Does Foreign Direct Investment Contribute to Poverty Reduction in Cameroon? An ARDL-Bounds Testing Approach

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Abstract: This paper investigates the impact of Foreign Direct Investment (FDI) on poverty reduction in Cameroon from on the period 1984-2014. Auto Regressive Distributed Lags (ARDL) bounds test approach to co-integration has been applied to analyze the data coming from freedom house and World Development Indicators (WDI). Three poverty reduction proxies namely life expectancy, per capita household consumption expenditure and infant mortality rate are used to capture multidimensional feature of poverty and to increase the robustness of the results. The findings revealed that the impact of FDI to alleviate poverty is less significant in Cameroon as evidenced by one out of three (infant mortality) poverty reduction proxies where a short-run positive impact of FDI on poverty reduction is confirmed. These findings suggest that Cameroon may use FDI as a short-term poverty reduction instrument.

JEL Classifications: F21, I30

Keywords: Foreign direct investment; poverty reduction; co-integration; autoregressive distributed lag; Cameroon.

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1. Introduction

In some Asian Developing countries, Foreign Direct Investment (FDI) is always presented as a main source of technology acquisition and modernization, economic development, employment, and consequently poverty reduction. The importance given to the FDI within the process of growth and development pushed several African countries to set up the incentive measurements to attract foreign investments.

Many theoretical studies try to show that the impact of FDI on poverty reduction can be direct or indirect. The indirect impact of FDI on poverty reduction passes through economic growth. It is asserted that the higher the economic growth rate, the higher the living standard, and the lower the poverty indicators. The direct impact is explained by its impact on jobs creation, development of the human capital (investment in the healthcare, education, sanitation equipment, water provision systems, etc.).

Nevertheless, the empirical literature on the relationship between foreign direct investment and poverty reduction is very far from being consensual. For instance, Gohou and Soumaré (2012) provided evidence that FDI is positively associated with poverty reduction in African countries. Fayyaz and al. (2019) presented similar cross-national evidence in the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) Economies. However, many other studies have reported a negative or insignificant impact of FDI on poverty reduction (See Huang et al., 2010; Quiñonez and al., 2018). Divergent results from empirical works suggest the necessity to consider the relationship between FDI and poverty reduction country by country. In fact the effects of FDI on poverty reduction can be different across countries due to their different economic, social and institutional conditions. These contradictory empirical results justify the present paper carried out specifically in the Cameroonian context where we want to check if FDI has significant impact. To the best of our knowledge, it is the first study till date which investigates the impact of FDI on poverty reduction in Cameroon. The study on the FDI and poverty reduction nexus in Cameroon could contribute to the ongoing debate and also give insight on poverty reduction policies in Cameroon.

At the beginning of the 80s, Cameroon was among the most prosperous countries in Africa from an economic, social and political standpoint. Until 1985 and during more than two decades of regular growth, the Cameroonian economy recorded real growth rates of 7%. The following years were characterized by a strong recession caused particularly by the fall of cocoa, coffee and oil prices. With the crisis which was declared in 1985, sanctioned by the devaluation of the years 1994, the country was put under structural adjustment. The Structural Adjustment Programs (SAPs) did not succeed either in stabilizing the heavy tendencies to imbalance nor to boost the economic growth. These programmes dramatically worsened the crisis by giving it a social dimension with an increase of the poor's number.

In fact poverty is a multidimensional phenomenon. It can be characterized by the monetary aspect and illustrates the capacity for individuals and households to satisfy their basic needs. It can also be characterized by a non-monetary aspect with taking in to account some household material assets like house characteristics and equipment. As indicated by United Nations Development Program (UNDP, 2016), Cameroon is classified among the set of countries with an average Human Development Index (HDI) of 0.50. According to the World Bank (2019), life expectancy at birth is increasing but it remains inferior to that of

many developing countries in Asia, for example. The monetary poverty incidence decreased from 56.4 percent in 1996, to 40.2 percent in 2001, 39.9 percent in 2007, and 37.5 percent in 2014 (National Institute of Statistics, INS, 2014)[4]. For sure, poverty rates shrunk in urban zones on the same period. However, the situation worsened in rural regions where the poverty incidence increased from 52.1 percent in 2001 to 55.0 percent in 2007, and 56.8 percent in 2014 (INS, 2014).

When Cameroon attained the decision point of the enhanced Heavily Indebted Poor Countries Initiative (HIPC) in October 2000, the government prepared three Annual Progress Reports (APRs) of the Poverty Reduction Strategy Paper (PRSP). The Cameroonian authorities worked out, according to a participatory approach, its first Poverty Reduction Strategy Paper on April 2003 (Republic of Cameroon, 2003). The main objective was to significantly reduce poverty with a strong and sustained economic growth. However, the persistence of poverty and inappropriate implementation and management of the PSRP led to a new document, the Growth and Employment Strategy Paper (GESP) in 2009 and confirmed the objective of reducing poverty through strong economic growth (Republic of Cameroon, 2009).

The national policy on FDI is outlined in the GESP in which Cameroon targets an FDI level of 25% of Gross Domestic Product (GDP). The government seeks to attract FDI to diversify economy and intensify growth in line with the needs and expectations of its population. In this context, Cameroon passed a new investment code in 2013 which does not discriminate between local and foreign investors. It laid out tax exemptions, duties and other non-tax related benefits (Republic of Cameroon, 2013). In addition Cameroon outlined plan to radically improve its energy transportation, telecommunication and construction facilities in order to attract more FDI. Despite these reforms, the flows of FDI to Cameroon remain relatively low but steadily increasing. The country attracted 355.399 million USD, 739.177 million USD, 567.239 million USD and 726.547 million USD from 2011 to 2014, which is below the target of 25% of GDP in GESP (World Bank, 2019).

It is within this background that this study investigates the impact of foreign direct investment on poverty reduction in Cameroon from 1984 to 2014. The question at stake is whether there exists a significant link between FDI and poverty indicators in Cameroun. However, due to lack of time-series data on the poverty variable, we use in this study three poverty reduction proxies as to know infant mortality rate, life expectancy and per capita household consumption expenditure.

The remainder of the paper is organized as follows. Literature review is depicted in Section 2. Section 3 presents the model specification, the data and the methodology used. Section 4 exposes the empirical results and analysis, while Section 5 concludes.

2. Literature Review

2.1 Theoretical Link between FDI and Poverty Reduction

The analysis of the theoretical literature shows that FDI can impact poverty through social and economic side. On the social side, FDI improves welfare through its impact on job creation, infrastructural development and local skills development. On the economic side,

[4] The downward trend in poverty in Cameroon is confirmed using international poverty lines. The proportion of population living on less than $1.90 shrunk from 29.3 percent in 2007 to 24 percent in 2014 (World Bank (2019).

FDI enhances human capital, stimulates technological progress and increases labour productivity. Studies on the endogenous growth theory suggest that human capital and technological progress are the main driving force behind the economic development and the self-sustained growth in GDP per capita (Solow, 1956).

FDI may have also a direct or indirect impact on poverty reduction. The FDI can have direct impacts on poverty reduction via spillovers effects. The spillovers effect on private sector is stronger through "Vertical" and "Horizontal" linkages with local suppliers and local companies in the same industry in developing countries (Gorg and Greenaway, 2004; Sumner, 2005). Multinational Enterprises (MNEs) provide technical assistance, training and other information to improve the quality of the supplier's products, and transfer the modern technology to the local companies in the host country. At the end of this integrated movement, total factor productivity and economic growth increase and contribute to improving on individual and national welfare. Another channel of the direct impact of FDI consists of job creation, infrastructural and human capital development, increasing investment in basic social amenities of host country like better sanitation services and effective water provision systems.

The indirect impact of FDI on welfare is explained at the macroeconomic level. FDI leads to increase income per capita, thereby reducing poverty. However, the poor are likely share in the gain from inward FDI when there are complementary policies in the host country (Mbiankeu, 2020). Such complementary policies include human capital and infrastructure development, macroeconomic stability, better governance and institutions performance, financial development, etc.

2.2 Empirical Link between FDI and Poverty Reduction

Numerous authors have dedicated they studies to the impact of FDI on poverty reduction. Most of these empirical works have investigated the indirect impact of FDI on poverty, obtained through the economic growth channel (see Borensztein et al., 1998; Dollar and al., 2013; Basnet and Pradhan, 2014; Pegkas, 2015; Azman-Saini and al., 2010; Alfaro et al., 2004; Herzer, 2012; Li and Liu, 2005). The findings of these studies are ambiguous.

Nonetheless, recent studies analysing the direct impact of FDI on poverty emerged. Using the fixed effect regression, Sharma and Gani (2004) found that FDI has a positive impact on Human Development Index (HDI) in low and middle countries. Gohou and Soumaré (2012) have investigated this link on a sample of 52 African countries from 1990 to 2007. The two authors used the panel regression techniques to show that FDI has a positive impact on poverty reduction through her positive and significant impact on HDI and GDP per capital. The authors also showed that the results appear stronger in poor countries than in less poor countries. Fowowe and Shuaibu (2014) re-examined this relationship and found a significant contribution of FDI inflows to poverty reduction in selected African countries comforting the Gohou and Soumaré (2012) results. Likewise, Israel (2014) and Anigbogu and al. (2016) investigated the impact of FDI on poverty reduction in Nigeria and found a positive relationship between FDI and poverty reduction. The same results were reached at by Zaman and al. (2012), Shamim and al. (2014) and Khan and al. (2019) in their study concerning Pakistan. Hung (2005) confirmed a positive and significant indirect impact of FDI on poverty reduction running from FDI to economic growth and poverty reduction in Vietnam. More recently, Uttama (2015) found that FDI is favourable to poverty reduction

and that the effects of different variables vary in both individual and spatial dimensions. Soumare (2015) also found that FDI improves welfare in North African countries. Fayyaz and al. (2019) re-examined the relationship between FDI inflow and poverty reduction in the ASEAN and SAARC Economies. Using the pooled OLS and the fixed effect with instrumental variables, the authors have found a positive and significant relationship between FDI net inflows and poverty reduction in Asia. The results also showed that FDI has a greater impact on welfare in SAARC countries than in ASEAN countries.

Despite the up cited studies which found a positive impact of FDI on poverty reduction, emerging literature questions the solidity of this relationship. Among these studies, Ali and al. (2010) investigated the relationship between FDI and poverty reduction in Pakistan and found that FDI has an insignificant impact on poverty reduction. Ogunniyi and Igberi (2014) confirmed this evidence in Nigeria. Quiñonez and al. (2018) indicated that FDI is not significantly associated with poverty reduction in Latin America. Tsai and Huang (2007) found insignificant impact of FDI on poverty reduction in Taiwan. Bharadwaj (2014), using a panel data analysis of 35 developing economies, found that FDI inflows have had an adverse effect on the incidence of poverty and on the poverty gap of those countries. Lazreg and Zouari (2018) found a negative impact of FDI on poverty reduction in Tunisia. Huang et al. (2010) have found that FDI has a negative impact on poverty reduction in East Asian countries and Latin America.

As it can be noticed, empirical studies seem to reveal an unsettled debate on the relationship between FDI and poverty reduction. The results of the empirical studies are divergent. The results vary according to methodology, both individual and spatial dimensions. The effect of foreign direct investment on poverty reduction varies across countries. Consequently it is important to investigate the subject country by country.

3. Methodology

3.1 The co-integration analysis (ARDL)

To investigate the impact of FDI on poverty reduction in Cameroon, we adopted the Autoregressive Distributed Lags (ARDL) bounds testing approach developed by Pesaran and al. (2001). The choice of this method is justified by the advantages following: first, the ARDL is more flexible and presents the advantage of being applicable when all variables are I (0), I (1), or are mutually integrated (Pesaran et al., 2001). Secondly, the ARDL is robust when the sample size is small (Odhiambo, 2009; Solarin and Shahbaz, 2013). The time series length is just 31 years in this study. Thirdly, in applying the ARDL method we can't obtain biased estimators in the long run model (Harris and Sollis, 2003).

3.2 Data and sources

In this study we chose three dependent variables as proxies of poverty indicators. These dependent variables are life expectancy, infant mortality rate and per capita household consumption expenditure (positive, negative and positive proxies, respectively).

The choice of these variables to assess poverty reduction is based on several justifications. First, poverty in developing world focuses on individual satisfaction of 'basic needs' in the consumption of goods and services. Therefore, in developing countries per capita household consumption expenditure, which includes all kinds of expenditure of

goods and services, becomes a good proxy for poverty. Likewise, per capita household consumption expenditure has been used as a measure of poverty in several previous empirical works (see Odhiambo, 2016; Sehrawat and Giri, 2016a; Uddin and al., 2014). Similarly, the life expectancy and the infant mortality rate are robust proxies for poverty in developing countries like Cameroon where there is lack of sufficient food and health facilities quality. Moreover, the life expectancy at birth also increases with higher economic growth and welfare improvement in developing countries. The United Nations Children's Fund report (UNICEF, 2018) has pointed out that the life expectancy and the infant mortality rate are closely linked to a country's income level. Dursun and Ogunleye (2016), and Olagunju and al., (2019) have used life expectancy and infant mortality as proxies for welfare and poverty. Second, the advantage of using these variables is that the time dimension of the data is longer which makes them especially useful in this study.

The independent variable is FDI inflows as a proportion of GDP (FDI). The control variables are; the level of democracy measured by Freedom House's civil liberty index (CL), human capital (HK) captured by gross primary school enrolment rate and price level (CPI) captured by Consumer Price Index. The study employed annual time series data from 1984 to 2014. The civil liberty index comes from Freedom House (2017) and all the other are obtained from the World Development Indicators (2019).

3.3 Models

We employ three models to investigate the impact of FDI on poverty reduction in Cameroon. Model 1 explores the relationship between FDI and life expectancy (Pov1), the first proxy of poverty reduction. Model 2 examines the relationship between FDI and infant mortality rate the second proxy of poverty reduction (Pov2), and Model 3 investigates the impact of FDI on poverty reduction proxied by per household consumption expenditure (Pov3). Thus, our three models are specified in equation (1) - (3) respectively.

$$Pov1_t = \alpha_0 + \alpha_1 FDI_t + \alpha_2 CPI_t + \alpha_3 CL_t + \alpha_4 HK_t + \varepsilon_t \quad (1)$$

$$Pov2_t = \beta_0 + \beta_1 FDI_t + \beta_2 CPI_t + \beta_3 CL_t + \beta_4 HK_t + \varepsilon_t \quad (2)$$

$$Pov3_t = \partial_0 + \partial_1 FDI_t + \partial_2 CPI_t + \partial_3 CL_t + \partial_4 HK_t + \varepsilon_t \quad (3)$$

where $Pov1$ is poverty reduction captured by life expectancy; Pov2 is poverty reduction captured by infant mortality rate; Pov3 is poverty reduction measured by per capita household consumption expenditure; FDI is foreign direct investment as a proportion of GDP; CL is civil liberties index; HK is human capital; CPI is price level; $\propto_0$ is a constant, $\propto_1$_$\propto_4$ are coefficients, and ε is the error term.

The ARDL model and the error correction specification are given in Equations (4) and (5) for Model 1, Equations (6) and (7) for Model 2, and Equations (8) and (9) for Model 3.

3.4 ARDL model specifications

- Model 1 ARDL Specification:

$$\Delta Pov1_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV1_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \vartheta_1 Pov1_{t-1} + \vartheta_2 FDI_{t-1} + \vartheta_3 CPI_{t-1} + \vartheta_4 CL_{t-1} + \vartheta_5 HK_{t-1} + \mu_t \quad (4)$$

Where $\propto_1 \_ \propto_5$ and $\vartheta_1 \_ \vartheta_5$ are coefficients, $\propto_0$ is a constant, and μ_t is a white noise error term.

- The error correction model for Model 1 is specified as follows:

$$\Delta Pov1_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV1_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \gamma_1 ECM_{t-1} + \mu_t \quad (5)$$

Where $\propto_1 \_ \propto_5$ and γ_1 are coefficients, $\propto_0$ is a constant, ECM_{t-1} is a lagged error term, and μ_t is a white noise error term.

- Model 2 ARDL Specification:

$$\Delta Pov2_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV2_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \vartheta_1 Pov2_{t-1} + \vartheta_2 FDI_{t-1} + \vartheta_3 CPI_{t-1} + \vartheta_4 CL_{t-1} + \vartheta_5 HK_{t-1} + \varepsilon_t \quad (6)$$

Where $\propto_1 \_ \propto_5$ and $\vartheta_1 \_ \vartheta_5$ are coefficients, $\propto_0$ is a constant, and μ_t is a white noise error term.

- The error correction model for Model 2 is specified as follows:

$$\Delta Pov2_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV2_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \gamma_2 ECM_{t-1} + \mu_t \quad (7)$$

Where $\propto_1 \_ \propto_5$ and γ_2 are coefficients, $\propto_0$ is a constant, ECM_{t-1} is a lagged error term, and μ_t is a white noise error term.

- Model 3 ARDL Specification:

$$\Delta Pov3_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV3_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \vartheta_1 Pov3_{t-1} + \vartheta_2 FDI_{t-1} + \vartheta_3 CPI_{t-1} + \vartheta_4 CL_{t-1} + \vartheta_5 HK_{t-1} + \pi_t \quad (8)$$

Where $\propto_1 \_ \propto_5$ and $\vartheta_1 \_ \vartheta_5$ are coefficients, $\propto_0$ is a constant, and μ_t is a white noise error term.

- The error correction model for Model 3 is specified as follows:

$$\Delta Pov3_t = \propto_0 + \sum_{i=1}^{n} \alpha_1 \Delta POV3_{t-i} + \sum_{i=0}^{n} \propto_2 \Delta FDI_{t-i} + \sum_{i=0}^{n} \propto_3 \Delta CPI_{t-i} + \sum_{t=0}^{n} \propto_4 \Delta CL_{t-i} + \sum_{t=0}^{n} \propto_5 \Delta HK_{t-i} + \gamma_3 ECM_{t-1} + \mu_t \quad (9)$$

Where $\propto_1 \_ \propto_5$ and γ_3 are coefficients, $\propto_0$ is a constant, ECM_{t-1} is a lagged error term, and μ_t is a white noise error term.

3.5 Augmented Dickey Fuller Test

For scrutinizing non-stationarity in a time series Augmented Dickey–Fuller test (ADF) test was purposed by Dickey and Fuller (1979). In order to check if the series carry one unit root, the ADF test presents the following specification:

$$\Delta Y_t = \alpha + \beta T + \varphi Y_{t-1} + \delta_i \sum_{i=1}^{p} \Delta Y_{t-i} + \varepsilon_t \quad (10)$$

where Y_t and ΔY_t are respectively the level and the first difference of the series, T is the time trend variable, $(\alpha, \beta, \varphi, \delta_i, \ldots, \delta_p)$ is set of parameters to be estimated and ε_t is the error term presenting zero mean and constant variance. The p lagged difference terms are added in order to remove serial correlation in the residuals.

The null hypothesis is H0: $\varphi = 0$ (unit root exists) and the alternative hypothesis is H1: $\varphi < 0$ (No unit root exists). If the stationary test is significant, it implies that the variable series is stationary and does not have a unit root test. The null hypothesis will therefore be

rejected, but the alternative hypothesis will be accepted. If the stationary test is not significant, then the variable series is nonstationary and has a unit root test; thus, the null hypothesis will be accepted.

3.6 Phillip Perron Test

Phillips and Perron (1988) propose an alternative (nonparametric) method of controlling for serial correlation when testing for a unit root. The PP method estimates the non-augmented DF test equation $[\Delta y_t = \alpha y_{t-1} + x_t'\delta + \epsilon_t]$ and modifies the t-ratio of the α coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. The PP test is based on the statistic:

$$\bar{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)\left(se(\hat{\alpha})\right)}{2{f_0}^{1/2}s} \tag{11}$$

Where is the estimate, and t_α the t-ratio of α, $se(\hat{\alpha})$ is coefficient standard error, and s is the standard error of the test regression. It is a consistent estimate of the error variance in equation (1) (calculated as $(T-k)s^2/T$ where k is the number of regressors). The remaining term, f_0 is an estimator of the residual spectrum at frequency zero.

4. Results

In this section, we present and discuss the estimation results on the relationship between FDI and poverty reduction in Cameroon (1984–2014). At first, we present the descriptive statistics and correlation analysis between all the variables considered in the three regressions. Afterwards, the estimation results of unit roots and cointegration tests are presented. Finally, we then follow it up with the long-run and short-run estimates and the associated diagnostic tests.

Table 1 provides the descriptive statistics and the correlation matrix of all the variables employed in this study. From the rule of Thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicolinearity but if the coefficient is less than 0.8 there is no multicolinearity. Overall, the coefficients of correlation between explanatory variables reveal the absence of damaging multicollinearity. This increases our confidence that the results are not distorted by spurious correlations between variables.

Table 1. Statistical table and the correlation matrix.

Variables	Pov1	Pov2	Pov3	FDI	CPI	CL	HK
Observations	31	31	31	31	31	31	31
Mean	52.5	87.054	665.479	0.934	72.964	5.838	95.643
Std. dev.	2.212	13.738	89.959	1.314	23.415	0.5226	10.693
Min	49.5	57	509.160	-0.880	35.1	5	73.4
Max	57.1	104.2	897.462	5.112	110.1	7	113.6
Pov1	1.000						
Pov2	-0.976	1.000					
Pov3	0.615	-0.508	1.000				
FDI	0.151	-0.180	0.126	1.000			
CPI	0.526	-0.650	0.062	0.382	1.000		
CL	0.469	-0.346	0.581	0.200	-0.002	1.000	
HK	0.904	-0.876	0.662	0.214	0.414	0.638	1.000

Source: Author's calculation

4.1 Unit root test

Before applying the co-integration test of Pesaran and al. (2001), it is imperative to carry out the stationarity test in order to be sure that no variable is integrated into a higher order than 1. In this study we used the unit root tests of Augmented Dickey-Fuller (ADF) and the Phillips Perron (PP). The results presented in table 2 indicate that the variables are stationary in level or in first difference. Thus, the requirements to carry out the co-integration test are satisfied.

Tableau 2. ADF and PP Tests

	Augmented Dickey Fuller			Phillips Perron (PP)		
Variables	Level	First difference	Order of Integration	Level	First difference	Order of Integration
Pov1	-5.612**	-5.449*	I(0)	-5.432**	-5.756***	I(0)
Pov2	-2,425	-1,634*	I(1)	-2,698	-1,633***	I(1)
Pov2	-1.176	-1.435*	I(1)	-3.607	-3.654**	I(1)
FDI	-4.895*	-5.388***	I(0)	-4.213**	-5.465***	I(0)
CPI	-0.432	-2.277**	I(I)	-4.884	-4.792*	I(1)
CL	-2.594***	-2.605	I(0)	-5.257*	-5.585*	I(0)
GPS	-0.688	-1.067*	I(1)	-3.963	-4.175**	I(1)

Note: *, **, and *** denote stationarity at 10%, 5%, and 1% significance levels, respectively
All variables in stake are stationary in level or in difference according to data contained in the Table 2.

4.2 Bound Test approach to co-integration

The results of the ARDL bound test are presented in table 3 below. The F-statistics in all the models are higher than upper critical values at 1, 5 and 10 percent level of significance. Therefore, the H0 assumption of absence of co-integration is rejected which implies that there is a long-run relationship among the dependent variables and the explanatory variables in the three models.

Tableau 3. Results of ADRL Bound-test

Model	F-statistics	Critical Values	[I_0]	[I_1]	Co-integration status
1	6.938	1%	3.74	5.06	Co-integrated
		5%	2.86	4.01	
		10%	2.42	4.25	
2	13.636	1%	3.74	5.06	Co-integrated
		5%	2.86	4.01	
		10%	2.12	3.65	
3	5.866	1%	3.74	5.06	Co-integrated
		5%	2.86	4.01	
		10%	3.23	4.89	

Source: Authors' calculation

Since the ARDL bound test established that all estimated ARDL models are cointegrated, the next step in the estimation process is the optimal lag length selection for all models. We make use of Akaike Information Criteria (AIC) to select the optimal lag length. The ARDL (2 2 0 1 1), ARDL (2 2 0 1 1), ARDL (2 2 0 2 2) are, respectively, selected for model (1), (2), and (3).

4.3 Impact of FDI on poverty reduction

Table 4 and 5 present the long run and short run empirical results for the three regression specifications estimated with life expectancy (Model 1), infant mortality rate (Model 2) and per capita household consumption expenditure (Model 3) as dependent variables.

Results as reported in model (1) show that the coefficient of FDI retains a positive sign but not statistically significant in the long run, while in the short run FDI is associated with a reduction in life expectancy. These results means that FDI has a positive and insignificant impact on poverty reduction in the long run, while in the short run FDI is associated with an increase in poverty level. A possible explanation for this short-term result is that the privatization and restructuring processes in water, electricity, railway, port and airline as prescribed by the International Financial Institutions (IFIs) in the years 1990, have in general resulted in loss of employment and income, poor access to basic services, resulting in deterioration in living conditions. This finding is in accordance with previous findings of Ali and al. (2010) and Lazreg and Zouari (2018) who found that FDI has a negative impact on poverty in Pakistan and Tunisia respectively.

With respect to the baseline model, model (2), the results show that the coefficient FDI is associated with an increase in infant mortality rate in the long run, while in the short run FDI is associated with lower infant mortality rate. This also suggest results that FDI is associated with higher poverty rate in the long run, while in the short run, FDI helps to reduce Cameroon's poverty. The long run impact could be the result of crowding-out effect of new investment on domestic-owned firms (Magombeyi and Odhiambo, 2018) and is consistent with the findings by Huang et al. (2010). The positive and significant impact of FDI on poverty reduction in the short run is supported by the results of Israel (2014) and Uttama (2015). It can be explained by spillovers effect through technological progress and investment in healthcare sector.

Based on the estimation results presented in model (3), FDI has a positive, although not statistically significant, impact on per capita household consumption expenditure in both the long run and the short run, lending support the view that an increase in FDI is likely to relieve poverty due to the investment creating more job opportunities and inducing higher wages that increase household consumption. These results suggest that the FDI has insignificant impact on poverty reduction in Cameroon. It can also be explained by the fact that FDI is not the exclusive policy to reduce poverty in Cameroon. The findings are consistent with the studies by Tsai and Huang (2007), and Quiñonez and al. (2018) who found that FDI has insignificant impact on poverty reduction.

Tableau 4. Estimated Long-Run Coefficients Using the ARDL Approach

Variables	Model 1		Model 2		Model 3	
	Coefficient	T-statistic	Coefficient	T-statistic	Coefficient	T-statistic
FDI	0.351	0.61	0.034***	0.83	0.064	0.60
CPI	0.145**	0.11	-0.487***	-0.24	0.009	0.84
CL	-0.538	-1.72	-0.486***	-0.37	0.008	0.13
HK	0.008*	0.93	-0.012***	-0.75	0.008*	0.56
C	1.983**	0.21	3.985**	0.36	6.625**	0.86

Note: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

With regards to the control variables, in the model (1) and (2), price level has a positive and significant impact on poverty reduction in both long run and short run, suggesting that low prices increase the purchasing power of the poor consumer, and therefore could help to relieve poverty. However, in model (3), price level has a positive impact but not statistically significant in the long run, while in the short run price level has a negative and significant impact on household's consumption expenditure. The short run result lends support the view that high prices erode the purchasing power of the poor, therefore putting them on a worse-off position (Mohr et al. 2008, p. 480). As reported in model (1), the results also reveal that, level of democracy (CL) has a negative and insignificant impact on life expectancy in both the long run and the short run. The results presented in the models (2) and (3) show that the level of democracy has positive impact on poverty reduction but only significant in model (2) in both the long run and the short run. This result supports the hypothesis of high efficiency in welfare improvement in democracies (see Sen, 1998) and the findings of Kadamatsu (2012) and Przeworski and al. (2000) who found that democracy reduces infant mortality rate. Consistent with neoclassical growth theory human capital enters with the correct sign and statistically significant in all the models in both the long run and the short run. This result could be attributed to Cameroonian government's decision to eliminate public school fees in the years 2000 (Republic of Cameroon, 2003). This result supports the findings of Huay and Bani (2018) and Ogundari and Awokuse (2018) that reveal that education as an important dimension of human capital improve welfare. Turning to the error correction term, we find that the coefficients of error correction terms in all the models are negative and significant, meaning long run link among the variables, thus rendering our long run estimates robust. Moreover, it also implies that disequilibrium in the previous year is corrected in the current year.

Tableau 5. Error Correction Representation for the Selected ARDL Models

Variable	Model 1		Model 2		Model 3	
	Coefficient	T-statistic	Coefficient	T-statistic	Coefficient	T-statistic
ΔPov1(-1)	0.362***	1.33				
ΔPov2(-1)			0.843***	4.81		
ΔPov3(-1)					0.659**	1.87
ΔFDI	-0.024	-0.17	-0.598***	-1.66	0.045	0.03
ΔFDI(-1)	-0.322**	-1.20	-0.454***	-0.14	0.035	0.83
ΔCPI	0.006***	0.51	-0.105***	-0.26	-0.016**	-0.39
ΔCL	-0.023	-0.71	-0.509***	-1.25	0.042	0.63
ΔCL(-1)					0.013	0.24
ΔHK	0.009*	0.14	-0.112***	-0.34	0.009*	0.50
ΔHK(-1)					0.002	0.95
ECM(-1)	-0.502***	-5.46	-0.612***	-4.17	-0.634****	-4.17
R-squared	0.81		0.79		0.61	
Adj R squared	0.80		0.77		0.59	
F-statistic	123.374		181.325		242.326	
Prob > F	0.000		0.002		0.024	
DubinWatson	1.938		1.953		2.555	

Note: *** p < 0.01, ** p < 0.05 and * p <0.1.

The robustness of the three models was revealed by various diagnostic tests (table 5). LM test for serial correlation confirm that the three models are considered as having no serial correlation problem. The White test confirms the absence of heteroskedasticity of the residus

whereas the Jarque-Bera test shows that among the three models, models 1 and 2 follow a normal distribution, while the model 3 does not follow a normal distribution. The Ramsey test shows that it does not have missing variables or problem of functional form in the three models. The CUSUM and CUSUMQ tests reveal that the specified models are consistent reliable and stable.

Tableau 6. Diagnostic Tests results

Tests	Model 1	Model 2	Model 3
Breusch-Godfrey	1.884 [0.884]	4.401 [0.265]	4.494 [0.1242]
Heteroskedasticity test	[0.411]	[0.409]	[0.409]
Normality test	1.386 [0.5002]	0.4452 [0.800]	0.452 [0.002]
Ramsey Test	1.30 [0.322]	0.93 [0.476]	0.62 [0.705]
CUSUM	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable

Note: The values between ranges correspond to p-value.

5. Conclusions

The goal of this study was to investigate the impact of FDI on poverty reduction in Cameroon. To achieve this goal, the study employed Autoregressive Distributed Lags (ARDL) bounds testing approach. To capture the multidimensional feature of poverty and to increase robustness of the results, we used three proxies for poverty reduction. It concerns life expectancy, infant mortality rate and per capita household consumption expenditure. The unit root tests of Augmented Dickey-Fuller and Phillip Perron have been employed to establish the order of integration in the series. The results indicated that all the variables are stationary in level or in first difference, and thus, the requirements to utilize the co-integration test are satisfied. The results of co-integration bound test showed that there is a long run relationship between foreign direct investment and poverty reduction in Cameroon.

The results of the long-run and the short-run estimates revealed that the impact of FDI on poverty reduction is negative and significant in the long run, while a positive and significant impact on poverty reduction is registered in the short run when infant mortality rate is used as poverty reduction proxy. When life expectancy is employed as poverty reduction proxy, an insignificant impact is confirmed in the long run, while in the short run, a negative and significant impact is registered. When per capita household consumption expenditure is used as poverty reduction proxy, FDI has an insignificant impact in both the long run and the short run.

Our findings suggest that the impact of FDI on poverty reduction in Cameroon is sensitive to poverty reduction proxy used and the term considered. The impact of FDI to alleviate poverty is less significant in Cameroon in the light of the positive impact of FDI on poverty reduction in short-term when infant mortality is used.

In line with the obtained results, the FDI policy of Cameroon may be used in the short-term in order to reduce poverty. However, national policies such as development of human capital and infrastructure, macroeconomic and politic stability, financial development have to be in place so that the poor are likely share in the gain from this globalization component.

References

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek S. (2004) 'FDI and Economic Growth: the Role of Local Financial Markets', *Journal of International Economics*, 64 (1), 89–112.

Ali, M., Nishat, M. and Anwar, T. (2010) "Do foreign inflows benefit Pakistan poor?", *The Pakistan Development Review*, 48(4), 715–738.

Anigbogu, Ukamaka, T., Edoko., Tonna, D., Okoli. and Ikechukwu, M. (2016) 'Foreign Direct Investment and Poverty Reduction in Nigeria', *International Journal of Business and Management Invention*, www.ijbmi.org || Volume 5 Issue 6 || June. 2016 || PP—19-28.

Azman-Saini, W.N.W., Law, S.H. and Ahmad, A. H. (2010) 'FDI and economic growth: New evidence on financial markets', *Economics Letter*, 107(2), 211-213.

Basnet, H, C. and Pradhan, G. (2014) 'Does the Inflow of FDI Stock Matter? Evidence from SAARC Countries', fEcon.gPap. 2014, 33, 305–312.

Bharadwaj, A. (2014) 'Reviving the globalization and poverty debate: Effects of real and financial integration on the developing world', *Advances in Economics and Business*, 2(1), 42-57. https://doi.org/10.13189/aeb.2014.020107.

Borensztein, E., De Gregorio, J. and Lee, J. W. (1998) 'How does foreign direct investment affect economic growth?', *Journal of international Economics*, 45(1), 115-135.Bosworth & Collins, 1999;

Dollar, D., Kleineberg, T. and Kraay, A. (2013) 'Growth still is good for the poor', *Policy Research Paper 6568*. Washington, DC: World Bank.

Dursun, G. and Ogunleye, B. (2016) 'Economic Growth, Employment and Poverty Reduction: The Case of West African Countries', *American Journal of Economics*, 6(1): 50–60.

Fayyaz, A., Muhammad, U, D., Lijuan, S., Ilhan, O., Abdul, R. and Shahid, A. (2019) 'Impact of FDI Inflows on Poverty Reduction in the ASEAN and SAARC Economies', *Sustainability* 2019, 11, 2565; doi:10.3390/su11092565.

Fowowe, B. and Shuaibu, M, I. (2014) 'Is foreign direct investment good for the poor? New evidence from African countries', *Economic Change and Restructuring*, 47, 321–339. doi:10.1007/s10644-014-9152-4.

Freedom House (2017), Freedom in the World Country Ratings, 1972-2017.

Gohou, G. and Soumaré, I. (2012) 'Does foreign direct investment reduce poverty in Africa and are there regional differences?' *World Development*, 40(1), 75–95. doi:10.1016/j.worlddev.2011.05.014.

Gorg, H. and Greenaway, D. (2004) 'Much ado about nothing? Do domestic firms really benefit from foreign direct investment?', *The World Bank Research Observer*, 19(2), 171–197. doi:10.1093/wbro/lkh019.

Harris R. and Sollis R. (2003). Applied Time Series Modelling and Forecasting. Wiley, West Sussex

Herzer, D. (2012) 'How Does Foreign Direct Investment Really Affect Developing Countries' Growth?' *Rev. Int. Econ*. 2012, 20, 396–414.

Huay, C, S. and Bani, Y. (2018) 'Remittances, poverty and human capital: Evidence from developing countries,' International Journal of Social Economics 45: 1227–35.

Huang, C., Teng, K. and Tsai, P. (2010) 'Inward and outward foreign direct investment and poverty reduction: East Asia versus Latin America', *Review of World Economics*, 146(4), 763–779. doi:10.1007/s10290-010-0069-3.

Hung, T.T. (2005) 'Impacts of Foreign Direct Investment on Poverty Reduction in Vietnam', *Discussion Paper; National Graduate Institute for Policy Studies*: Tokyo, Japan.

Israel, A, O. (2014) 'Impact of foreign direct investment on poverty reduction in Nigeria', *Journal of Economics and Sustainable Development*, 5(20), 34–45.

Kudamatsu, M. (2012) 'Has Democracy Reduced Infant Mortality in Sub-Saharan Africa? Evidence from Micro Data', *Journal of European Economic Association*, 10(6), 1294-1317.

Lazreg, M. and Zouari, E. (2018) 'The Relationship between FDI, Poverty Reduction an Environmental Sustainability in Tunisia', *Journal of Economics and Management Sciences*; Vol. 1, No. 1; 2018. doi.org/10.30560/jems.v1n1p114.

Li, X. and Liu, X. (2005) 'Foreign direct investment and economic growth: an increasingly endogenous relationship', *World development*, 33(3), 393-407.

Khan, M, B., Huobao, X and Saleem, H. (2019) 'Direct impact of inflow of foreign direct investment on poverty reduction in Pakistan: a bonds testing approach', *Economic Research-Ekonomska Istraživanja*, 32:1, 3647-3666, DOI:10.1080/1331677X.2019.1670088.

Magombeyi, M, T and Odhiambo, N, M. (2018) 'FDI inflows and poverty reduction in Botswana: an empirical investigation', Cogent Economics & Finance, 6: 1480302 https://doi.org/10.1080/23322039.2018.1480302.

Mbiankeu, N, S. (2020) 'The Impact of Infrastructure development on Foreign Direct Investment in Cameroon', halshs-02446497

Mohr, P., Fourie, L. and Associates. (2008). Economics for South African students, 4th ed., Pretoria: *Van Schaik Publisher*.

National Institute of Statistics (INS), (2014). Quatrième enquête camerounaise auprès des ménages (ECAM 4), Yaoundé

Odhiambo, N, M. (2009) 'Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach', Energy Policy, 37, 617–622. doi:10.1016/j.enpol.2008.09.077.

Odhiambo, N, M. (2016) 'Poverty and Economic Growth in Ethiopia: A Multivariate Causal Linkage', *Unisa Economic Research Working Paper Series* 04/2016 (4).

Ogundari, K. and Awokuse, T. (2018) 'Human capital contribution to economic growth in Sub-Saharan Africa: Does health status matter more than education?', Economic Analysis and Policy 58: 131–40.

Ogunniyi, M, B. and Igberi, C, O. (2014) 'The Impact of Foreign Direct Investment on Poverty Reduction in Nigeria', *Journal of Economics and Sustainable Development*, 5(14), 73-83.

Olagunju, K, O., Ogunniyi, A, I., Oguntegbe, K, F., Raji, I, O. and Ogundari, K. (2019) 'Welfare Impact of Globalization in Developing Countries: Examining the Mediating Role of Human Capital', Economies 2019, 7, 84; doi:10.3390/economies7030084.

Pegkas, P. (2015) 'The Impact of FDI on Economic Growth in Euro Zone Countries', J. *Econ. Asymmetries* 2015, 12, 124–132.

Pesaran, M, H., Shin, Y., and Smith, R, J. (2001) 'Bounds testing approaches to the analysis of level relationships', *Journal of Applied Econometrics*, 16(3), 289–326. doi:10.1002/(ISSN) 1099-1255.

Przeworski, A. and Limongi, F. (1993) 'Political Regimes and Economic Growth', *Journal of Economic Perspectives* 7 (Summer): 51-69.

Quiñonez, P., Sáenz, J. and Solórzano, J. (2018) 'Does foreign direct investment reduce poverty? The case of Latin America in the twenty-first century', *BEH-Business and Economic Horizons*, Volume 14 | Issue 3 | 2018 |pp.488-500. DOI: http://dx.doi.org/10.15208/beh.2018.35.

Republic of Cameroon, Poverty Reduction Strategy Paper, 167 pages, April 2003.

—, Growth and Employment Strategy Paper (GESP), August 2009.

—, Law N° 2013/004 of 18 April 2013 to lay down private investment incentives.

Sehrawat, M. and Giri, A.K. (2016a) 'Financial development and poverty reduction in India: an empirical investigation', *International Journal of Social Economics*, 43(2):106 – 122.

Sen, A. (1988) 'The concept of development ', *Handbook of development economics* 1: 9–26.

Shamim, A., Azeem, P. and Naqvi, M, A. (2014) 'Impact of foreign direct investment on poverty reduction in Pakistan', *International Journal of Academic Research in Business and Social Sciences*, 4(10), 465–490. doi:10.6007/IJARBSS/v4-i10/1244.

Sharma, B. and Gani, A. (2004) 'The effects of foreign direct investment on human development', *Global Economy Journal*, 4(2), Article 9. doi:10.2202/1524-5861.1049.

Solarin, S, A. and Shahbaz, M. (2013) 'Trivariate causality between economic growth, urbanization and electricity consumption in Angola: Cointegration and causality analysis', *Energy Policy*, 60, 876–884. doi:10.1016/j.enpol.2013.05.058.

Solow, R. M. (1956) 'A Contribution to the Theory of Economic Growth', Quarterly Journal of Economics, 70 (1), 65-94.

Soumare, I. (2015) 'Does foreign direct investment improve welfare in North Africa?', *Africa Development Bank*, https://www.afdb.org/filead min/uploads/afdb/Document/Publication.

Sumner, A. (2005) 'Is foreign direct investment good for the poor? A review and stocktake', *Dev. Pract.* 2005, 15, 269–285.

Tsai, P. and Huang, C. (2007) 'Openness, growth and poverty: The case of Taiwan', *World Development*, 35(11), 1858–1871. doi:10.1016/j.worlddev.2006.11.013.

Uddin, G.S., Shahbaz, M., Arouri, M. and Teulon, F. (2014) 'Financial development and poverty reduction nexus: A cointegration and causality analysis in Bangladesh', *Economic Modelling*, 36: 405-412.

United Nation Development Program (UNDP). (2016) 'The Human Development Report' United Nation Statistics Division, available online at http://hdr.undp.org/en.

The United Nations Children's Fund (UNICEF). (2018) 'Levels and trends in child malnutrition', *eSocialSciences*.

Uttama, N, P. (2015) 'Foreign Direct Investment and the Poverty Reduction Nexus in Southeast Asia: In Poverty Reduction Policies and Practices in Developing Asia', *Economic Studies in Inequality, Social Exclusion and Well-Being*; Heshmati, A., Maasoumi, E., Wan, G., Eds.; Springer: Singapore, 2015; pp. 281–298.

World Bank. (2019) 'World development indicators', Retrieved December 22, 2019, from http://www.data.worldbank.org.

Zaman, K., Khan, M, M. and Ahmad, M. (2012) 'The relationship between foreign direct investment and pro-poor growth policies in Pakistan: The new interface', *Economic Modelling*, 29, 1220–1227. doi:10.1016/j.econmod.2012.04.020.