Journal of Economic and Financial Sciences
ISSN: (Online) 2312-2803, (Print) 1995-7076

Examining the cointegrating relationship between financial intermediation and poverty in a selected panel of developing countries

Authors:
Margaret R. Magwedere[1]
Joseph Chisasa[1]
Godfrey Marozva[1]

Affiliations:
[1]Department of Finance, Risk Management and Banking, Faculty of Economics and Financial Sciences, University of South Africa, Pretoria, South Africa

Corresponding author:
Margaret Magwedere,
rumagwedere@gmail.com

Dates:
Received: 13 July 2020
Accepted: 16 Nov. 2020
Published: 26 Feb. 2021

How to cite this article:
Magwedere, M.R., Chisasa, J. & Marozva, G., 2021, 'Examining the cointegrating relationship between financial intermediation and poverty in a selected panel of developing countries', *Journal of Economic and Financial Sciences* 14(1), a606. https://doi.org/10.4102/jef.v14i1.606

Orientation: Access to and use of formal finance can be an epitome for poverty reduction in developing and transitional economies. Most of these economies experienced great growth in gross domestic product (GDP) compounded with exploding inequality, including racial wealth gaps, increasing starvation, exorbitant health and housing costs.

Research purpose: The aim of this study was to examine the relationship between financial intermediation and poverty within the context of financial dimensions of financial access, financial efficiency and financial stability.

Motivation for the study: Previous literature focuses mainly on the role of financial development in poverty reduction, with a dearth of literature on the other financial dimensions of financial access, financial efficiency and financial stability in reducing poverty.

Research approach/design and method: A quantitative approach was used in this study through econometric analysis of the data. A panel data analysis was used for a panel of 35 developing countries, mainly in Africa. The panel heterogeneous estimation method of pooled mean group was employed in a panel autoregressive distributed lags setting for this article

Main findings: Financial intermediation, including the other financial dimensions, reduces poverty. The effect of the financial dimensions depended on how poverty is measured.

Practical/managerial implications: Policymakers and development agencies should take note of poverty measurement in addressing poverty challenges. Distorted understanding of poverty will result in distorted policies, which yield little or no results for the effective use of formal finance to reduce poverty.

Contribution/value-add: Other financial dimensions of the formal financial sector can be considered for the use in poverty reduction strategies.

Keywords: poverty; financial intermediation; cointegration; pooled mean group; inequality; financial stability; financial access; financial efficiency.

Introduction

High levels of poverty and inequality remain a challenge for most developing and transitional economies. In Africa, the 2030 agenda seeks to reduce poverty and inequality (Hagen-Zanker, Mosler Vidal & Sturge 2017). Challenges to poverty can be addressed by a number of ways, in which finance can be epitome in dealing with these challenges (Rewilak 2017). Empirical evidence to date has mainly focused on the role of financial development in the real economy, without a focus on the other financial dimensions of financial access, financial efficiency and financial stability (Zhang & Naceur 2019). According to Cruz et al. (2015), the past few decades have realised shifts in the composition of poverty in the developing and transitional economies. For the past few decades, 95% of the global poverty was concentrated in East Asia and Pacific, South Asia and sub-Saharan Africa (Cruz et al. 2015). In the 1990s, 50% of the global poverty was reported in East Asia, with 15% in sub-Saharan Africa (World Bank 2015). However, by 2015, there was a shift in poverty concentration, with more than half of the global poverty concentrated in sub-Saharan Africa, whilst 12% reported in East Asia (World Bank 2018).

Poverty affects the majority of the world's population and denies the poor of meeting their basic needs, which includes financial services, education, healthcare and sanitation, amongst others (see eds. Kandachar & Halme 2017:10). Prahalad and Hart (2002) argued that serving the poor in a way that is responsive to their needs is an effective mechanism for poverty reduction. Formal

finance is regarded as the link to achieve the sustainable development goals (SDGs) (Klapper, El-Zoghbi & Hess 2016). The formal financial services will act as an enabler of achieving SDGs if the poor people actively and successfully use formal financial products and services sustainably, such as deposits and savings accounts, payment services, credit and insurance, to meet their specific needs (CGAP 2012). However, the formal financial services are not easily available to the poor because of the lack of a number of requirements needed for the use of the formal financial services.

In the absence of efficient formal financial intermediation, the use of informal services by the poor results in 'poverty penalty', that is, the poor end up paying more for financial services than their richer counterparts (Gutiérrez-Nieto et al. 2017; Hammond et al. 2007). This view supported the previous assertion by Wright and Muteesassira (2001) that 99% of the poor reported loss of savings in the informal sector compared with 15% reports for the formal sector. Limited access to formal financial services forces poor households to rely on risky and expensive options, and this has stifled economic progress of poor households (Hammond et al. 2007; Narayan 2000). Risk-return considerations by formal financial intermediaries discriminate the poor and low-income households from access to and use of formal financial services (Baradaran 2012). Access to formal financial services can help people safeguard their earnings and manage risks, payment transactions and entrepreneurial activities (World Bank 2017).

The objective of this article was to include the other dimensions of the formal financial sector beside only the size or depth of the sector in examining the cointegrating relationship between finance and poverty. The structure of the remainder of the article is as follows: the next section reviews the literature from related previous studies. The data used and the methodology are described next, followed by the main results of the study. Finally, the 'Conclusion' section concludes the study.

Literature review

Theoretical perspective on finance and poverty

Frictions in the financial markets that include information, asymmetry, transaction costs and monitoring are central to the theories that the financial sector can bind to the poor and promote persistent poverty (Banerjee & Newman 1993; Galor & Zeira 1993; Greenwood & Jovanovic 1990; Stiglitz 1969). The ability of the financial sector to reduce these market frictions has a poverty-reducing effect as the efficiency of the financial sector reduces the financial bottlenecks that prevent the poor from full access to and use of the formal financial products and services. Market imperfections result in involuntary exclusion from the use of financial products by the poor (Aguera 2015).

Furthermore, the behavioural finance theory combines psychology and cognitive science in explaining people's irrational and illogical decision on spending, borrowing, saving and investing money (Belsky & Gilovich 1999). Decision-making is a function of a person and the situation and some choices that people make, which do not always enhance their welfare, and these are driven by behavioural biases (Mullainathan & Shafir 2013).

Empirical review

According to Levine (2008), the financial system impacted the degree to which the economic prospects of individuals are shaped by talent rather than the parental wealth. The operational ability of the formal financial sector can unlock economic efficiencies that influence poverty and inequality. So far, ample research that is available has examined the size of the financial sector in shaping economic opportunities, and few have researched on the other formal financial dimensions of efficiency, stability and access in shaping the economic opportunities that finance makes available to the poor. Better developed financial systems have the capacity to reduce poverty and inequality by efficiently allocating resources (Clarke, Xu & Zou 2003; Rewilak 2017). However, in most developing economies, formal financial services such as the banking sector and stock markets cater mainly affluent areas with large enterprises and wealthy individuals (see Claessens 2006). Mader (2018) contested the benefits of expanding financial access to the low-income households, arguing that poor products are offered at higher prices.

This suggests that the distribution of the financial services has been largely skewed without providing the welfare benefits of equitable distribution of income. Morduch (1999) argued that the financial services should be reliable (available when needed), convenient (easy access), continuous (finance can be accessed repeatedly) and flexible (the product is tailored to individual needs). These dimensions are usually lacking for the poor households with regard to the availability of formal financial services. In addition, there is a dearth of literature on the effects of these financial dimensions on poverty and inequality (De Haan & Sturm 2017) According to Beck, Demirgüç-Kunt and Levine (2004), poverty and inequality are lower in countries with well-developed financial intermediaries. However, Claessens and Perrotti (2007) found that the depth and the size of the financial sector do not provide equal access to the financial services. The results of Aslan et al.'s (2017) study revealed that the distribution of access to finance matters for income inequality than financial depth. In India, Prahalad (2010) concluded that inclusive formal finance is not only beneficial for poverty reduction, but the banks can also benefit profitably in treating the poor as a potential profitable market. However, Park and Mercado (2018) suggested that inclusive financial systems have poverty-reducing effects only for high- and middle-high-income economies than for middle-low and low-income countries. The major drawback of the formal financial intermediaries in servicing the poor is serving the market segment of the poor with already developed products and services that were developed for the affluent segment (Han & Melecky 2017; Prahalad 2010). Supply

bottlenecks by formal financial services, such as cost barriers, distance barriers and credit barriers, amongst others, lead to formal financial exclusion.

Zhang and Naceur (2019) argued that the banking sector has more influence on the role of finance in poverty reduction than the stock market. However, Fanta and Makina (2017) suggested that the bond market has more effect on growth than the banking and stock market which influence growth, which in turn helps in the reallocation of resources and reduces poverty. These studies (Fanta & Makina 2017; Zhang & Naceur 2019) were, however, based on time-series studies, which might be a challenge for this study to look at the effects of different financial markets on poverty as in some developing countries the bond market and the stock market data are not available. Furthermore, the bond market has limited potential when compared with bank finance as participants in the bond market are mainly large enterprises (Beck, Demirgüç-Kunt & Honohan 2009; Gormley, Johnson & Rhee 2006). This study will focus on selected developing countries in Africa and Asia depending on data availability.

Data and methodology

Secondary annual data from a panel of 35 developing economies for the period 2004–2016 were used. The choice of the study period was guided by data availability mainly on the other financial dimensions, such as access. Data availability for the access measure is available from 2004. The dynamic panel model was used for the balanced panel as it allows us to control for endogeneity problems in the model. The data on the World Bank and the Standardized World Income Inequality Database (SWIID) databases were used for analysis in this study. There is no universal definition of poverty, and in this article, we adopted the World Bank (2000) definition of poverty as 'the unacceptable physiological and social deprivation in human wellbeing consisting of low incomes and the incapacity to attain the basic goods and services essential for survival with dignity'. For this reason, to ensure robustness of the results of this study, a number of poverty measures were employed.

Following Levine's (2008) arguments, the present study used three poverty measures, namely, poverty line, poverty gap and income distribution. Furthermore, there is no universal measure of financial intermediation in the literature, and in this study we employed the domestic credit as a percentage of the gross domestic product (GDP). Private credit is a preferred measure for this study as it is the measure closest to the definition of financial intermediation (see Levine 2008; Rewilak 2017). This measure is mainly based on the banking sector as the data of other financial systems, such as the stock market and the bond market, are not available in some of the countries in our panel.

The control variables that we used in this study include the other financial dimensions of access, efficiency and stability. Improving the size or depth of the financial sector without access, efficiency and stability of the sector can be detrimental to the poor. Furthermore, increasing the size of the financial sector can result in the instability of the sector, thereby increasing the level of poverty incidences. In this study, the financial stability is proxied by the *Z*-score. The ratio of private credit in the banking sector was used as the proxy for financial intermediation, whilst the number of commercial banks per 1000 km^2 is used as the proxy for financial access.

As the study aims to empirically test the cointegration between financial intermediation and poverty, the unit root test was performed to establish the order of integration of the variables[1] as the Autoregressive Distributed Lag (ARDL) model cannot be performed with variables with higher order integration I(2) and above (Peseran et al. 1999). The optimal lag length was selected using the Akaike information criterion (AIC). Furthermore, the Hausman test (Hausman 1978) was employed to determine the model to use between the pooled mean group (PMG), mean group (MG) and the dynamic fixed effects (DFE).

Panel autoregressive distributed lags

This study used the panel heterogeneous estimation technique of PMG approach to estimate the cointegration for the panel of countries. The Hausman test was used to determine the most appropriate estimation technique from the PMG, MG and DFE. The use of the dynamic model is preferred as poverty is persistent. The long-run and short-run effects for this study are jointly estimated using the ARDL model and the error correction model (ECM) in a panel data setting. When arguing for the advantage of using panel data, Baltagi (1995, 2008) opined that panel data assume heterogeneity, which is not the case with either time series (T) or in cross-sectional studies (N). If heterogeneity is disregarded, that is, non-controlling of the individual country-specific variables, the misspecification of a model occurs (Baltagi 2008). Using the panel ARDL for cointegration, we employed the procedures of PMG, MG and DFE[2] as suggested by Pesaran (1997) and Pesaran, Shin and Smith (1999). These techniques are used for estimating non-stationary dynamic panels where parameters are assumed to be heterogeneous across groups. To determine the best estimator between the techniques, we employed the Hausman test.

Panel data improve the efficiency of the econometric estimates, in that they give the researcher a large number of data points, increasing the degrees of freedom and reducing the multicollinearity amongst the variables of the study (Baltagi 2008; Fujiki, Hsiao & Shen 2002; Hsiao 2014; Hsiao, Mountain & Illman 1995). In addition, panel data allow a researcher to analyse a number of vital economic problems using aggregate data that cannot be addressed using cross-sectional or time-series data sets (Baltagi 2008; Hsiao 2014).

1.Owing to space constraints, the unit root tests are not described here but are available upon request.

2.Because of space consideration the table of results for the PMG, MG and DFE tables are omitted but are available upon request.

In panel ARDL estimation, there is a need to establish whether the MG or the PMG can be used in model estimation (see Pesaran & Smith 1995; Pesaran et al. 1999). Pesaran et al. (1999) argued that MG is inconsistent as it is not a good estimator when either N or T is small. Prior to the model estimation, the hypothesis of homogeneity amongst the long-run parameters cannot be assumed. Hence, the Hausman test is used to determine whether the MG or the PMG is the preferred method of estimation (Hausman 1978). The main difference between the MG and the PMG is that under MG estimator, separate equations for each cross section (N) are run, and the consistent estimators are produced by averaging of parameters of the model (Pesaran et al. 1999). Contrary to the MG and the DFE, the PMG estimator incorporates MG estimator characteristics and pools the estimators (Pesaran et al. 1999). Consistency and the independence of the regression residuals across countries are the essential assumption of the PMG estimation (Loayza & Rancière 2006).

The PMG permits country heterogeneity in error variances, the short-run coefficients, together with the intercepts, the speed of adjustment to the long-run equilibrium values with a proposal of homogeneous long-run slope coefficients across countries (N) (Loayza & Rancière 2006; Pesaran et al. 1999). In this study, the financial intermediation is a determinant of poverty. For the purpose of this study, poverty is hypothesised to be a function of financial intermediation (including other dimensions of financial intermediation such as access, efficiency and stability). The following system of equation is estimated to examine the relationship between financial intermediation and poverty in the selected developing economies. The unrestricted panel ARDL system of equations to be estimated is generalised as follows:

$$\mathrm{POV}_{it} = \varphi_0 + \sum_{k=1}^{p} \delta_{it} \mathrm{POV}_{i,t-1} + \sum_{i=0}^{q} \delta_{2t} \mathrm{X}_{i,t-1} + \mu_i + \varepsilon_{it}, \quad \text{[Eqn 1]}$$

where Y_{it} is the dependent variable and $\mathrm{X}_{i,t-1}$ is the ($k \times 1$) vector of the explanatory variables for group i, μ_i is the fixed effect and k is the studied country with p and q as the lag length (see Pesaran et al. 1999). Equations 2–4 are the proposed model specifications for the ARDL system of equations that are specific for this study.

Equation 2 can be reparameterised to the specifications of this study to a system of equations, in which the dependent variable (poverty) is proxied by headcount ratio, povgap and Gini,[3] and the following system of equations illustrates the proposed model specifications for this study:

$$\begin{aligned}\mathrm{HCR}_{it} = {} & \beta_0 + \beta_{1i}\mathrm{HCR}_{i,t-1} + \beta_{2i}\mathrm{FI}_{i,t-1} + \beta_{4i}\mathrm{FA}_{i,t-1} \\ & + \sum_{i=0}^{n} \delta_{1t} \Delta\mathrm{HCR}_{i,t-1} + \sum_{i=0}^{n} \delta_{2t} \Delta\mathrm{FI}_{i,t-1} \\ & + \sum_{i=0}^{n} \delta_{4t} \Delta\mathrm{FA}_{i,t-1} + \varepsilon_{it}. \end{aligned} \quad \text{[Eqn 2]}$$

3.The system of equations using head count ratio, poverty gap and Gini as the dependent variables is not presented in this article because of space constraints but can be available upon request.

Equation 3 is the generic equation using the poverty gap as the dependent variable:

$$\begin{aligned}\mathrm{POVGAP}_{it} = {} & \beta_0 + \beta_{1i}\mathrm{POVGAP}_{i,t-1} + \beta_{2i}\mathrm{FI}_{i,t-1} \\ & + \beta_{4i}\mathrm{FA}_{i,t-1} + \sum_{i=0}^{n} \Psi_{2t} \Delta\mathrm{POVAP}_{i,t-1} \\ & + \sum_{i=0}^{n} \Psi_{2t} \Delta\mathrm{FI}_{i,t-1} + \sum_{i=0}^{n} \Psi_{4t} \Delta\mathrm{FA}_{i,t-1} + \varepsilon_{it} \end{aligned} \quad \text{[Eqn 3]}$$

Equation 4 is the generic equation using the Gini index as the dependent variable:

$$\begin{aligned}\mathrm{GINI}_{it} = {} & \beta_0 + \beta_{1i}\mathrm{GINI}_{i,t-1} + \beta_{2i}\mathrm{FI}_{i,t-1} + \beta_{4i}\mathrm{FA}_{i,t-1} + \sum_{i=0}^{n} \varphi_{1t} \Delta\mathrm{GINI}_{i,t-1} \\ & + \sum_{i=0}^{n} \varphi_{2t} \Delta\mathrm{FA}_{i,t-1} + \sum_{i=0}^{n} \varphi_{4t} \Delta\mathrm{FA}_{i,t-1} + \varepsilon_{it}, \end{aligned}$$

[Eqn 4]

where HCR is headcount ratio, POVGAP is the poverty gap and Gini is the Gini index in which all were alternatively used in this study as proxies of poverty:

FI is financial intermediation

FA is financial access

β are the long-run coefficients of the independent variables.

δ, φ, λ, Θ and γ are the short-run coefficients.

ε_{it} is the error term, where i and t represent the country and time period, respectively.

For easy reference and clarity in the methodology, the equations of the ARDL and the ECM are presented separately but in Stata the ARDL and ECM were estimated as one equation.

Error correction model

After determining the long-run relationship between poverty and financial intermediation, the study determines the short-run effects using the panel-based vector ECM (Apergis & Payne 2010; Pesaran et al. 1999). The ECM has the advantage that it incorporates cointegration and also captures the short-run effects of the variables under study (see Engle & Granger 1987; Hoffman & Rasche 1996). If there is no cointegration, ECM is used instead of performing the vector error correction. However, in panel ARDL, the ECM is estimated. The generic ECM that is proposed for this study is, therefore, specified in Equation 5:

$$\begin{aligned}\Delta\mathrm{POV}_{i,t} = {} & \alpha_{0,t} + \sum_{j=1}^{p} \beta_j \Delta\mathrm{POV}_{i,t-j} + \sum_{j=0}^{q} \phi_{i,j} \Delta\mathrm{X}_{i,t-1} \\ & + \varphi_{1i}\mathrm{ECT}_{i,t-1} + \omega_{it} \end{aligned} \quad \text{[Eqn 5]}$$

where D is the first-difference operator; p and q are the lag lengths selected using the AIC.

POV is each of the poverty proxies.

X is a matrix of the independent variables.

ECT is the error correction term.

α is the constant.

β and ϕ are short-run coefficients.

φ is the speed of adjustment to the long-run equilibrium.

ω is the error term, which is assumed to be normally distributed with zero mean and constant variance.

The error correction term coefficient (φ) in the ECM equations explains the speed of adjustment of the system to the long-run equilibrium after a shock in the short run. The coefficient of the ECT (φ) is expected to be negative and statistically significant to show how the variables converge to the equilibrium level (Bildirici & Kayıkçı 2013).

The system of equations for the trivariate ECM is as specified in Equations 6–8:

$$\Delta HCR_{it} = \alpha_0 + \sum_{k=1}^{q} \beta_{1i} \Delta HCR_{i,t-1} + \sum_{k=1}^{q} \beta_{2i} \Delta FI_{i,t-1} + \sum_{k=1}^{q} \beta_{3i} \Delta FA_{i,t-1} + \lambda_{1i} ECT_{i,t-1} + \varepsilon_{1it}. \quad \text{[Eqn 6]}$$

Equation 7 is the proposed specification using the poverty gap:

$$\Delta POVGAP_{it} = \alpha_0 + \sum_{k=1}^{q} \beta_{1i} \Delta POVGAP_{i,t-1} + \sum_{k=1}^{q} \beta_{2i} \Delta FI_{i,t-1} + \sum_{k=1}^{q} \beta_{3i} \Delta FA_{i,t-1} + \varphi_{1i} ECT_{i,t-1} + \varepsilon_{1it}. \quad \text{[Eqn 7]}$$

We also used the Gini index as a measure of inequality, and Equation 8 is the generic equation for the error correction between poverty as measured by the Gini index and the financial variables (financial intermediation, financial efficiency, financial access and financial stability):

$$\Delta GINI_{it} = \alpha_0 + \sum_{k=1}^{q} \beta_{1i} \Delta GINI_{i,t-1} + \sum_{k=1}^{q} \beta_{2i} \Delta FI_{i,t-1} + \sum_{k=1}^{q} \beta_{3i} \Delta FA_{i,t-1} + \phi_{1i} ECT_{i,t-1} + \varepsilon_{1t}. \quad \text{[Eqn 8]}$$

As specified in Equations 6–8, HCR, POVGAP and GINI are poverty proxies.

FI is the financial intermediation.

FA is the financial access.

α is the constant.

β are short-run coefficients.

λ, φ, and ϕ are the speed of adjustments to the long-run equilibrium.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

Results

Panel cointegration and the error correction model: Pooled mean group approach

In this section, the study discusses the results[4] of the cointegration and the error correction between the poverty proxies and the financial dimensions, namely, financial intermediation, financial efficiency, financial access and financial stability. Each of the financial dimensions is jointly tested with financial intermediation to examine the cointegrating relationship with the poverty proxies. The results presented here used the PMG, which assumes that a long-run relationship between poverty and the financial dimensions is identical across countries, whilst allowing the short-run relationship to be country specific. The coefficients have been verified for the long-run homogeneity using the Hausman test as Tables 1–3 report the results of PMG estimation of the long-run and short-run coefficients of the financial dimensions and the coefficient of the error correction term.

Cointegration and error correction model for poverty proxies, financial intermediation and financial efficiency

Table 1 summarises the PMG estimates of the cointegrating relationship between the financial dimensions (financial intermediation and financial efficiency) and poverty proxies for the selected developing countries of this study.

The results in Table 1 show that there is a long-run relationship between poverty and financial intermediation and financial efficiency. The long-run relationship between financial intermediation and poverty as measured by the headcount ratio is negative and significant at 10% level. Increase in the financial intermediation in the long run reduces poverty incidences as the low-income households access more credit for consumption smoothing or human capital investments. The same result was observed when the study measured poverty with the poverty gap that when financial intermediation is increased, poverty (headcount and poverty gap) is reduced in the long run and the result is significant at 1% significant level. The results show that an increase in financial intermediation widens the inequality gap in the long run.

There is a significant positive long-run relationship between all poverty proxies and financial efficiency. There is an intuitive expectation of a negative relationship between poverty proxies and financial efficiency where efficiency in financial intermediation is required to reduce poverty. Theory has mixed results on the effects of the financial efficiency on poverty incidences as financial efficiency can either have a positive or a negative effect on poverty incidences (Prokopenko & Holden 2001; Rewilak 2017). Theoretically, financial efficiency is expected to be poverty reducing as the banks are able to manage the risk of information asymmetry and to reduce transaction costs and

4.The results of the correlation analysis, the unit root test and the Hausman test are not reported here because of space constraints, but are available upon request.

TABLE 1: Summary of the pooled mean group on the cointegrating and causality relationship between poverty proxies and financial intermediation and financial efficiency.

Independent variables	(1)	(2)	(3)
	Δ.hcr	Δ.povgap	Δ.gini
Long run			
Pcredit	-0.0000591*	-0.00163***	0.00733**
	(-2.51)	(-19.62)	(2.75)
Is	0.0108***	0.00193***	0.0198***
	(125.30)	(8.11)	(8.03)
ECT	-0.437***	-0.493***	-0.208***
	(-6.43)	(-4.64)	(-6.16)
Short run			
Δ.pcredit	-0.00179	-0.00152	-0.000871
	(-1.11)	(-1.18)	(-0.23)
Δ.is	-0.00523	-0.00433	0.000679
	(-1.14)	(-1.27)	(0.02)
_cons	0.107***	0.0870***	9.223***
	(3.70)	(4.23)	(5.60)
N	321	321	411

Note: *t* statistics in parentheses. hcr, povgap and Gini as poverty proxies, pcredit is financial intermediation (FI), the interest rate spread measuring bank efficiency (FE). The xtpmg routine in Stata was used for the estimations. The first panel displays the results of the long-run effects, whilst the second panel displays the results of both the ECT and the short-run effects. Δ is the difference operator.

hcr, headcount ratio; povgap, poverty gap; Gini, Gini index; ECT, error correction term.

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

make credit available to the poor. It is expected that as the financial sector improves efficiency, it should result in poverty reduction ceteris paribus. Lower interest rate spreads (better financial efficiency) can significantly reduce poverty in the long run, in which this positive significant relationship between financial efficiency and poverty is consistent with the finding of Zhang and Naceur (2019).

Most banks in developing countries have monopoly power, and lack of competition enables them to charge higher spreads (Allen & Gale 2004). Higher spreads discourage participation in the formal financial sector by the poor, thereby increasing poverty incidences. Alternatively, higher spreads imply that banks are still profitable without increasing a product offering that meets the need of the poor; hence, higher spreads have a positive effect on poverty (Zhang & Naceur 2019). Higher cost of credit irrespective of it being profitable for the banks hurts the poor in that credit will be expensive and not easily available to poor households who often lack collateral or do not have good credit scoring. The role of financial efficiency in poverty reduction, to our knowledge, is empirically under-researched. Hence, the cost of credit can be a barrier to participation in formal financial sector by the poor, resulting in the failure to unlock human capital that has a potential to reduce poverty. Higher spread means expensive credit, and it hurts the poor, whilst lower spread has a poverty-reducing effect as the cost of credit is cheaper and the poor and small businesses can access the credit, which they can use for consumption smoothing, capital accumulation and risk management.

Additionally, improved financial efficiency by the financial sector implies improved screening and monitoring of loan applications, and most likely the loans with negative present value are declined. As most of the low income and small businesses lack collateral, their loan application is likely to fall in the category of loan with negative present value, and they are denied access to the credit facilities, which have a poverty-reducing effect through consumption smoothing and availability of funds to absorb negative shock. However, in the short run, the study observed an insignificant negative relationship between efficiency and poverty as measured by the headcount ratio and the poverty gap. As financial efficiency improves in the capital allocation and allows for income generation by enhancing the productive capacity of poor households, this can have a poverty-reducing effect. Bank inefficiency (higher spread) is accompanied with credit rationing consequently lowering the credit that is channelled to qualifying borrowers (Beck 2007; Bester 1987). Financial intermediation and financial efficiency can jointly explain the level of poverty, in that if the credit is rationed and not all borrowers have the access to the financial services and products, inequality can increase. This study found that in the presence of financial efficiency, financial intermediation increases inequality in the long run (Table 1).

The error correction term is negative and significant under the preferred PMG estimator. Poverty as measured by the headcount ratio adjusts to changes in financial intermediation and financial efficiency to its long-run equilibrium at a speed of adjustment of 43.7%, whilst poverty as measured by the poverty gap adjusts to its long-run equilibrium at a speed of adjustment of 49.3%. The Gini index adjusts at a speed of adjustment of 20.8% to any shocks to financial intermediation and financial efficiency.

All the poverty proxies have a significant long-run relationship with financial intermediation and financial efficiency. Zhan and Sherraden (2011) asserted that improved accumulation of financial assets amongst the low-income earners has a poverty-reducing effect as increased intermediation of the financial services allows for consumption smoothing and improved standard of living. All poverty proxies are significantly related to financial intermediation in the long run where the poverty is measured by the headcount ratio and the poverty gap is reduced as financial intermediation increases. However, as measured with the Gini index, an increase in financial intermediation increases the Gini index (inequality). The relationship is positive and significant at 5% level. The relationship between poverty proxies and financial efficiency is positive and significantly related at 1% level for all the poverty proxies for the selected developing countries.

The insignificance of the *p*-values for all the proxies in the short run also implies that there is no short-run cointegration. However, for all the proxies, the error correction term is negative and significant as expected. For all the proxies of poverty, there is a cointegration amongst the variables at 1% significance level. Any deviations from the long-run equilibrium are corrected at the speed of adjustment of 43.7%, 49.3% and 20.7% for poverty headcount ratio, poverty gap and the Gini index, respectively.

Cointegration and error correction model for poverty proxies, financial intermediation and financial access

This section discusses results of the cointegrating relationship between financial intermediation, financial access and poverty proxies, as presented in Table 2.

From Table 2, it is evident that the relationship between bank branch expansion and poverty as measured with the headcount ratio is negative. This is in line with the experimental findings of the survey by Burgess and Pande (2005) in India, which states that as bank branches increase in the rural India, poverty decreases. Improving financial access can reduce poverty for the selected countries in this study, as the headcount ratio decreases with an increase in branch expansion. Degryse and Ongena (2005) argued that as the distance between the bank branches and the borrower and/or firms increases, the loan rates increase, worsening the lending conditions. These findings are similar only when poverty is measured by the Gini index. However, the relationship is insignificant in the long run. With improved access to finance, poverty can be reduced in that the poor have the capacity to reduce their vulnerability to economic shocks (Dupas et al. 2018). The study found that the bank branch penetration is cointegrated to poverty as measured by the poverty gap. In estimating the Gini index in this model, the study dropped the period before 2008 as data prior to this had no variability.

In most developing countries, the number of bank branches' penetration is lower than in higher income countries (Dhrifi 2015). Financial intermediation accompanied with financial access reduces inequality in the long run, as more resources are accessible and are allocated to the poor (Dabla-Norries et al. 2015). There is no long-run and short-run relationship between access to finance and inequality in this study. This is in contrast with Mookerjee and Kalipioni's (2010) findings of a significant negative relationship between access to finance and inequality. The study fails to observe any short-run effect between poverty proxies and financial intermediation and financial access. Greenwood and Jovanovic (1990) suggested that in the early stages of development, finance increases poverty, and in later stages it reduces poverty as resource allocation will be accessible by the larger population. The error correction terms for all the proxies of poverty are highly significant at 1% significance level. Any variability from equilibrium between the poverty proxies, financial intermediation and financial access is corrected at speeds of adjustment of 45.4%, 57.9% and 14.4% for poverty headcount ratio, poverty gap and Gini index, respectively.

Cointegration and error correction model for poverty proxies, financial intermediation and financial stability

This section discusses the results of the estimation on the cointegration between poverty proxies' financial intermediation and financial stability as measured by the bank *Z*-score. The 2007–2009 Global financial crises provided a hint that financial instability can have detrimental effects on the welfare of the people, specifically the poor who lacks investments to absorb periods of economic shocks. The results are summarised in Table 3 followed by the discussion of the long-run and short-run relationships between the financial intermediation, financial stability and poverty proxies.

In the presence of financial intermediation, the financial stability has a positive long-run relationship with the headcount ratio and the poverty gap. In this study, the positive coefficients of *Z*-score suggest that an increase in the *Z* score (financial stability) in the long run increases poverty, whilst it reduces inequality.

TABLE 2: Summary of the pooled mean group on the cointegration of poverty proxies and financial intermediation and financial access.

Independent variable	(1)	(2)	(3)
	Δhcr	Δpovgap	Δgini
Long run			
pcredit	0.000316***	-0.00107***	-0.106***
	(4.02)	(-6.54)	(-15.92)
cb	-0.0536***	-0.00804***	0.0910
	(-41.33)	(-4.67)	(1.53)
ECT	-0.454***	-0.579***	-0.144***
	(-5.12)	(-5.57)	(-2.87)
Short run			
Δ.pcredit	-0.000706	-0.000609	0.0226
	(-0.41)	(-0.31)	(0.86)
Δ.cb	-0.0618	-0.112	-0.208
	(-0.49)	(-1.10)	(-0.27)
_cons	0.210***	0.111***	6.303**
	(4.38)	(4.95)	(2.79)
N	271	271	313

Note: *t* statistics in parentheses. hcr, povgap and Gini as poverty proxies, pcredit is financial intermediation (FI) and cb measures the financial access (FA). Δ is the difference operator.

hcr, headcount ratio; povgap, poverty gap; Gini, Gini index; ECT, error correction term; cb, commercial bank branches/1000 km^2.

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

TABLE 3: Summary of the pooled mean group on the cointegration of poverty proxies and financial intermediation and financial stability.

Independent variable	(1)	(2)	(3)
	Δhcr	Δpovgap	Δgini
Long run			
pcredit	0.00131***	0.000406**	0.00134
	(3.18)	(2.76)	(0.65)
Z	0.0103***	0.00412***	-0.00333
	(11.82)	(10.89)	(-0.73)
ECT	-0.258***	-0.433***	-0.272***
	(-4.17)	(-5.16)	(-6.21)
Short run			
Δpcredit	-0.000321	-0.000353	0.00478
	(-0.16)	(-0.26)	(0.48)
Δz	-0.00140	-0.00218*	0.0119
	(-0.90)	(-1.86)	(1.18)
_cons	0.0501***	0.0312***	11.79***
	(2.99)	(3.49)	(6.23)
N	324	324	411

Note: *t* statistics in parentheses. hcr, povgap and Gini as poverty proxies, pcredit is financial intermediation (FI) and *Z* measures the bank *Z* score measuring bank stability (FS). Δ is the difference operator.

hcr, headcount ratio; povgap, poverty gap; Gini, Gini index; ECT, error correction term.

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

For the entire tests where poverty proxies were the dependent variables, the error term which measures the speed of adjustment to the long-run equilibrium after the short-run divergence is negative and significant at 1%. Gujarati and Porter (2009) posited that the ECT must be negative and significant for the correction of the short-run divergence to the convergence of its long-run equilibrium. A positive error term will signify the divergence of the time series from its equilibrium and none of the error terms from this study was positive. The results of the study further satisfy the PMG condition of dynamic stability (long-run relationship), negative and significant coefficients of the error which are not less than −2 (Loayza & Rancière 2006). Cointegration and causal relationships between the poverty proxies and selected financial variables, namely, financial intermediation, financial efficiency, financial access and financial stability, as the dependent variables were performed. This analysis gives this study the advantage of examining some relationships that have not yet been extensively empirically researched. The study is able to examine how financial access, stability and efficiency have an impact on poverty reduction if they are added to the financial intermediation setting. In the presence of financial access, the long-run relationship between financial intermediation and poverty proxies (headcount ratio and the Gini index) is positive and negative, respectively. These long-run relationships are different from the relationship between financial intermediation and these poverty proxies in the presence of financial efficiency (see Table 3).

In the presence of financial efficiency, financial intermediation has a poverty-reducing effect with the poverty headcount ratio, whilst in the presence of financial access, the poverty headcount ratio increases with an increase in financial intermediation. Moreover, the same changes in the relationships were observed with inequality. In the presence of financial efficiency, an increase in financial intermediation increases inequality, whilst in the presence of financial access financial intermediation reduces inequality. The financial dimensions can influence the other dimensions and have an impact on poverty reduction; for example, access to finance is poverty reducing only when it is accompanied with lower transaction costs (financial efficiency). If the financial services and products are accessible but too expensive, the poor household and small business will not afford the financial services.

In the presence of financial stability, financial intermediation has a positive long-run relationship with all the poverty proxies, although the inequality index is insignificant. This finding is consistent with that of Zhang and Naceur (2019), which reveals that financial instability results in increased poverty incidences as all the long-run coefficients are positive. The financial dimensions are linked with each other as they can amplify or reduce the favourable effects on each other for poverty reduction. Policymakers should be mindful of other financial dimensions when instituting policies targeting poverty reduction using any of the financial dimensions. This study observed that the short-run relationships between the joint effect of financial intermediation and the other financial dimensions were not significant, except for the joint effect of financial stability on poverty gap. In a nutshell, the study observed some changes in the coefficients of financial intermediation if another financial dimension is introduced into the model.

Conclusion

The aim of this study was to examine the nexus between poverty and financial intermediation. Using a panel data of 35 countries from 2004 to 2016, the results were mixed. The cointegration analysis of the study found that there is a long-run equilibrium relationship between financial intermediation and poverty proxies. The results reveal that in the long run, financial intermediation and financial efficiency increase inequalities. In economies with existing inequalities, the rich benefit more from financial intermediation through accumulation of capital and investments in entrepreneurial projects to earn more income.

Levine (2005) argued that the removal of credit inefficiencies reduces inequality as the access to the financial products allows for capital accumulation, borrowing for consumption smoothing and for entrepreneurs to start businesses, which has poverty-reducing effects. The results of the study where financial access has a poverty-reducing effect confirm the theoretical arguments made by Shaw (1973) and Pagano (1993) where finance is poverty reducing when the financial resources are available to the poor and the small businesses. For all the financial variables, the study found long-run relationships rather than the short-run relationships, supporting that poverty is persistent.

Furthermore, the results of the study revealed that financial intermediation has a poverty-reducing effect when poverty is measured by the poverty gap and the Gini index. Improved financial intermediation combined with bank efficiency contributes to poverty reduction by facilitating capital accumulation amongst the low-income earners through making financial services efficiently available. Increased intermediation of financial services to the poor enables them to manage their risks through the increased availability of financial services. Access to affordable finance is crucial for closing the gaps between household inequalities through the ability of the financial sector to channel financial resources from the deficit to the surplus units (Demirgüç-Kunt, Klapper & Singer 2017).

The nature, strength and level of significance of the relationship were dependent on the measure of poverty used, as the poverty proxies are related differently to the financial variables. Policymakers should take note of how poverty is measured in using financial dimensions to address the challenges of poverty. Distorted understanding and definition of poverty will result in distorted policies, which yield little or no results for the effectiveness of the financial sector in poverty reduction. Empirical studies are needed to examine whether digital finance is a substitute or

it complements physical access to formal financial services in Africa.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

M.R.M. was responsible for conceptualisation of the study and literature review, data collection, analysis and interpretation of results. J.C. and G.M. provided guidance in conceptualising the article, data analysis and for reviewing the article as supervisors.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

References

Aguera, P., 2015, 'Financial inclusion, growth and poverty reduction', World Bank, presentation, Financial for all: Promoting financial inclusion for Central Africa, 23 March 2015, ECCAS Regional Conference, Brazzaville, Congo, World Bank, Washington, DC.

Allen, F. & Gale, D., 2004, 'Financial intermediaries and markets', *Econometrica* 72(4), 1023–1061.

Apergis, N. & Payne, J.E., 2010, 'Renewable energy consumption and economic growth: Evidence from a panel of OECD countries', *Energy policy* 38(1), 656–660. https://doi.org/10.1016/j.enpol.2009.09.002

Aslan, G., Deléchat, C., Newiak, M.M. & Yang, M.F., 2017, *Inequality in financial inclusion and income inequality,* International Monetary Fund, Washington, DC.

Baltagi, B., 2008, *Econometric analysis of panel data,* Wiley, Hoboken, NJ.

Baltagi, B.H., 1995, *Econometric analysis of panel data,* Wiley, Chichester.

Banerjee, A.V. & Newman, A.F., 1993, 'Occupational choice and the process of development', *Journal of Political Economy* 101(2), 274–298. https://doi.org/10.1086/261876

Baradaran, M., 2012, 'How the poor got cut out of banking', *Emory Law Journal* 62, 483.

Beck, T., 2007, 'Efficiency in financial intermediation: Theory and empirical measurement', in B. Balkenhol (ed.), *Microfinance and public policy,* International labour organization (ILO) century series, pp. 111–125, Palgrave Macmillan, London.

Beck, T., Demirgüç-Kunt, A. & Levine, R., 2004, *Finance, inequality and poverty: Cross country evidence*, World bank policy research working paper no, 3338, World Bank, Washington, DC.

Beck, T., Demirgüç-Kunt, A. & Honohan, P., 2009, 'Access to financial services: Measurement, impact, and policies', *The World Bank Research Observer* 24(1), 119–145. https://doi.org/10.1093/wbro/lkn008

Belsky, G. & Gilovich, T., 1999, *Why smart people make big money mistakes and how to correct them: Lessons from the new science of behavioural economics*, 2nd edn., Simon and Schuster, New York, NY.

Bester, H., 1987, 'The role of collateral in credit markets with imperfect information', *European Economic Review* 31(4), 887–899. https://doi.org/10.1016/0014-2921(87)90005-5

Bildirici, M.E. & Kayıkçı, F., 2013, 'Effects of oil production on economic growth in Eurasian countries: Panel ARDL approach', *Energy* 49(1), 156–161. https://doi.org/10.1016/j.energy.2012.10.047

Burgess, R. & Pande, R., 2005, 'Do rural banks matter? Evidence from the Indian social banking experiment', *American Economic Review* 95(3), 780–795. https://doi.org/10.1257/0002828054201242

Claessens, S. & Perrotti, E., 2007, 'Finance and inequality: Channels and evidence', *Journal of Comparative Economics* 35(4), 748–773. https://doi.org/10.1016/j.jce.2007.07.002

Clarke, G.R., Xu, L.C. & Zou, H.F., 2003, *Finance and income inequality: Test of alternative theories, World Bank Publications*, vol. 2984, World Bank, Washington, DC. https://doi.org/10.2139/ssrn.364160

Consultative Group to Assist the Poor (CGAP), 2012, *Financial inclusion and stability: What does research show?*, CGAP Brief, Consultative Group to Assist the Poor, Washington, DC.

Cruz, M., Foster, J.E., Quillin, B. & Schellekens, P., 2015, *Ending extreme poverty and sharing prosperity,* viewed 17 April 2019, from https://openknowledge.worldbank.org/bitstream/handle/10986/23604/Ending0extreme0rogress0and0policies.pdf?sequence=1.

Dabla-Norris, M.E., Kochhar, M.K., Suphaphiphat, M.N., Ricka, M.F. & Tsounta, E., 2015, *Causes and consequences of income inequality: A global perspective*, International Monetary Fund, Washington, DC.

Degryse, H. & Ongena, S., 2005, 'Distance, lending relationships, and competition', *The Journal of Finance* 60(1), 231–266. https://doi.org/10.1111/j.1540-6261.2005.00729.x

De Haan, J. & Sturm, J.E., 2017, 'Finance and income inequality: A review and new evidence', *European Journal of Political Economy* 50, 171–195.

Demirgüç-Kunt, A. & Levine, R., 2009, 'Finance and inequality: Theory and evidence', *Annual Review of Financial Economics* 1(1), 287–318. https://doi.org/10.1146/annurev.financial.050808.114334

Dhrifi, A., 2015, 'Financial development and the growth-inequality-poverty triangle', *Journal of the Knowledge Economy* 6(4), 1163–1176. https://doi.org/10.1007/s13132-014-0200-0

Dupas, P., Karlan, D., Robinson, J. & Ubfal, D., 2018, 'Banking the unbanked? Evidence from three countries', *American Economic Journal: Applied Economics* 10(2), 257–297. https://doi.org/10.1257/app.20160597

Engle, R.F. & Granger, C.W., 1987, 'Co-integration and error correction: Representation, estimation, and testing', *Econometrica: Journal of the Econometric Society* 55(2), 251–276. https://doi.org/10.2307/1913236

Fanta, A.B. & Makina, D., 2017, 'Equity, bonds, institutional debt and economic growth: Evidence from South Africa', *South African Journal of Economics* 85(1), 86–97. https://doi.org/10.1111/saje.12122

Fujiki, H., Hsiao, C. & Shen, Y., 2002, 'Is there a stable money demand function under the low interest rate policy? A panel data analysis', *Monetary & Economic Studies* 20(2), 1–23.

Galor, O. & Zeira, J., 1993, 'Income distribution and macroeconomics', *The Review of Economic Studies* 60(1), 35–52. https://doi.org/10.2307/2297811

Gormley, T., Johnson, S. & Rhee, C., 2006, *Corporate bonds: A spare tire in emerging markets? Documento de trabajo*, Washington University, John M. Olin School of Business, San Luis.

Greenwood, J. & Jovanovic, B., 1990, 'Financial development, growth, and the distribution of income', *Journal of Political Economy* 98(5, Part 1), 1076–1107. https://doi.org/10.1086/261720

Gujarati, D.N. & Porter, D., 2009, *Basic econometrics*, McGraw-Hill International Edition, India.

Gutiérrez-Nieto, B., Serrano-Cinca, C., Cuéllar-Fernández, B. & Fuertes-Callén, Y., 2017, 'The poverty penalty and microcredit, *Social Indicators Research* 133(2), 455–475. https://doi.org/10.1007/s11205-016-1368-4

Hagen-Zanker, J., Mosler Vidal, E. & Sturge, G., 2017, *Social protection, migration and the 2030 Agenda for Sustainable Development*, ODI, London.

Hammond, A.L., Kramer, W.J., Katz, R.S., Tran, J.T. & Walker, C., 2007, 'The next 4 billion', *Innovations: Technology, Governance, Globalization* 2(1–2), 147–158. https://doi.org/10.1162/itgg.2007.2.1-2.147

Han, R. & Melecky, M., 2017, 'Broader use of saving products among people can make deposit funding of the banking system more resilient', *Journal of International Financial Markets, Institutions and Money* 47, 89–102. https://doi.org/10.1016/j.intfin.2016.11.005

Hausman, J.A., 1978, 'Specification tests in econometrics', *Econometrica: Journal of the Econometric Society* 46(6), 1251–1271. https://doi.org/10.2307/1913827

Hoffman, D.L. & Rasche, R.H., 1996, 'Assessing forecast performance in a cointegrated system', *Journal of Applied Econometrics* 11(5), 495–517. https://doi.org/10.1002/(SICI)1099-1255(199609)11:5%3C495::AID-JAE407%3E3.0.CO;2-D

Hsiao, C., 2014, *Analysis of panel data,* Cambridge University Press, Cambridge.

Hsiao, C., Mountain, D.C. & Illman, K.H., 1995, 'A Bayesian integration of end-use metering and conditional-demand analysis', *Journal of Business & Economic Statistics* 13(3), 315–326. https://doi.org/10.1080/07350015.1995.10524605

Kandachar, P. & Halme, M. (eds.), 2017, *Sustainability challenges and solutions at the base of the pyramid: Business, technology and the poor,* Routledge, London.

Klapper, L., El-Zoghbi, M. & Hess, J., 2016, *Achieving the sustainable development goals: The role of financial inclusion*, Consultative Group to Assist the Poor, Washington, DC.

Levine, R., 2005, 'Finance and growth: Theory and evidence', in *Handbook of economic growth*, vol. 1, part A, pp. 865–934, Elsevier, North-Holland. https://doi.org/10.1016/S1574-0684(05)01012-9

Levine, R., 2008, 'Finance and the poor', *The Manchester School* 76(s1), 1–13. https://doi.org/10.1111/j.1467-9957.2008.01078.x

Loayza, N. & Rancière, R., 2006, 'Financial development, financial fragility, and growth', *Journal of Money, Credit and Banking* 38(4), 1051–1076. https://doi.org/10.1353/mcb.2006.0060

Mader, P., 2018, 'Contesting financial inclusion', *Development and Change* 49(2), 461–483.

Mookerjee, R. & Kalipioni, P., 2010, 'Availability of financial services and income inequality: The evidence from many countries', *Emerging Markets Review* 11(4), 404–408. https://doi.org/10.1016/j.ememar.2010.07.001

Morduch, J., 1999, 'The microfinance promise', *Journal of Economic Literature* 37(4), 1569–1614. https://doi.org/10.1257/jel.37.4.1569

Mullainathan, S. & Shafir, E., 2013, 'Decision making and policy in contexts of poverty', in *Behavioural foundations of public policy,* pp. 281–300, Princeton University Press, Upper Saddle River, NJ.

Narayan, D., 2000, *Voices of the poor: Can anyone hear us?,* World Bank, Washington, DC.

Park, C.Y. & Mercado, R., 2018, *Financial inclusion: New measurement and cross-country impact assessment,* p. 35. SSRN 3199427. https://doi.org/10.2139/ssrn.3199427

Pagano, M., 1993, 'Financial markets and growth: An overview', *European Economic Review* 37(2–3), 613–622. https://doi.org/10.1016/0014-2921(93)90051-B

Pesaran, M.H., 1997, 'The role of economic theory in modelling the long run', *The Economic Journal* 107(440), 178–191. https://doi.org/10.1111/1468-0297.00151

Pesaran, M.H., Shin, Y. & Smith, R.P., 1999, 'Pooled mean group estimation of dynamic heterogeneous panels', *Journal of the American Statistical Association* 94(446), 621–634. https://doi.org/10.1080/01621459.1999.10474156

Pesaran, M.H. & Smith, R., 1995, 'Estimating long-run relationships from dynamic heterogeneous panels', *Journal of Econometrics* 68(1), 79–113. https://doi.org/10.1016/0304-4076(94)01644-F

Prahalad, C.K., 2010, *The fortune at the bottom of the pyramid,* Pearson Education, Cranbury, NJ.

Prahalad, C.K. & Hart, S.L., 2002, 'The fortune at the bottom of the pyramid', *Strategy+Business* 26, 2–14.

Prokopenko, M.V. & Holden, M.P., 2001, *Financial development and poverty alleviation: Issues and policy implications for developing and transition countries*, International Monetary Fund, Washington, DC.

Rewilak, J., 2017, 'The role of financial development in poverty reduction', *Review of Development Finance* 7(2), 169–176. https://doi.org/10.1016/j.rdf.2017.10.001

Shaw, E., 1973, *Financial deepening and economic development*, Oxford University Press, New York, NY.

Stiglitz, J.E., 1969, 'Distribution of income and wealth among individuals', *Econometrica: Journal of the Econometric Society* 37(3), 382–397. https://doi.org/10.2307/1912788

World Bank, 2000, *World Development Report: Attacking poverty*, World Bank, Washington, DC.

World Bank, 2017, *Financial inclusion*, viewed 14 August 2017, from http://www.worldbank.org/en/topic/financialinclusion/overview.

World Bank, 2018, *The shifting gravity of global poverty*, viewed 01 March 2020, from https://blogs.worldbank.org/developmenttalk/shifting-gravity-global-poverty.

Wright, G. & Muteesassira, L., 2001, 'The relative risks to the savings of poor people', *Small Enterprise Development* 12(3), 33–45. https://doi.org/10.3362/0957-1329.2001.031

Zhan, M. & Sherraden, M., 2011, 'Assets and liabilities, educational expectations, and children's college degree attainment', *Children and Youth Services Review* 33(6), 846–854.

Zhang, R. & Naceur, S.B., 2019, 'Financial development, inequality, and poverty: Some international evidence', *International Review of Economics & Finance* 61, 1–16. https://doi.org/10.1016/j.iref.2018.12.015