The Impact of Financial Inclusion on Poverty in Low and Lower-middle Income Countries

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Abstract: *Promoting financial inclusion is considered as primary strategy in poverty alleviation efforts globally. However, the effectiveness of financial inclusion in achieving poverty free world is fairly inconclusive. This study examines the impact of financial inclusion on poverty in low and lower-middle income countries by employing multivariate OLS and the Ordered Probit Model. The estimation under multivariate OLS model confirms that the improvement in financial inclusion reduces poverty even after controlling for physical and human capital. The results are robust and statistically significant. It reveals that the Financial Inclusion Index (FII) has greater impact on poverty than Adults Account Holding Ratio (ADACC) indicating to policy makers that improving account penetration alone has little impact on poverty reduction. Thus a mixed approach is required for an effective poverty alleviation intervention. In addition, the positive and significant relationship between primary education and poverty signals that the failure of attending primary education at appropriate age induces poverty.*

The ordered probit model takes into account of greater discrepancies in poverty among low and lower-middle income countries when estimating the impact of financial inclusion on poverty. This model estimates the likelihood of a country being exposed to different scale of poverty given the level of financial inclusion. While the sign and the significance of coefficient show that the financial inclusion lessens poverty the marginal effects indicate that the impact of financial inclusion varies based on the scale of poverty. Accordingly, financial inclusion is most likely to reduce poverty significantly in countries where poverty is very low and further increases poverty in countries where poverty is very high. This finding will help policy makers to reassess their poverty alleviation strategies for countries exposed to very high poverty.

Keywords: *Financial Inclusion, Financial Inclusion Index, Poverty, Poverty Gap, Low income Countries, Lower-middle Income Countries*

I.   Introduction

The global poverty remains as one of the biggest threat to the humanity. The Millennium Development Goals Report 2015 states that 836 million people are still living under extreme poverty that is below 1.25 USD per day. It also mentions that the half of the world's employed people work in vulnerable conditions though one billion people have been rescued from extreme poverty since 1990. Although there have been several initiatives taken place to eradicate the poverty globally, the incidence of poverty is still a threat for sustainable economic development. In recent past, the financial inclusion has emerged as one of the key policy priorities among low and lower-middle income countries as a tool to eliminate poverty and improve wellbeing of the people.

The general view of the development economics is that the financial inclusion promotes efficient allocation of economic resources while reducing the use of informal financing. The greater financial inclusion potentially reduces the cost of capital, improves income opportunities and facilitates poverty reduction thus promotes sustainable economic growth. Therefore the policy makers around the globe strive to enhance the financial inclusion by demanding more credits to marginalized people & economic sectors, high penetration of bank branches, new technologies in payment system and additional credit schemes at concessional rate etc. to eradicate poverty and ensure the better living standards.

Despite the continuous efforts taken by the governments of low and lower-middle income countries and the multilateral agencies to eradicate the poverty by implementing several strategies including easy access to finance, the people are still severely exposed to poverty. Given the severity of the poverty and the emerging focus on financial inclusion as a tool for poverty alleviation the impact of financial inclusion on poverty deserve more attention. Therefore this study evaluates the impact of financial inclusion on poverty in low and lower-middle income countries.

The remaining part of this paper is structured as follows. A brief on relevant literatures both theories and empirical studies are given in section 2. The Section 3 presents sources, explanations and measurement

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framework of data. Research methodology and specifications are described in section 4. In section 5 the empirical results are discussed before concluding in section 6.

II.   Literature Review

The impact of financial inclusion on poverty has not been studied comprehensively and the findings also fairly discrete. In addition there have been very little researches done on low and lower-middle income countries. So the general question about the relationship between financial inclusion and poverty is yet to be answered. Hence there is scope for a study on the impact of financial inclusion on poverty in low and lower-middle income countries with a large cross-sectional data.

The stylized fact is that the expansion of financial inclusion is supportive for the enhancement of microenterprises' income which improves the household income. The improved household income may provide food security; education & skill development, health and increase in the household assets thus reduce poverty. However development economic literature provides mixed views on the impact of financial inclusion on poverty at the household level and macro level. Although there are substantial debate on the impact of financial inclusion on poverty, majority of the empirical evidence shows a positive association between financial inclusion and welfare of the people.

The improvement in financial inclusion is considered to be positively correlated with growth and employment in a macro view (Robert Cull et al, 2014). Butler and Cornaggia (2008) also find that better access to finance can enhance productivity which intern support the income enhancement. A study by Chant Link (2004) identifies that the financial exclusion is both a cause and consequence of social exclusion and hinter the economic development. Accordingly greater financial inclusion is considered as a key for economic growth in policy circle.

Kai and Hamori (2009) examined the impact of microfinance on inequality in 61 developing countries using cross country regression model at macro level. This study articulates that the microfinance lowers the inequality and it can be used as distribution tool.

The impact of micro finance on self-employment profits of 8,189 households was studied by Lensink and Pham (2012) and reported a positive effect using instrumental variable method within a fixed-effect framework.

Imai and Arun (2009) study the effect of Micro Finance Institutions (MFIs) on multidimensional poverty index in India by using cross-sectional household data at national level. This study employs Propensity Score Matching and the Treatment Effects Model for the estimation. The result indicates that the productive purpose loan has significant effect on poverty compare to other loans.

When it comes to household level studies the majority of them supports the view of positive correlation between financial inclusion and the well-being. Aigbokhan, B. E. (2011) finds a significant positive effect of access to finance on poverty reduction. This study uses cross-sectional data of 500 household obtained through Stratified Random Sampling and concludes that the microfinance institutions play a major role in poverty reduction.

Chowdhury et al (2005) conduct a household level survey of 954 samples and confirm a negative relationship between micro-credit and the poverty by employing logit model. However the paper argues that the micro-credit must have a long-run perspective to sustain the poverty reduction. The micro-credit with short-run perspective only reduces the poverty temporarily as the people lifted out from the poverty when they receive the micro-credit and fall back to poverty when they spend it.

In general the literatures do not provide concrete evidence with regard to the impact of financial inclusion on poverty. Therefore this research tries to fill the gap in the literatures through studying the impact of financial inclusion on incident of poverty in the context of low and lower-middle income countries.

2.1 Poverty in low and lower-middle income countries

The World Bank estimates, as of 2012, 896 million people lived at or below USD1.90 a day which is 12.7% of the world's population. Since the low and lower-middle income economies are defined based on the income level, it is obvious that the global poverty distribution has significantly concentrated on those countries. Basically food security, healthcare and education, electricity, safe water and other critical services remains elusive for many people. However, a wider range of discrepancies in poverty can be seen through the poverty head count ratio irrespective of the income level of the countries, Figure 1.
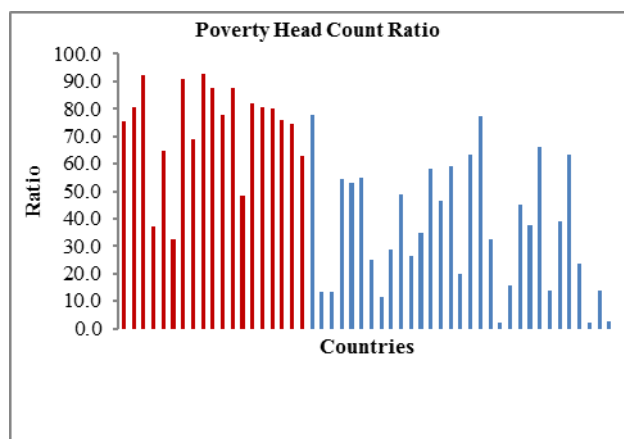
Figure 1: Poverty Head Count Ratio in Low and Lower-middle Income Countries

However, the recent trend in global poverty shows that the majority of the world's poor is living in the middle income countries Sumner (2012). This study further elaborates that 711.1mn people categorized under extreme poverty of USD 1.25 threshold are living in lower-middle income countries which is accounted for 57.7% of world's poor. Moreover 1,394.5mn people classified under USD 2.00 threshold are living in lower-middle income countries and accounted for 59.2% of world's poor, Table 1. Therefore, it is inevitable to devise unique strategy to eradicate poverty which suits for different economic environments.

Table 1: Poverty indicators in Low, Middle and Lower-middle Income Countries

Poverty Line	Indicator	LIC	MIC	LMIC
$1.25	Millions of People	316.7	917.1	711.6
	% of World Poor	25.7	74.3	57.7
	Poverty Incidents (% pop)	48.5	19.5	30.2
$2.00	Millions of People	486.3	1871.1	1394.5
	% of World Poor	20.6	79.4	59.2
	Poverty Incidents (% pop)	74.4	39.7	59.1

Sources: PovcalNet (2012) processed by Sumner (2012)

2.2 Financial inclusion in low and lower-middle income countries

According to The Little Data Book on Financial Inclusion (2015) the average percentage of adults holding accounts globally is only 61.5%. Further, it is 27.5% in low income countries whereas the lower-middle income countries reached to 42.7%. Interestingly 19.4% adults belonging to poorest 40% have accounts in low income countries and it is 33.2% in lower-middle income countries. Moreover the account holding percentage of young adults (15-24 years old) is also shown a significant gap which is 20.2% in low income countries and 34.7% in lower-middle income countries. While the percentage of adult holding account in low income countries increased from 21.1% (2011) to 22.3% (2015) the lower-middle income countries moved from 28.7% (2011) to 41.8% (2015) which revealed that the gap in financial inclusion between the low and lower-middle income countries is widening. Further it is also noted that the level of financial inclusion measured by percentage of adults holding accounts in low and lower-middle income countries is significantly low compared with high income countries, Table 2.

Table 2: Financial Inclusion indicators in High, Low, Middle and Lower-middle Income Countries

Account Holding Indicator (% age 15+)	World	HI	MIC	LMIC	LIC
All adults	61.5	90.6	57.6	42.7	27.5
Women	58.1	90.5	52.9	36.3	23.9
Adults belonging to the poorest 40%	54.0	86.9	49.1	33.2	19.4
Young adults (% ages 15–24)	46.3	79.7	44.9	34.7	20.2
Adults living in rural areas	56.7	90.2	53.8	40.0	24.8
Mobile Account (% age 15+)	2.0	-	1.5	2.5	10.0

Sources: The Little Data Book on Financial Inclusion (2015)

III. Data and Measurement

This study uses cross country data of low and lower-middle income countries. According to World Bank country classification based on the income level, there are 81 countries listed under low and lower-middle income countries. However, fifty countries have been shortlisted among them for this study due to the limited data availability, Table 11 (Appendix). It is also noted that the data on poverty gap is available only for 43 countries out of those fifty countries.

The poverty headcount ratio (PHCR), education, capital formation (CF) and the inflation (INF) were extracted from the World Bank data set. The poverty headcount ratio indicates the population below USD 3.10 per day as a percentage of total population. The education is measured by two variables namely primary education (EDPRI) and tertiary education (EDTER). The primary education refers the total enrollment in primary education, regardless of age, expressed as a percentage of the population of official primary education age in the particular country. The tertiary education refers the total enrollment in tertiary education (ISCED 5 and 6), regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving. The capital formation reflects the gross capital formation as percentage of GDP which consists of outlays of additions to the fixed assets of the economy plus net changes in the level of inventories. The percentage of adults holding an account with formal financial institutions was obtained from The Little Data Book on Financial Inclusion 2015 of World Bank. The financial inclusion index was extracted from Park et al (2015).

The level of poverty is classified into four scales and the criteria are given as follows
1 (low) : if $0\% < PHCR_i \leq 20\%$
2 (moderate) : if $20\% < PHCR_i \leq 40\%$
3 (high) : if $40\% < PHCR_i \leq 60\%$
4 (very high) : if $60\% < PHCR_i$

IV. Econometric Model and Specifications

The impact of financial inclusion on poverty cannot be evaluated with one country at a time as it leads to country specific bias and it requires long time series data. On the other hand, the study cannot infer much if the evaluation is made at a global scale where there will be vast differences among countries. In addition the threat of poverty is significant in low and lower-middle income countries where the financial inclusion initiatives also taken place in wider scale. Therefore this study focuses on low and lower-middle income countries by forming cross-country data.

Firstly a multivariate regression model with different specifications is employed to evaluate the effect of financial inclusion on poverty. While absolute poverty level is considered as depended variable an indicator of the level of financial inclusion is considered as independent variable. The control variables are education, capital formation and inflation which have significant impacts on economic growth and poverty. The classical economic theory considered capital and the labour are the primary pillars in the economic growth model, $Y = f(K, L)$. In this paper the physical capital and human capital are proxied by capital formation and primary education/ tertiary education respectively. The effect of country specific macroeconomic conditions is captured by introducing inflation into the model.

Accordingly the equation (1) estimates the overall impact of the financial inclusion on poverty. The $PHCR_i$ indicates the poverty head count ratio of country i which is regressed on $Adultacc_i$, which represents the percentage of adults holding an account with formal financial institutions for country i, a proxy for the level of financial inclusion. A vector of control variables ($Controls_i$) includes education, capital formation and the inflation.

$$PHCR_i = \alpha + \beta_{1*}Adultacc_i + \gamma_*Controls_i + u_i \qquad (1)$$

Further a multi-dimensional index of financial inclusion defined by Park et al (2015) is also used to represent the level of financial inclusion. Park et al (2015) constructed a multidimensional index for financial inclusion with the modification to financial inclusion index of Sarma (2008) which is similar to Human Development Index (HDI) of United Nations Development Programmes (UNDP). Park et al (2015) consider two dimensions of financial inclusion namely (i) availability of banking services measured by ATMs for 1000 adults and commercial bank branches for 1000 adults and (ii) usage of banking system measured by borrowers from commercial banks for 1000 adults, depositors with commercial banks for 1000 adults and domestic credit to GDP ratio. The dimension index is calculated by using equation (2).

$$d_i = \frac{A_i - m_i}{M_i - m_i} \qquad (2)$$

The A_i, m_i and M_i indicate the actual value of dimension$_i$, minimum value of dimension$_i$ and maximum value of dimension$_i$ respectively. Then the index of financial inclusion for country$_i$ is calculated by the normalized inverse of Euclidean distance of point d_i as given in equation (3).

$$FII_i = 1 - \frac{\sqrt{(1-d_1)^2+(1-d_2)^2+\dots(1-d_n)^2}}{\sqrt{n}} \quad FII_i = 1 - \frac{\sqrt{(1-d_1)^2+(1-d_2)^2+\dots(1-d_n)^2}}{\sqrt{n}}$$
$$(3)$$

Accordingly the impact of financial inclusion can be assessed better by equation (4) as it provides more accurate measurement of financial inclusion by covering several elements of financial inclusion compare to the percentage of adults holding an account with formal financial institutions.

$$PHCR_i = \alpha + \beta_{1*}FII_i + \gamma_*Controls_i + u_i \qquad (4)$$

Further, as a robustness test, the Poverty Gap ($PGap_i$) is used as dependent variable instead of $PHCR_i$ to estimate the effect of financial inclusion on the poverty gap of countries, equation (5) & (6).

$$PGap_i = \alpha + \beta_{1*}Adultacc_i + \gamma_*Controls_i + u_i \qquad (5)$$

$$PGap_i = \alpha + \beta_{1*}FII_i + \gamma_*Controls_i + u_i \qquad (6)$$

In order to obtain best linear unbiased estimation (BLUE) from regression model the key assumptions of classical linear regression model are validated. Firstly if the variance of error terms is not constant $V(e_j) \neq \sigma^2$, then the estimation is no longer BLUE. Therefore this study performed the Breusch Pegan test for hetroskedasticity. Further, Jarque-Bera test for normality, multicollinearity test, Serial Correlation LM Test for serial correlation and F-test for joint significant are also performed.

In addition, the high discrepancies of poverty level within low and lower-middle income countries requires this study to examines the probability of a country being exposed to different scale of poverty with regard to the level of financial inclusion. The choice of estimation technic is led by the dependent variable which shows the spread of poverty measured by a number of categories of an ordinal nature. Therefore Ordered Probit Model is used for the estimation which is specified as follows.

$$y_i^* = \sum_{k=1}^{K} \beta_k x_{ki} + u_i, \qquad u_i \sim N(0,1) \qquad (7)$$

The unobserved latent variable, y_i^* has four possible values for the country i which are 1 for low level of poverty, 2 for moderate level of poverty, 3 for high level of poverty and 4 for very high level of poverty.

The x_{ki} indicates the vector of explanatory variables which includes financial inclusion, capital formation, education and inflation for i^{th} country. Two different specifications are formulated for estimation under ordered probit model. The education is represented by primary education in first specification and the tertiary education in the second specification. The unobserved disturbance term, u_i, is assumed to have standard normal distribution which captures the omitted variable bias/ measurement errors. Contrasting to standard regression the variance of the error components is assumed to be one. The relationship between the

unobserved latent variable y_i^* and the observed outcome of y_i for country i is expressed using the following rule.

$$
\begin{aligned}
y_i \quad &= 1 \text{ if } y_i^* \leq \alpha_1 \\
&= 2 \text{ if } \alpha_1 < y_i^* \leq \alpha_2 \\
&= 3 \text{ if } \alpha_2 < y_i^* \leq \alpha_3 \\
&= 4 \text{ if } \alpha_3 < y_i^*
\end{aligned} \tag{8}
$$

Given the assumption of standard normal distribution for u with the unknown threshold parameters of α_1, α_2 and α_3 the conditional distribution of y given x is derived. Accordingly the response probability can be calculated as follows.

$$
\begin{aligned}
P(x) &= P(y^* \leq \alpha_1 | x) = P(x\beta + u \leq \alpha_1 | x) = \frac{1}{1+exp\,(x\beta - \alpha_1)} \\
P(x) &= P(\alpha_1 < y^* \leq \alpha_2 | x) = \frac{1}{1+exp\,exp\,(x\beta - \alpha_2)} - \frac{1}{1+exp\,exp\,(x\beta - \alpha_1)} \\
P(x) &= P(\alpha_2 < y^* \leq \alpha_3 | x) = \frac{1}{1+exp\,exp\,(x\beta - \alpha_3)} - \frac{1}{1+exp\,exp\,(x\beta - \alpha_2)} \\
P(x) &= P(y^* > \alpha_3 | x) \quad = 1 - \frac{1}{1+exp\,exp\,(x\beta - \alpha_3)}
\end{aligned} \tag{9}
$$

By employing the above model (9), the log likelihood function is formed and maximized to obtain Orderd Probit Maximum Likelihood Estimations (MLEs). The sign of the estimated coefficient and its statistical significance can only imply the direction of the response related with the explanatory variable. Hence the marginal effect of explanatory variables related to different poverty scales can be computed from the estimated coefficient by following model.

$$
\frac{\partial P(y=j)}{\partial x_k} = \left[\emptyset \left(\alpha_{j-1} - \sum_{k=1}^{K} \beta_k x_k \right) - \emptyset \left(\alpha_j - \sum_{k=1}^{K} \beta_k x_k \right) \right] \beta_k \tag{10}
$$

The derivative of the probability with respect to x_k is given in equation (10).

V.   Empirical Results

5.1 Summary Statistics

Descriptive statistics of the variables are presented in Table 3. The average poverty head count ratio and the poverty gaps are 49.04% and 21.44% respectively. It suggests that the incident of poverty in low and lower-middle income countries is severe. In the other hand, the mean of the adults holding account (28.16%) and the financial inclusion index (13.18%) indicate that the majority of the people living in these countries, on average, are financially excluded.

Table 3: Summary Statistics

	Mean	Median	Max	Min	S.D.	Obs.
PHCR	49.04	49.00	92.90	2.00	27.53	43
PGAP	21.44	18.50	59.00	0.50	17.47	43
ADACC	28.16	26.80	82.70	7.00	14.86	43
FII	13.18	9.36	46.26	2.38	9.75	43
EDPR	109.05	107.00	145.00	69.00	15.42	43
EDTER	17.37	12.00	80.00	1.00	15.21	43
CF	24.35	23.00	46.00	6.00	9.12	43
INF	5.63	4.10	36.90	-1.10	6.66	43

Fascinatingly, the average percentage of enrollment in primary education is 109.05%, revealing that, on average, the number of enrolment in primary education is more than the population of official primary education age in those respective countries.

Accordingly, it is evident that the primary education system in low and lower-middle income countries failed to reach the population who attain official primary education age in the past. The summary statistics shows that there are significant variations in all the variables among low and lower-middle income countries.

5.2 Correlation Analysis

Table 4 reports correlation coefficient for the variables used in this study. This metrics revealed that the FII has a very strong negative correlation with the poverty head count ratio. The tertiary education is negatively correlated with poverty head count ratio and poverty gap. Overall the correlations among the independent variables shows weak relationship, thus this study is not affected by multicollinearity.

Table 4: Correlation metrics

	PHCR	PGAP	ADACC	FII	EDPR	EDTER	CF	INF
PHCR	1.00							
PGAP	0.95	1.00						
ADACC	-0.32	-0.32	1.00					
FII	-0.52	-0.43	0.44	1.00				
EDPR	0.41	0.47	-0.08	-0.19	1.00			
EDTER	-0.70	-0.64	0.24	0.66	-0.23	1.00		
CF	-0.11	-0.18	0.16	-0.07	0.11	0.06	1.00	
INF	-0.01	-0.02	-0.08	0.01	-0.18	0.04	-0.13	1.00

Though the correlation between financial inclusion indicators and the poverty indicators are negative the strength of the correlations are differs among low and lower-middle income countries. The Figure 2 shows that percentage of adults holding accounts is negatively correlated with poverty head count ratio.

Figure 2: Poverty Head Count Ratio and percentage of adults holding accounts in Low and Lower-middle Income Countries
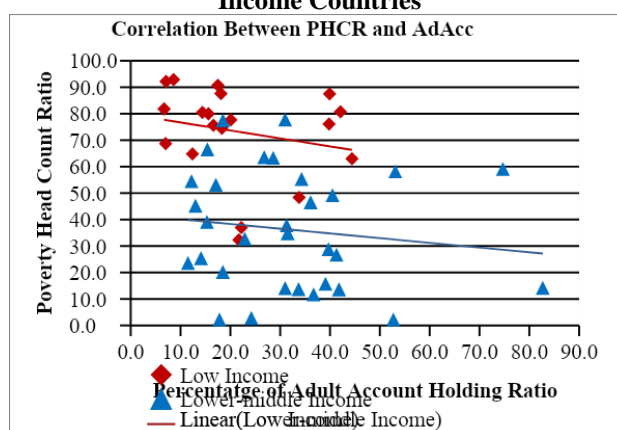
However, the impact of financial inclusion on poverty is stronger in low income countries than the lower-middle income countries.

In addition the Figure 3 explains that the poverty gap also negatively correlated with percentage of adults holding accounts similar to poverty head count ratio and the relationship is stronger in low income countries.

Figure 3: Poverty Gap and percentage of adults holding accounts in Low and Lower-middle Income Countries
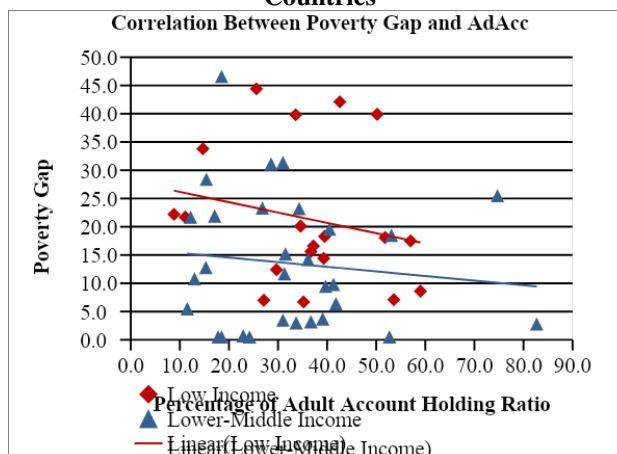
The Figure 4 indicates that the Financial Inclusion Index is negatively correlated with poverty head count ratio. In contrast to the Figure 2, the relationship between Financial Inclusion Index and poverty head count ratio in lower-middle income countries is very stronger than low income countries.

Figure 4: Poverty head count ratio and financial Inclusion Index in Low and Lower-middle Income Countries
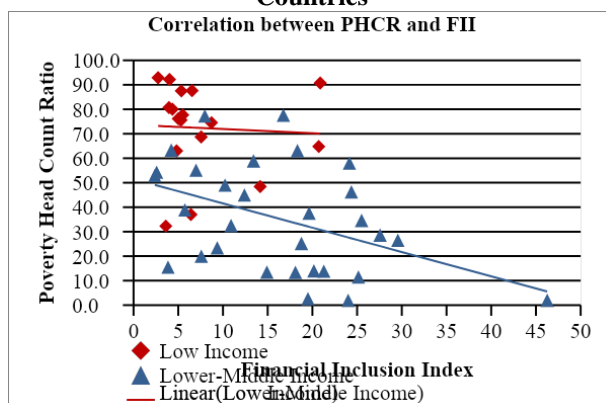
Further analysis on the correlation using poverty gap instead of poverty head count ratio against the FII shows similar trend, Figure 5.
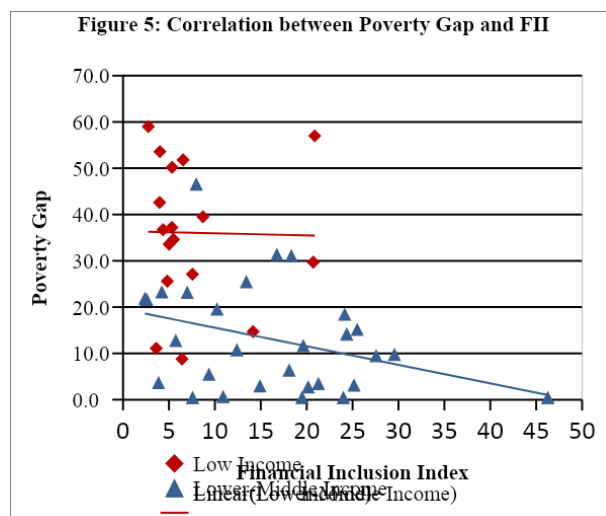
5.3 The impact of adult's account holding on poverty head count ratio

The results of the estimation of the impact of financial inclusion proxied by percentage of adults holding accounts on poverty using multivariate Ordinary Least Square (OLS) model conditioned to primary education, capital formation and inflation are given in Table 5. The 5(a) reports the impact of the adult holding accounts on poverty without controlling for other variables. The adults account holding coefficient is -0.54 at 5% significant level. This negative significant coefficient of adult holding accounts confirms that the high financial inclusion, on average, reduces the poverty level in low and lower-middle income countries.

The coefficients of adult holding accounts when augmented with primary education, capital formation and inflation has slightly increased as -0.5526, -0.5543 and -0.5537 respectively at 5% significant level, 5(b) – 5(d).

Table 5: Impact of financial inclusion (Percentage of Adults Holding Accounts) on Poverty (Poverty Head Count Ratio)

	5(a)	5(b)	5(c)	5(d)
ADACC	-0.5440**	-0.5526**	-0.5543**	-0.5537**
	-2.3392	-2.4713	-2.4467	-2.4236
EDPRI		0.4858**	0.4871**	0.4820**
		2.2221	2.2011	2.1573
CF			0.0429	0.0042
			0.1064	0.0101
INF				-0.2779
				-0.4728
CONS	65.4573*	13.3667***	12.2304***	15.2009***
	8.7586	0.5452	0.4533	0.5443
Obs.	50	50	50	50
Adj. R^2	0.0836	0.1531	0.1349	0.1919
F-Stat	5.4718**	5.4291*	3.5470**	2.6713**

*, **, *** indicates 1%, 5% and 10% significant respectively

Surprisingly, the results shows that the primary education has positive coefficients of 0.48 approx. in all three specifications, 5(b) – 5(d) which are significant at 5% level. This implies that the improvement in the primary education increase the poverty. The reason behind this contradictory outcome is that the number of enrolment in primary education is more than the population of official primary education age in those particular countries. This means the pupil in those countries fail to start their primary education at the official primary education age and pursuing studies at later stage. Accordingly, it reveals an interesting finding that the level of poverty will increase if the primary education is not provided at an appropriate age.

5.4 The impact of Financial Inclusion Index on poverty head count ratio

The Table 6 provides the impact of FII proxied for financial inclusion on poverty using multivariate OLS. The all four specifications show a high negative relationship between Financial Inclusion Index on poverty head count ratio at 1% significant level. The coefficient without controlling other independent variable (-1.5) is slightly higher than the average coefficient of rest of the specification, 6(b) – 6(d), which is -1.35 approx. and without condition, 6(a) is -1.5.

This finding shows that the FII covering two aspects of availability of banking services, usage of banking system better explaining the impact on poverty and suggest that the effort to increase the account holding has little beneficial in reducing poverty. In addition the F-statistics at 1% significant level infer that this model specification is highly appropriate.

Table 6: Impact of financial inclusion (Financial Inclusion Index) on Poverty (Poverty Head Count Ratio)

	6(a)	6(b)	6(c)	6(d)
FII	-1.5486*	-1.3342*	-1.3571*	-1.3550*
	-4.2325	-3.8363	-3.9232	-3.8716
EDPRI		0.6111*	0.6249*	0.6316*
		2.8680	2.9487	2.9129
CF			-0.4495	-0.4391
			-1.2633	-1.2078
INF				0.1051
				0.2036
CONS	69.1128*	-0.5885	8.8678	7.2520
	11.6599	-0.0236	0.3429	0.2654
Obs.	47	47	47	47
Adj. R^2	0.2688	0.3700	0.3784	0.3642
F-Stat	17.9141*	14.5079*	10.3349*	7.5888*

*, **, *** indicates 1%, 5% and 10% significant respectively

5.5 Robustness test using Poverty Gap and Tertiary Education

This study also performed robustness test using poverty gap as dependent variable instead of poverty head count ratio. This explains the impact of financial inclusion on the incident of poverty. The Table 7 reports negative coefficients of adults holding accounts at 5% significant level for all four specifications, 7(a) – 7(d), which is approx. -0.34.

Table 7: Impact of financial inclusion (Percentage of Adults Holding Accounts) on Poverty Gap

	7(a)	7(b)	7(c)	7(d)
ADACC	-0.34**	-0.35**	-0.35**	-0.34**
	-2.36	-2.62	-2.57	-2.54
EDPRI		0.38*	0.38*	0.38*
		2.95	2.90	2.85
CF			-0.18	-0.20
			-0.75	-0.81
INF				-0.15
				-0.44
CONS	31.90*	-9.15	-4.39	-2.77
	6.81	-0.63	-0.27	-0.18
Obs	49	49	49	49
Adj. R^2	0.09	0.21	0.21	0.19
F-Stat	5.57**	7.60*	5.20*	3.88*

*, **, *** indicates 1%, 5% and 10% significant respectively

Further the impact of financial inclusion index on poverty gap also tested and the results show negative coefficients within the range of -0.6 to -0.8 approx., Table 8 (a) – (d). In both cases the results are similar to the impact on poverty head count ratio.

Table 8: Impact of financial inclusion (Financial Inclusion Index) on Poverty Gap

	8(a)	8(b)	8(c)	8(d)
FII	-0.80*	-0.63*	-0.65*	-0.65*
	-3.29	-2.82	-3.00	-2.95
EDPRI		0.46*	0.48*	0.49*
		3.39	3.63	3.58
CF			-0.45**	-0.45***
			-2.02	-1.95
INF				0.07
				0.23
CONS	32.03*	-20.92	-11.72	-12.87
	8.15	-1.30	-0.73	-0.75
Obs.	46	46	46	46
Adj. R^2	0.18	0.34	0.38	0.37
F-Stat	10.84*	0.34*	10.24*	7.52*

*, **, *** indicates 1%, 5% and 10% significant respectively

In addition this study also incorporated tertiary education into the model instead of primary education to examine the validity of the positive relationship with the poverty and its inference to the outcome. Table 9 provides the results of the robustness test using tertiary education with the independent variables of poverty head count ratio and variables interested which are adults account holding and the FII.

Table 9: Impact of financial inclusion (Financial Inclusion Index and Percentage of Adults Holding Accounts) on Poverty

	9(a)	9(b)
ADACC	-0.3112	
	-1.5219	
FII		-0.32145
		-0.74179
EDTER	-1.22752***	-1.1295***
	-6.0637	-4.0878
CF	-0.0348	-0.2046
	-0.1076	-0.5896
INF	-0.0720	0.0153
	-0.1578	0.0323
CONS	80.5181***	77.5663***
	7.6769	7.1978
Obs.	46	44
Adj. R^2	0.4916	0.4505
F-Stat	11.8787*	9.8125*

*, **, *** indicates 1%, 5% and 10% significant respectively

Table 10 provides the results of the robustness test with the poverty gap. As expected the results suggest negative relationship between the tertiary education and the poverty indicators at 1% significance level.

Table 10: Impact of financial inclusion (Financial Inclusion Index and Percentage of Adults Holding Accounts) on Poverty Gap

	10(a)	10(b)
ADACC	-0.1991	
	-1.4334	
FII		-0.06758
		-0.23
EDTER	-0.69618***	-0.7010***
	-5.0580	-3.7206
CF	-0.2097	-0.2806
	-0.9560	-1.1760
INF	-0.0808	-0.0299
	-0.2634	-0.0925
CONS	44.8987***	41.5073***
	6.2892	5.6429
Obs.	45	43
Adj. R^2	0.4205	0.3769
F-Stat	8.9818*	7.3511

*, **, *** indicates 1%, 5% and 10% significant respectively

5.6 Varying impacts of financial inclusion in different scales of poverty

As the scale of poverty among the low and lower-middle income countries has wider discrepancies this study also evaluates the relationships of financial inclusion on different poverty scales. The estimation of the probability of a country being exposed to different scale of poverty with the given level of financial inclusion is performed using Ordered Probit Model under Quadratic Hill Climbing Maximum Likelihood Procedure. The Table 12 and 13 represent the estimated parameters and their statistical significance. The human capital is represented by primary education in Table 12 and the tertiary education in Table 13. The specified ordered probit model is appropriate as the probability of Likelihood Ratio Test (Chi-square) is significant at 5% (Table 12) and 1% (Table 13).

Table 12: Ordered Probit Model Estimates for Poverty Level

Variables	Coef	Std.Er	z-Stat	P Values
ADACC	-0.0278	0.0107	-2.6024	0.0093
EDPR	0.0194	0.0108	1.7925	0.0731
CF	-0.0037	0.0179	-0.2065	0.8364
INF	-0.0147	0.0252	-0.5841	0.5592
α1	0.2008	1.2619	0.1591	0.8736
α2	0.8532	1.2667	0.6736	0.5006
α3	1.3669	1.2727	1.0740	0.2828
Goodness of Fit Test		Chi-square		P>Chi-Square
Likelihood ratio test		10.3238		0.0353

Table 13: Ordered Probit Model Estimates for Poverty Level

Variables	Coef	Std.Er	z-Stat	P Values
ADACC	-0.0256	0.0135	-1.9023	0.0571
EDTER	-0.0941	0.0196	-4.7966	0.0000
CF	0.0127	0.0202	0.6263	0.5311
INF	-0.0160	0.0267	-0.5976	0.5501
α1	-3.3901	0.7526	-4.5043	0.0000
α2	-2.3311	0.6823	-3.4168	0.0006
α3	-1.5269	0.6376	-2.3948	0.0166
Goodness of Fit Test		Chi-square		P>Chi-Square

Likelihood ratio test	36.3653	0.0000	

The signs of the estimated coefficients are indicators of the direction of the impact on the scale of poverty with regard to the variable interested. A negative sign on the statistically significant parameter estimates of an explanatory variable signals the likelihood of the response decreasing if there is an increase in the corresponding variable holding other explanatory variables constant. The results show that the likelihood of becoming less poverty country is increased when there is an improvement in financial inclusion. The tertiary education also has the same effect on poverty level.

The threshold parameters are 0.2008, 0.8532 and 1.3669 for α_1 α_2, and α_3 respectively (Table 12), which satisfies the condition of positive coefficient and the relationship of for proper ordering (Manddala, 1983). Further the model predicted 44% of observed scales correctly under specification 1(Table 12) and 63% of observed scales correctly under specification 2 (Table 13).

Total Effect for individual countries and the average total effect for pooled data produced by ordered probit model is given in Table 14 (Appendix). The results from pooled data demonstrate the likelihood of classifying countries into different scales of poverty for the average level of financial inclusion of 28.16%, (Table 3). Accordingly, countries are expected to be classified into low poverty bracket with the probability of 0.20 for the average level of financial inclusion and the probabilities of 0.19, 0.18 & 0.43 for moderate, high and very high degree of poverty respectively. This outcome confirms that the low level of financial inclusion is more likely to lead for high level of poverty. Table 15 (Appendix) reports the marginal effects of the financial inclusion variable for different magnitude of the poverty level for individual countries and pooled data under ordered probit model. Accordingly, the average marginal effect of increasing financial inclusion reveals a decrease in likelihood of low, moderate and high degree of poverty and increase in likelihood for very high degree of poverty. It implies that a one percent increase in financial inclusion reduces the probability of falling into low degree of poverty by 0.68 percent. In other words a 0.68 percentage of people from low degree of poverty will be moved out of poverty. The probabilities of falling in moderate and high degree of poverty also decrease by 0.26% and 0.02% when the financial inclusion increases by 1%.

The alarming fact is that the likelihood of increase in poverty is 0.96% for countries exposed to very high poverty when the financial inclusion increases by 1%. This finding supports the study of Chowdhury et al (2005) which concludes that the poor people use the fund for consumption purpose then again fall into poverty. Therefore the policy makers should be more caution when introduce strategies to improve the financial inclusion where the degree of poverty is very high. It is also noted that the lower-middle income countries are more likely to enjoy the benefits of financial inclusion compare to low income countries in low poverty category in contrast to moderate and high poverty category (Table 16).

Table 16: The Average Total and Marginal Effects of Financial Inclusion (ADACC) in Low and Lower-Middle Income Countries

		Poverty ≤20%	Poverty ≤40%	Poverty ≤60%	Poverty >60%
Total Effects	LIC	0.1309	0.1622	0.1712	0.5357
	LMIC	0.2450	0.2126	0.1833	0.3591
Marginal Effects	LIC	-0.0052	-0.0032	-0.0013	0.0098
	LMIC	-0.0077	-0.0022	0.0005	0.0095

VI.   Conclusion

The major challenge of low and lower-middle income countries is to fight against poverty. These countries have put in place several strategies to eradicate the poverty and to improve the well-being of the people. Improving financial inclusion is the focal point of the poverty alleviation strategy of developing countries. This study examines the impact of financial inclusion on poverty in low and lower-middle income countries using multivariate OLS model with various specifications and the ordered probit model.

The results of the all specifications under OLS indicate that there is a robust and significant correlation between financial inclusion measured by adults account holding/ multidimensional FII and the poverty indicators measured by poverty head count ratio/ poverty gap. The importance of the financial inclusion is confirmed by the significant negative coefficients of financial inclusion indicators even after controlling for capital formation and the education. In conclusion this study revealed that the improvement in financial inclusion lowers the poverty level which is similar to the findings of Chant Link (2004) and Aigbokhan, B. E. (2011).

Interestingly, overall result shows that the multidimensional FII has strong negative correlation with the poverty indicators compared to adults holding accounts. This evidence insists policymakers to think beyond opening of new bank accounts and to formulate a financial inclusion policy framework for the improvement of availability and usage of financial products and services. In addition the significant positive correlation between primary education and the poverty indicators assume that the successful provision of the primary education at appropriate age is vital for the poverty reduction.

This study also examines whether the relationship of financial inclusion on poverty is similar across the countries irrespective of their degrees of poverties. The countries are classified under four different scales and the ordered probit model is employed for the estimation.

The outcome of ordered probit model reconfirms that the improvement in financial inclusion reduces poverty which consistent with the results under OLS. However, the total effects and the marginal effects reveal that the impact of financial inclusion varies among countries based on the scale of poverty. The financial inclusion reduces poverty significantly in countries where poverty is very low. In contrast the improvement in financial inclusion increases poverty further in countries where poverty is very high. In addition the results also confirm that the lower-middle income countries enjoy the benefits of the greater financial inclusion more than the low income countries in low poverty category. Therefore it is recommended that the poverty alleviation strategies for countries exposed to very high poverty should focus other alternatives or mixed strategies instead of financial inclusion as a key.

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Table 11: Countries and Classification

Country	Income Level	Country	Income Level
Bangladesh	LM	Sudan	LM
Benin	L	Swaziland	LM
Bhutan	LM	Tajikistan	LM
Bolivia	LM	Tanzania	L
Burkina Faso	L	Togo	L
Burundi	L	Uganda	L
Cambodia	L	Ukraine	LM
Cameroon	LM	Vietnam	LM
Chad	L	West Bank and Gaza	LM
Comoros	L		
Congo, Dem. Rep	L		
Congo, Rep.	LM		
Côte d'Ivoire	LM		
Egypt, Arab Rep.	LM		
El Salvador	LM		
Georgia	LM		
Ghana	LM		
Guatemala	LM		
Guinea	L		
Honduras	LM		
India	LM		
Indonesia	LM		
Kenya	LM		
Kyrgyz Republic	LM		
Lao PDR	LM		
Lesotho	LM		
Madagascar	L		
Malawi	L		
Mali	L		
Mauritania	LM		
Moldova	LM		
Morocco	LM		
Mozambique	L		
Nepal	L		
Niger	L		
Pakistan	LM		
Philippines	LM		
Rwanda	L		
Senegal	LM		
Sierra Leone	L		
Sri Lanka	LM		

L: Low Income Country
LM: Lower-middle Income Country

Appendix

Table 14: The Total Effects of Financial Inclusion (ADACC) on the Probability of Relative Poverty Levels

Country	Poverty ≤20%	Poverty ≤40%	Poverty ≤60%	Poverty >60%	Country	Poverty ≤20%	Poverty ≤40%	Poverty ≤60%	Poverty >60%
Bangladesh	0.1648	0.2087	0.2023	0.4242	Mozambique	0.2636	0.2444	0.1952	0.2967
Benin	0.0486	0.1085	0.1540	0.6889	Nepal	0.1109	0.1737	0.1932	0.5222

Country					Country				
Bhutan	0.2578	0.2431	0.1961	0.3029	Niger	0.1907	0.2211	0.2026	0.3856
Bolivia	0.4015	0.2550	0.1638	0.1797	Pakistan	0.1429	0.1962	0.2002	0.4607
Burkina Faso	0.1643	0.2085	0.2022	0.4250	Philippines	0.1912	0.2213	0.2026	0.3849
Burundi	0.0209	0.0623	0.1089	0.8080	Rwanda	0.1321	0.1892	0.1985	0.4802
Cambodia	0.0711	0.1364	0.1740	0.6186	Senegal	0.1790	0.2159	0.2027	0.4024
Cameroon	0.0782	0.1440	0.1787	0.5991	Sierra Leone	0.0352	0.0884	0.1364	0.7400
Chad	0.0960	0.1612	0.1878	0.5550	Sri Lanka	0.7750	0.1454	0.0522	0.0273
Comoros	0.1219	0.1820	0.1963	0.4999	Sudan	0.4580	0.2498	0.1478	0.1444
Congo, Dem. Rep	0.0798	0.1456	0.1796	0.5950	Swaziland	0.1319	0.1891	0.1984	0.4805
Congo, Rep.	0.0850	0.1508	0.1825	0.5816	Tajikistan	0.1035	0.1676	0.1907	0.5382
Côte d'Ivoire	0.2610	0.2439	0.1956	0.2995	Tanzania	0.4064	0.2548	0.1625	0.1764
Egypt, Arab Rep.	0.0748	0.1404	0.1765	0.6083	Togo	0.0349	0.0880	0.1360	0.7411
El Salvador	0.1993	0.2247	0.2023	0.3737	Uganda	0.3181	0.2531	0.1847	0.2441
Georgia	0.2947	0.2502	0.1896	0.2656	Ukraine	0.4432	0.2516	0.1521	0.1531
Ghana	0.3177	0.2531	0.1848	0.2445	Vietnam	0.2070	0.2277	0.2018	0.3635
Guatemala	0.2845	0.2485	0.1916	0.2754	West Bank and Gaza	0.1904	0.2210	0.2026	0.3861
Guinea	0.1156	0.1773	0.1946	0.5125	**Average**	**0.2017**	**0.1935**	**0.1787**	**0.4262**
Honduras	0.2141	0.2303	0.2013	0.3542					
India	0.3785	0.2557	0.1700	0.1958					
Indonesia	0.2453	0.2400	0.1980	0.3168					
Kenya	0.5956	0.2189	0.1060	0.0796					
Kyrgyz Republic	0.1225	0.1825	0.1964	0.4986					
Lao PDR	0.1122	0.1747	0.1936	0.5194					
Lesotho	0.1192	0.1800	0.1956	0.5052					
Madagascar	0.0129	0.0446	0.0866	0.8558					
Malawi	0.0525	0.1139	0.1582	0.6754					
Mali	0.2119	0.2295	0.2015	0.3570					
Mauritania	0.2015	0.2256	0.2022	0.3708					
Moldova	0.1687	0.2108	0.2024	0.4180					
Morocco	0.1967	0.2237	0.2024	0.3772					

Table 15: The Marginal Effect of Financial Inclusion (ADACC) on the Probability of Relative Poverty Levels

Country	Poverty ≤20%	Poverty ≤40%	Poverty ≤60%	Poverty >60%	Country	Poverty ≤20%	Poverty ≤40%	Poverty ≤60%	Poverty >60%
Bangladesh	-0.0069	-0.0036	-0.0004	0.0109	Mozambique	-0.0091	-0.0020	0.0015	0.0096
Benin	-0.0028	-0.0039	-0.0031	0.0098	Nepal	-0.0053	-0.0042	-0.0016	0.0111
Bhutan	-0.0090	-0.0021	0.0014	0.0097	Niger	-0.0076	-0.0033	0.0002	0.0106
Bolivia	-0.0108	0.0005	0.0029	0.0073	Pakistan	-0.0063	-0.0039	-0.0009	0.0110
Burkina Faso	-0.0069	-0.0036	-0.0004	0.0109	Philippines	-0.0076	-0.0032	0.0002	0.0106
Burundi	-0.0014	-0.0029	-0.0033	0.0076	Rwanda	-0.0059	-0.0040	-0.0011	0.0111
Cambodia	-0.0038	-0.0042	-0.0026	0.0106	Senegal	-0.0073	-0.0034	-0.0001	0.0108
Cameroon	-0.0041	-0.0042	-0.0025	0.0107	Sierra Leone	-0.0022	-0.0035	-0.0033	0.0090
Chad	-0.0047	-0.0042	-0.0020	0.0110	Sri Lanka	-0.0083	0.0042	0.0024	0.0018
Comoros	-0.0056	-0.0041	-0.0014	0.0111	Sudan	-0.0110	0.0015	0.0032	0.0063
Congo, Dem. Rep	-0.0041	-0.0042	-0.0024	0.0108	Swaziland	-0.0059	-0.0040	-0.0011	0.0111
Congo, Rep.	-0.0043	-0.0042	-0.0023	0.0109	Tajikistan	-0.0050	-0.0042	-0.0018	0.0110

Côte d'Ivoire	-0.0090	-0.0021	0.0014	0.0097	Tanzania	-0.0108	0.0006	0.0030	0.0072
Egypt, Arab Rep.	-0.0039	-0.0042	-0.0026	0.0107	Togo	-0.0021	-0.0035	-0.0033	0.0090
El Salvador	-0.0078	-0.0031	0.0004	0.0105	Uganda	-0.0099	-0.0010	0.0022	0.0087
Georgia	-0.0096	-0.0014	0.0019	0.0091	Ukraine	-0.0110	0.0012	0.0032	0.0066
Ghana	-0.0099	-0.0010	0.0022	0.0087	Vietnam	-0.0079	-0.0030	0.0005	0.0104
Guatemala	-0.0094	-0.0016	0.0018	0.0093	West Bank and Gaza	-0.0076	-0.0033	0.0002	0.0106
Guinea	-0.0054	-0.0041	-0.0015	0.0111	**Average**	**-0.0068**	**-0.0026**	**-0.0002**	**0.0096**
Honduras	-0.0081	-0.0029	0.0006	0.0103					
India	-0.0106	0.0001	0.0028	0.0077					
Indonesia	-0.0087	-0.0023	0.0012	0.0099					
Kenya	-0.0108	0.0033	0.0033	0.0041					
Kyrgyz Republic	-0.0056	-0.0041	-0.0014	0.0111					
Lao PDR	-0.0053	-0.0042	-0.0016	0.0111					
Lesotho	-0.0055	-0.0041	-0.0014	0.0111					
Madagascar	-0.0009	-0.0023	-0.0031	0.0063					
Malawi	-0.0030	-0.0040	-0.0031	0.0100					
Mali	-0.0081	-0.0029	0.0006	0.0104					
Mauritania	-0.0078	-0.0031	0.0004	0.0105					
Moldova	-0.0070	-0.0036	-0.0003	0.0109					
Morocco	-0.0077	-0.0032	0.0003	0.0106					