

**Microfinance institutions:  
financial sustainability and efficiency  
(preliminary results)**

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# Introduction

The goal of this research is analysing the relationship between financial sustainability<sup>1</sup> and efficiency<sup>2</sup> in terms of:

- Outreach to the poor;
- Relation between gender and repayment;

We also try to investigate whether the recent Global Financial Crisis has had any effect on the issues we mentioned above.

<sup>1</sup>The term sustainability is used to indicate that MFIs have to cover their costs in order to avoid bankruptcy.

<sup>2</sup>The term efficiency is used to indicate that MFIs are efficient if they are able to provide services to the poor (outreach).

# Literature review (a)

- Mersland et al. (2009) investigate the impact of management, firm ownership type, competition and regulation on MFIs financial performance and outreach to poor clients using random effect panel data model. They found that corporate government as well as bank regulation have a little impact on MFIs financial and outreach performances;
- Ahlin et al. (2010) investigate the impact of macroeconomic and macro institutional features on performance of MFIs by using a dataset of 373 MFIs from 74 countries. Their results show that MFI performances are affected by both macroeconomic and institutional environment;
- Hermes et al (2011) provide evidence of the trade-off between sustainability and outreach, using data for a large number of MFIs. Their study focuses on the relationship between cost efficiency of MFIs (as a measure of sustainability) and the depth of outreach measured by the average loan balance. Results find strong evidence that outreach is negatively related to efficiency of MFIs. That is, MFIs that have lower average loan balance are also less efficiency.

# Literature review (b)

- Gibbons and Kasim (1991) find that in Malaysia 95% of women repaid their loans, compared with 72% of the men.
- Kevane and Wydick (2001) report that female credit group had better loan repayment records than male group.
- D'Espellier et al. (2011) find that MFIs with a larger proportion of female borrowers have lower portfolio at risk and lower write-off rates. Their results seem to indicate that women are better credit risks.

# Dataset (b)

- The data on MFIs are taken from MikMarket website;
- The data on Countries are taken from World Bank website;
- The period of analysis is from 2000 to 2010;
- We have information for 1779 MFIs and 104 countries;
- Our dataset is based on 34 variables and 218538 observations.

# Methodology (a)

There are broadly two classes of panel estimator approaches that can be employed in empirical research:

- Fixed effect models (they permit cross-section heterogeneity to vary across individuals);
- Random effect models (they treat the heterogeneity across individuals as a random component).

We use the Hausman test in order to identify whether a fixed effect or a random effect model is more suitable for our analysis.

# Methodology (b)

Two types of dataset can be alternatively used in empirical analysis:

- Balanced panels (the same number of time-series observations for each cross-sectional unit);
- Unbalanced panels (there are some cross-sectional elements with fewer observations or observations at different times to others)

We use an unbalanced dataset in our paper.

# Methodology (b)

We analyse the issue of outreach and financial sustainability by using the following equation:

$$\ln(ALBB) = \alpha_1(\ln CB) + \alpha_2(\ln BSM) + \alpha_3 \ln(TWB) + \beta_1 Z_{it} + u_{it} + \epsilon_{it}$$

Where the loan size, proxied by the Average Loan balance per borrower (ALBB) is usually taken as a proxy of the depth of outreach. Cost per Borrower (CB), and Borrowers per Staff member are both measure of efficiency and productivity. Total Women Bottowers (TWB) is another proxy for efficiency since loans to women are more highly valued by society.  $Z_{it}$  is a vector of control variables, such real GDP per capita (RGDPPC), Domestic Credit provided by Banking sector, (DCBS), Domestic credit to private sector, (DCPS) and Lending Interest rate (LIR).



# Methodology (c)

We also analyse the issue dealing with women and repayment in microfinance by using the following model:

$$\text{PaR30}_{it} = \beta_0 + \beta_1 \ln \text{TWB}_{i,t} + \theta_i Z_{i,t} + u_{i,t}$$

Where  $\text{PaR30}_{it}$  is the portfolio at risk for MFIs, TWB is as defined previously, and  $Z_{i,t}$  is a matrix of MFI-specific controls as in the previous slide.

# Methodology (d)

We investigate both outreach, as well as the relation between gender and repayment by using either Fixed Effect or Random Effect models.

We repeat our analysis by:

- taking into consideration where MFIs are geographically located;
- taking into consideration the recent Global Financial Crisis by splitting our dataset in two sub-periods (i.e 2000-2007 and 2008-2010);

**Table 1 – MFIs: Regions and Countries**

Region	Countries
Africa	Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Guinea Bissau, Namibia
East Asia and the Pacific	Cambodia, China, East Timor, Indonesia, Malaysia, Papua New Guinea, Philippines, Samoa, Tonga, Vietnam, Laos, Thailand, East Timor
Eastern Europe and Central Asia	Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Croatia, Kazakhstan, Kosovo, Kyrgyzstan, Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Tajikistan, Turkey, Ukraine, Hungary, Uzbekistan,
Latin America and the Caribbean	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela
Middle East and North Africa	Egypt, Iraq, Jordan, Lebanon, Morocco, Palestine, Sudan, Syria, Tunisia, Yemen
South Asia	Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka

Source: MikMarket.

# Results (a)

**Table 2 – Tests of outreach with fixed effects model**

Variable	2000-2010	2000-2007	2008-2010
Intercept	<b>-3.854***</b> (0.360)	<b>-3.906***</b> (0.478)	<b>1.088</b> (1.816)
lnCB	<b>0.362***</b> (0.014)	<b>0.371***</b> (0.018)	<b>0.106***</b> (0.034)
lnBSM	<b>-0.164***</b> (0.019)	<b>-0.151***</b> (0.026)	<b>-0.190***</b> (0.036)
lnTWB	<b>0.029***</b> (0.009)	<b>0.050***</b> (0.013)	<b>-0.054**</b> (0.025)
lnGDPPC	<b>1.211***</b> (0.061)	<b>1.163***</b> (0.08)	<b>0.889***</b> (0.262)
lnDCPS	<b>0.188***</b> (0.022)	<b>0.230***</b> (0.033)	<b>0.005</b> (0.041)
LIR	<b>-0.009***</b> (0.001)	<b>-0.008***</b> (0.001)	<b>-0.056</b> (0.004)
R <sup>2</sup> within	<b>0.488</b>	<b>0.443</b>	<b>0.155</b>
Ho : $u_i = 0$	<b>F(1228,3283)=2</b> <b>4.04</b> <b>P-value=0.00</b>	<b>F(1032,2194)=2</b> <b>0.16</b> <b>P-value=0.00</b>	<b>F(801,477)=30.1</b> <b>6</b> <b>P-value=0.00</b>
Rho	<b>0.954</b>	<b>0.953</b>	<b>0.92</b>

Comments on FE results:

The null hypothesis that fixed effects are jointly zero is rejected at 1% level (i.e. pooled OLS would be inappropriate).

**Table 3 – Tests of outreach and sustainability with random effects panel model**

Variable	2000-2010	2000-2007	2008-2010
Intercept	<b>0.787***</b> (0.160)	<b>0.976***</b> (0.193)	<b>3.336***</b> (0.307)
lnCB	<b>0.545***</b> (0.012)	<b>0.577***</b> (0.014)	<b>0.553***</b> (0.022)
lnBSM	<b>-0.124***</b> (0.018)	<b>-0.092***</b> (0.023)	<b>-0.128***</b> (0.032)
lnTWB	<b>0.031***</b> (0.007)	<b>0.021**</b> (0.009)	<b>-0.126***</b> (0.014)
lnGDPPC	<b>0.371***</b> (0.023)	<b>0.320***</b> (0.026)	<b>0.242***</b> (0.030)
lnDCPS	<b>0.219***</b> (0.019)	<b>0.202***</b> (0.027)	<b>0.159***</b> (0.034)
LIR	<b>-0.008***</b> (0.00)	<b>-0.008***</b> (0.001)	<b>-0.012***</b> (0.002)
Hausman test	<b>843.31</b>	<b>655.29</b>	<b>316.63</b>
Prob>chi2	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Rho	<b>0.954</b>	<b>0.867</b>	<b>0.947</b>
LM statistic (chi-squared)	<b>4584.19</b> <b>0.00</b>	<b>2496.23</b> <b>(0.00)</b>	<b>278.21</b> <b>(0.00)</b>
Prob>chi2			
R <sup>2</sup> overall	<b>0.624</b>	<b>0.0627</b>	<b>0.670</b>

Comments on RE results:

The Hausman test statistic has a p-value equals to zero leading us to reject the hypothesis that the coefficient estimates are equal to another (i.e. the FE is preferred to the RE).

The Breusch-Pagan LM statistic that there are no random effect. In other words the RE model is more appropriate than an OLS model.

# Results (b)

Table 4 – Tests of outreach and sustainability with fixed effects panel models for MFIs located in Africa

Variable	2000-2010	2000-2007	2008-2010
Intercept	-8.272*** (1.099)	-9.281*** (1.389)	10.25 (7.847)
lnCB	0.290*** (0.049)	0.371*** (0.06)	0.088 (0.121)
lnBSM	-0.195*** (0.059)	-0.138* (0.075)	-0.460* (0.190)
lnTWB	0.022 (0.028)	-0.006 (0.037)	-0.098 (0.123)
lnGDPPC	2.126*** (0.208)	2.22*** (0.260)	-0.101 (1.276)
lnDCPS	0.289*** (0.077)	0.33*** (0.113)	-0.183 (0.395)
LIR	-0.023** (0.001)	-0.003** (0.001)	0.00 (0.007)
R <sup>2</sup> within	0.517	0.477	0.268
Ho : u <sub>i</sub> = 0	F(181,468)=16.08 P-value = 0.00	F(166,365)=14.04 P-value=0.00	F(81,30)=20.08 P-value=0.00
Rho	0.973	0.976	0.970

Notes: standard errors are among brackets. \*,\*\* and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.

# Results (c)

Table 5 – Tests of outreach and sustainability with fixed effects panel models for countries located in East Asian and the Pacific

Variable	2000-2010	2000-2007	2008-2010
Intercept	-7.089*** (1.259)	-7.469*** (1.636)	17.247 (15.664)
lnCB	0.480*** (0.052)	0.607*** (0.061)	-0.045 (0.161)
lnBSM	-0.173 (0.05)	-0.085 (0.067)	-0.133 (0.085)
lnTWB	-0.056** (0.025)	-0.046 (0.035)	-0.05 (0.047)
lnGDPPC	1.684*** (0.205)	1.565*** (0.262)	-2.732 (2.901)
lnDCPS	0.076 (0.072)	0.099 (0.076)	2.289 (1.409)
LIR	-0.02* (0.010)	-0.012 (0.016)	0.058 (0.042)
R <sup>2</sup> within	0.606	0.621	0.151
Ho : u <sub>i</sub> = 0	F(140,276)=27.09 P-value=0.00	F(108,170)=33.09 P-value=0.00	F(93,38)=16.82 P-value=0.00
Rho	0.968	0.977	0.995

Notes: standard errors are among brackets. \*,\*\* and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.

# Results (d)

**Table 6 – Tests of outreach and sustainability with fixed effects panel models for country located in Central Europe and Asia**

Variable	2000-2010	2000-2007	2008-2010
Intercept	-0.028 (0.592)	-0.452 (0.742)	1.66 (3.174)
lnCB	0.277*** (0.028)	0.277*** (0.031)	-0.063 (0.115)
lnBSM	-0.269*** (0.045)	-0.326*** (0.058)	-0.049 (0.099)
lnTWB	-0.027 (0.028)	0.058 (0.040)	-0.146* (0.077)
lnGDPPC	0.882*** (0.098)	0.912*** (0.119)	0.938** (0.405)
lnDCPS	0.368*** (0.043)	0.330*** (0.056)	0.189 (0.204)
LIR	-0.021 (0.002)	-0.019*** (0.003)	-0.003 (0.009)
R <sup>2</sup> within	0.633	0.595	0.143
Ho : u <sub>i</sub> = 0	F(232,614)=16.07	F(200,423)=13.65	F(145,71)=20.13
Rho	0.00	0.00	0.00
	0.914	0.910	0.977

Notes: standard errors are among brackets. \*,\*\* and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.

# Results (e)

Table 7 – Tests of outreach and sustainability with fixed effects panel models for countries located in Latin America and the Caribbean

Variable	2000-2010	2000-2007	2008-20010
Intercept	-8.127*** (0.874)	-12.093*** (1.327)	12.695*** (3.906)
lnCB	0.513*** (0.025)	0.513*** (0.029)	0.049 (0.065)
lnBSM	-0.171*** (0.034)	-0.126*** (0.042)	-0.448*** (0.071)
lnTWB	0.001 (0.018)	0.028 (0.023)	-0.052 (0.04)
lnGDPPC	1.723*** (0.131)	2.194*** (0.196)	-1.998*** (0.531)
lnDCPS	0.098*** (0.029)	0.097* (0.051)	0.11 (0.04)
LIR	-0.007*** (0.002)	-0.00 (0.002)	-0.047*** (0.006)
R <sup>2</sup> within	0.599	0.582	0.405
Ho : $u_i = 0$	F(366,1079)	F8287,671)	F(284,196)
Rho	0.984	0.989	0.996

Notes: standard errors are among brackets. \*,\*\* and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.



# Results (f)

Table 8 – Tests of outreach and sustainability with fixed effects panel models for countries located in East Asian and the Pacific

Variable	2000-2010	2000-2007	2008-2010
Intercept	-7.089*** (1.259)	-7.469*** (1.636)	17.247 (15.664)
lnCB	0.480*** (0.052)	0.607*** (0.061)	-0.045 (0.161)
lnBSM	-0.125 (0.05)	-0.085 (0.067)	-0.44 (0.085)
lnTWB	-0.056** (0.025)	-0.066 (0.035)	-0.05 (0.047)
lnGDPPC	1.684*** (0.205)	1.565*** (0.262)	-2.965 (2.901)
lnDCPS	0.076 (0.072)	0.111 (0.076)	2.369 (1.409)
LIR	-0.02* (0.010)	-0.012 (0.016)	0.058 (0.042)
R <sup>2</sup> within	0.606	0.621	0.151
Ho : u <sub>i</sub> = 0	F(140,276)=27.09 P-value=0.00	F(108,170)=33.09 P-value=0.00	F(93,38)=16.82 P-value=0.00
Rho	0.968	0.977	0.995

Notes: standard errors are among brackets. \*,\*\* and \*\*\* denote significance at the 10%, 5% and 1% levels respectively.

# Preliminary comments

Considering MFIs located in Africa and in the region of East Asian and the Pacific we can see that the fixed effect model are preferred to the random effects. All the estimated coefficients have the same sign as we have found for the overall sample. We also found that DCPS has a larger effect on ALBB provided by African MFIs.

Considering the MFIs in the East Asian and Pacific we can see that the results for both the entire period and the first sub-periods are almost identical. However none of the coefficients is significant during the period 2008-2009. For the entire period we may also note the negative sign of the TWB. As this increases, the ALBB reduces. It is worthy to note that GDPPC has a larger impact on ALBB if compared to the overall results.

The results for MFIs located in Central Europe and Asia show that the FE model is preferred to the RE. For Latin American and the Caribbean we observe that the results are quite similar across all periods. It is worthy to note that the gender variable (TWB) has no statistically significant effect on ALBB on both the entire period and the first sub-period. However the effect is both significant and negative during the crisis period.

For the MFIs located in the Middle East and North Africa most of the estimated parameters are all statistically significant during the overall period. However none of the coefficients estimated are significant in the second sub-period (2008-2009) For the MFIs firms located in South East Asia we observe that just only CB and GDPPC coefficients are statistically significant for the overall period of analysis. On the other side during the crisis period the effect of GDPPC on ALBB is larger.

# Women and repayment in microfinance: preliminary results (a)

Table 9 – Tests of women and repayment in microfinance with fixed effects panel models

Variable	2000-2010	2000-2007	2008-2010
Intercept	-0.066 (0.522)	1.032 (0.645)	4.436 (3.567)
lnTWB	-0.009 (0.012)	0.005 (0.014)	-0.005 (0.061)
lnGDPPC	0.030 (0.087)	-0.131 (0.107)	-0.531 (0.506)
lnDCPS	0.087** (0.034)	0.034 (0.041)	-0.063 (0.123)
lnLIR	0.00 (0.001)	0.001 (0.001)	0.00 (0.012)
R <sup>2</sup> within	0.002	0.00	0.003
Ho : $u_i = 0$	0.543F(1339,3796)=3.18	F81067,2603)=3.34	F(917,543)=2.21
Rho	0.511	0.573	0.729

Notes: standard errors in brackets; \*\*\*p-value <0.01, \*\* p-value < 0.05\*\*\*; \*p-value < 0.1

# Women and repayment in microfinance: preliminary results (b)

Table 10 – Tests of women and repayment in microfinance with random effects panel models MFIs located in Africa

Variable	2000-2010	2000-2007	2008-2010
Intercept	0.628 (0.351)	0.846** (0.408)	0.314 (0.565)
lnTWB	-0.036* (0.019)	-0.042* (0.022)	-0.048 (0.032)
lnGDPPC	0.006 (0.057)	-0.029 (0.065)	0.232** (0.109)
lnDCPS	0.022 (0.056)	0.025 (0.062)	-0.224 (0.155)
lnLIR	0.001 (0.002)	0.002 (0.002)	-0.003 (0.005)
Hausman test chi2(4)	1.51	0.79	8.76
Prob>chi2	0.825	0.939	0.067
Rho	0.185	0.158	0.540
LM statistic (chi-squared)	57.19	41.79	1.13
Prob>chi2	0.00	0.00	0.287
R <sup>2</sup> overall	0.013	0.014	0.063

# Women and repayment in microfinance: preliminary results (c)

**Table 11 – Tests of women and repayment in microfinance with random effects panel models for MFI located in East Asia and the Pacific**

Variable	2000-2010	2000-2007	2008-2010
Intercept	0.985* (0.594)	1.521** (0.690)	1.315 (1.111)
lnTWB	-0.004 (0.015)	-0.012 (0.018)	-0.013 (0.026)
lnGDPPC	0.125 (0.066)	-0.021 (0.079)	0.125 (0.111)
lnDCPS	-0.174*** (0.052)	-0.184*** (0.06)	-0.301*** (0.102)
lnLIR	0.25 (0.013)	-0.019 (0.018)	0.336 (0.020)
Hausman test chi2(4)	10.07	10.965	9.68
Prob>chi2	(0.039)	0.027	0.046
Rho	0.257	0.303	0.578
LM statistic (chi-squared)	89.58	88.05	12.75
Prob>chi2	0.00	0.00	0.00
R <sup>2</sup> overall	0.055	0.059	0.095

Notes: standard errors in brackets; \*\*\*p-value < 0.01, \*\* p-value < 0.05\*\*\*; \*p-value < 0.1.

# Women and repayment in microfinance: preliminary results (d)

Table 12 – Tests of women and repayment in microfinance with fixed effects panel models for MFIs located in Eastern Europe and Central Asia

Variable	2000-2010	2000-2007	2008-2010
Intercept	0.45 (0.591)	1.120** (0.602)	11.107 (8.419)
lnTWB	0.017 (0.019)	0.034* (0.02)	-0.136 (0.156)
lnGDPPC	-0.2** (0.098)	-0.181* (0.099)	-1.785* (1.015)
lnDCPS	0.197*** (0.045)	0.63 (0.047)	0.892 (0.541)
lnLIR	0.022 (0.003)	-0.00 (0.002)	0.036 (0.26)
R <sup>2</sup> within	0.034	0.011	0.160
Ho : u <sub>i</sub> = 0	F(283,756)=4.42 0.000	F(214,535)=4.07 0.000	F(190,95)=2.60 0.00
Rho	0.761	0.739	0.901

# Women and repayment in microfinance: preliminary results

Table 10 – Tests of women and repayment in microfinance with random effects panel models MFIs located in Africa

Variable	2000-2010	2000-2007	2008-2010
Intercept	0.628 (0.351)	0.846** (0.408)	0.314 (0.565)
lnTWB	-0.036* (0.019)	-0.042* (0.022)	-0.048 (0.032)
lnGDPPC	0.006 (0.057)	-0.036 (0.065)	0.232** (0.109)
lnDCPS	0.225 (0.056)	0.025 (0.062)	-0.224 (0.155)
lnLIR	0.001 (0.002)	0.002 (0.002)	-0.125 (0.005)
Hausman test chi2(4)	1.51	0.79	8.76
Prob>chi2	0.825	0.939	0.067
Rho	0.185	0.158	0.569
LM statistic (chi-squared)	57.36	41.79	1.13
Prob>chi2	0.00	0.00	0.287
R <sup>2</sup> overall	0.013	0.014	0.063

# Women and repayment in microfinance: preliminary results

Table 11 – Tests of women and repayment in microfinance with fixed effects panel models for MFIs located in South East Asia

Variable	2000-2010	2000-2007	2008-2010
Intercept	-3.918*** (1.612)	2.243*** (2.222)	-3.918*** (1.612)
lnTWB	-0.074*** (0.027)	0.020 (0.03)	-0.023*** (0.02)
lnGDPPC	0.885** (0.36)	-0.605 (0.591)	0.885** (0.360)
lnDCPS	-0.138 (0.209)	0.399 (0.478)	-0.138 (0.209)
lnLIR	-0.009 (0.022)	0.021** (0.011)	-0.009 (0.013)
R <sup>2</sup> within	0.011	0.007	0.011
Ho : u <sub>i</sub> = 0	F(269,815)=3.06	F(8234,552)=3.88	F(269,815)=3.06
Rho	0.606	0.712	0.606



## Preliminary conclusions

Our paper has used panel data methodologies in order to investigate the relation between outreach and financial sustainability as well as the interaction between women and repayment in microfinance. Using the Hausman test we find that Fixed Effect models are usually more suitable than Random effect model in order to describe the relations among variables used in our analysis.

The first part of our analysis shows that the Cost per Borrower (CB) and the Total Women Borrowing (TWB) variables have positive effect on the Average Loan Balance Per Borrower (ALBB). We find almost the same results by splitting the sample in geographic areas taking into account where MFIs are located.

Moving to analyse the relation among gender and Portfolio at Risk in MFIs, our results show that as the percentage of total female borrowers increase the level of risk for MFIs tend to reduce.

However our results have to be considered preliminary. Refining the database could be a way of getting better results.