



EMPIRICAL ANALYSIS OF POVERTY ERADICATION AND ITS DETERMINANTS IN RWANDA: LESSONS FROM CHINA

Gerard, BIKORIMANA^{1*}, Dieudonne UWIZEYE¹ & Celestin NDIKUMANA¹

¹College of Arts and Social Sciences, University of Rwanda, Rwanda

* Corresponding author: bikogerard@gmail.com

ABSTRACT

This paper analyzed empirically the lessons Rwanda learned on poverty reduction strategies used by China. The simulations were made using the Fixed Effect Model where the coefficients of explanatory variables were constant or the same for both countries to reflect how poverty reduction strategies used by both countries result in the same outcomes and relatively the same output. Outcomes from simulations revealed that Adjusted Net Saving, government spending, citizen's empowerment, education for all and Foreign Direct Investments strategies used and drawn from Chinese economy by Rwanda are statistically significant; hence reduced poverty in both economies. In the light of the findings, the study recommended to policy makers a strong review of their empowerment strategies since it was the only explanatory variable which was not statistically significant in the model. It also recommended that women empowerment in political, social and economic aspects must be accompanied by youths' empowerment in those domains as the main driving forces of both economies.

Keywords: Poverty eradication, Fixed effect, Rwanda, China

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1. INTRODUCTION

The poverty reduction target is among the major objectives which every country puts ahead as a priority but the achievements are different due to the effort and commitment made by countries. Rwanda is a landlocked and low-income country. Its economy has been growing gradually from 1995 with Gross Domestic Product (GDP) growth rate of 8 % at constant market price in 2013.

According to the assessment conducted by NISR (2016), Rwandan poverty rate has been reducing gradually from 44.9 % in 2010/2011 to 39.1% in 2013/4. The life-threatening poverty reduced from 24.1% to 16.3% and also from 0.507 to 0.448 in Gross National Income (GNI) coefficient correspondingly in 2010/2011 to 2013/14. In addition, Rwanda is among African countries which have very quick economic growth. Nevertheless, many challenges persist for sustainable and inclusive development of the country's economy.

The poverty level remained very high in rural areas with 48.7% people living in poverty compared to urban ones with 22.1% in 2010/11. Most Rwandans are relying and living in rural areas where 90% of populace live in the family which possessed a portion of land and more than 60% of families cultivate below 0.7 hectares (NISR, 2007). Yet the harvest from agriculture remains very low as it contributed only 33% to national GDP (IPAR, 2015). The employment is among the key indicators that link economic and poverty reduction. Rwandan population still depends heavily on agriculture wage as a source of income and have nearly high level of poverty. The next one includes those who work in their own agriculture fields. Other people who rely on non-farm jobs like self-employment tend to be much less poor (NISR & MINECOFIN, 2012).

In the same viewpoint, China was a poor country as other countries which are still struggling with high rate of poverty today. The rural areas in China have suffered poverty since mid-1950 to 1970. Around 770 million people were suffering from poverty situation in 1978. This situation of poverty crises has been stimulating the creation and implementation of economic reforms since 1978. The reforms were implemented into 4 phases and each achieved a very impressive result in poverty reduction. In general, the poor people reduced from the 770 in 1978 to 55.8 million people in 2015 and recent programmes implemented have a target to raise all population that persevere in poverty by 2020 (UNDP, 2016). Therefore, the achievement of economic reforms was facilitated by committed and competent Chinese leadership who implemented them.

Hence, Hejun said,

“ China-Rwanda relations have evolved into a mature partnership, highlighting the increase of close political, economic, military, cultural, educational and health ties, among other at the 67th anniversary of the founding of the People's Republic of China, at a reception held at the Chinese embassy in Kigali ”(Julius, 2016).

This shows how poverty reduction strategies of Rwanda in the post-Genocide era have drawn many lessons from Chinese's poverty reduction strategies.

The present study therefore, conducted an investigation on poverty eradication and its determinants in Rwanda focusing on lessons learnt from China. We used data from (i) World Development Indicators, (ii) NISR and Rwanda National Accounts and variables were tested by using Hadri LM (2000) and Engel-Granger models for Unit root and Co-integration tests along with OLS regression analysis. The main contribution of this study provides clear understanding on poverty reduction issue and its determinants with the purpose of facilitating the formulation of effective policies which can drive the sustainable development in both Rwanda and China.

The rest of the study is structured as follows: section two briefly summarizes the literature review, section three describes the methodology used in our study, while section four deals with presentation of empirical results and discussions and the last part of study provides the conclusion.

2. LITERATURE REVIEW

The writing on poverty and its determinants clearly takes the debatable arguments among scholars. Some parts of literature have validated the use of monetary measurement to poverty analysis where some study use consumption expenditures; others use income per capita or other kinds of revenues as proxies of poverty reduction. To know what the determinants are of poverty and household well-being, many methodologies have been employed by scholars and some of them focus on non-monetary measurement such as asset index which gives socio-economic standing of each household (McKay, 2013).

According to Dasgupta & Mäler (2001), “In relation to the demographic bases, each generation should leave to its successor at least as large a productive base as it had inherited from its predecessor”. If it were to do so, the economic possibilities faced by the successor would be no worse than those it faced when inheriting productive assets from its predecessor. From this perspective, the well-being will not be permitted to decay, yet the utility could fall in level which safeguards better welfare in the upcoming, whereby the prosperity at any moment is the current value for forthcoming uses.

The treasure of government consists of the social worth for the whole focused capital. The expansion to the broader variety of resources, comprising resources with undesirable eclipse prices should extend (Atkinson & Hamilton, 2007). Shadow pricing contains assessment of all forms of properties (such as factory-made, human, natural resources, social, monetary and education at their present value).

The current price of commodities is the bulk afforded to one item of the good. Then, considered by treasure, well-being improvement or poverty reduction is linear in assets. Treasure accumulation as one among many determinants of poverty reduction, Keynes (1936) initially analyzed wealth accumulation rationales, highlighting eight distinct reasons, and also Browning & Lusardi (1996) added another reason. Such reasons are: “(1) precautionary motive, (2) life-cycle motive, (3) inter-temporal substitution motive, (4) improvement motive, (5) independence

motive, (6) enterprise motive, (7) bequest motive, (8) avarice motive and (9) down payment motive”.

In the paper released by the World Bank (2004), the regulated national saving is the outcomes of net nation-wide thriftiness plus expenses on instruction excluding properties rents (for instance decay of energy, natural resources) excluding carbon dioxide harm. In estimation of regulated disposable saving, contemporary spending on schooling (buying books, wages for instructors etc...) is considered as saving instead of intake, as it upsurges the country's human development capital.

Different discussions have been conducted in the research works related to the contributing factors which influence the poverty decrease linked with economic progress. In this discussion, the level and distribution of government expenditure have contended to be a major stimulus to poverty reduction. A number of cross-country econometric researches have explored the association between government expenditure and revenue poverty and displayed a stimulating diversity of results.

However, empirical evidence to support this view is not constantly forthcoming. A number of cross-country econometric studies have investigated the association between government spending and income poverty and have displayed a stimulating diversity of results. For instance, Mosley et al. (2004) discovered that “pro-poor” government expenditure has an adverse and influential outcome on a dollar per day (\$1 per day poverty headcount) while Kwon & Kim (2014) discovered that health expenditure has a negative and significant meaningful on poverty lessening.

The linkage between government outlay and deprivation decrease is complicated and can fluctuate for several reasons. The first one can possibly depend on sort of expenditure/outlay taken into consideration by government. The government outlay on transfers and subventions may decrease deprivation right away by increasing the actual saving of impoverished families. It might as well do so incidentally by improving the nourishment, health and schooling amongst the deprived families which sequentially spearheads to higher market revenue. The government outlay on fundamental health and schooling facilities and some sort of physical infrastructure is also generally considered to decrease deprivation by growing the yield and revenue potentials of deprived families (Mosley et al., 2004; McKay, 2004; Paternostro et al., 2007). These types of government outlay are most likely to reduce poverty since much of the gains from government wellbeing and schooling outlay are welcomed by the low and middle classes, especially in suburban and rural settings.

According to Cavallari & Di Gioacchino (2005), the macroeconomic implications of fiscal policy coordination under different cyclical conditions can lead to favorable outcomes for output under both demand and supply shocks and for inflation under demand shocks. Uhlig (2002) shows that in the absence of fiscal shocks and symmetrical countries size wise, all fiscal authorities would be better off under a cooperative equilibrium characterized by a common fiscal policy of zero deficits. The decentralization of power has contributed to the upsurge of personal

and employment life excellence of females in current spans. The education, political empowerment and employment are efficient tools to women empowerment. Hence, its relationship to poverty reduction cannot be ignored here. Consequently, women empowerment is fundamentally vital and actively valued to rescue them from poverty.

The capability method highlighted by Sen focuses more on significance of agency in upholding enlargement of human being. According to Trommlerová et al (2015), it shows that empowerment is a theory closely linked to agency. In brief, empowerment refers to the upsurge in agency that allows human to hunt for treasured and imperative objectives. This implies that the promotion of empowerment could be a valuable tool for upholding human enlargement and poverty reduction.

The education is considered as key to development in both developed and Third World countries. In doing so, among the objectives of MDGs one of them was voted for promoting universal primary education, specifically in under developing countries. The free education was introduced in different low income countries and this allows even poor people to have access to education (UNESCO, 2007).

According to Masood et al. (2011), education contributes to the increase of knowledge and skills which is a good supporting tool in poverty reduction. It helps indirectly in the fulfillment of getting the elementary necessities such as water and sanitation access to health, housing as well as affecting positively family planning issues. Therefore, every family expects to grab an utility function which may be subjected to training (education) of their children as well as benefitting from all other needed goods. According to Gaddah et al.(2016), the greatest investment which households can make is educating their children which requires to reduce consumption of other commodities with expectation of obtaining highest utility in the future. Analysts on education contend that free education may not create the predictable effects on poor families due to other extra costs apart from school fees. In line with promoting poverty reduction, governments should not only consider free education but also other social means of attaining school for the poor (Gaddah et al., 2016).

The World Bank (2004) highlighted that education conveys social profits which upgrade the status for the poor in the way that it upsurges the skills which are needed in the production process and helps them to fully partake in the economy. Education training is core basis for competence of labour forces which impact significantly on the progress of economy (Julius & Bawane, 2011). Therefore, the present study also seeks to determine how education proxied by school enrollment affects poverty reduction.

Also, on other side, the Foreign Direct Investment (FDI) is considered as a vital component of fruitful economic progress and expansion especially for developing countries. It is the central point which speeds up the economic progress of every country and was found as one of the most strategic tools for poverty reduction (Klein et al., 2001). Foreign Direct Investment is

the engine in making progress thus being the greatest main element in the eradication of deprivation.

The effect of Foreign Direct Investment on promoting the human progress can be assessed in two perspectives. For insistence on social aspect, the key priority of every country, even the so called developed ones is to fight against poverty and promote the welfare among their populations. On other perspective of economy, the present research works on endogenous growth highlighting that the investment in human progress may be the major provider for restricted progress in GDP per capita (Solow, 1956). According to Ravallion & Datt (2002), the progress in agrarian and services domains specially contributed more in poverty reduction than manufacturing progress. By analyzing the country's level data for the case of India, the findings showed that the elasticity of poverty for non-agricultural progress diverse considerably crosswise among countries and was better in the countries with advanced preliminary learning and farmhouse production.

The progress in economy alongside disparity may well uphold the smoothness of a country's poverty. Ravallion (2007) specified that although economic progress was realized as essential in enlightening people's prosperity, in the case that it is not for pro poor, focus may increase disparity and results with no effect on welfare. More importantly, many studies have analyzed the general influence of FDI on economic progress, indicating significant relationship between the economic progress and well-being. Yet, the said hypothesis was queried (Anand & Sen, 2000).

Mayne (1997) shows that influences of FDI on poverty and other social objectives of progress build upon various factors; for insistence, the host country programmes and institutions capacity, standard of investment, rules and regulation in place, availability of workers, infrastructures facilities etc. According to UNCTAD (2006), it is highlighted that the policies were amended at national level in the favor of FDI as justified in 1992 to 2002; out of 2,267 policies 2,078 were modified. In contrast, adversaries of outside investments in countryside economies contend for tending to damage the local surrounding resources. The current support from FAO (2012) research testimonial show that some cases of rural areas faced the environment problems that affected their reliable resources for subsistence. Different studies support the contribution of FDI which is imperative once it comes to the upsurge of the economic progress in under developing states (Dollar & Aart, 2001; Kolstad & Tønne, 2002).

Many of the researches on the impact of Foreign Direct Investment on deprivation decrease found that most African states are mainly portrayed by low levels of institutional competence and a weak business setting, both of which adversely blow FDI. Hence, this study devoted enough time to analyze whether FDI contribute to poverty reduction in Rwanda and China thereby drawing up lessons learnt.

3. METHODOLOGY

3.1. The Data

We collected data with the aim of finding out the changing level between poverty reduction and its determinants in both economies of China and Rwanda. This information is valuable for assessing and advising policy decisions. The time series used cover the period of 1997 to 2015 for the two cross section units which are China and Rwanda.

The study is interested in finding out how poverty reduction, with a proxy of Final Consumption Expenses (**Fce**) as % of GDP depend on:

- The specific qualitative characteristics for two countries - China and Rwanda - in time (such as security features, leadership and administration styles, individual strengths, or speed to recover from external macroeconomic shocks). All these qualitative characteristics are outside of our model and aggregated in a qualitative dummy variable D_{it} ;
- The adjusted saving X_{1it} (as a percentage of GNI);
- The overall government final intake expenditure X_{2it} (as percentage of GDP);
- The percentage of places occupied by women in legislative body X_{3it} (as a percentage of total parliament members);
- The secondary school enrollment, X_{4it} (as percentage of gross enrollment);
- And on the foreign direct investment X_{5it} (net inflows as percentage of GDP)

The interested variables under the research were acquired from: (i) World Development Indicators, (ii) NISR and Rwanda National Accounts accessible electronically.

Table 1: Showing Statistics for the Two-Cross-section Units

Variables	Obs	Mean	Std. Dev.	Min	Max
Fce	38.0	75.8402	22.62	48.7422	105.1768
D_{it}	38.0	0.5	0.5067	0.0	1.0
X_{1it}	38.0	29.92414	17.2558	5.1	51.8484
X_{2it}	38.0	14.88304	2.3828	9.582661	19.5635
X_{3it}	38.0	33.01579	16.6365	17.1	63.8
X_{4it}	38.0	47.90159	29.36	8	96.2417
X_{5it}	38.0	2.460055	1.5275	0.94941	4.600337

Sources: Researcher's compilation from E-view

3.2. The Empirical Model Specification

When establishing Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS II), Rwanda was in the tenth position of rapid upward growing economies in the world over the span from 2000. In the similar period, more than millions of poor people were raised from poverty situation. This study examines the causal relationship between poverty and its

determinant for Rwanda and China thereby drawing up lessons learnt by Rwanda on China throughout the period of 1997 to 2015.

Applying the fundamental model of poverty proposed by Ravallion & Chen (2003), yet again the frameworks speculated by Dollar & Kraay (2002), empirical research of Agénor (2004); Rizwanul (2004) and Anyanwu & Erhijakpor (2012) the correlation which we need to estimate can be done using a *Fixed effect model*.

The use of “fixed effects” is due to the fact that, even if the intercept may change crossways individual cross-section unit (Here, the two countries Rwanda and China are considered as cross-section units), every individual’s intercept does not change across time; that it is a time invariable, because there is no much changes or external shocks in security, leadership and policy- making despite their continuity for these two countries. The time series ranging from 1997 to 2015 period were utilized. To permit for the (fixed effect) intercept to change among countries, the study introduced differential intercept dummies.

To examine the determinants of poverty reduction in both countries thereby drawing up lessons learnt by Rwanda from China, therefore the following model is established:

$$Fce_{it} = \beta_1 + \beta_2 D_{2i} + \beta_3 X_{1it} + \beta_4 X_{2it} + \beta_5 X_{3it} + \beta_6 X_{4it} + \beta_7 X_{5it} + U_{it} \quad (3.1)$$

Whereby i portrays i^{th} cross-sectional entity, t represents t^{th} time span, as a matter agreement, the study will allow i to stand for the cross-section attributive and t represents time attributive. In this research, we obtained a balanced panel whereby each country has sample 19 observations.

The crucial standard for choosing the prospective determinants of this model was exogeneity and economic theory. The main objective of the model is deduced causation variables which may be affected by the final intake expenditure as well as endogeneity in variables were disqualified.

The present study uses final intake expenditure as a proxy of poverty decrease and as percentage of GDP in the investigation. Even if revenue has been commonly applied as proxy for poverty reduction, final intake expenditure in economy has the benefit for easy measuring and offers more precise picture of a household’s poverty reduction situation.

According to Deaton & Zaidi (2002), the periodic variations in intake paradigm are normally less magnified compared to income. Therefore, while using (Fce) as a quota of poverty, the study supposes that (i) every person in family obtains the same distribution of stuffs spent regardless of age or sex; (ii) every person in a family has similar wants regardless of age or sex and (iii) the expenses for two or more persons who live together is similar just as they survived independently (Skoufias, Davis & Behrman, 1999). Contrary to that, an adult corresponding basis standardizes intake by considering age and sex made of the family. The issues of applying the adult corresponding or equivalents is that intake for non-food stuffs specifically is not nearly connected, no matter the age and sex of a person. Therefore, being persistent by normal procedure of poverty analysis, the study adopts the use of final consumption expenditure as a basis.

Fce_{it} = is Final consumption expenditure of households in both countries

In addition to the above explanatory variable, basing on individuality of every cross-sectional entity is to allow the change of intercept for every nation, yet again, it supposes that slope coefficients are stable. The only disparities may be happiness to particular characteristics of every country for instance security feature, leadership and administration styles, individual strength or speed to recover from external macro-economic shocks.

D_{it} = differenetial intercept dummy; $D = 1$ for Rwanda and $D = 0$ otherwise

Therefore, as there are two countries in this study, the only one dummy variable has been used to dodge sinking in **dummy-variable trap**. In this, there is no dummy for China, β_1 represents the intercept of China and β_2 for Rwanda.

That is the distinction intercept which informs how much the intercept of every country under the study differs. In brief, China turns into a comparison country.

As long as the study is applying dummies to approximate the fixed effects, then the model (3.1) is as well recognized as **least-squares dummy variable (LSDV)** model. Thus, concepts fixed effects and LSDV may be applied interchangeably. Therefore, the study choices were based on economic theories on poverty, World Bank indicator of poverty reduction and likewise variables with substantial interest to Rwanda and China decision makers.

In analyzing **saving** in poverty reduction, scholars highlighted it as important factor for both macroeconomic and microeconomic level. The scope of savings may not only consist of physical capital, likewise human resources, assets, social capital etc... all have money-wise worth. Then these features reinforce poverty reduction in a sustainable manner (Gnègnè, 2009). From him the adjusted saving is taken as asset bases for poverty reduction. The economic theory proposes a negative connection among Adjusted Saving (AS) and poverty, for instance accumulation of (AS) leads to poverty reduction.

The Adjusted National saving = $\{(Y_{dis} - F_{ce}) + (Taxes - Government\ expenditures)\}$.
And,

Disposable income (Y_{dis}) in nominal terms is taken as fixed and being explained as:

$Y_{dis} = Y_{tot} - D_{tax}$, whereby **$Y_{tot}$** is defined as total income and **D_{tax}** as direct tax revenues.

Therefore, National income, Y_{tot} , needs trained staff in production, ST_p , personal capital, PK , and Government capital in health and infrastructure, GK_{hea} and GK_{inf} , correspondingly. GK_{inf} facilitates the production of own company to generate more output while GK_{hea} assist in improving the health quality work force working in production sector (Emmanuel & Nihal, 2008).

$X_{1it} = Adjusted\ savings: gross\ savings\ as\ \% \ of\ GNI$

Since, the Final Consumption Expenditure in nominal terms, **F_{ce}** , is explained as fixed part of disposable income corresponding:

$F_{ce} = (1 - s) \frac{Y_{dis}}{P_{gt}}$ Whereby $0 < s < 1$ represent the savings rate while **P_{gt}** is tax-inclusive mixed market price of merchandises traded locally. Then, the increase of Consumption Expenditures leads to decrease in AS or vice-versa and we expect a negative sign of β_3 .

While defining poverty reduction indicators, World Bank (2017) has said that a country gathers taxes and uses it for different activities for instance wage payments, buying goods and services as well as for investment in various expenditures such as education, health, infrastructure etc.

Then $X_{2it} = WLE_G + Pqt(CG + TIG) + IRG * NER FdeG_{-1} + IRD DdebtG_{-1}$ (3.2)

By which X_{2it} : stands for general government expenditure, WLE_G : represents government salaries invoice, CG : stands for current non-interest expenditure on good and service, TIG : stand for the overall government investment, NER : represent nominal exchange rate, $FdeG_1$: stands for store of foreign debt, IRG : represents interest rate on foreign credit, $DdebtG$: represents store of local public debt, IRD : represents interest rate on local public debt. The IRG and IRD are supposed exogenous.

Therefore, increase of country acquisition helps to maintain output, yet crowd out intake and more social benefits to household affect significantly the private intake, but an unimportant issue on production and investment simply because in these economies, these transfers are targeting vulnerable groups (Kollmann et al., 2012). That is the reason why we expect a negative sign of

β_4

$X_{2it} = \text{General government's final consumption expenditure (\% of GDP)}$

Kabeer (1999) highlights a valuable theoretical frame and asserts that a wide notion of “resources”, along with material, personal, as well as social properties accessible to people and societies upset their empowerment. In this study, we indeed focus on how empowerment (proxied by the number of Parliament Seats held by women): X_{3it} leads to poverty reduction in the two cross-section units for the years 1997 to 2015. Hence, we expect a negative association among poverty reduction and empowerment variables and a negative sign of β_5

$X_{3it} = \text{Ratio of seats grasped by women in national parliaments (\%)}$

In promoting poverty reduction framework and improving the lives of poor people, United Nations adopted the Millennium Development Goals which have eight objectives among them there is universalization of admittance to primary training as well to decrease absolute poverty by 2015. Rwanda is well positioning in achievement of those objectives, whereby for instance primary and secondary education enrolment (X_{4it}) recently positioning around 65 percent in average and as well poverty reduced up to 39.1 percent by 2015 (Rolleston, 2011). Therefore, in our study because of contribution of education to poverty, we expect a negative relationship between poverty reduction and education (proxied by secondary school enrollment) variables and a negative sign of β_6

$X_{4it} = \text{School enrollment (\% gross)}$

Different scholars highlight the contribution of FDI as crucial ingredient for prosperous economic progress in the country especial developing states. This situation happens for the reason that the actual spirit of economic progress is fast and adequate transfer and implementation of “greatest practice” across boundaries (Klein et al., 2001). It is a distinctly most essential factor which impacts poverty discount. The same author shows that; the rapid

growth of China economy has been dependent on heavy FDI. Several studies highlight that FDI tends to increase production in the beneficiary economy.

The work of Dunning (1998) on motivations of FDI, through the supposed OLI paradigm, designating the key factors which attract the foreign companies (Ownership, Location, and Internationalization), suggests that International Corporations have a tendency to orient their investment to countries with small salaries and plentiful of natural resources.

In our current investigation, the study indicates the upsurge of FDI inflows, X_{5it} , after the removal of barriers which face these two economies. To find out the magnitude of relationship between both variables on poverty reduction, the study expects the negative relationship between them. Hence, the negative sign of β_7 . More importantly, this corresponds to the recent country plan of attracting FDI by which they are offering attractive conditions to stimulate investors.

$X_{5it} = \text{Foreign direct investment, net inflows (\% of GDP)}$

U_{it} is the error term. Firstly, we take up that X 's are non-stochastic and the error term pursue the classical hypothesis, specifically, $E(U_{it}) \sim N(0, \sigma^2)$

3.3. Test of Estimates

In the model estimation, the present study adopted the OLS technique to estimate the model estimates. The intention is to consider the regression's essence of variables. In the assessment of model reliability, the study used two main valuation benchmarks which were: (i) a-priori forecast criteria that focused on signs as well as significant levels of the variable coefficients under consideration in the study, (ii) statistical standard which is focusing on some theories of applied statistics were taken into consideration. For instance Ordinary Least Square (OLS) which is containing the **R**-square (R^2), **F**-statistic, **T**-statistic, Unit Root and cointegration tests were applied.

3.3.1. The Coefficient of Determination (R^2)

The R-Square (R^2) is a statistical measure in a regression model that determines the proportion of variance in the dependent variable that can be explained by the independent variable. It is the goodness-of-fit measure for a model based on regression analysis. Also R-Square measures the share of the overall variance of the response variable as explicated by predictor variable. It is highlighted that the more value R^2 , the better the model your results describe.

3.3.2. F-statistic

The present study uses F-stat to check the whole model significance and also the steady of coefficients. It is a valid tool in proving the whole significant of an estimated model. Therefore, hypothesis testing consists of: H_0 : Estimated model has no goodness of fit while H_1 :

Estimated model has goodness of fit. Conclusion instruction for hypothesis: Reject H_0 : for $F_{calc} > F_{\zeta}$ on $\zeta = 5\%$, accept if alternatively.

Then the study will draw the conclusion on the fitness of the model based on F-stat.

3.3.3. Unit Root Test

In the empirical literature, most economic time series are changing over time. Then it is very significant to inspect if the research series is stationary or non-stationary before econometric estimation, as long as estimation use non-stationary variables may produce spurious regression model (Granger, 1974; Asterious & Hall, 2010). Data are contrasted for the purpose of reducing non-stationarity of the series to stationarity. To inspect the stationarity of variables under the present study, Hadri Lagrangian Multiplier test was applied for level and first difference test for stationarity.

The (Hadri, (2000) Lagrangian Multiplier test applies panel data to check the null hypothesis whether panel data are stationary against the alternative hypothesis that at least one-panel data hold a unit root. In contrast, other unit root tests generally dismiss the null hypothesis that all series hold unit roots in the backing of the alternate hypothesis that a few are stationary. See Levin et al. (2002), Harris & Tzavalis (1999), the inspiration for the test is upfront. For instance, we include a panel-specific time trend and write our series Y_{it} as:

$$Y_{it} = r_{it} + \beta_i t + \epsilon_{it} \quad (3.3)$$

Where r_{it} is a random walk,

$$r_{it} = r_{it,t-1} + \omega_{it} \quad (3.4)$$

Also ϵ_{it} and ω_{it} are zero-mean i.i.d. normal errors. In the case that variance of ω_{it} were zero, as result r_{it} would failure to a consistent, thus Y_{it} would be trended stationary. Applying this idea, the Hadri Lagrangian Multiplier test examines the hypothesis:

$$H_0: \beta = \frac{\sigma^2 \omega}{\sigma_\epsilon^2} = 0 \text{ Versus } H_1: \beta > 0$$

Where both ω_{it} and ϵ_{it} are standing for error term which are randomly normal distributed. Suppose $\hat{\epsilon}_{it}$ represent residuals obtain from a regression of Y_{it} for particular intercept and time flow of a panel. Since trend is stated, so:

$$\widehat{LM} = \frac{\frac{1}{N} \sum_i \frac{1}{T^2} \sum_t S_{it}^2}{\hat{\sigma}_\epsilon^2}$$

Where

$$S_{it}^2 = \sum_{j=1}^t \hat{\epsilon}_{it}$$

And

$$\hat{\sigma}_\epsilon^2 = \frac{1}{NT'} \sum_{i=1}^N \sum_{j=1}^T \hat{\epsilon}_{it}^2$$

Whereby

$T' = T - 2$ Because trend is stated and $T' = T - 1$ alternatively

$$\text{So, } Z = \frac{\sqrt{N}(LM-\omega)}{\sigma}$$

Then, study tests the null hypothesis whether the variables are stationary for the sub-section of two cross section unit (Rwanda and China). To resistor for serial correlation and heteroscedasticity, we apply spectral estimation method of Bartlett kernel with (0) and (1) lags.

3.3.4. Cointegration Test

To determine the presence of a long- run association between the variables under consideration with the study, the cointegration test was used. This test implies testing for the presence of such a long- run association among series variables and also is required for any economic model which uses non-stationary series statistics, as was adopted in this study. When the variables are not cointegrated in the model, it implies the presence of untruthful regression analysis and the econometric assistance turns out to be valueless (Engle & Granger, 1987).

In the long run, a set of variable X_t and Y_t is in equilibrium, in such situation the following condition is satisfied:

$$Y_t = \alpha_0 + \alpha_1 X_t + u_t$$

And taking the error term of the regression:

$\widehat{u}_t = Y_t - \widehat{\alpha}_0 - \widehat{\alpha}_1 X_t$, if $\widehat{u}_t \sim I(0)$, thus the variables (X_t and Y_t) are supposed to be cointegrate. In this study, all variables intend to be exposed on Engle-Granger cointegration test to circumvent the problem of correlation which regularly connected with non-stationarity of time series data. The Engle – Granger take into account the problematic of testing null hypothesis of no cointegration among a couple of variables by calculating the coefficient of a statistics correlation among the variables under the study applying OLS residuals to be tested for the unit root and stationarity.

4. EMPIRICAL RESULTS

4.1. Estimation Using the Unit Root Test

Table 2 and 3 presented the results of Hadri LM test computed up to the sample time frame for the unit root test at the level and first difference correspondingly to find out the stationarity of the variables the study is interested in.

The findings highlight that the variables in consideration by this study are all stationary at the level and first difference. Therefore, as all variables under consideration are stationary, then the adoption of OLS provides regression result which is trustworthy and efficient estimates.

Table 2: Unit Root Test at Level

Model: $Y_{it} = r_{it} + \beta_{it} + \epsilon_{it}$ $H_0: \beta = \frac{\sigma_{\omega}^2}{\sigma_{\epsilon}^2} = 0$ versus $H_1: \beta > 0$

Variables	Hadri LM test z-Statistic values	p-value	Remarks
Fce	7.4094	0.0000*	Stationary
X _{1it}	7.6384	0.0000*	Stationary
X _{2it}	5.5260	0.0000*	Stationary
X _{3it}	7.2572	0.0000*	Stationary
X _{4it}	9.6234	0.0000*	Stationary
X _{5it}	3.8882	0.0001*	Stationary

P-value (*significant @ 1%): The study rejects the null hypothesis that all panels' series are stationary in the backing of the alternative that leastwise one of them holds a unit root.

Sources: Researcher's compilation from E-view

Table 3: Unit Root Test using Hadri LM test at First Difference

Model: $Y_{it} = r_{it} + \beta_{it} + \epsilon_{it}$ $H_0: \beta = \frac{\sigma_{\omega}^2}{\sigma_{\epsilon}^2} = 0$ versus $H_a: \beta > 0$

Variables	Hadri LM test z-Statistic values	p-value	Remarks
Fce	3.5814	0.0002*	Stationary
X _{1it}	3.9745	0.0000*	Stationary
X _{2it}	2.7424	0.0030*	Stationary
X _{3it}	4.1051	0.0000*	Stationary
X _{4it}	4.4593	0.0000*	Stationary
X _{5it}	2.0083	0.0223**	Stationary

P-value (*significant @ 1%; **significant @ 5%): The study rejects the null hypothesis that all panels' series are stationary in the backing of the alternative that leastwise one of them holds a unit root.

Sources: Researcher's compilation from E-view

4.2. Testing for cointegration using Engel-Granger Test

As highlighted above, the regression of non-stationary series might generate bogus regression estimation. Therefore, the presented result in table 4 below displays that the null hypothesis for all panels' series is stationary, then was rejected in the backing of the alternative that leastwise one of them holds a unit root. This indicates that all panels' series of the OLS model estimated and residuals of regression model on poverty reduction are stationary. Then, the study result means that the variables under consideration such as poverty reduction (proxied by Fce), Adjusted savings as % of GNI (X_{1it}), General government's final consumption expenditure as % of GDP (X_{2it}), Ratio of places detained by women in parliaments in %, Secondary school enrollment as % of gross enrollment and Foreign direct investment with a consideration of net inflows as a % of GDP are stationary and cointegrated. Thus, it is suitable for making

implications from OLS linear regression for purpose of illustrating the correlation among the variables in the study.

Table 4: Engel- Granger Estimation Test (Applying OLS Residual)

Model: $\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_2 t + \sum_{i=1}^p \beta_i \Delta Y_{t-i} + \mu_t$; $H_0: \gamma = 0$ versus $H_a: \gamma > 0$

Variables	Hadri LM test z-Statistic values	p-value	Remark
Residuals	3.4017	0.0003*	Stationary

P-value (*significant @ 1%)

Sources: Researcher’s compilation from E-view

Regression Model Estimation Result

Table 5: Estimated Result using OLS

Variables	Coefficients	Standard Error	T-Statistic	Prob. (P> t)
Const.	102.5251	2.842165	36.07	0.000
D_{it}	10.87237	1.929149	5.64	0.000
X_{1it}	- 0.7705225	0.0451404	-17.07	0.000
X_{2it}	- 0.2067916	0.0833717	-2.48	0.019
X_{3it}	0.0304574	0.0221908	1.37	0.180
X_{4it}	- 0.1038957	0.0181606	-5.72	0.000
X_{5it}	-0.8179405	0.210433	-3.89	0.000
Number of observations	38			
R-Squared	0.9987			

The estimated equation is:

$$Fce_{it} = 102.5251 + 10.87237 D_{2i} - 0.7705225 X_{1it} - 0.2067916 X_{2it} + 0.0304574 X_{3it} - 0.1038957 X_{4it} - 0.8179405 X_{5it} + U_{it}$$

Sources: Researcher’s compilation from E-view

The result presented in table 5 above indicates clearly that the coefficients of poverty decrease determinants or explanatory variables are specified in the equation (3.1) which are:

$D_{it} = 1$ for Rwanda and $D_{it} = 0$ for China with the coefficient of 10.87237, ($T=5.64$) and P-value of 0.000. This makes it statistically significant, which implies that poverty level in Rwanda is higher than in China if we hold other explanatory variables exogenous from the model.

Since the researcher allowed the differences in capacities to respond on external shocks each country has, by introducing the **least-squares dummy variable** which, after estimation, has shown that the intercept values of the two countries are statistically different; being 102.5251 for China and 113.39747 ($=102.5251+10.87237$) for Rwanda. This difference in intercept values truly reflect the capacities of the two economies to respond on those external shock or exogenous variables that increase poverty in both economies once we exclude all the explanatory variables that we included in our model. Here, by holding the explanatory variables of poverty reduction constant, the poverty level in Rwanda (113.39747) is higher than the level of poverty in China (102.5251) simply because Chinese economy is less poor than Rwandan economy. Hence, this is a reason why Rwanda has many lessons to learn from China on poverty reduction strategies.

Adjusted Saving X_{1it} , as % of GNI with the coefficient of $\beta_3 = -0.7705225$ where ($T = -15.28$) and $P = 0.000$ That makes it statistically significant, implies that poverty is reduced at 77% once adjusted net saving increase by one unit as percentage of GNI. From our results, it is clear that Adjusted savings exerts a significant influence over poverty as measured by the reduction of poverty with 77% once Gross National Income increase by 1% in both countries and over time. This is due to the expenditures on education and conservation activities are treated as human and physical capital accumulation. It also confirms the impact from strategies and policies adopted by both countries of investing first of all in the knowledge/skills of their population as the basic condition to develop service and knowledge economies.

Government spending X_{2it} , as percentage of GDP with the coefficient of $\beta_4 = 0.2067916$ where ($T = -2.48$) and $P = 0.0000$ that makes it statistically significant, implies that poverty is reduced by 20.6% once government spending increases by one unit as percentage of GDP.

The findings suggest that Government spending changes have an impact to reduce poverty. These are government expenditures on elementary health and certain categories of infrastructures which are also broadly considered reducing poverty, with the increase of production and potentials pays to poor families. Government expenditure on transfers and grants in these two countries do relatively reach poor families as it is explained by 0.206% reduction in poverty because of one-unit percent upsurge in government spending as a percentage of GDP. This is due to effective fiscal targeting that Rwandan economy may have learned from the Chinese economy.

However, the proportion of places detained by women in parliaments X_{3it} is not only in line with a priori expectation, it is also statistically irrelevant. This variable was taken into consideration to incorporate and to assess the people's empowerment strategies used by both economies. In this

empirical analysis of what lessons Rwanda learnt to Chinese economy, the proxy of people's empowerment by their governments is insignificant. This is because the Chinese strategies to empowerment are totally different from Rwandan's strategies to empowerment. Hence, they cannot move in the same direction of poverty reduction.

The secondary school enrollment X_{4it} , as the percentage of gross enrollment with the coefficient of $\beta_6 = -0.1038957$ where $(T = -5.72)$ and $P - value = 0.000$ that makes it statistically significant, implies that education to population of both economies reduce poverty. What is directly realizable in our results is that for both the proportional change/impact of education/school enrollment has reduced poverty over time. The study finding is significant to the practical form with pertinent clarifications. With the observation about the increase of private schools, government schools as well as the number of students contribute to poverty reduction by supplying the qualified labor on market.

The foreign direct investment X_{5it} as a percentage of GDP with the coefficient of $\beta_7 = -0.654315$, $t - stat = -3.49$, and $P = 0.001$ that makes it statistically significant, implies that poverty is reduced by 0.65% once FDI increases by one unit percent. It is highlighted that the current development of China, FDI contributed a lot on that hardest journey and tangible success is visible nowadays whereby China is the second biggest economy in the world. Therefore, it is a great opportunity for Rwandan country to continue learning a lot from the Chinese economy on the best practices of FDI.

The OLS result also shows that the model has the R-squared of 99.8% which explains that variations or changes in poverty reduction of Rwanda and China in the period covered by the study are explained by explanatory variables while errors contained in the remaining 0.2% are included in the variables that are not taken into account in the estimated model of this study. The study F-stat (3927.11) is statistically significant based on the probability value (0.0000) which is lower than 1% level of significance and which indicates that the overall model is statistically significant.

5. CONCLUSION

The paper aimed at empirically analyzing poverty eradication and its determinants in Rwanda focusing on lessons learnt from China using OLS regression analysis within the period of 1999 to 2017. The study findings revealed that the level of poverty in Rwanda is high compared to the situation of China. This is a reason why Rwanda has many lessons to learn from China on poverty reduction strategies. The results also indicated that adjusted savings, government spending, gross capital formation and foreign direct investment have been impacting poverty by reducing it; given their negative linear connection with poverty reduction proxy. Given the shares of these variables to poverty reduction in Rwandan and Chinese economies, their impacts are because of the strong implementation and evaluation of development agendas. In this empirical study also, the study made simulations which allow retrieving the lessons to learn by

Rwandan economy from the Chinese one by allowing the coefficient of each variable to vary in the same direction for both countries.

RECOMMENDATIONS

Based on the above findings, the following recommendations are made.

- In line with poverty reduction, Rwanda could learn from the economic reform policies that have contributed to the poverty reduction in China especially in rural zones.
- The policy makers are recommended to review the women and youths' empowerment strategies whereby the study suggested that women empowerment in political, social and economic aspects must be accompanied by youths' empowerment in those domains as the main driving forces of both economies.
- The Foreign Direct Investment (FDI) incentives should be strengthened based on the vision of both countries (Rwanda and China) and especially for Rwanda. With this principle in attention, investors should be neatly targeted centered on sector forecasts and investments motivations.

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