

# Financial Development, Economic Development and Poverty: Is there a Threshold Effect?

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**Abstract:** The purpose of this article is to propose an empirical study that allows the determination of the threshold effects of financial development and economic development to reduce poverty. Our study, based on the PTR model developed by Hansen (1999), will be carried out on a sample of 49 countries, over the period 2004-2017. The main results show that the effect of financial development on poverty is a function of levels of economic development and financial development. The results conclude that threshold levels associated with financial development and economic development are necessary to have a significant reduction in poverty. Thus, economic policies aiming to promote financial development are necessary in poverty reduction strategies; these economic policies must be sufficient to place the economy above the thresholds and successfully fight poverty.

**Keywords:** Financial development, Economic development, Poverty, PTR, Threshold, Non-linearity.

**JEL Classification:** C23, C24, D73, H63, O43.

## 1. INTRODUCTION.

There is a general agreement among economists that a financial system that effectively provides financial services and better capital allocation, is crucial for the economic growth (King and Levine, 1993; Beck et al., 2000; Beck and Levine, 2004). In the same case, theory suggests that financial development forms an important instrument to achieve sustainable growth (Honohan, 2004; Levine, 2004; Beck and Levine, 2004). The literature confirms that an effective financial system can boost specialization, reduce costs transaction and information, mobilize savings, support investment especially productive one and minimize risk (Laaoul and Oulhaj, 2021 and Sakli and Bouzahzah, 2021).

The literature offers asset of explanations for the role of financial development in economic growth. Many economists analyze financial development as an important variable for output growth. Particularly, government restrictions on the banking system stop financial development and reduce output growth (McKinnon, 1973 and Shaw, 1973). There is no agreement among economists that financial development is beneficial for growth. In an endogenous growth model, Pagano (1993) uses the AK model (AK model production function is a special case of a Cobb-Douglas function with constant returns to scale) to conclude that the country growth rate depends positively on the part of savings turned into investment. So growth is influenced by diverting savings to

investment. Berthelemy and Varoudakis (1996) find that the growth rate depends positively on the number of banks or the degree of competitiveness of the financial system. Their results display that financial lagging is a barrier when the educational system is not successful.

Beck et al. (2000) examined the relationship between financial development and economic growth and also the relationship between financial development and the sources of growth in terms of private saving rates, physical capital accumulation and total factor productivity. They conclude that higher levels of financial development lead to higher rates of economic growth and total factor productivity.

Although the establishment of causal linkage between financial development and growth, the same relationship cannot be said between financial development and poverty reduction. Many developing countries in the past two decades implemented an extensive program of economic reforms and financial liberalization.

Few studies have examined the relationship between financial development and poverty reduction. Generally, in theoretical literature, it is argued that financial development can help to reduce income inequality and poverty by two ways, directly by providing financial services and several types of credit to the poor that help us to increase their income through investing productive activities, and indirectly by its growth stimulating effect (Schumpeter, 1934 and McKinnon, 1973). Financial development can also indirectly reduce poverty and inequality through increasing economic growth and the gains from growth to the poor.

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In the same case, we can cite certain numbers of empirical studies find that financial development reduces poverty (Honohan, 2004; Jalilian and Kirkpatrick, 2005; Beck *et al.*, 2008; Jeanneney and Kpodar, 2011 and Sehrawat and Giri, 2015).

The aim of this paper is to analyze whether financial development had an impact on poverty reduction through economic growth. The goal is to know if there is a certain threshold to reach for financial development/economic development so that it plays a primordial role for a better use of resources and to reduce poverty. The study will be conducted on a sample of 49 countries, over the period 2004-2017. Using a PTR model, developed by Hansen (1999), we propose to verify that the relationship between financial development, economic development and poverty may be non-linear.

The rest of the document is organized as follows: a review of the literature highlighting the role of financial development in poverty reduction. The different relationships between these two variables will be developed, namely the linear relationship and the non-linear relationship, in section 2. Section 3 describes the proxy measures of financial development and poverty that will be used in the study and the developments of certain stylized facts. Section 4 discusses the econometric methodology and presents the estimation results. Finally, Section 5 draws the conclusion and implications in this study.

## 2. LITERATURE REVIEW

### 2.1. Linear Relationship between Financial Development and Poverty

One of the way in which financial development enhances economic growth is through the mobilization of funds from unproductive to productive aims. Boukhatem and Bochora (2012) make evidence that the degree of financial intermediation has a strong and positive impact on the income of the poor (Jalilian and Kirkpatrick, 2002 and Beck *et al.*, 2007). Financial development can increase the opportunities for the poor to access formal finance and eliminate the causes of financial market failures such as information asymmetry (Stiglitz, 1998). Other findings suggested that financial development can aid the poor to create micro enterprises, which generates more employment and higher income.

Milanovi (2005) indicated that there were significant increases in domestic and global inequality during the periods of global financial liberalization policies. In this regard, high interest rates, caused by financial liberalization policies, harm small firms and leave large firms in very good condition. Ang and McKibbin (2007) empirically examined the relationship between financial liberalization and financial development using the time series data of Malaysia. Empirical findings suggested that real interest rate and financial repression have negative impact on financial development, by removing the repressive policies financial liberalization promotes country's financial sector.

Pradhan (2010) considers the relationship between the financial development, the economic growth and the poverty reduction in India through time series data covering the period 1951- 2008. It shows the existence of long-term equilibrium between financial development, economic growth and pov-

erty reduction relationship. It also concludes the existence of direction causality of poverty reduction to economic growth, economic growth to financial development, economic growth to poverty reduction and financial development to poverty reduction. It concludes that financial development and economic growth have a contribution to reducing poverty. Uddin *et al.* (2012) examined the causal relations between financial development and poverty reduction, in the case of Bangladesh, using data over the period of 1976-2010. These auteurs applied the VECM Granger causality for long run and ARDL bounds test approach. Their results confirm the existence of relation of cointegration between the variables and causal effect between financial development and poverty reduction.

Singh and Huang (2015) argue financial development would contribute to equalize opportunities by reducing the importance of initial wealth and then would favor the poor and this is possible, if financial markets were perfect, and would allow individuals to fund education, training or business opportunities. In the same case, in Pakistan, Shahbaz and Rehman (2013) find that financial development causes poverty reduction. The second view maintains that it is economic growth that drives the development of the financial sector. The third-view examined the existence of bi-directional causality between financial development and economic growth.

Moreover, all mechanisms dependent on economic structures and policies. Some empirical studies (Honohan, 2004; Quarey, 2005; Odhiambo, 2009; Selim Akhter, 2010; Sin-Yu and Odhiambo, 2011; Azra *et al.*, 2012 and Gazi *et al.*, 2012) show a positive and robust link between financial development and poverty reduction. Other studies find that the positive effects of financial development are undermined by growing inequalities caused by inequality in distribution of the positive results of growth (Galor and Zeira, 1993 and Rajan and Zingales 2003). These studies show that many barriers of access to finance can be the main cause of the persistent of income inequality and extreme poverty.

Shahbaz and Kirkpatrick (2001) tested the relationship between financial development and poverty through the growth channel. They conclude that one unit change in financial development leads to a 0.4 per cent change in the growth rate of the poor incomes, considering that there are no direct effects. The study of Kopar (2006) showed that the effect of 20% points increased in M3/GDP ratio have consequence a decline in poverty incidence of 7.4. per cent points and also decrease by 0.42 points induced by financial instability.

Dhrifi (2013) analyzed the effect of financial development on poverty reduction using a model of simultaneous equations on a sample composed of 89 countries over the period 1990-2011. He took into account a model based on a trilateral relationship linking economic growth, inequality and poverty. To do this, the author explains that the effects of financial development on poverty reduction can be decomposed into two opposite effects: a growth effect and a disparity effect. The results show that while the indirect effect of financial development on poverty is not robust and ambiguous, the direct effect of financial development, through the channels of insurance, access to credit services and savings, is robust to reducing poverty. This effect also depends on the magnitude and sign of the effects of financial development

on inequality and growth. The author used a financial development indicator constructed from three measures of financial development using the principal factors method (PCF): the ratio of M2 to nominal GDP, domestic credit to the private sector relative to GDP and domestic credit provided by the banking sector to GDP. Dhrifi (2013) notes that institutional quality is an important determinant of the relationship between financial development and poverty reduction.

Bushra Kheir (2018) studied empirically the impact of financial development on poverty reduction via gross domestic product (GDP) growth in Egypt, over a period from 1980 to 2015 and using the autoregressive distributed lag approach. The author used two specifications, the first depends on poverty by the domestic credit/private sector ratio (percentage of GDP) and the second depends on poverty by the ratio of liquid liabilities to GDP or M3/GDP. It shows that the development of the financial sector in Egypt should reduce the level of poverty by widening access to financial resources to the poor. In this sense the government must encourage banks to grant loans for this segment of households. Thus, financial development enables these poor households to accumulate assets and thus enables them to increase their level of future income. The long-term causality study shows that the relationship between economic growth and poverty is bidirectional. In addition, financial development and poverty (measured by household final consumption expenditure per capita) are complementary and bidirectional (in the Granger sense). As for the short term, the study finds bidirectional causality between financial development (real domestic credit to the private sector per capita) and poverty reduction.

Boukhathem (2016) studies the direct contribution of financial development to poverty reduction in 67 low- and middle-income countries over the period 1986-2012. Using the GMM estimation method, it attempts to quantify and identify the channels in which development affects poverty. The results obtained suggest the important contribution of financial development to poverty reduction. On the other hand, the instability linked to financial development would penalize the poor population and would annihilate the positive effects of development. The financial development indicators used in the study are the M3/GDP ratio and bank loans to GDP. He finds that the variables of the level of GDP per capita and the level of financial development (M3/GDP) are negatively and significantly correlated with the poverty gap. More specifically, any increase in the level of GDP per capita or the liquidity ratio leads to a reduction in the poverty gap leading to a reduction in poverty. Also, the logarithm of GDP per capita and the bank credit/GDP ratio are negatively correlated with the poverty gap. However, the impact of the bank loans to GDP ratio is not significant. The author questions pro-poor public investment policy in low- and middle-income countries.

Le et al. (2016), for a sample of Asian countries, and Muye and Muye (2017), for various regional blocs, estimate a significant impact of institutions on financial development and economic growth, especially in developing economies.

The study of Donou-Adonsou and Sylwester (2016) analyse the extent to which banks and the presence of microfinance institutions reduce poverty. They involve the approach of instrumental variables, namely double least squares with

fixed effects, to a panel of 71 developing countries over the period 2002-2011. They develop the growth-poverty model proposed by Ravallion (1997) and Ravallion and Chen (1997). Adams and Page (2005) used this model to study the impact of international migration and remittances on poverty in developing countries. Using credit to GDP as the main indicator of financial development, results from the work of Donou-Adonsou and Sylwester (2016) indicate that banks reduce poverty when poverty is measured by the staffing ratio and the gap of poverty. As for the squared poverty gap, there is no significant effect of the banks. On the other hand, microfinance does not seem to have an impact on poverty, whatever poverty measure is used. These results mean that while banks have some ability to reduce poverty, this is not the case for microfinance institutions. On the other hand, the link is robust when they use assets relative to GDP as an alternative measure of financial development.

The work of Jalilian and Kirkpatrick (2002), Beck et al. (2008), and Jeanneney and Kpodar (2011) find that financial development promotes growth which then reduces poverty. They find that bank credit reduces poverty when poverty is measured by the headcount ratio and the poverty gap. These results support those of Honohan (2004), Jalilian and Kirkpatrick (2005), Beck et al. (2007), Jeanneney and Kpodar (2011), and Sehrawat and Giri (2015), who also find that financial development reduces poverty.

The endogenous growth model of Greenwood and Jovanovic (1990) shows that the poor must pay fees to participate in the formal financial market. Failure to pay these fees prevents the poor from taking advantage of financial sector opportunities.

Odhiambo (2009) examined the causal relationship between finance, growth and poverty reduction in South Africa, using a three-variable causality model. He indicated that financial development and Granger economic growth cause poverty reduction in South Africa Quartey (2005), examining the relationship between financial development, savings mobilization and poverty reduction in Ghana, finds that although financial development does not Granger cause mobilization of savings in Ghana. Jalilian and Kirkpatrick (2001) tested the relationship between financial development and poverty through the growth channel. They concluded that a unit shift in financial development results in a 0.4 percent decrease in the growth rate of the incomes of the poor, assuming no direct effects. Furthermore, they found that financial development contributes to poverty reduction through a stimulating effect on growth up to a certain threshold of economic development.

## **2.2. Non-linear Relationship between Financial Development and Poverty**

Theoretical study advocate that financial development contributes to poverty reduction: first, in a direct way by savings, insurance services and access to credits that can enhance the productivity for poor by allowing them to productive investment. Financial development can improve opportunities for the poor to access to formal finance (Jalilian and Kirkpatrick, 2001). But, the direct relationship between financial development and poverty reduction depends on fi-

financial instruments, services and institutions available for poor (Holden and Prokopenko, 2001).

Second, in indirect way, by improving productivity and increasing the potential to achieve sustainable gains (Jalilian and Kirkpatrick, 2001), financial system facilitates the poor to access financial services, particularly credit and insurance risk, improving the resources of them. However, the problem is how to provide financial services to poor households on a sustainable basis (Robinson, 2001 and Gonzalez, 2003).

However, the economic literature developed from this perspective shows that the poor are often barriers in their access to financial services. Financial development can also contribute indirectly to reducing poverty through its impact on economic growth, in addition to its direct effect on poverty reduction (World Bank, 2001).

Fan et al. (2000), Ravallion and Datt (2002) and Uddin et al. (2014) found that a long-term relationship between financial development, economic growth and poverty reduction exists in Bangladesh, and financial development helps to reduce poverty, but its effect is not linear.

Many studies conclude that the evolution of the formal financial system has no direct effect on income of the poor, that these have no access to financial services, other than that through growth. Greenwood and Jovanovic (1990) show that Bank credits may be hindered by high interest costs of small loans and asymmetric information. Holden and Prokopenko (2001) show the existence of situations where coexist in the same time high rate of economic growth and no reduction in poverty. For some economies, a high growth rate does not translate into poverty reduction. In this case, there is no guarantee that this supplement potential of growth drained by financial development benefits the poor. This phenomenon is explained by the increase of the inequality of income distribution that goes with the increased growth rate caused by the financial development. Really, the poor, who constitute the most deprived parts of the society, lack the necessary guarantees and are therefore excluded from the formal financial system. The bank prefers give loans and facilities to households and rich, who have adequate safeguards, for profit reasons and less risk. Only the wealthiest households can borrow and grow because of imperfections in the financial system.

The work of Uddin et al. (2013) examines the relationship between financial development, economic growth, and poverty reduction in Bangladesh using quarterly data over the period 1975-2011. Using the ARDL approach, the empirical results indicate the presence of a long-term relationship between financial development, economic growth and poverty reduction in Bangladesh. These authors applied a financial development index borrowed from Hye and Islam (2012). They generated a comprehensive index of financial development from the various financial development proxies (liquid liabilities, domestic credit provided by banks, percentage of GDP, domestic credit to the private sector, percentage of GDP, money plus quasi-money divided by money and market capitalization of listed companies, percentage of GDP).

Financial development has an indirect impact on the standard of living of the poor through its support of economic growth (World Bank, 2001). Clark et al. (2002) are of the opinion

that there is a negative relationship between financial development and income inequality rather than an inverted U-shaped relationship but Greenwood and Jovanovich, (1990) noted an inverted U-shaped relationship between financial development and income inequality.

Kiendrebeogo (2011) proposes to assess the implications of the development of the financial system on poverty reduction in WAEMU and to highlight possible threshold mechanisms in the relationship studied from theoretical and empirical analyses. The results obtained from panel data for a sample of seven countries in the Zone over the period 1981-2005 show that financial deepening is a reducing factor of monetary poverty in the Union. Moreover, taking other developing countries into account in the sample reveals that there are threshold mechanisms in the relationship between financial deepening and poverty. These results are robust to the introduction of additional control variables.

Kamdem (2019) sets out to empirically assess the influence of financial development on monetary poverty in Cameroon over the period 1970-2017. The results of the estimates show that, on the one hand, financial intermediation does not significantly combat monetary poverty in Cameroon. On the other hand, economic growth, the added value in the agricultural sector and the level of private investments make it possible to significantly reduce poverty. The author is inspired by the poverty model of Kpodar (2006) reformulated by Kiendrebeogo (2010) in the analysis of the effects of financial development on poverty in WAEMU. Poverty is not declining significantly in Cameroon despite the measures put in place by the public authorities. This, according to the author, shows that little attention has been paid to the development of financial systems as an effective tool in the fight against poverty. Thus monetary poverty is correlated in various ways with indicators of financial development. Thus, there is a positive and significant correlation between the liquidity indicator of the system and the measurement of monetary poverty. Similarly, the correlation is positive between credit to the private sector and the monetary poverty indicator used; but the associated coefficient is not robust. In the long term, financial development can negatively influence poverty. Taking the examples of Mexico and the United States, Haber (2005) asserts that the financial system can contribute to growth without its impact on income distribution being really determined.

Although the trickle-down effect theory, developed by Aghion and Bolton in 1997, shows that the accumulation of capital by the rich can benefit the poor, this is in fact only possible without the implementation of a redistribution policy to increase long-term economic efficiency.

According to Guillaumont and Kpodar (2006), financial system disruptions and bank closures have much more serious effects on the poorest individuals. The freezing of deposits is particularly detrimental to the poor since they cannot diversify their assets and in particular invest their savings in foreign banks. Financial instability induces instability in investment and growth rates. During this period of instability, the incomes of the poor fall especially in periods of growth, Janvry and Sadoulet (2000) analyze 12 Latin American countries to highlight this phenomenon.

Jalilian and Kirkpatrick (2001) econometrically tested the relationship between financial development and poverty reduction through the growth channel in 25 developed and developing countries. The use of a log-linear model and the application of two estimation techniques (ordinary least squares and double least squares) allowed them to conclude that a change of one percentage point in financial development is synonymous with 0.4% change in the growth rate in the income of the poor.

The study by Jeanneney and Kpodar (2004) aims to show that financial development has two positive effects on poverty. The first positive effect is direct via McKinnon's "conduit effect". The second positive effect is indirect through the channel of economic growth. This study also shows that financial development simultaneously leads to financial instability which is not favorable to the poor. For their work, two indicators of monetary poverty were used: the average income of the poorest 20% of the population and the share of individuals living on less than one dollar a day in percentage of the total population. The logarithm of per capita income is the variable used to account for the impact of economic growth on poverty. McKinnon's "conduit effect" is captured by the M3 to GDP ratio, while financial instability is represented by the average difference in the growth rate or the average of the residuals in absolute value of this indicator. The study was carried out for a sample of developing countries over the period 1966-2000. Estimates were made by ordinary least squares and the system generalized method of moments. From his work, the author draws three conclusions: first, financial instability and financial development go hand in hand, second, financial instability affects the income of the poor and finally financial development is pro-poor.

### 3. DATA AND STYLIZED FACTS

The study proposes to examine the relationship between financial development, economic development and poverty for a panel of 49 countries over the period 2004-2017. The data are annual and cylindrical. The variables are real GDP per capita, in logarithm (Lgdp. Source: WDI), poverty headcount ratio at 1.9\$ a day (Pov\_head. Source: Poverty and equity database, World Bank), ratio of liquid liabilities to GDP (Llgdp. Source: Financial development and structure dataset), private credit by deposit money banks to GDP (Credit. Source: Financial development and structure dataset), deposit money bank assets to GDP (Actif. Source: Financial development and structure dataset), government final consumption expenditure to GDP (G. Source WDI), gross fixed capital formation to GDP (Inv. Source WDI), export plus import to GDP (Trade. Source WDI), inflation measured by the GDP deflator (Inf. Source WDI) and political stability (Ps. Source: WGI).

The descriptive statistics (Table A2-Appendix) show that, on average, the total sample displays an Lgdp equal to 11.16, a poverty rate equal to 2.27%, a financial development of 66% to 75% and a political stability index equal to 0.28. A remarkable difference in these indicators is observed between poor countries (Lgdp below 10) and rich countries (Lgdp above 10). For the latter, the poverty rate is 1.2%, or 2.91% lower than that of poor countries; the financial development indicator is between 75% and 88% against 50% and 61%

only for poor countries. For the latter, the index of political stability is 10 times lower than that of rich countries.

Remarkable differences are also observed between countries that do not have the same level of financial development. Indeed, countries that have crossed the 50% threshold for the Credit indicator have, on average, a poverty rate equal to 0.89% against 3.84% for countries with relatively low financial development. The political stability indicator is 0.6 for the former against (-0.07) for the other countries.

These observations show that, on the whole, countries with a developed and/or wealthy financial system have low poverty rates. A question about the nature of the relationship between financial development, economic development and poverty can be asked. Is the relationship linear or do threshold levels associated with financial development and/or economic development intervening to influence said relationship?

## 4. MODEL SPECIFICATION AND ESTIMATION RESULTS

Wang (2015) notes that heterogeneity is a common problem for panel data. Traditional methods (fixed effects and random effects) capture this heterogeneity only in the intercept. However, it is possible that heterogeneity intervenes to influence structural relationship between variables. In this case, a non-linear specification is more plausible.

Using a PTR model, developed by Hansen (1999), we propose to verify that the relationship between financial development, economic development and poverty may be non-linear. We have to identify, endogenously, the thresholds associated to financial development and economic development that separate distinct growth regimes.

### 4.1. Model Specification

The PTR model proposes the following specification:

$$\text{Pov\_head}_{it} = \alpha_i + \beta X_{it}(q_{it}, \gamma) + \varepsilon_{it} \quad (1)$$

" $\alpha_i$ " denotes the individual fixed effects. " $X_{it}$ " is the matrix of independent variables; coefficients are given by the matrix " $\beta$ ". The latter is a function of the threshold(s) ( $\gamma$ ) associated to the transition variable ( $q_{it}$ ). " $\varepsilon_{it}$ " is the error term. In the case of a single threshold (two regimes), equation (1) is reformulated as follows:

$$\text{Pov\_head}_{it} = \alpha_i + \beta_1 X_{it} I(q_{it} \leq \gamma) + \beta_2 X_{it} I(q_{it} > \gamma) + \varepsilon_{it} \quad (2)$$

In this equation "I(.)" is an indicator function. The proposed specification considers " $\beta_i$ " as a function of the threshold ( $\gamma$ ) associated to the transition variable " $q_{it}$ ". The coefficient matrix is " $\beta_1$ " if " $q_{it} \leq \gamma$ "; it is " $\beta_2$ " if " $q_{it} > \gamma$ ". The threshold ( $\gamma$ ) separates, thus, two distinct growth regimes. Each regime is characterized by linear growth dynamics. When the threshold " $\gamma$ " is reached, the PTR model considers that the transition from one regime to another is brutal (in the same period).

Hansen (1999) considers that in order to estimate " $\gamma$ ", we should search on a subset of the transition variable " $q_{it}$ ". Instead of searching on the entire sample, " $\gamma$ " is restricted to the interval  $(\gamma, \bar{\gamma})$  which are quantiles of " $q_{it}$ ". The estimator of " $\gamma$ ", i.e. " $\hat{\gamma}$ ", is that which minimizes the residual sum of

**Table 1. Estimation Results of the Linear Model.**

Pov_head	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat
Lgdp	- 0.118*	- 1.92	- 0.121**	- 1.98	- 0.139**	- 2.28
G	- 0.198***	- 5.15	- 0.191***	- 4.92	- 0.239***	- 6.66
Inv	- 0.062**	- 2.31	- 0.063**	- 2.36	- 0.066**	- 2.46
Inf	- 0.056***	- 2.72	- 0.058***	- 2.81	- 0.048**	- 2.38
Ps	- 2.144***	- 9.70	- 2.122***	- 9.58	- 2.074***	- 9.67
Trade	0.002	0.83	0.002	0.79		
Credit	- 0.008**	- 2.17				
Actif			- 0.009**	- 2.46		
Llgdp					- 0.002*	- 1.74
C	9.643***	7.82	9.742***	7.91	10.49***	8.38

\*\*\*, \*\* and \* denote significance at 1%, 5% and 10%, respectively.

squares. If "γ" is known, the model is estimated by the ordinary least squares method.

Before adopting a non-linear structure, we should verify if the model is linear or not. This amounts to testing the H0 hypothesis against the H1 hypothesis:

H0: β1 = β2. Linear model; H1: β1 ≠ β2. Non-linear model.

The F-statistic is constructed as:  $F = \frac{S_0 - S_1(\hat{\gamma})}{\hat{\sigma}^2}$ . "S0" and

"S1" are the residual sum of squares  $\hat{\sigma}^2$  under, respectively, the null and alternative hypothesis. The null hypothesis is rejected if the F-statistic is higher than the simulated critical values. When non-linearity is verified, we have to estimate the threshold(s) associated to the transition variable. It is possible that the transition variable has more than one threshold level. In the case of two thresholds (three regimes) equation (2) is reformulated as follows:

$$Pov\_Head_{it} = \alpha_i + \beta_1 X_{it} I(q_{it} \leq \gamma_1) + \beta_2 X_{it} I(\gamma_1 < q_{it} < \gamma_2) + \beta_3 X_{it} I(q_{it} > \gamma_2) + \varepsilon_{it} \tag{3}$$

Estimating the number of regimes amounts to testing the following hypotheses:

H0: β3 = 0. Two-regime model; H1: β3 ≠ 0. Three-regime model

The F-statistic is constructed as:  $F = \frac{S_1(\hat{\gamma}_1) - S_2(\hat{\gamma}_1, \hat{\gamma}_2)}{\hat{\sigma}^2}$

"S2" is the residual sum of squares for the three-regime model. The null hypothesis is rejected if F-statistic is higher than the simulated critical values.

**4.2. Estimation Results**

Before proceeding to estimation, it is necessary to test the stationarity of the variables and examine the correlation between them. Stationarity is examined by referring to the unit

root test of Levin and al. (2002). The results (Table A3-appendix) indicate that all variables are stationary. The covariance matrix (Table A4-appendix) shows the absence of any correlation between the independent variables, except the correlation between "Llgdp" and "Trade". The estimation results of the linear model are presented in Table 1.

Overall, the linear model results confirm the theoretical predictions. Indeed, the main results used show that average wealth, public spending, investment, inflation and political stability contribute to a significant reduction in poverty. The effect of trade openness on poverty is not significant. Note that the results show that poverty reduction is strongly linked to political stability and public spending. Indeed, the poverty rate drops by approximately 2% if the political stability index increases by one unit or public expenditure increases by 10%.

The most important result is that relating to the effect of financial development. It shows that whatever the financial development indicator, the latter makes it possible to reduce poverty. The drop is 0.02% to 0.09% depending on the indicator used, if the latter increases by 10%. The negative relationship between financial development and poverty is similar to that retained by numerous studies (Jalilian and Kirkpatrick, 2001; Kapor, 2004; Jeanneney and Kpodar, 2011; Uddin et al., 2012 and Kheir, 2018). This work distinguishes the direct effects from the indirect effects, via economic growth, of financial development on poverty.

However, it should be noted that these results should be interpreted with caution; in fact, many studies have managed to show that the relationship between financial development, economic development and poverty can be non-linear ((Deidda and Fatouh, 2002; Aghion et al., 2004; Kpodar, 2006 and Uddin et al., 2014).

The linearity test conducted us to reject the null hypothesis and to retain a non-linear relationship between financial development, economic development and poverty. Table 2 shows the identified thresholds that separate different growth regimes.

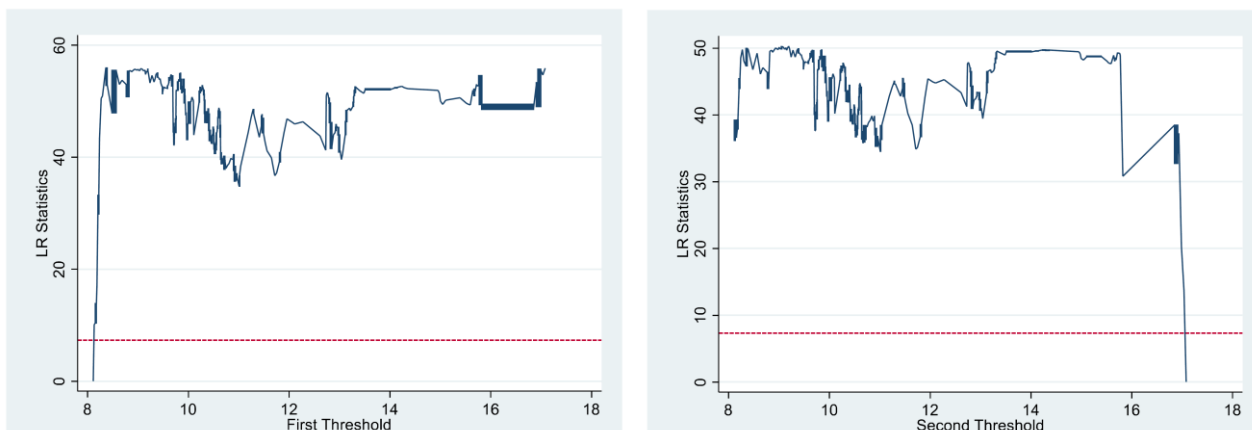


Fig. (1). Confidence interval. Thresholds associated to Lgdp.

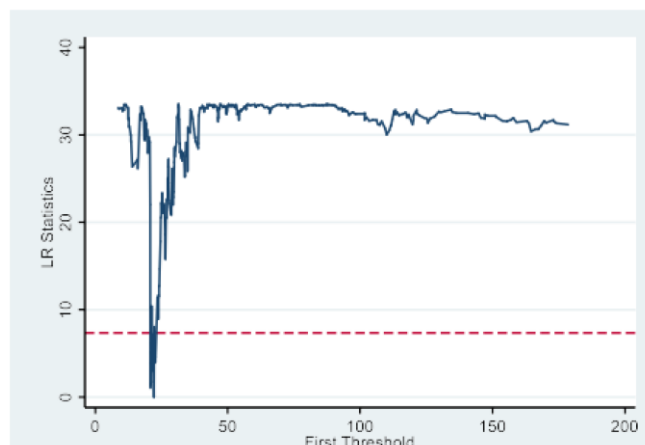


Fig. (2). Confidence interval. Threshold associated to the Credit.

Table 2. Estimation of Threshold Levels.

	Threshold	F-stat	Prob
Transition Variable : Lgdp			
First Threshold	8.11	55.51	0.082
Second Threshold	17.08	42.26	0.097
Transition Variable : Credit			
First Threshold	22.12	33.03	0.087

We identify three growth regimes associated to **Lgdp**. The first is characterized by an **Lgdp** below 8.11; the second corresponds to an **Lgdp** between 8.11 and 17.08; the third corresponds to an **Lgdp** beyond 17.08. For the financial development, the results estimate two growth regimes separated by a threshold equal to 22.12. Figs. (1 and 2) show the confidence intervals of the identified thresholds.

The estimation results of the nonlinear model are reported in Table 3. Compared to the linear model, these results show a positive and non-significant effect of inflation on poverty; the effect of trade openness is positive and significant. The extent of political stability on poverty, always negative and significant, is less important.

Model 1 highlight that the effect of financial development on poverty is a function of the level of economic development. Indeed, financial development leads to aggravation of poverty in poor economies. As the country accumulates wealth, the positive effect of financial development on poverty becomes uncertain (the effect is negative and not significant). Once the country succeeds in crossing the threshold of 17 for the Lgdp, financial development begins to significantly reduce the poverty rate; from this threshold, an increase in the financial development indicator of 10% would have reduced the poverty rate by 1.09%; this effect is more than 13.5 times greater than that of the linear model. This result suggests that while, on average, financial development contributes to poverty reduction, its effect is accelerated by economic development.

Model 2 shows that the relationship between financial development and poverty is based on a threshold level associated with financial development. Indeed, financial development contributes to increasing poverty for countries with relatively low financial development. The relationship is negative (or even absent) but not significant above the threshold level.

The results of the estimates conclude, therefore, that threshold levels associated with financial development and economic development are necessary to have a significant reduction in poverty.

**Table 3. Estimation Results of the Non-linear Models.**

Pov_head	Model 1: Thresholds Associated to Lgdp		Model 2: Threshold Associated to Credit	
	Coefficient	T-Stat	Coefficient	T-Stat
Lgdp	- 8.290***	- 15.91	- 8.306***	- 15.09
G	- 0.194***	- 4.04	- 0.219***	- 4.44
Inv	- 0.073***	- 4.27	- 0.084***	- 4.80
Ps	- 0.884***	- 3.55	- 1.164***	- 4.66
Inf	0.005	0.45	0.009	0.77
Trade	0.010**	2.13	0.008*	1.69
Credit				
0	0.079***	6.07	0.076***	5.15
1	- 0.002	- 0.64	- 0.0003	- 0.08
2	- 0.109***	- 5.95		
C	99.213***	16.96	100.034***	16.18

\*\*\*, \*\* and \* denote significance at 1%, 5% and 10%, respectively.

This result is justified by Kpodar (2004) by considering if the financial system is developed, it may extend its services to the poor. Financial development promotes poverty reduction indirectly through its effects on growth (Boukhatem and Mokrani, 2012); however, the positive effects of financial development on growth are verified only from an income threshold (Kpodar, 2004).

Various channels account for the effects of financial development and economic development on poverty reduction. In fact, a threshold level associated with financial development is necessary to enable the poor to promote their access to the financial system, reduce transaction costs, improve the quality of information and ensure geographical coverage. Financial development offers attractive deposit opportunities for the poor to facilitate the creation of their own businesses and improve their incomes (Aghion et al., 2004 and Kpodar, 2006). A threshold level for financial development is needed, too, to allow banks to rationalize risks and compress their costs leading, finally, to put its services to the benefit of the poor. These mechanisms are conducive to the gradual integration of the poor into the formal financial system, which eventually leads to them being able to cross the poverty line.

## 5. CONCLUSION AND POLICY IMPLICATION

A large amount work has been done on the effect of financial development on poverty. Studies have generally provided evidence of pro-poor impact from financial development. A part of these studies estimates a direct effect, justified by the fact that financial development facilitates access to financial services; these services facilitate transactions and provide the opportunity to accumulate assets and smooth incomes (Stiglitz, 1998; Zhuang et al., 2009; Donou-Adonsou and Sylwester, 2016 and Boukhatem, 2016). Other studies suggest that financial development reduces poverty indirectly, via economic development (Federici and Caprioli, 2009; Kabir et al., 2011; Barajas et al., 2013 and Boshra, 2018).

The objective of our study is to empirically verify that the relationship between financial development and poverty (i) is non-linear and (ii) is dependent on economic development. For a sample of 49 countries over the period 2004-2017, using the PTR model developed by Hansen (1999), we proposed to estimate the threshold effects associated to financial development (private credit by deposit money banks to GDP) and economic development (real GDP per capita, in logarithm) that condition the impact of financial development on poverty (poverty headcount ratio at 1.9\$ a day).

From the study, there are many important findings. First, the financial development contributes to increase poverty in poor economies. As the country develops, the positive effect of financial development on poverty becomes uncertain. Once the country exceeds the threshold of 17.08, for the development economic, financial development contributes to reduce poverty; up to this threshold, if the financial development increases by 10%, poverty would have decreased by 1.09%.

Second, the relationship between financial development and poverty is a function of a threshold level associated to financial development (equal to 22.12). Indeed, for countries with relatively low financial development, financial development contributes to increase poverty. The relationship is negative (or absent) and not significant above the estimated threshold.

Third the variable of trade is positive and promotes the growth and increase the poverty (Bardi and Hfaied (2021)) and investment variable reduce the poverty and increase the economic growth (Bardi et al (2019) and Ayouni and Bardi (2018)) in our sample of countries.

These results conclude that threshold levels associated to financial development and economic development are necessary to have significant poverty reduction; as the financial system develops, it may extend its services to the poor; financial development promotes poverty reduction indirectly via its effects on growth; however, the positive effects of



financial development on growth are verified only above an income threshold (Uddin et al., 2014, Jalilian, 2005 and Kpodr, 2004).

Thus, economic policies aiming to promote financial development and encourage the investment are necessary in pov-

erty reduction strategies; these economic policies must be sufficient to place the economy above the thresholds and successfully fight poverty.

## APPENDIX

**Table A1. List of Countries.**

<b>Argentina</b>	<b>Denmark</b>	<b>Greece</b>	<b>Kyrgyz Rep.</b>	<b>Paraguay</b>	<b>Sweden</b>
Armenia	Dominican R.	Honduras	Latvia	Peru	Switzerland
Austria	Ecuador	Hungary	Lithuania	Poland	Thailand
Belarus	El Salvador	Iceland	Luxembourg	Portugal	Turkey
Belgium	Estonia	Indonesia	Moldova	Russian Fed.	Ukraine
Bolivia	Finland	Ireland	Netherlands	Slovak Rep.	United King.
Brazil	France	Italy	Norway	Slovenia	United States
Costa Rica	Georgia	Kazakhstan	Panama	Spain	Uruguay
Czech Rep.					

**Table A2. Summary and Descriptive Statistics.**

	<b>Whole Sample</b>	<b>Lgdp&lt;10</b>	<b>Lgdp&gt;10</b>	<b>Credit&lt;50</b>	<b>Credit&gt;50</b>
<b>Nbr. Obs</b>	686	253	433	321	365
<b>Lgdp</b>	11.16	9.27	12.26	11.31	11.03
<b>Pov_head</b>	2.27	4.11	1.20	3.84	0.89
<b>Credit</b>	66.66	51.86	75.31	30.86	98.14
<b>Actif</b>	75.83	61.40	84.26	36.90	110.06
<b>Llgdp</b>	74.80	50.91	88.76	37.58	107.53
<b>Ps</b>	0.28	0.04	0.42	-0.07	0.60

**Table A3. Unit Root Test.**

	<b>Statistic</b>	<b>P-value</b>
<b>Lgdp</b>	- 4.7	0.000
<b>Pov_head</b>	- 59.7	0.000
<b>G</b>	- 6.3	0.000
<b>Inv</b>	- 7.4	0.000
<b>Inf</b>	- 5.3	0.000
<b>Trade</b>	- 5.0	0.000
<b>Ps</b>	- 5.6	0.000
<b>Credit</b>	- 6.6	0.000
<b>Actif</b>	- 6.3	0.000
<b>Llgdp</b>	- 4.7	0.000

Table A4. Correlation Matrix.

	Pov_head	G	Inv	Trade	Inf	Ps	Llgdp	Credit	Actif	Lgdp
Pov_head	1.000									
G	- 0.393	1.000								
Inv	- 0.008	- 0.245	1.000							
Trade	- 0.145	0.128	0.121	1.000						
Inf	0.113	- 0.266	0.127	- 0.105	1.000					
Ps	- 0.503	0.468	- 0.045	0.351	- 0.330	1.000				
Llgdp	- 0.177	0.079	- 0.154	0.623	- 0.183	0.325	1.000			
Credit	- 0.346	0.538	- 0.133	0.113	- 0.391	0.479	0.304	1.000		
Actif	- 0.359	0.566	- 0.157	0.111	- 0.404	0.491	0.300	0.980	1.000	
Lgdp	- 0.092	- 0.089	0.057	- 0.062	0.022	0.091	- 0.026	0.033	0.006	1.000

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