Foreign Capital and Poverty Reduction in West Africa

Madow Nagou[1*]

[1]*Faculté des Sciences Économiques et de Gestion, Université de Lomé, Togo.*

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

This paper investigates the effect of foreign capital on poverty reduction. For our analysis, we used recent panel data for ten West African countries* for the period 2000 - 2014. Results of the empirical test of the simultaneous equation model indicate that foreign capital affects poverty through growth and inequality. The total effect on poverty reduction is negative when the inequality effect outweighs the growth effect. Thus, foreign capital inflows promotion policies should necessary account for receiving countries socioeconomics mutations.

1. INTRODUCTION

The rapidly growing experiences of a small number of new industrial countries in East Asia and especially China over the last fifteen years have contributed to the idea that foreign capital plays a key role in mitigating lack of resources in low-income countries [1]. This dynamic leads some economists to argue that foreign capital affects economic growth and, in turn, alleviates

_____

Corresponding author: E-mail: yvounagou@gmail.com;

poverty. However, this dynamic does not seem to be reflected in the case of sub-Saharan Africa, which received net FDI inflows in 2015 estimated at $ 54 billion and on average between 2011 and 2013, around $ 40 billion a year. These flows accounted for 3% of global FDI stocks in 2013. Official Development Assistance (ODA) granted by member countries of the Organization Economic Cooperation and Development (OECD) Development Assistance Committee increased by 6.9% in constant 2015 to reach a total of $ 131.6 billion. The external debt of sub-Saharan African countries is on average one of the lowest in the world. According to the IMF, it stood at less than 30% of GDP in 2015, and represented in stocks, 911 billion US dollars in 2014 [2]. Currency transfers by African migrants have increased substantially and now represent the second largest source of financial flows to Africa - behind FDI - with about $ 62 billion annually in 2013 [3].

At the same time, poverty in sub-Saharan Africa is slowly declining. It stood at 43% in 2012 with a forecast for 2015 of 35.2% of the population living on less than US $ 1.9 [4] per day. However, poverty is still too high in Africa compared to other parts of the world, specifically Asian countries that are experiencing a reduction in poverty rates due in part to foreign investment in Africa's natural resources. In addition, the majority of foreign capital received is concentrated in the exploitation of these natural resources [5]. From this contrast arises the need to analyze the relationship between foreign capital and poverty, identify the mechanisms that link them, and assess the magnitude of the effects transmitted on poverty.

This necessity also motivates the current study to examine the relationship between foreign capital and poverty based on the case of the West African countries. The purpose consists on examining the role of foreign capital in promoting growth and their effects on inequalities and poverty. Theoretically, the study is based on the fact that the relationship between an economic phenomenon based on reasons of profitability or global strategy of foreign capital and another intrinsically social and also economic phenomenon, that is, poverty; this relationship is composed of various transient effects [6]. The study also finds its foundation in the research of [7]) on the interactions between growth, inequalities and poverty designated through the triangle growth-inequalities-poverty. Indeed, the triangle growth-inequalities-poverty allows

analyzing the mechanism by which the foreign capital affects poverty through their effects on growth, inequalities and poverty. In the same vein, this article is part of that the scientific interest is threefold, in order to identify the relationship between foreign capital and poverty in West Africa.

First, this study differs from previous studies by simultaneously taking into account three types of foreign capital: foreign direct investment (FDI), official development assistance (ODA) and long-term debt (DELT). Second, the empirical analysis is based on an econometric model in simultaneous equations tested on non-cylinder panel data, with the majority of studies using rolled panel data. It differs, like that of [6], by the addition of an equation for poverty that allows estimating the totality of the interactions within the trilateral relationship growth-inequalities-poverty. Finally, this research targets an economic zone, West Africa which has not yet been the subject of a similar study.

The remainder of the study is organized in three (3) sections. Section II consists of the literature. Section III covers the basic model, the estimation methods, the data used and the econometric results. Section IV deals with the conclusion and resulting policy recommendations.

2. LITERATURE REVIEW: SOME THEORETICAL AND EMPIRICAL CONSIDERATIONS

In this section, we highlight some recent works on the positive relationship between foreign capital and economic growth on the one hand, and growth and absolute poverty on the other to identify variables and the channels through which foreign capital interacts with poverty. The theoretical literature on the impact of foreign capital on the economic growth of host countries is abundant, while there is limited research on their effects on poverty. However, the empirical literature has focused primarily on the relationship between foreign capital (including FDI, ODA and long-term debt), economic growth, inequality and poverty in developing countries with mixed results.

2.1 The Role of FDI in Economic Growth, Inequality and Poverty Reduction

FDI can affect growth and then reduce poverty [8]. [9,6,10,5 and 11 found that FDI has a

positive effect on economic growth, [12] and [13] reported a negative effect. [14] have produced rather nuanced results. Moreover, [15] reported that among the seventy-two macroeconomic studies identified, 50% highlight a positive impact of foreign capital, especially FDI on growth, and 11% indicate a negative effect while 39% find no conclusive effect.

Unlike research on the impact of FDI on economic growth, those interested in their impact on well-being and/or poverty are few and have focused mainly on the direct link between FDI and well-being. Among them, some have used the HDI as a measure of well-being. [16] reported that between 1975 and 1999, FDI had a positive impact on the HDI of the low and middle income countries they studied. Considering the net inflows of FDI per capita and the UNDP (United Nations Development Program) HDI as key variables, [17] found a positive relationship between net inflows of FDI and well-being in Africa, despite differences between sub-regions. They also concluded that FDI has a greater impact on well-being in poor countries than in rich countries [11].

Some studies by [7,17,18] explicitly assessed the relationship between FDI and poverty reduction. They found that FDI positively influences economic growth and, in turn, leads to a reduction in poverty when it is inclusive. But, economic growth remains a necessary ingredient for poverty reduction [19]. Recent studies suggest that growth tends to lift the income of the poor proportionately with overall growth [20]. FDI as a key vehicle to generate growth is thus a most important ingredient for poverty reduction. It is also argued that FDI can actually do more than just generate growth. FDI has the potential to improve the quality of growth for reducing inequality and poverty by reducing the volatility of capital flows and incomes, improving asset and income distribution at the time of privatization, helping improve social and environmental standards and helping improve social safety nets and basic services for the poor [4].

Beyond this, the impact of foreign capital on poverty through the reduction of inequalities has attracted research interest. [21] used the Gini coefficient calculated from the Lorentz curve to test the impact of FDI on the twenty percent (20%) poorest population of Thailand. They found that a strong presence of foreign capital does not exacerbate inequality and marginalize the poorest.

2.2 ODA and Poverty Reduction

Official Development Assistance (ODA) is nowadays considered as one of the main solutions to promote economic development and fight against poverty, despite the controversy that existed in the 80s and 90s among the experts of the development on its effectiveness.

A research by [22] reported that Aid would be effective and positively impact economic growth exclusively in countries with "good" institutions and sound economic policies. Several studies also identified some natural and structural factors that may influence the impact of aid. According to [23], the aid was on average more effective in countries highly exposed to external shocks, such as abrupt swings in the terms of trade, where large climatic variations have a negative impact on agricultural production. Similarly, [24] argued that the aid could indeed have a "compensating" effect and mitigate the negative impact of these exogenous shocks on growth. Subsequently, [25] found that the aid was less effective in countries geographically close to the tropics, highlighting the fact that yields induced by ODA, especially in the agricultural sector, would be limited by too little productivity caused by the difficult climatic conditions of these geographical areas. In addition, other studies by [26], [27] emphasized the preponderance of institutional quality, particularly the political climate in the performance of ODA.

To find a way out of the debates on the role and effectiveness of ODA, (existence of publication bias, highlighted by [28], for example), a recent study by [29] contradicted the results of existing meta-analyzes by demonstrating that there was no publication bias and aid was globally efficient through the capital accumulation process; but very low growth in a recipient country also encourages donor countries to provide more support.

Finally, microeconomic studies on the effectiveness of multiple programs financed by official development assistance, notably the [30] and that of [31], confirmed the positive impact of these interventions on social, financial and health services of the targeted communities.

Foreign aid can thus, according to literature, improve growth and reduce poverty Economic literature shows also that ODA can reduce inequality and thus poverty. [32] find that the distributional impact of aid is equality enhancing.

Foreign aid can thus have positive impact on inequality reduction. In another empirical study basing on the dataset over 1971-2002, [33] find that foreign aid contributes to the improvement of income distribution and poverty reduction when the institutional quality is taken into account.

2.3 External Debt and Poverty Reduction

There is a broad literature review on the role and effects of debt on growth and thus on poverty reduction. Two main schools of thought oppose each other. These include Keynesians and classics. Yet, the literature has finally questioned the last fifteen years on the optimal level of debt of a country. Some authors suggest that public debt is sustainable only when it helps fuel growth. However, it is shown that there is no relevant magic ratio of optimal debt levels for all countries and all periods [34]. Similarly, there is no linear link between debt and growth.

According to Keynesian logic, the impact of external debt on growth is positive. In other words, current debt is needed for economic recovery. Proponents of enriching external indebtedness however suggest that, loans should be contained within reasonable limits to secure economic growth in developing countries. [35] stressed that external debt has the potential to stimulate economic growth, when it is used to finance investments. The authors added that it is necessary to have a measure of indebtedness because there is a certain threshold beyond which debt negatively influences growth.

Considering the classics, indebtedness is a future tax. Theoretical studies on the relationship between external debt and economic growth are then largely focused on the negative effects of over-indebtedness. Some authors place particular emphasis on crowding out productive investment and Ricardian equivalence to support the idea that external debt is detrimental to economic growth.

Somme authors including [36] predicted that high debt is detrimental to economic growth as it discourages investment. According to the authors, when the debt exceeds the domestic resources of a country, this country may no longer be able to repay past loans, and this will have a deterrent effect on creditors and investors.

[37] assessed public debt trends and the real growth rate over the long term. The results showed a weak relationship between public debt and long-term growth for debt levels below the 90% of GDP threshold. Beyond 90%, the median growth rate and the average growth rate decrease. But for developing economies, when the public debt holds 60% of GDP, growth falls by two points; when it exceeds 90% of GDP, growth becomes negative.

[38] pointed out the existence of a negative correlation between the public debt and economic growth, especially from high levels of indebtedness. But they refute any causality between these two variables because the existence of correlation does not necessarily imply the existence of causality.

From a database, [39] followed the evolution of the public debt to GDP ratios of several IMF members since 1875, which public debt represents on average 55% of GDP, and which average annual growth rate of real output is 2.24%. They found that there is no empirical evidence of the existence of a public debt threshold from which medium-term growth prospects are affected. However, they reported that in the medium term, the relationship between public debt and growth weakens for very high levels of indebtedness.

Overall, debt can affect growth which will also contribute in poverty reduction. External debt can also reduce inequality and poverty when considering effect of debt services on social spending. Underlying the debt relief debate is the belief that fiscal resources released by the debt relief will be channeled towards social sectors by increasing public spending on improving the access to and quality of health, education, water, sanitation, income redistribution and other human essential services to the poor. A key assumption is that an increase in social spending leads to better social outcomes. And recently, [40] found a long-run equilibrium relationship between poverty, external debt, GDP per capita, gross domestic fixed investment, education level, infrastructure, health condition and openness. Their experience reveal that debt have beneficial effects on the lives of vulnerable households and then reduce inequality and poverty.

It is clear from these various studies that foreign capital, such as foreign direct investment (FDI), official development assistance (ODA) and long-term public debt, have effects on both economic growth and poverty and these effects vary by country.

4

3. MODEL OF THEORETICAL ANALYSIS

Foreign capital should play an important role in reducing poverty. This section attempts to explain the theoretical relationship between foreign capital and poverty. More specifically, it seeks to identify the mechanisms underlying this relationship in ten (10) West African countries; eight countries of the Economic and Monetary Union of West Africa and two (2) English-speaking countries (Ghana and Nigeria) which are close to this geographical area. To this end, it adopts the framework of analysis of the interactions between growth, inequalities and poverty established by [41]. This framework the author designated by the triangle "growth - inequalities - poverty" emphasizes that the three factors influence each other, hence a simultaneity of their interrelations. In the same vein, we posit that the effect of foreign capital on poverty is not direct, it passes first through growth. For that reason, understanding the dynamic between foreign capital and poverty implies first, analyzing the transitory effects of foreign capital on growth; second, examining the transitory effects of foreign capital on inequality, and third, assessing the final effects on the incidence of poverty in these countries. To achieve these objectives, we build like [6], a model with three simultaneous equations, built on the trilateral relationship "growth-inequalities-poverty". The first equation explains economic growth, the second one explains inequality and the last one explains poverty. The general model to be estimated is stated as follows:

$$CPIBH_{i,t} = \delta_1 INE_{i,t} + \theta_1 CAPETR_{i,t} + \rho_1 X_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$INE_{i,t} = \gamma_2 CPIBH_{i,t} + \theta_2 CAPETR_{i,t} + \rho_2 Y_{i,t} + \mu_{i,t} \quad (2)$$

$$PAUV_{i,t} =$$

$$\gamma_3 CPIBH_{i,t} + \delta_3 INE_{i,t} + \theta_3 CAPETR_{i,t} + \rho_3 Z_{i,t} + \omega_{i,t} \quad (3)$$

Where:

CPIBH = per capita income growth;
INE   = income inequality;
PAUV = absolute poverty rate;
i = transversal dimension (the countries);
t = time dimension that is to say (the year).

Each equation has common variables and specific variables. The CAPETR variable is assumed to be a vector of variables consisting of official development assistance (ODA), foreign direct investment (FDI) and long-term debt (DELT) that are common to all three equations. Concerning the specific variables, they are represented by the following vectors:

- "X" is the vector of growth-specific economic variables (domestic investment, education, trade openness and inflation).
- "Y" is the vector of variables specific to income inequality. It mainly includes institutional variables.
- "Z" is the vector of the variables specific to poverty. It includes, among other things, the rate of population growth, the unemployment rate, the quality of infrastructure and the access of the population to telecommunications, drinking water and electricity.

The structure of the model indicates both a transitive and reflexive relationship between each retained variable and the endogenous variable. In order to identify the total effect of all the variables, we substitute equation (1) in (2) and then in equation (3) to obtain the reduced form and determine the total effect of all the variables tested in the three poverty equations. Thus, the "reduced" form of equation (3) represents the answer to the main objective of this work, which consists on determining the total and independent effect of CAPETR on poverty. The "reduced" form of equation (3) is stated as follows (see appendix):

$$PAUV_{i,t} = (\gamma_3 \left[\frac{\theta_2 \delta_1 + \theta_1}{1 - \delta_1 \gamma_2} \right] + \delta_3 \left[\frac{\theta_1 \gamma_2 + \theta_2}{1 - \delta_1 \gamma_2} \right] + \theta_3)$$
$$CAPETR_{i,t} + a X_{i,t} + b Y_{i,t} + c Z_{i,t} + e_{i,t} \quad (4a)$$

$$PAUV_{i,t} = (\gamma_3 \upsilon + \delta_3 \pi + \theta_3) CAPETR_{i,t} + a X_{i,t} + b Y_{i,t} + c Z_{i,t} + e_{i,t} \quad (4b)$$

We can state from equations 4a and 4b (see demonstration in appendix):

$$\upsilon = \frac{\theta_2 \delta_1 + \theta_1}{1 - \delta_1 \gamma_2} \quad (5)$$

$$\pi = \gamma_2 \upsilon + \theta_2 \quad (6)$$ (See demonstration of equation 6 in appendix.)

υ is the total effect of CAPETR on growth and (π) is the total effect of CAPETR on inequalities.

In the following of this study, we break up CAPETR in three (3) previously mentioned variables in ODA, FDI and DELT which are besides the only explanatory variables common to the three equations and likely to affect simultaneously, but in different ways, each of the three endogenous variables. In addition, the choice of variables specific to each equation was made in such a way to minimize the risk of correlation with the endogenous variables of the other equations. Hence, we study the matrix of correlations between the variables of the model in order to avoid statistical biases and reduce the risks of endogeneity.

The estimation model is stated as follows:

$$CPIBH_{i,t} = \propto_0 + \propto_1 INE_{i,t} + \propto_2 ODA_{i,t} + \propto_3 FDI_{i,t}$$
$$+ \propto_4 DELT_{i,t} + \propto_5 INV_{i,t}$$
$$+ \propto_6 TSS_{i,t} + \propto_7 PIBHI_{i,t}$$
$$+ \propto_8 OUV_{i,t} + \propto_9 INF_{i,t} + \varepsilon_{i,t} \quad (7)$$

$$INE_{i,t}$$
$$= \beta_0 + \beta_1 CPIBH_{i,t} + \beta_2 ODA_{i,t} + \beta_3 FDI_{i,t}$$
$$+ \beta_4 DELT_{i,t} + \beta_5 PIBH_{i,t} + \beta_6 (PIBH)^2{}_{i,t} + \beta_7 IPC_{i,t}$$
$$+ \mu_{i,t} \quad (8)$$

$$PAUV_{i,t} = \varphi_0 + \varphi_1 CPIBH_{i,t} + \varphi_2 INE_{i,t} + \varphi_3 ODA_{i,t}$$
$$+ \varphi_4 FDI_{i,t} + \varphi_5 DELT_{i,t} + \varphi_6 TSS_{i,t}$$
$$+ \varphi_7 TPOP_{i,t} + \varphi_8 TCHO_{i,t}$$
$$+ \varphi_9 TEL_{i,t} + \omega_{i,t} \quad (9)$$

Like [43,6], we assume that the specific variables in equation (7) are orthogonal to inequality and poverty; those in equation (8) are orthogonal to growth and poverty; and those in equation (9) are orthogonal to growth and inequality; In other words, the variables form a set of non-collinear vectors.

4. EMPIRICAL ANALYSIS

The first equation is built from Solow's "standard" growth models from 1956. It is further enriched by [43,13,44]. The variable to be explained in this equation is GDP per capita growth (CPIBH). The equation contains in addition to the inequality indicator, the vector of foreign capital variables (ODA, FDI and DELT) found in the three equations of the model, the initial GDP per capita (GDPHI) and the aggregate variables defined by standard growth models. The second equation explains the inequalities evaluated by the GINI coefficient. This is the most empirically used measure for studying income inequality [40, 41 and 43]. Moreover, we introduce in this equation, the growth of the average income (CPIBH), the ODA, FDI and the DELT. The relatively weak correlation between these four variables allows introducing them simultaneously.

The third equation explains the absolute poverty rate ([7], [46]. As such, the only indicator of income poverty is used; it is available for the countries of our sample in the World Bank database. This indicator is "the rate of the population living below the national poverty line". It corresponds to the absolute poverty approach where the threshold is set according to the basic needs of local populations. All the variables of these three (3) equations and their expected signs are shown in Table 1.

To empirically test the simultaneous equations model, we have separately estimated each of the three equations identified including equations (7), (8) and (9). The identification tests indicated that they are all "over identified"; this led us to adopt three different estimation techniques to address the problems of endogeneity and simultaneity. These are the least squares (2SLS), least squares (3SLS) and least squares (W3SLS) least squares method.

4.1 Data from the Study

The description of the variables of the model is recorded in Table 2 above.

In the framework of our work, we have generally been able to build a base of 44 observations characterizing ten (10) West African countries (Benin, Burkina Faso, Côte d'Ivoire, Guinea-Conakry, Mali, Niger, Senegal, Togo, Ghana and Nigeria) over the period 2000-2014. The model variables are mostly extracted from the World Bank database (WDI-2014). Considering the Corruption Perception Index (CPI), it comes from the Transparency International (TI) base and is used in our model as an institutional variable.

As shown in Chart 1, FDI flows have increased steadily since 2006, four times higher than their level in 1995. Furthermore, since 2010, FDI flows have been higher than development and debt. In 2013, for example, they were almost ten times higher than ODA flows [47]. However, these flows have benefited more the oil or mining countries and the most industrialized economies (Nigeria, Ghana, Ivory Coast, Senegal, etc.).

Table 1. **Description of the variables**

| Variables	Description	Expected signs
	Equation 7	
INV	Investment rate (gross fixed capital formation) as% of GDP	**+**
TSS	High school enrollment ratio, It represents a proxy of human capital.	**+**
OUV	Indicator of commercial opening. It is measured by the sum of imports and exports in relation to GDP.	**+**
INF	Inflation rate. This is the indicator of economic stability	**-**
	Equation 8	
IPC	Transparency International Corruption Perceptions Index. Being considered as a proxy for measuring corruption,	**+**
PIBH	Gross domestic product per capita. It allows testing the hypothesis of Kuznets in the short term.	**+**
$(PIBH)^2$	Square of gross domestic product per capita. For the verification of the Kuznets long-term hypothesis	**+**
	Equation 9	
TSS	Secondary school enrollment rate. It tests the effect of education on poverty	**+**
TCHO	Unemployment rate	**-**
TPOP	Population growth rate	**+/-**
TEL	Proportion of people with access to the telephone (public or private) per 1000 inhabitants.	**+**

Source: Author, from the literature

Table 2. **Descriptive statistics**

Variables	Observation	Mean	Student deviation	Minimum	Maximum
CPIBH	130	4.29	3.38	-6.71	15.00
INE	130	40.14	4.16	31.16	46.26
PAUV	130	46.35	11.61	24.2	69.3
ODA	130	9.56	5.39	0.51	33.10
FDI	130	2.65	3.02	0.28	16.62
DELT	130	3.92	5.90	0	27.69
INV	130	18.94	7.53	5.46	39.95
PIBH	130	677.73	348.49	183.67	1604.90
OUV	130	2.37	4.04	0	14.29
TSS	130	31.28	13.64	6.95	58.29
INF	130	6.27	10.21	-9.82	80.74
POP	130	2.73	0.53	1.37	3.83
TCHO	130	5.90	2.71	0.7	10.1
TEL	130	28.93	27.47	0	100.9
IPC	130	2.76	0.61	1.4	4.5

Source: *Author's calculassions from data used*

The Corruption Perception Index (CPI) is expressed on a scale of (0; 10) where 0 means a very high level of corruption and 10 represents a very low level of corruption equivalent to a high level of probity. Indeed, the average of these corruption scores is 2.76. The minimum is only 1.4 while the maximum does not reach 5. This shows how much the problem of corruption arises acutely in the countries our sample. In addition, some variables are characterized by large differences. This is the case, for example, with GDP per capita, the rate of inflation, access to telecommunications, high school enrollment, public support and poverty.
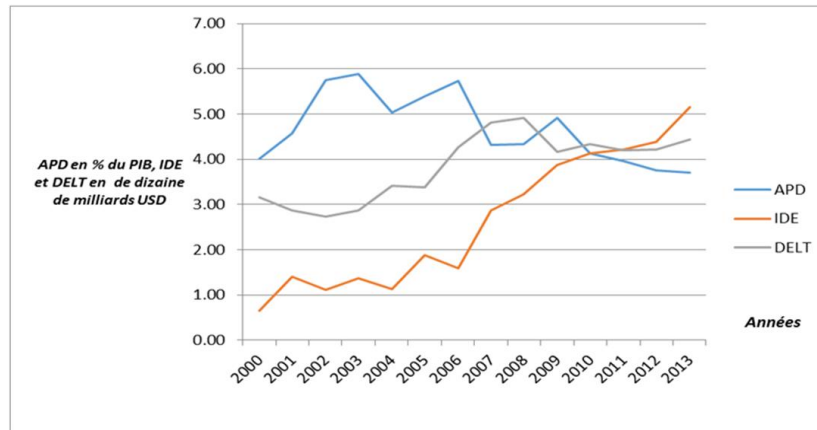
Chart 1. Evolution of foreign capital in West Africa from 2000 to 2013
Source: Author, based on data from the World Bank, 2015.
Note: ODA: Official Development Assistance, FDI: Foreign Direct Investment and DELT: Long-Term Debt

These differences are probably related not only to the differences in development between countries but also to the international economic situation, especially when we know that the countries in our sample are mostly exporters of raw materials. Finally, there is a little difference in relation to the unemployment rate, which averages 5.90%, once again demonstrating the homogeneity of the countries in the sample on the issue of unemployment. After this brief data analysis, we present in the next section, the interpretation of the main results of our estimates.

4.2 Results and Interpretations

The results of the regression of the system of poverty equations are summarized in Table 3.

The econometric model of this study estimates the interactions between growth, inequality and poverty (See also appendix for results). Further, it highlights the role of foreign capital. First, present the results of the growth estimates. Second, we focus on understanding the determinants of inequality within our sample. Finally, we estimate the equation that defines the rate of absolute poverty, which allows us to determine the reduced form of the model (Equation 4) (See also appendix for results).

4.2.1 Growth equation

In this equation, the influence of the variables of interest i.e. ODA, FDI, DELT and inequalities as well as the other determinants (control variables)

of growth are presented in the table (Table 4). The results show that ODA, FDI and DELT all have a positive and significant effect in the first two estimation methods with practically stable coefficients. Thus, an increase in these capitals, by one point respectively, would result in an increase in per capita GDP growth of 0.21, 0.07 and 0.47 point respectively (2SLS) then 0.28, 0.07, 0.49 point (3SLS). Moreover, the effects of these capitals are not significant in the last estimation method, except for that of the DELT, which remains significant. These findings are identical to those found by [48] who reported that public debt stimulates economic growth in WAEMU countries, especially when its level is below a threshold estimated at 48%.

Overall, foreign capital taken as a whole has a positive effect on growth because it contributes to strengthen national investments, true machines of endogenous growth models. The variable "income inequality" is statistically insignificant; however, the test results for the linear effects assumption are positive. Thus, as expected, an increase of the GINI index by 1 point would decrease the growth of 0.029 point in the method (2SLS), 0.041 point in the method (3SLS) and 0.072 point in the method (W3SLS). These results are consistent with several empirical works. Indeed, [42] found that the effect of inequalities on growth is equal to 0.0036; [45] reported that it is equal to 0.047 and [46] found that it is at most 0.04. Moreover, [6] estimated that this effect is 0.63 points for sub-Saharan Africa countries.

Yet, these studies, with the exception of [6], deal with heterogeneous panels with different biases. In this context, simple control by dummy variables is not enough to control the structural effects. Our result is therefore more in keeping with the particular case of West African countries.

In short, we find from our estimates that income inequality is a determinant of growth, reason why we are now analyzing its determinants and their relationships with foreign capital, growth, and institutions.

4.2.2 Equality inequality and the Kuznets hypothesis applied to the countries of the sample

This equation attempts to test three types of effects: the effects of institutional variables, the effects of foreign capital, and the effects of growth on inequality. The third effect itself includes two eventualities, namely, linearity and nonlinearity.

In developing countries, the institutional characteristics explain much of the income is distributed to the population.

According to the estimation table of the inequality equation (Table 5), an increase in the corruption index by one point would imply an increase in inequalities of 1.3 points according to the 2SLS method (column 2) and 1.9 points according to the 3SLS method (column 9). The robustness of our results is confirmed by the relative constancy of the CPI coefficients estimated by the three different methods. In fact, corruption directly affects interactions among economic agents such as contract fulfillment, property rights, administrative procedures and the functioning of the public sector. The results clearly show that a reduction in corruption is synonymous with greater equality in access to opportunities. Thus, the reduction of corruption is one of the arguments in favor of a fairer redistribution and likely to favor the reduction of inequalities.

Moreover, against all odds, foreign capital (with the exception of ODA) reinforces inequalities. Indeed, the FDI and DELT coefficients are positive and significant in the three estimation methods; this confirms their robustness. Thus, a respective increase of one point of debt and FDI would increase respectively between 4.8 points (column 1) and 4.9 points (column 3) and between 8.9 points (column 2) and 7.8 points (column 3) of the coefficient from GINI. Such a

result seems to be confirmed by economic theory which shows that foreign capital is likely to increase inequality in host countries by favoring sectors with a revealed comparative advantage over others and relatively skilled labor, compared to the non-qualified. The results also show that ODA attenuates (but not significantly) inequalities. This may be due to the fact that in recent years many projects and programs in sub-Saharan African countries have been funded by ODA. According to Development Assistance Committee, statistics, bilateral projects, programs and technical cooperation in support of development accounted for 58.67% of net total ODA [2]. Thus, the execution of these projects, especially in rural areas, contributes significantly to the reduction of inequalities, taking into consideration the beneficial effect of humanitarian aid, which is a component of the ODA.

Overall, it appears that foreign capital has a positive effect on income inequality. However, these regressions would contain a high risk of endogeneity between growth and CAPETR foreign capital. According to the results, the sum of the estimated coefficients of the four variables is not significant (close to one). To control this risk of endogeneity and verify the robustness of the CAPETR coefficients, we remove the growth of the equation (columns (7), (8) and (9)). As a result of this change, the effects of CAPETR on inequality remain positive but lose in terms of magnitude and even significance. Also, the internal characteristics of the countries that make up our sample are perceptible in their redistribution and adjustment processes because the CAPETR coefficients are more negligible and insignificant in the W2SLS method (short term).

The effect of growth on inequalities is tested in two ways: the direct effect through the test of GDP per capita growth and the quadratic effect through the introduction of GDP per capita (GDPH) and its square [(PIBH) ^{2}]. The first hypothesis test shows that an increase in per capita GDP growth of one point would be followed by a decrease in inequality of about 2.2 percentage points. However, in the absence of foreign capital, the coefficient of growth loses its significance. In the latter case, an increase in the average income growth rate of 1 point would reduce inequality by 2.5 percentage points. According to [47], growth reduces inequality by coefficient equal to 0.8, especially when controlling estimates by a dummy variable indicating sub-Saharan Africa.

Table 3. Estimation of the determinants of poverty - Dependent variable: PAUV

Variables	Growth and CAPETR			Growth without CAPETR			CAPETR without growth		
	2SLS	3SLS	W3SLS	2SLS	3SLS	W3SLS	2SLS	3SLS	W3SLS
CONS	97.1**	102.3***	117.1***	-91.5	-89.2	62.27*	174.8***	149.2***	129.8***
	(2.52)	(3.13)	(3.95)	(-1.52)	(-1.53)	(1.68)	(4.51)	(6.99)	(6.41)
CPIBH	0.579	-0.09**	0.71***	0.82	0.97	0.69	-	-	-
	(1.32)	(2.07)	(3.13)	(1.58)	(1.69)	(0.09)			
INE	0.25**	0.27**	0.616**	0.74**	0.84***	0.87***	0.59**	089***	0.93***
	(2.31)	(2.75)	(2.47)	(2.53)	(3.05)	(2.99)	(2.01)	(3.58)	(4.02)
ODA	0.481	0.49	-0.531				0.07	0.08**	0.09**
	(0.92)	(0.81)	(-2.05)	-	-	-	(0.41)	(2.35)	(2.24)
FDI	5.7***	5.19***	-6.06***				4.49	3.87***	3.99***
	(3.05)	(3.82)	(-3.94)	-	-	-	(1.29)	(3.91)	(4.04)
DELT	0.437*	0.367	-0.913				0.46*	0.47***	0.51***
	(1.95)	(0.51)	(-0.81)	-	-	-	(1.94)	(2.98)	(3.91)
TSS	-0.62***	-0.53***	-0.58**	0.88	-0.83	-0.09	-0.07***	-0.69**	-0.64***
	(-3.93)	(-3.69)	(-2.38)	(0.39)	(-0.35)	(-0.41)	(-3.11)	(-2.64)	(-4.89)
TPOP	7.03	7.92*	6.23***	3.88	4.79	1.28	1.57	1.99***	1.48***
	(1.37)	(1.97)	(3.51)	(1.34)	(1.08)	(0.09)	(0.79)	(3.29)	(4.02)
TCHO	0.85***	0.94***	0.39***	0.813*	0.57**	0.93***	0.91**	0.64**	0.62**
	(5.62)	(3.09)	(3.09)	(1.72)	(3.51)	(3.12)	(2.46)	(2.58)	(2.03)
TEL	-0.23	-0.09	-0.083	-0.94	-0.12	-0.17	-0.17	-0.12**	-0.14**
	(-0.72)	(-1.27)	(-1.51)	(-1.51)	(-1.39)	(-0.98)	(-1.39)	(-2.41)	(-2.93)
RMSE	1.261	1.072	0.974	0.991	1.095	0.925	1.13	1.09	1.315
Statistic	53.03	91.54	89.07	19.13	46.13	42.17	27.42	109.2	91.8
(Prob)	(0.007)	(0.000)	(0.000)	(0.00)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R^2	0.76	0.78	0.83	0.65	0.69	0.64	0.85	0.86	0.89

*, ** and *** refer to 10%, 5%, and 1% significance levels, respectively. Figures in brackets represent z-statistics.
Note: PAUV is the poverty rate, CPIBH is GDP per capita growth, INE is income inequality (GINI), ODA is official development aid as % of GDP, FDI is foreign direct investment as % of GDP, DELT is the long-term public debt as a % of GDP, TSS is the secondary school enrollment rate, CPI is the corruption index, TCHO is the unemployment rate, TEL is telephone access per 1000 inhabitants, TPOP is the growth rate of the population

Table 4. Estimation of the determinants of the growth equation - Dependent variable: CPIBH

Variables	2SLS	3SLS	W3SLS
CONS	43.291**	32.876*	27.631
	(2.09)	(1.87)	(1.09)
INE	-0.029	-0.041	-0.072
	(-0.95)	(-0,74)	(-1.23)
ODA	0.217**	0,282**	0.219
	(2.14)	(2.77)	(0.98)
FDI	0.071**	0.078***	0.069
	(2.61)	(3.16)	(1.57)
DELT	0.472**	0.496***	0.408***
	(2.01)	(4.03)	(4.21)
INV	0.81*	0.629***	0.731***
	(1.92)	(3.04)	(4.46)
PIBHI	0.437**	0.456***	-0.519***
	(2.06)	(2.89)	(-3.46)
OUV	-0.724**	-0.961***	-0.586
	(-2.31)	(-3.87)	(-0.801)
TSS	0.570**	0.672***	-0.294***
	(2.95)	(3.13)	(4.21)
INF	-0.837***	-0.852***	-0.795***
	(-3.83)	(-4.37)	(-5.17)
RMSE	1.086	0.975	1.127
Statistic	52.31	81.32	70.92
(Prob)	(0.001)	(0000)	(0000)
Adjusted R^2	71.01%	73.03%	76.15%
Number of observation	130	130	130

Source: Author's estimate from Stata 12 software.
*, ** and *** refer to 10%, 5%, and 1% significance levels, respectively. Figures in brackets represent z-statistics.
Note: RMSE is the Root Mean Standard Error. Statistic represents Chi2 (for 3SLS and W3SLS) or F statistic (for 2SLS). CPIBH is per capita GDP growth, GDPHI is initial GDP per capita, INE is income inequality (GINI), ODA is official development aid as% of GDP, FDI is foreign direct investment as% of GDP, DELT is the long-term public debt as a% of GDP, INV is domestic investment, OUV is trade opening, TSS is the secondary school enrollment rate, finally INF is the inflation rate.

Finally, our model has made it possible to better explain inequalities with a variability that is more than 68% translated in the three estimation methods while that of growth is explained to 71%. However, it is important to test Kuznets's hypothesis that the relationship between inequality and average income forms an inverted "U" curve.

Moreover, the Kuznets's hypothesis [48] assumes that inequality in the distribution of a country's income evolves during its economic development according to a U-shaped inverted scheme: it increases in a first time, then

stabilizes and eventually decreases. The results of our estimates show that the quadratic relationship between GDP per capita and the GINI coefficient is reversed in the W3SLS method and confirmed in the 2SLS and 3SLS methods. Indeed, the coefficient of GDP per capita is positive and significant while the sign of the coefficient of its square is negative and significant.

4.2.3 Equation of poverty

The ultimate purpose of this research is to estimate the equation of poverty. Indeed, the analysis of the poverty equation completes the analysis of the model. Table 6 summarizes the estimation results. Hence, the effects of per capita GDP growth on poverty are mixed. In fact, according to the 3SLS method, growth is followed by a decline in poverty in the countries of our sample. However, the W3SLS method transforms the growth coefficient into a positive coefficient, showing that in the short term an increase in growth is synonymous with an increase in poverty. Against all odds, according to the 2SLS and 3SLS methods, foreign capital would increase poverty. On the flip side, the application of the W3SLS method leads to a contrary result.

In this context, we suspect the presence of a strong endogeneity between growth and foreign capital. We then proceed to a separate test between the effects of growth and those of foreign capital on poverty in order to control the robustness of the results.

Following this test, the influence of growth on the incidence of poverty becomes positive but not significant in all regressions. That of foreign capital remains positive and significant with the 3SLS and W3SLS methods and not significant in the 2SLS method. These results indicate that the direct effects of growth and foreign capital on poverty reduction in sub-Saharan Africa appear to be fragile and inconsistent in their entirety. The analysis of the effect of inequality on absolute poverty shows that they are positive and significant in all regressions with all methods. Thus, a 1-point increase in the GINI coefficient would increase the incidence of poverty by 0.25 points to 0.93 points according to different estimation methods. It is therefore doubtful that the most effective way of reducing poverty in sub-Saharan Africa, and particularly in the countries in our sample, is certainly the reduction of inequalities through a better redistribution of wealth.

Table 5. Estimation of the determinants of the inequality equation - Dependent variable: INE

Variable	Growth and CAPETR			Growth without CAPETR			CAPETR without growth		
	2SLS(1)	3SLS(2)	W3SLS(3)	2SLS(4)	3SLS(5)	W3SLS(6)	2SLS(7)	3SLS(8)	W3SLS(9)
CONS	39.4***	38.9***	37.08***	42.3***	49.1***	24.9***	32.4***	39.7***	41.5***
	(3.07)	(5.76)	(6.73)	(5.21)	(5.26)	(3.47)	(4.98)	(7.10)	(6.99)
CPIBH	-0.18**	0.22***	-0.30**	-0.28	-0.22*	-0.19	-	-	-
	(-2.06)	(3.17)	(-3.07)	(-1.06)	(-1.89)	(-1.70)			
ODA	-0.235	-0.241*	-0.35*				0.28	0.39	0.36
	(-1.42)	(-1.87)	(-0.96)	-	-	-	(0.97)	(1.48)	(1.24)
FDI	0.91**	0.89***	0.78***				0.153*	0.235	0.243
	(2.12)	(5.02)	(3.92)	-	-	-	(1.92)	(0.91)	(0.81)
DELT	0.48***	0.47*	0.49***				0.290	0.23	0.39
	(2.96)	(1.90)	(3.05)	-	-	-	(1.07)	(1.51)	(1.42)
PIBH	0.07***	0.08***	-0.06	0.042***	0.05***	-0.037	0.08***	0.09***	-0.070*
	(3.09)	(2.93)	(-1.42)	(3.35)	(3.45)	(-1.21)	(3.15)	(3.34)	-(1.87)
PIBH^2	0.51***	-0.89***	0.638	-0.79***	0.62**	0.72	-2.01**	-1.9***	2.33**
	(-3.12)	(-4.69)	(1.72)	(-3.03)	(2.02)	(1.51)	(-2.58)	(-3.51)	(2.59)
IPC	0.013**	0.019***	0.014***	0.02	0.031	0.06***	0.071	0.05**	0.71***
	(2.15)	(3.17)	(4.21)	(1.57)	(0.81)	(3.09)	(0.81)	(2.03)	(3.24)
RMSE	1.197	1.040	0.980	1.152	1.423	1.391	1.039	0.9751	0.960
Statistic	21.95	38.12	39.77	19.51	31.74	25.75	29.31	48.05	41.53
(Prob)	(0.005)	(0.000)	(0.000)	(0.002)	(0.00)	(0.000)	0.007	(0.000)	(0.000)
R^2	68.77%	71.03	69.08	71.41%	74.20%	72.14%	85.12%	87.15%	81.2%
Obs	130	130	130	130	130	130	130	130	130

*, ** and *** refer to 10%, 5%, and 1% significance levels, respectively. Figures in brackets represent z-statistics.

Note: INE is income inequality (GINI), CPIBH is GDP per capita growth, ODA is official development assistance as % of GDP, FDI is foreign direct investment as % of GDP, DELT is the public debt long-term as % of GDP, GDPH is GDP per capita, GDPH2 is the square of GDP per capita, CPI is the perception index of corruption.

Table 6. **Total Effect of CAPETR on Growth, Inequality and Poverty**

Estimation methods	2SLS (1)	3SLS (2)	W3SLS (3)
1-Model with growth and CAPETR			
1.1- Total effect on growth$(\vartheta))$	0.392	0.369	0.358
1.2- Total effect on inequality$(\pi))$	0.746	0.794	-0.806
1.3- Total effect on poverty	3.719	5.083	2.891
2-Model with growth only			
2.1- Total effect on growth (ϑ)	0.285	0.293	0.207
2.2- Total effect on inequality (π)	-0.052	-0.063	-0.081
2.3- Total effect on inequality	0.351	0.338	0.095
3- Model with CAPETR only			
3.1- Total effect on growth (ϑ)	0.358	0.371	0.396
3.2- Total effect on inequality (π)	0.526	0.581	0.049
3.3- Total effect on inequality	6.834	7.546	6.908

Source: Author, tables of author estimates

Note: The total effects of CAPETR on poverty, growth and inequality are calculated from the estimates found in Tables 3, 4 and 5 and using respectively the formulas: (4), (5) and (6). As a reminder, the total effect of CAPETR on poverty is equal to, in this framework, i) the total effect of CAPETR on poverty through growth and ii) the total effect of CAPETR on poverty across inequalities. Finally, it is the direct effect of CAPETR on poverty.

In line with our expectations, unemployment statistically and significantly increases poverty in all regressions, while education negatively influences the poverty rate. In fact, sufficient education is synonymous with the creation of new skills, know-how and skills that are essential for an adequate integration into the labor market. Such a result revives the debate about the importance of human capital.

In fact, our simultaneous equations model allows evaluating the direct effects and the total effects of each variable on the variable of interest. Hence, we recognize that CAPETRs affect growth which in turn affects inequality and poverty. Similarly, CAPETRs directly affect the inequalities and poverty that affect growth. In order to evaluate the total effect of CAPETR on the growth, inequality and poverty triangle, all of its interactions should be taken into account. These effects are determined from the reduced model of the set of estimated equations. As such, the total CAPETR effect on poverty breaks down into three effects, two of which are indirect through growth and inequality respectively, and one direct. The final result is a function not only of the sign and magnitude of each effect, but also of the importance of each of these factors in the poverty equation. Table 6 summarizes the results by showing the total effect of CAPETR on growth, inequality and poverty, taking into account different assumptions and different estimation methods.

4.2.4 Foreign capital and dynamic growth, inequality and poverty reduction

Overall, the results indicate that CAPETRs in the countries in our sample do not contribute to poverty reduction; on the contrary, they would aggravate pre-existing situations in the short and medium term. Such a result remains unchanged even when structural differences among the countries in the sample (W3SLS) are neglected.

However, although estimates in all methods indicate that CAPETRs stimulate economic growth, they show that the total effect of these CAPETRs on poverty reduction is positive but very low. It is clear that the CAPETR appears in the medium term to widen inequalities further and apparently worsen poverty in the countries of our sample. In fact, it seems that the scale of inequality significantly decreases the potential for reducing poverty through growth.

The result obviously indicates in cases where the total effect of CAPETR on inequalities is negative, their total effect on poverty decreases and varies between 0.095 and 0.351 [line (2.2) and (2.3)]. Therefore, this once again insists on the determinism of income distribution in poverty reduction. Moreover, when the estimates show that the CAPETR aggravate the inequalities [line (3.2)], the total effect of the latter on poverty would increase and vary between 6.83 and 7.546 depending on the estimation method and the assumptions used.

The results indicate that economic growth may not automatically lead to poverty reduction. The economic growth negatively affects poverty in the long run, only when it leads to a redistribution of income for the benefit of the poorest.

5. CONCLUSION AND RECOMMENDA-TIONS

This study aims to examine the role of foreign capital on growth, inequality and poverty reduction policies in ten West African countries over the period 2000-2014. Empirical analyses were conducted on panel data over fourteen (15) years and several important results in development policies in West Africa were found. Indeed, the study revealed that the effects of foreign capital on poverty are subdivided into two main components. The first component shows that foreign capital favors the fact that foreign capital contributes to the increase of overall welfare when promoting economic growth. The second component indicates that foreign capital taken as a whole affects the reduction of poverty through its effects on distribution of income. Hence, the model shows that foreign capital directly favors the increase of inequalities in the short and medium term (Kuznets effect). However, corruption, political instability and the emergence of social conflicts are likely to increase inequalities and delay the reduction of poverty. In addition, growth, inequality and poverty affect each other. Foreign capital seems to be a major factor of growth. The benefits of this growth do not seem to be significant enough to generate positive growth or at least to offset the negative effects of foreign capital by acting effectively and quickly on the economy. The total effect of foreign capital on poverty depends on three factors: (1) the effects of foreign capital on growth and inequality; (2) the double causality between growth and inequality; (3) the income elasticity of the poor relative to changes in average income and distribution. The conclusions of the analysis of the effects of foreign capital conflict with the generally accepted notion that foreign capital produces automatic effects. On the other hand, reducing inequality is an effective policy for reducing poverty.

This analysis challenges thus African countries in their policies to reduce inequality and poverty. Complementary policies are then required to achieve sustainable levels of inequality. Indeed, the existence of a rule of law that promotes social equity on one hand and growth through investment on the other hand. We also believe that these countries must prioritize their investments in so-called social sectors such as education and health because the current situation of emerging countries, such as China, shows that foreign capital is not just looking for raw materials but also attracted by the human capital endowment in R&D. The more this sector is developed in an economy, the more this economy has the chance to attract foreign capital and capture more technology. Further, investors can increase the impact of foreign direct investment on development in developing countries by improving investment conditions, both domestically and internationally, especially by reinvesting the benefits of these investments in developing countries and in basic social infrastructure sectors. It is also important to reflect on the potential function of ODA as a source of counter-cyclical financing to cushion the impact of the instability of other components of foreign capital.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Jude Cristina. Investissement direct étranger, transfert de technologie et croissance économique en Europe Centrale et Orientale. Économies et finances. Université d'Orléans, 2012. French. NNT: 2012ORLE0510. tel-01127259.
   Available:http://tel.archives-ouvertes.fr/tel-01127259/
2. International Monetary Fund (IMF). World Economic Outlook: Sub-Saharan Africa, Facing a Degrading Environment. IMF, Washington, October. HC800.A1 R445; 2015.
   ISBN: 978-1-49834-433-3 French.
3. OECD, Development Co-operation 2014: Mobilizing Resources for Sustainable Development", OECD Publishing, Paris; 2014.
4. World Bank. "World Development Indicators; 2015.
   Available:http://publications.worldbank.org/WDI/
5. Koussani W, Tozanli S. Economic liberalization and promotion of foreign direct investment in the Tunisian Agri-Food Industry. New Medit N 2; 2014.

6.   Lahimer M. FDI and the growth-inequality-poverty triangle: Application to Sub-Saharan African Countries; 2009. Available:www.researchgate.net/publication/237594018, 24/10/2014

7.   Bourguignon F. The poverty-growth-inequality triangle. Indian Council for Research on International Economic Relations, New Delhy; 2003.

8.   Dollar D, Kraay A.. Growth is good for the poor. Journal of Economic Growth. 2002; 7(3):195-225.

9.   Makki S, Somwaru A. Impact of foreign direct investment and trade on economic growth: Evidence from development countries. American Journal of Agricultural Economics. 2004;86(6):795-801.

10.   El-Wassal KA. Foreign direct investment and economic growth in arab countries: An inquiry into determinants of growth benefits. Journal of Economic Development. 2012;37(4):79-100.

11.   Soumaré I. Does foreign direct investment improve the well-being of people in North African countries? Discussion Paper, North Africa Policy Notes Series, African Development Bank; 2015.

12.   Hermes N, Lensink R. Foreign direct investment, financial development and economic growth. Journal of Development Studies. 2003;40:142-163. Available:http://dx.doi.org/10.1080/0022038 0412331293707

13.   Alfaro L, Al. Does Foreign direct investment promote growth? Exploring the role of financial markets on linkages. Journal of Development Economics.2010; 1(2):242-256.

14.   Borensztein E, De Gregorio J, Lee JW. How does foreign direct investment affect economic growth? Journal of International Economics. 1998;45(1):115-135.

15.   Bruno RL, Campos NF. Reexamining the conditional effect of foreign direct investment, IZA DP. 2013;7458 June.

16.   Sharma B, Gani A. The effects of foreign direct investment on human development. Global Economy Journal. 2007;4(2):9:1-20.

17.   Gohou G, Soumaré I. Does Foreign direct investment reduce poverty in Africa and are there regional differences? World Development. 2012;40(1):75–95.

18.   Klein M, Aaron C, Hadjimichael B. Foreign direct investment and poverty reduction. policy research working paper; No. 2613.

World Bank, 2001. Washington, DC. World Bank. Available:https://openknowledge.worldbank.org/handle/10986/19600

19.   Jalilian H, Weiss J. Foreign direct investment and poverty in the ASEAN Region. ASEAN Economic Bulletin. 2002; 19(3).

20.   Bussman M, de Soysa I, Oneal JR. The effect of foreign investment on economic development and income inequality. ZEF Discussion papers on development policy. 2002;53.

21.   Burnside C, Dollar D. Aid, policies, and growth. American Economic Review. 2000; 90:847-868.

22.   Chauvet L, Guillaumont P. Aid, volatility, and growth again: when aid volatility matters and when it does not. Review of Development Economics. 2009;13(3):452-463. ISSN 1363-6669

23.   Collier P, Dehn J. Aid, Shocks and growth, World Bank, Development Research Group, Washington D.C.; 2001.

24.   Dalgaard CJ, Hansen H, Tarp F. On the empirics of foreign aid and growth. The Economic Journal. 2004;114(496):F191–F216.

25.   Kosack S. Effective aid: How democracy allows development aid to improve the quality of life. World Development. 2003; 31(1).

26.   Collier Paul, Hoeffler Anke. The challenge of reducing the global incidence of civil war. In: Global Crises, Global Solutions. Edited by Bjorn Lomborg. Cambridge University Press; 2004. Available:http://www.copenhagenconsensus.com/sites/default/files/CP%2B-%2BConflicts%2BFINISHED.pdf

27.   Doucouliagos H, Paldam M. The aid effectiveness literature: the sad results of 40 years of research. Journal of Economic Surveys, Wiley Blackwell. 2009;23(3):433-461, 07

28.   Mekasha TJ, Tarp F. Aid and growth: what meta-analysis reveals. The Journal of Development Studies. 2013;49(4):564-583.

29.   Faber E, Naidoo J. Innover par la mobilisation des acteurs: 10 propositions pour une nouvelle approche de l'aide au développement. Rapport élaboré pour le Ministère français des affaires étrangères et du Développement International; 2014.

Available:http:www.diplomatie.gouv.fr/fr/publications/enjeux-planetaires cooperation

30. Ndikumana L. Applying evaluation to development and aid: Can evaluation bridge the micro-macro gaps in aid effectiveness? Revue D'économie du Développement. 2012;20(4):125-153.

31. Bourguignon F, Diaz-Bonilla C, Lofgren H. Aid, service delivery, and the millennium development goals in an economy-wide. Policy Research Working Paper 4683. The World Bank Development Economics Prospects Group; 2008.

32. Calderon C, Chong A, Gradstein M. Can foreign aid reduce income inequality and poverty? Public Choice. 2009;140(1–2):59–84.

33. Nersisyan Yeva S, Wray L. Randall. Un excès de dette publique handicape-t-il réellement la croissance? Revue de l'OFCE. 1/2011;116:173-190.

34. Benedict Clements, Rina Bhattacharya et Toan Quoc Nguyen. L'allégement de la dette peut-il doper la croissance des pauvres? Fonds Monétaire International; 2005. French.
ISBN 1-58906-464-X ISSN 1020-7724.
Available:https://www.imf.org/~/media/Websites/IMF/imported...loe-pdfs/.../issue34f.ashx

35. Krugman P. Financing vs. forgiving a debt overhang. Journal of Dev. Econ. 1988; 29(3):253-268.

36. Reinhart Carmen M, Rogoff Kenneth S. Growth in a time of debt. NBER working paper. January. 2010;15639.

37. Panizza, Ugo, Presbitero Andrea F. Is high public debt harmful for economic growth? In: VoxEU.org 2012;22 April.

38. Pescatori Andrea, Damiano Sandri, John Simon. Debt and growth: Is there a magic threshold? FMI, working paper. 2014; 14/34, february.

39. Zaghdoudi T, Hakimi A. Does external debt- poverty relationship confirm the debt overhang hypothesis for developing counties? Economics Bulletin. 2017;37(2): 653-665.

40. Bourguignon F. The poverty-growth inequalities triangle. Contemporary Africa. 2004/3(211):29-56.

41. Forbes KJ. A reassessment of the relationship between inequality and growth. American Economic Review. 2000;90(4, September):869-887.

42. Lundberg M, Squire L. The simultaneous evolution of growth and inequality. The Economic Journal. 2003;113(487):326-344.

43. Mankiw GN, Romer D, Weil DN. A contribution to the empirics of economic growth. Quarterly Journal of Economics. 1992;407-437.

44. Deininger K, Squire L. New ways of looking at old issues: Inequality and growth. Journal of Development Economics. 1998;57:259-287.

45. OECD. Development Co-operation 2015: making partnerships real coalitions for action. OECD Publishing, Paris; 2015.

46. Mbabazi J, Morrissey O, Milner CR. Inequality, trade liberalization and growth. CREDIT and School of Economics, University of Nottingham, Working Paper, 2002;(102/2).

47. Wade, A. The impact of public debt on economic growth in the WAEMU Zone; 2014.
Available:http://www.ecoasso.org/articles/Aida_Wade. Pdf
(Accessed 27/11/2016)

48. Kuznets S. Economic growth and income inequality. American Economic Review 1955;45(1):1-28.

APPENDIX

$$CPIBH_{i,t} = \delta_1 INE_{i,t} + \theta_1 CAPETR_{i,t} + \rho_1 X_{i,t} + \varepsilon_{i,t} \tag{1}$$

$$INE_{i,t} = \gamma_2 CPIBH_{i,t} + \theta_2 CAPETR_{i,t} + \rho_2 Y_{i,t} + \mu_{i,t} \tag{2}$$

$$PAUV_{i,t} = \gamma_3 CPIBH_{i,t} + \delta_3 INE_{i,t} + \theta_3 CAPETR_{i,t} + \rho_3 Z_{i,t} + \omega_{i,t} \tag{3}$$

$$(1) \; in \; (2) \Rightarrow INE_{i,t} = \delta_1\gamma_2 INE_{i,t} + \gamma_2\theta_1 CAPETR_{i,t} \tag{i}$$
$$+\gamma_2\rho_1 X_{i,t} + \gamma_2\varepsilon_{i,t} + \theta_2 CAPETR_{i,t} + \rho_2 Y_{i,t} + \mu_{i,t}$$

$$INE_{i,t} = \left(\frac{\gamma_2\theta_1 + \theta_2}{1-\delta_1\gamma_2}\right) CAPETR_{i,t} + \frac{\gamma_2\rho_1}{1-\delta_1\gamma_2} X_{i,t}$$
$$+\frac{\gamma_2}{1-\delta_1\gamma_2}\varepsilon_{i,t} + \frac{\rho_2}{1-\delta_1\gamma_2} Y_{i,t} + \frac{1}{1-\delta_1\gamma_2}\mu_{i,t} \tag{ii}$$

$$(1) \; and \; (ii) \; in \; (3) \Rightarrow PAUV_{i,t} = \left(\gamma_3\left[\frac{\delta_1(\theta_1\gamma_2 + \theta_2)}{1-\delta_1\gamma_2} + \theta_1\right] + \delta_3\left[\frac{\theta_1\gamma_2 + \theta_2}{1-\delta_1\gamma_2}\right] + \theta_3\right)$$
$$CAPETR_{i,t} + aX_{i,t} + bY_{i,t} + cZ_{i,t} + e_{i,t} \tag{iii}$$

$$PAUV_{i,t} = (\gamma_3\left[\frac{\theta_2\delta_1 + \theta_1}{1-\delta_1\gamma_2}\right] + \delta_3\left[\frac{\theta_1\gamma_2 + \theta_2}{1-\delta_1\gamma_2}\right] + \theta_3)CAPETR_{i,t}$$
$$+aX_{i,t} + bY_{i,t} + cZ_{i,t} + e_{i,t} \tag{4a}$$

$$PAUV_{i,t} = (\gamma_3\upsilon + \delta_3\pi + \theta_3)CAPETR_{i,t} + aX_{i,t} + bY_{i,t} + cZ_{i,t} + e_{i,t} \tag{4b}$$

Where:

$$a = \frac{(\gamma_3\delta_1 + \delta_3)\rho_1\gamma_2}{1-\delta_1\gamma_2} + \gamma_1\gamma_3 \tag{iv}$$

$$b = \frac{\rho_2(\gamma_3\delta_1 + \delta_3)}{1-\delta_1\gamma_2} \tag{v}$$

$$c = \rho_3 \tag{vi}$$

a, b and c are parameters.

$$e_{i,t} = \left[\frac{\gamma_2(\gamma_3\delta_1 + \delta_3)}{1-\delta_1\gamma_2} + \gamma_3\right]\varepsilon_{i,t} + \frac{\gamma_3\delta_1 + \delta_3}{1-\delta_1\gamma_2}\mu_{i,t} + \omega_{i,t} \tag{vii}$$

We can state from equations 4a and 4b:

$$\upsilon = \frac{\theta_2\delta_1 + \theta_1}{1-\delta_1\gamma_2} \tag{5}$$

$$\pi = \gamma_2 \upsilon + \theta_2 \tag{6}$$

Demonstration of equation 6 is:

$$\pi = \frac{\theta_1 \gamma_2 + \theta_2}{1 - \delta_1 \gamma_2} = \frac{\theta_1 \gamma_2 + \theta_2}{1 - \delta_1 \gamma_2} - \theta_2 + \theta_2 = \gamma_2 \left[\frac{\theta_2 \delta_1 + \theta_1}{1 - \delta_1 \gamma_2} \right] + \theta_2 = \gamma_2 \upsilon + \theta_2$$

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/22433