The authorities should promote the monitoring of MFIs in their financial management and risk management. MFIs with good practices in terms of the use of the surety to contain moral hazard and adverse selection should be used as an example to those MFIs who have difficulty managing those risks. Finally, given that subsidies have a positive impact on socio-financial efficiency, they should be used to fund the training and consultations MFIs offer to their customers. This strategy will help offset the cost of such training that negatively impacts efficiency. Such reforms will help the microfinance sector to successfully perform the roles of both a social and financial intermediary.

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## Annexes:

**Table 7: The statistics for the inputs and outputs used for the estimate of the efficiency scores with DEA**

Variable	Mean	Standard Deviation	Minimum	Maximum
FIEXP*	1.22E+08	2.53E+08	0	2.03E+09
OPEXP*	8.51E+08	1.88E+09	659377.8	1.77E+10
PERS	123.04	200.205	2	1005
POV	0.8548	0.211	0	1
NAB	15384.68	22822.78	16	112166
GLP*	5.06E+09	1.06E+10	68416.65	7.88E+10
PWOB	0.5895	0.2725	0.0075	11.937

\* Monetary values are expressed in CFA Francs.

**Table 8: The correlation coefficients for explanatory variables**

	CAR	DER	RISK	ROA	SIZE	FORM	EXP	SUBV
CAR	1							
	510							
DER	-0.3340*	1						
	0							
	510	510						
RISK	-0.1328*	0.0352	1					
	0.0027	0.4283						
	510	510	510					
ROA	0.0702	0.0548	-0.0963*	1				
	0.1135	0.2163	0.0296					
	510	510	510	510				
SIZE	-0.0517	0.039	-0.1515*	0.2166*	1			
	0.2437	0.3792	0.0006	0				
	510	510	510	510	510			
FORM	-0.0989*	0.0633	0.044	-0.1230*	-0.0944*	1		
	0.0256	0.1536	0.3208	0.0054	0.033			
	510	510	510	510	510	510		

EXP	-0.0203	-0.0285	-0.0898*	0.0921*	0.3767*	-0.0583	1	
	0.6482	0.5215	0.0428	0.0375	0	0.1888		
	510	510	510	510	510	510	510	
SUBV	0.0860*	-0.0314	-0.1209*	-0.018	0.1135*	0.0825*	0.2530*	1
	0.0523	0.4792	0.0062	0.6849	0.0103	0.0627	0	
	510	510	510	510	510	510	510	510

\* Significant at the 10% level

**Table 9: The panel regressions with risk and ROA as dependent variables**

	RISK	DRISK	ROA	ROA	ROA
				-1.63E-01	-1.51E-01
				(0.0513)***	(0.0512)***
NGO	6.70E-02	1.28E-02	1.06E-01	1.16E-01	1.04E-01
	(0.1182)	(0.2238)	(0.0536)*	(0.0486)**	(0.0506)**
COOP	1.03E-01	-1.24E-01	1.38E-01	1.44E-01	1.15E-01
	(0.1129)	(0.2102)	(0.0508)**	(0.0459)***	(0.0477)**
CAR	-0.2091	-1.29E-01	1.01E-01	2.03E-02	1.23E-02
	(0.1177)*	(0.1662)	(0.0229)***	(0.0410)	(0.0381)
DER	2.84E-05	8.75E-03	-3.76E-05		
	(0.0001)	(0.0027)***	(2.98 E-5)		
GLP/TA	-5.11E-02		1.10E-02	8.31E-03	-1.28E-04
	(0.0450)		(0.0114)	(0.0121)	(0.0373)
NAB/PERS	-5.88E-07		1.24E-04	1.34E-04	
	(0.0001)		(4.3 E -5)***	(0.4E-5)***	
PWOB	1.23E-02	2.85E-01	-1.36E-02	-1.59E-02	
	(0.1078)	(0.1604)*	(0.0344)	(0.0365)	
ALB/GNlc		2.72E-02			1.14E-02
		(0.0256)			(0.0059)*
Constant	1.23E-01	-1.90E-01	-2.10E-01	-1.75E-01	-1.51E-01
	(0.1342)	(0.2271)	(0.0545)***	(0.0518)***	(0.0526)***
R <sup>2</sup>	0.07	0.06	0.22	0.29	0.23
Number of Observations	338	338	335	286	286

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### Résumé

Cette étude a pour but d'évaluer l'efficacité sociale et financière des institutions de micro-finance (IMFs) dans la zone UEMOA (Union Economique et Monétaire Ouest Africaine). Nos résultats suggèrent que lorsque l'efficacité financière augmente, l'efficacité sociale diminue. Par ailleurs, les institutions de micro-finance qui prennent le plus de risques en étendant leurs crédits aux populations les plus pauvres ont une efficacité sociale élevée et une efficacité financière faible. Les variables d'«outreach» ont un impact négatif sur le risque et la profitabilité des IMFs, ce qui confirme l'arbitrage en faveur de la viabilité des IMFs. Lorsque les deux fonctions (sociale et financière) sont considérées dans un index composite, une bonne gestion du risque, une bonne capitalisation et les subventions permettent aux IMFs d'être efficaces socialement et financièrement.

**Mots clés:** Efficacité, micro-finance, outreach, programmes de réforme, viabilité, UEMOA

