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RESEARCH PAPER

On the Interplay between Microfinance and Sustainable Development: Evidence from MENA Countries

Wajdi Moussa[a,*], Nidhal Mgadmi[b], Azza Bejaoui[c], Tarek Sadraoui[d]

a. Department of Quantitative Methods, Higher Institute of Management of Tunis, University of Tunis, Tunisia
b, d. Department of Quantitative Methods, Faculty of Economics and Management of Mahdia, University of Monastir, Tunisia
c. Department of Finance, Manouba Business School, University of Manouba, Tunisia

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Abstract
In this paper, we attempt to examine the relationship between microfinance and sustainable development for 10 MENA countries over the period 1990-2018. To this end, we use a multi-step approach based on different statistical tests and econometric models (STAR, ESTAR, LSTAR, and STECM). The empirical results clearly show a positive and significant relationship between the indicators of microfinance and sustainable development. By offering the opportunity to access microcredit, microfinance institutions can contribute to reinforcing sustainable development. Therefore, households should be encouraged to create investment opportunities and increase their demand for microcredit Our empirical analysis establishes a positive and significant relationship between microfinance indicators and sustainable development. Such a relationship seems to be dynamic over time and especially significant during short-term. Therefore, by providing the possibility to access microcredit, microfinance institutions can contribute to boosting sustainable development. Accordingly, the present study contributes to the literature on microfinance by providing convincing evidence that microfinance and microcredit have a significant effect on sustainable development.
Keywords: Microcredit, Growth, Long-term Relationship, STAR, STECM.
JEL Classification : G21, O57, Q01, Q14.

Introduction

Broadly speaking, microfinance is considered as the provisions of financial services (e.g., microcredit, micro-savings) to low-income customers. Unlike the banking system, microfinance can be considered as a high-growth industry (Garcia-Perez et al., 2017) in terms of the number of customers served (Mersland et al., 2013) and provides a wide geographical coverage (developing and emerging countries). According to Beisland et al. (2015), it increasingly helps bolster the financial system (Ledgerwood, 1998).

From academic standpoint, many researchers profess the adverse effects of microfinance such as women's exploitation, increased income inequality, creation of dependencies and barriers to sustainable local economic and social development (e.g., Bateman and Chang, 2009); Copestake et al., 2002). Nonetheless, other researchers have attempted to analyze the different positive effects of microfinance. In this regard, Garikipati (2012) and Rahman et al. (2009), among others, have examined the impact of microfinance on women's empowerment. Rewilak (2017) and Donou-Adonsou and Sylwester (2017) rather prefer to analyze how the microfinance can lead to poverty alleviation. Other effects of microfinance, including the

impact on consumption level, nutrition, health and education, have also been under study (e.g., Leatherman et al., 2012; Jacobsen, 2009). According to van Rooyen et al. (2012), the underlying logic behind the aforementioned studies is that microfinance allows people to manage their money differently, open new businesses, invest, acquire productive assets and boost their skills levels.

In this context, microcredit can be considered as a useful tool to help poor people invest, break out of their vicious cycle of poverty (Li et al., 2011), create employment for farmers and boost them to increase production and welfare (Luan and Bauer, 2015). In this regard, Park et al. (2004) report that microcredit leads to poverty reduction. As well, the percentage of people in poverty tends substantially to reduce in China over time. Luan and Bauer (2015) examine the effect of microcredit on different groups of accessed households (classified by loan volumes, relative poverty, access to agricultural extension, services, and ethnicity) in Vietnam. They show that the credit access differently affects recipient groups. They also report that microcredit seems to positively influence household income. Felix and Belo (2019) examine the effect of microcredit on poverty reduction for 11 developing countries in South-east Asia over the period 2007-2016. They indicate that microcredit can diminish poverty (approximated by poverty gap, squared poverty gap and headcount index). Samer et al. (2015) reveal that the impact of microcredit on poverty alleviation clearly differs from one context to another according to population density, attitudes to being in debt, group-cohesion, business development, financial literacy, and financial service providers. Ferdousi (2015) tries to measure and analyze the effectiveness of microenterprise loans on raising entrepreneurs' innovation and income. The empirical findings report that higher loans enhance income, but less innovative business practices can loom such income. Li et al. (2011) attempt to analyze which factors influence the microcredit access by Chinese rural households. They identify households-level factors (educational level, household size, income) as determinants of households' credit access. They also show the existence of positive relationship between households' credit demand and access to credit.

By providing the access to credit for customers who usually excluded from the formal banking system, the microfinance through the financial institutions can contribute to sustainable economic and financial systems development. To that extent, Lopatta et al. (2017) indicate that both outreach and profitability seem to be negatively related to sustainable development. Ramaswany and Krishnamoorthy (2016) indicate the importance of regulatory changes to make microfinance useful tool with the aim of achieving sustainable development. By using a case study of ACCION San Diego, Doshi (2010) displays that having positive possibilities and ability to reframe are successfully key factors for customers and microfinance institutions, implying a better sustainable development.

This paper lies to the aforementioned literature and attempts to explore the relationship between the microfinance and sustainable development in 10 MENA countries during the period 1990-2018. For this end, we apply different econometric models on variables under consideration to highlight the behavior and evolution of the microfinance-sustainable development nexus.

This paper is organized as follows. Section 2 presents the methodology and Section 3 reports data and the descriptive statistics. The empirical results are presented in Section 4. Section 5 concludes.

Methodology

In order to examine the impact of microfinance on sustainable development in MENA countries, we use the following model:

$$GS_{it} = A_i (AB)_{it}^{\alpha_i} (GLP)_{it}^{\beta_i} (FBCF)_{it}^{\chi_i} (SME)_{it}^{\delta_i} (UR)_{it}^{\phi_i} (INF)_{it}^{\gamma_i} \exp(\varepsilon_{it}) \quad (1)$$

where:

- GS corresponds to the Genuine Savings (or Adjusted Net Saving) and is an indicator of sustainable development[1];
- Active Borrowers (AB) is the ratio of the number of people who contacted microcredit on the benefits of microcredit from microfinance institutions in order to finance economic activities.
- Gross Loan Portfolio (GLP) represents the securities portfolio of microfinance institutions.
- Gross Fixed Capital Formation (GFCF) measures the fixed capital investment of the various resident agents in the national accounts and is used in the production process. These fixed assets correspond to capital goods, housing, buildings, etc.
- Small and Medium Enterprises (SME) correspond to the number of small and medium-sized enterprises. The change of such variable over time provides insightful information about either the creation of new small businesses or the increase of the size of other companies. Such variable can be used for determining the contribution of small and medium-sized enterprises in job creation and economic wealth as measured by gross domestic product (GDP).
- Unemployment rate (UR) is the unemployment rate which is approximated by the percentage of people who can work and create wealth, but they are still looking for an income-generating activity.
- Inflation rate (Inf) is measured by the GDP deflator to identify the rise in the general price level. This deflator is calculated as the ratio between nominal economic wealth (nominal GDP) and real national output (real GDP).

We afterwards use the Neperian logarithm operator to make the model linear:

$$Log(GS)_{it} = Log(A)_i + \alpha_i Log(AB)_{it} + \beta_i Log(GLP)_{it} + \chi_i Log(FBCF)_{it} + \delta_i Log(SME)_{it} + \phi_i \mathrm{Log}(UR)_{it} + \gamma_i Log(INF)_{it} + \varepsilon_{it} \quad (2)$$

Data and Descriptive Statistics

In this paper, we use the aforementioned variables in annual frequency for a sample of 10 MENA countries including Egypt, Iraq, Jordan, Lebanon, Morocco, Palestine, Sudan, Syria, Tunisia and Yemen over the period 1990-2018. The descriptive statistics of the data used in this study are reported in Table 1. Descriptive statistics comprise the mean, median, standard deviation, minimum, maximum, skewness, kurtosis, Jarque-Bera for normality test and respective probabilities.

From Table 1, the mean for each variable spans from 0.47435 (variable LGS) to 11.1541 (variable LGLP). The standard deviation seems to be very small for each variable. Therefore, there is a low variation around the average for each variable. The explanatory and endogenous variables do not follow the normal distribution given that the Jarque-Bera statistics are higher than the critical value of Chi-square. This result is confirmed by the skewness and kurtosis values. Indeed, the negative value of skewness shows that the distributions of all the variables are skewed left, except for the variable LSME. As well, the Kurtosis statistic displays that all the variables are focused more than normal distributions with the help of long tails.

Table 1. Descriptive Statistics

1. Pearce et al. (1989) define the sustainability of development as a situation where well-being for a given population is not declining, or preferably is increasing over time.

	LGS	LAB	LGLP	LGFCF	LSME	LUR	LINF
Mean	0.7435	4.3838	11.1541	2.6315	4.6965	2.5703	2.4960
Median	0.8477	5.5085	11.7096	2.8445	4.6634	2.6830	2.5870
Maximum	1.0830	6.7081	13.2079	3.2317	6.1737	2.8803	3.8230
Minimum	0.3611	0.2231	6.7524	0.5315	3.9120	2.1188	1.0109
St. Dev	0.2278	1.9937	1.8201	0.5687	0.5718	0.2863	0.6640
Skewness	-0.2120	-0.5414	-1.0178	-1.8239	0.8752	-0.6223	-0.3519
Kurtosis	1.5351	2.0457	2.9127	7.0140	3.4355	1.7314	2.6882
Jarque-Bera	28.1007	25.1754	50.1692	355.4920	39.3207	38.1645	7.1608
Signification (JB)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0278
Observations	290	290	290	290	290	290	290
Cross sections	10	10	10	10	10	10	10

Source: Research finding.

We then analyze the stationarity of all the variables based on different unit root tests (Table2). The homogeneous unit root test on Panel data proposed by Levin et al. (2002) shows that all variables are non-stationary in level. The heterogeneous unit root test of Im et al. (2003) confirms such finding. So, the first difference of the variables makes them stationary. That is, these variables are integrated of order 1 and we use the Co-integration theory for panel data to avoid the existence of a fallacious relation from the usual estimation procedure.

Table 2. Results from Unit Root Tests for Panel Data

	Lags	Model	In Level		In First Difference	
			Levin et Lin	IPS	Levin et Lin	IPS
LGS	2	M3	-0.23322	-1.14514	-2.66584	-3.78922
LAB	1	M2	-0.62540	-0.79261	-3.38228	-4.35443
LGLP	1	M2	0.08722	0.05715	-2.53484	-3.78595
LGFCF	2	M3	-0.96482	-1.30978	-2.16970	-3.92029
LSME	1	M2	-0.07422	-0.19758	-3.34705	-4.88288
LUR	1	M2	-1.09487	-1.17830	-5.10823	-4.10262
LINF	1	M2	-1.09487	-1.17830	-5.10823	-4.10262

Source: Research finding.

Estimation Results and Interpretation

We apply the Co-integration theory on panel data to estimate a dynamic relationship between the sustainable development and other explanatory variables. We also study the linear fit of the sustainable development within an error correction model (ECM) estimated by modified least squares technique. But before estimating this ECM, we examine the stationarity of the residuals in the long-term relationship based on seven tests of Pedroni (2004). Table 3 shows the results of such tests.

Table 3. Pedroni (2004)' Tests

	Within Tests				Between Tests		
	Rho-stat	v-stat	pp-stat	Adf-stat	Rho-stat	pp-stat	Adf-sta
$\hat{\varepsilon}_{it}$	-6.36165	-3.61655	-6.79287	-0.88729	-8.89095	-10.2116	-6.50740

Source: Research finding.

The Within and Between tests show that the residual of the long-term relationship is stationary in level without difference given the values of statistics. Therefore, we confirm the

long-term relationship estimated by Hansen (1995)'s Fully Modified procedure. The estimation results of this long-term relationship are presented in Table 4.

Table 4. Estimation Results for Long-Term Relationship based on Fully Modified Procedure

	Coefficients	**T-Statistics**
LAB	0.16	11.31
LGLP	-0.07	-1.08
LGFCF	-0.04	-4.90
LSME	0.04	0.34
LUR	-0.23	-5.59
LINF	-0.01	1.48

Source: Research finding.

From Table 4, the ratio of the number of people who contacted microcredit on the benefits of microcredit from microfinance institutions (AB) seems to affect the sustainable development positively and significantly. However, the securities portfolio of microfinance institutions (GLP) and the number of small and medium-sized enterprises (SME) have no impact on the sustainable development. The fixed capital investment of the various resident agents in the national accounts (GFCF), the unemployment rate and inflation rate negatively and significantly influence the Genuine Savings (GS).

We then examine a long-run equilibrium relationship between the sustainable developed and different explanatory variables using an error correction model (ECM). The estimation results are shown in Table 5 below.

Table 5. Estimation Results for ECM based on Fully Modified Procedure

	Coefficients	**Signification**
Δ **LAB**$_{it}$	0.1357	0.0000
Δ **LGLP**$_{it}$	-0.0125	0.5776
Δ **LGFCF**$_{it}$	-0.0439	0.4658
Δ **LSME**$_{it}$	0.1306	0.0002
Δ **LUR**$_{it}$	-0.2912	0.00007
Δ **LINF**$_{it}$	-0.00943	0.5652
Residual$_{it-1}$	-0.0272	0.0221

Source: Research finding.

The error-correction model (ECM) encompasses the short-run equilibrium where the explanatory and endogenous variables are stationary by the first-difference effect. As well, it includes the long-run equilibrium where the residual of the long-term relationship is delayed by one-period with negative and significant coefficient. As expected, the estimation results show that the ECM provides significant short-term coefficient with a negative and significant adjustment speed. Hence, the imbalance in sustainable development can be rectified by about 2.7% from the monetary authorities and market mechanisms.

Afterwards, we examine the nonlinear dynamics of microfinance and sustainable development for the ten MENA countries over the period 1990-2018. For this end, we test for the nonlinear nature of the endogenous variable as well as the explanatory variables (AB, GLP, GFCF, SME, UR and INF) based on the LM statistics (Table 6).

Table 6. Estimation Results for Linearity Tests

Delays	Δ **LGS**$_{it}$	Δ **LAB**$_{it}$	Δ **LGLP**$_{it}$	Δ **LGFCF**$_{it}$	Δ **LSME**$_{it}$	Δ **LUR**$_{it}$	Δ **LINF**$_{it}$

d=1	10.3729	**0.3794**	**0.6283**	12.1715	3.2125	11.9114	2.1703
d=2	2.3535			5.1701	3.7954	7.9134	2.1809
d=3	5.1061			7.8528	**1.4668**	2.2223	2.7560
d=4	**0.8931**			3.4098		7.0849	2.8992
d=5				4.3660		10.9457	**1.8088**
d=6				9.1596		6.0458	
d=7				3.6591		2.7294	
d=8				3.1384		2.2317	
d=9				**1.6651**		2.1094	
d=10						2.1117	
d=11						5.7127	
d=12						2.2639	

Source: Research finding.

From Table 6, the first difference of variable GS seems to be nonlinear for d=3 given that the LM statistic is significant. The first difference of variable AB is characterized by a linear fluctuation, i.e. a symmetrical cyclical phenomenon. The variable GLP (in first difference) is linear whereas the variable GFCF is characterized by a nonlinear cyclical fluctuation during the eighth year. The variable SME tends to have nonlinear variability during the second year. The unemployment rate (in first difference) is nonlinear during the twelfth periods. Thus, the inflation rate is nonlinear during the fourth year. For this end, we examine the behavior of the sustainable development, gross fixed capital formation, small and medium-sized enterprises, unemployment rate, and inflation rate based on nonlinear models with smooth regime switching. Nevertheless, we model the dynamics of active borrowers by employing linear autoregressive models. Afterwards, we choose between the LSTAR and ESTAR specifications. In this regard, Teräsvirta (1994) compares the two regressions related to the linearity tests to the LSTAR and ESTAR models. These two models differ only in terms of the presence of the cubic term in the regression associated with the LSTAR model. The idea behind such model is based on the comparison between the coefficients of the two regressions. If the suitable model is ESTAR model, then there is no cube term. Table 7 reports the results from the choice between the ESTAR and LSTARS models.

Table 7. Tests for Specification Choice

Variables	Δ **LGS**$_{it}$	Δ **LGFCF**$_{it}$	Δ **LSME**$_{it}$	Δ **LUR**$_{it}$	Δ **LINF**$_{it}$
Fisher Statistics	H_{01}: 0.0001	H_{01}: 0.2356	H_{01}: 0.0011	H_{01}: 0.0063	H_{01}: 0.8858
Models	ESTAR	LSTAR	ESTAR	ESTAR	LSTAR

Source: Research finding.

Note that ESTAR models can be used to estimate the relationship between the variables ΔLGS_{it} and $\Delta LSME_{it}$, ΔLUR_{it}. On the other hand, we model the variables $\Delta LGFCF_{it}$ and $\Delta LINF_{it}$ by employing the LSTAR models. The estimation of the ESTAR and LSTAR model parameters is obtained by the nonlinear least squares technique. Table 8 reports the estimation results of the STAR models.

Table 8. Estimation Results of STAR Models

Variables	Δ **LGS**$_{it}$	Δ **LGFCF**$_{it}$	Δ **LSME**$_{it}$	Δ **LUR**$_{it}$	Δ **LINF**$_{it}$
Linear Part					

Intercept	0.0366	-0.49	-0.0743	-7.4947	0.0021
d=1	0.9801*	0.59**	-3.4943	3.7103	-0.9256
d=2		0.10	0.9740	0.2385	0.3412
d=3		0.48**			
Nonlinear Part					
Intercept	-0.0592	0.97***	0.0404	7.8385	-0.7861
d=1	-0.0756	0.11	4.1258	-3.1663	0.3217
d=2		-0.04	-0.5988	0.0799	0.1635
d=3		-0.39			
$\hat{\gamma}$	0.8812	1.56	0.81052	0.9470	0.8064
Threshold	0.7778**	1.92	0.63694	3.3083	-0.2060

Source: Research finding.

From Table 8, the estimated parameters of the transitions ($\hat{\gamma}$) are statistically insignificant for all the explanatory and endogenous variables. This implies that the transition between the central regime and the external regime is relatively slow. The presence of a nonlinear adjustment with mean reversion remains irreversible for these variables given that the transition between regimes is smooth. Afterwards, we investigate the nonlinear adjustment of the sustainable development according to all the variables towards its fundamental value. To do so, we test for the presence of a unit root. Following Kapetanios et al. (2003), we use the nonlinear unit root. We then employ an error correction model with a smooth regime change (STECM) to analyze the nonlinear adjustment. Table 9 reports the estimation results from the unit root test for different variables.

Table 9. Unit Root Test of KSS

Variables	t_{KSS1}	t_{KSS2}
LGS_{it}	1.54164	0.34675
$LGFCF_{it}$	1.26969	1.18895
$LSME_{it}$	1.26648	1.77891
LUR_{it}	0.73083	1.08206
$LINF_{it}$	2.87457	2.70979

Source: Research finding.

From Table 9, we find nonlinear unitary roots in level for different variables based on the KSS1 and KSS2 statistics. By taking the first difference, these variables become stationary given that the t-statistics are significant at 5% level. Therefore, they are integrated of order one and the model of error correction with change of smooth regimes (STECM) can be used to study the nonlinear dynamics of the sustainable development towards its equilibrium value. The estimation results of the STECM model using the non-linear least squares procedure are presented in Table 10.

From Table 10, we show that all the coefficients seem to be insignificant for the short-term when the linear and nonlinear variables are stationary by taking the first difference. The linear adjustment rate has a negative and insignificant coefficient. Even though the monetary authorities can reduce the deviation from the equilibrium of the sustainable development towards a partially stable situation, the backrest pressure remains insignificant. As well, the nonlinear adjustment speed has a negative and insignificant sign. Hence, it is a linear and nonlinear adjustment that rectifies the deviation from equilibrium for the sustainable development.

Table 10. Estimation Results of STECM Model

Variables	**Coefficients**	**Signification**

Linear Part		
Intercept	0.0432	0.0112
$dLAB_{it}$	0.0119	0.4772
$dLGLP_{it}$	-0.0134	0.2835
$dLGFCF_{it}$	0.0758	0.1998
$dLSME_{it}$	0.0437	0.4099
$dLUR_{it}$	0.1345	0.2743
$dLINF_{it}$	0.0281	0.1202
$Residual_{it-1}$	-0.0560	0.1678
Nonlinear Part		
Intercept	-0.3207	0.0643
$dLGFCF_{it}$	-0.6466	0.1437
$dLSME_{it}$	-0.1373	0.6909
$dLUR_{it}$	-0.3273	0.6204
$dLINF_{it}$	-0.1864	0.2754
$Residual_{it-1}$	-0.1642	0.1647
$\hat{\gamma}$	0.4345	0.2363
Threshold	0.2108	0.0213

Source: Research finding.

Conclusion

The concept of microfinance and its potential impact continue to present an interest in research. In particular, the effectiveness of microcredit and microfinance in improving the living conditions of households. In this regard, many researchers recognize that microenterprises access to microcredit implies an increase in their income and thus poverty alleviation. Cognizant this fact, the present paper attempts to analyze the nature and dynamics between the microfinance and sustainable development by using a multi-step approach. We use different variables from 10 MENA countries including Egypt, Iraq, Jordan, Lebanon, Morocco, Palestine, Sudan, Syria, Tunisia, and Yemen over the period 1990-2018.

The empirical analysis establishes a positive and significant relationship between the indicators of microfinance and the sustainable development. Such relationship seems to be dynamic over time and especially significant during short-term. Therefore, and by providing the possibility to access to microcredit, microfinance institutions can contribute to boost the sustainable development. On the other hand, households should be encouraged to create investment opportunities and increase their demand for microcredit. So, the present study contributes to the literature on the microfinance by providing convincing evidence that the microfinance and microcredit have a significant effect on the sustainable development.

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