Research on the Determinants of Poverty in Different Countries

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Abstract. This study investigates the factors contributing to variations in poverty levels among different countries. The data in this research is sourced from the World Bank, employing pooled cross-sectional data over time for each variable. A comprehensive set of diagnostic tests is applied to examine the research hypotheses. Contrary to the initial assumption that foreign direct investment and the proportion of the female labour force could alleviate poverty, the findings demonstrate that poverty is primarily influenced by factors such as agriculture, grants, and advancements in science. As a result, it is recommended that organizations and advanced nations adopt distinct approaches when dealing with impoverished countries. Different policies should be implemented to enhance efficiency and capacity in poverty reduction efforts.

Keywords: poverty, pooled cross-sectional data.

1. Introduction

Poverty, a complex phenomenon influenced by various determinants, requires diverse approaches for evaluation (Economic and Social Inclusion Corporation, 2017). Economists have long been concerned with identifying the factors influencing poverty. Women play a crucial role in poverty alleviation, as they contribute a significant proportion of their earnings to household maintenance (Bennett, 1992; Stier & Lewin, 2002). Foreign direct investment (FDI) is a key element in reducing poverty, particularly income poverty (Klein, Aaron, & Hadjimichael, 2001). FDI has shown remarkable effectiveness, leading to a rapid doubling of per capita income in a decade (Klein, Aaron, & Hadjimichael, 2001). Access to agricultural land positively impacts poverty reduction by increasing landholders' income (Nguyen, 2013). Science and technology have limited efficacy in extreme poverty situations (Toyama, 2010). Political and institutional instability hampers poverty reduction efforts (Aisen & Veiga, 2010). Comprehensive approaches are needed to address poverty's multifaceted nature and the differential impacts of various factors.

This paper hypothesizes that the percentage of the female labour force (*LABORF*) and foreign direct investment (*FDI*) significantly influence poverty reduction issues. However, to have an overall analysis of the poverty issues and the hypothesis, other indicators potentially affecting poverty are also considered. These determinants are agriculture (*AGRI*), science and technology (*STJ*), political stability (*POLSTA*), and social welfare (*SW*).

2. Methodology

This paper employs various tests and methodologies to identify a suitable model for explaining the determinants of poverty. The dependent variable selected for this study is the poverty headcount ratio, specifically focusing on values above 1.9 as an indicator of relatively poor conditions. As outlined in the paper's objectives, the independent variables considered in this analysis include LABORF, FDI, the proportion of AGRI, STJ, GRANTS, and POLSTA, sourced from 53 countries from 2011 to 2012. The paper utilizes natural forms to improve the original data to address outliers and mitigate polarization between dependent and independent variables. Additionally, the data from 2011 and 2012 are combined by pooling cross-sections across time, with a dummy variable term (Y12) introduced to distinguish between the two years. The grant variable is selected as a proxy for unobserved social welfare, which is believed to impact LPOVERTY1. Furthermore, tests for multicollinearity among explanatory variables are conducted, and R^2 values are collected to measure

their correlations. The General-to-Specific methodology and diagnostic tests such as RESET and homoscedasticity are employed to identify potential variables for the optimal model. The overall significance of the model is assessed using the F-test. Finally, the model with the smallest AIC is selected as the most suitable.

3. Results and Analysis

This section applies different approaches to develop a more accurate and compelling model, followed by diagnostic tests to examine the essay's hypothesis.

The initial model is (1).

$$POVERTY = c + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 SW + \beta_3 LFDI + \beta_4 LSTJ + \beta_5 POL + \beta_6 POL * Y_{12} + \beta_7 LABORF + u \quad (1)$$

Initially, the data for POVERTY includes three zeros, which cannot be transformed into a logarithmic form. To retain the influence of these three samples on *POVERTY*, a new notation, *POVERTY*$_1$, is introduced by adding one to each poverty data point. Additionally, following Wooldridge (2016), the term *POL*Y*$_{12}$ is introduced, as pooled estimation is commonly utilized to investigate the impact of policy factors on the dependent variable. Observing social welfare directly is challenging, as it is a vague concept. Therefore, as Wooldridge (2016) suggested, a proxy variable can represent the unobserved variable that the model needs to control. In this study, grants are considered as a proxy variable for social welfare, based on Burch's (2013) assertion that grants serve as subsidies contributing to federal control over social welfare. Hence, grants are utilized as a proxy variable for the omitted variable *SW* in the poverty equation.

Grants can be composed as (2):

$$\mathrm{SW} = \delta_0 + \delta_2 GRANTS + v_2 \quad (2)$$

It is important to note that there is an error term, v_2, as Grants and *SW* cannot be perfectly related. The coefficient δ_2 measures the strength of the relationship between *SW* and Grants. In most cases involving proxy variables, these two terms exhibit a positive relationship, implying that $\delta_2 > 0$. However, the intercept, δ_0, can be positive or negative depending on different scales.

This model assumes that (3):

$$\mathrm{E}(SW|AGRI, LFDI, LSTJ, POLSTA, POLSTA * Y_{12}, LABORF) = \delta_0 + \delta_2 GRANTS \quad (3)$$

Therefore, in this model, the severity of poverty is influenced by the proxy variable rather than other variables.

From the above equations (4).

$$POVERTY_1 = C + \delta_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 GRANTS + \beta_3 LFDI + \beta_4 LSTJ + \beta_5 POLSTA + \beta_6 POLSTA * Y_{12} + \beta_7 LABORF + \beta_2 V_2 + u \quad (4)$$

To simplify this model: this report use $\alpha 0 = c + \delta_0$ as a new intercept and $e = \beta_2 V_2 + u$ as an unknown error term.

In summary, the new model is (5):

$$POVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 GRANTS + \beta_3 LFDI + \beta_4 LSTJ + \beta_5 POLSTA + \beta_6 POLSTA * Y_{12} + \beta_7 LABORF + e \quad (5)$$

In addition to the aforementioned approaches, further methods are employed to explain this model. Firstly, logarithms are applied to adjust the functional form of the regression. Transforming variables into their logarithmic form helps meet the assumptions of the classical linear model, reduces the numerical range, and mitigates heteroscedasticity issues (Wooldridge, 2016). Consequently, *POVERTY1*, *FDI*, *GRANTS* and *STJ* are replaced with their logarithmic counterparts to reduce excessive variations and improve the significance of coefficients, as indicated by minor standard errors and p-values.

Next, the regression is assessed for potential misspecification. The RESET test is conducted using two fitted values. The EViews results indicate a p-value below 0.05, suggesting that the null hypothesis is not rejected at a 5% significance level. To address this, a quadratic variable, $LGRANT^2$, is introduced, resolving the misspecification issue and capturing a diminishing marginal effect on poverty.

Furthermore, the regression incorporates an interaction term. Foreign direct investment facilitates knowledge and technology transfer across countries, enhancing productivity (Van Pollelsberghe de la Potterie, 2001). This implies that the impact of *LSTJ* on a country's poverty level may vary depending on the corresponding *FDI* level. As a result, the interaction term *LSTJ*LFDI* is included in the regression to account for this potential interaction effect.

Now the final model is (6):

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_3 LGRANTS^2 + \beta_4 LFDI + \beta_5 LSTJ + \beta_6 LFDI * LSTJ + \beta_7 POLSTA + \beta_8 POLSTA * Y_{12} + \beta_9 LABORF + e \quad (6)$$

So far, the ultimate model has been established, and Table 1 is constructed primarily based on it.

Table 1. The regression result of model

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 04/26/17 Time: 18:52				
Sample (adjusted): 2 75				
Included observations: 74 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.22814	8.969115	3.258754	0.0018
Y12	0.009360	0.228150	0.041026	0.9674
AGRI	-0.019300	0.006109	-3.159259	0.0024
LGRANT	-3.311312	0.905559	-3.656651	0.0005
LGRANT^2	0.107398	0.025211	4.259976	0.0001
LFDI	-0.051355	0.137571	-0.373299	0.7102
LSTJ	-0.710711	0.403921	-1.759531	0.0833
LFDI*LSTJ	0.022647	0.017759	1.275258	0.2069
POLITICAL	-0.010252	0.014397	-0.712085	0.4790
POLITICAL*Y12	0.374783	0.264130	1.418936	0.1608
LABORF	-0.007234	0.016820	-0.430057	0.6686
R-squared	0.561840	Mean dependent var		1.728277
Adjusted R-squared	0.492291	S.D. dependent var		1.232983
S.E. of regression	0.878546	Akaike info criterion		2.715271
Sum squared resid	48.62615	Schwarz criterion		3.057767
Log likelihood	-89.46501	Hannan-Quinn criter.		2.851897
F-statistic	8.078316	Durbin-Watson stat		2.050765
Prob(F-statistic)	0.000000			

The model performs well in both the RESET and Homoscedasticity tests. The F-statistics p-values for these tests are 0.252 and 0.652, respectively. According to the 5% significance level criterion, the null hypothesis (H0) cannot be rejected. At this stage, only AGRI, LGRANT, and LGRANT^2 demonstrate statistically significant effects. The R-squared value indicates that the explanatory variables account for approximately 56.2 percent of the variation in *LPOVERTY1*, which is a reasonable outcome.

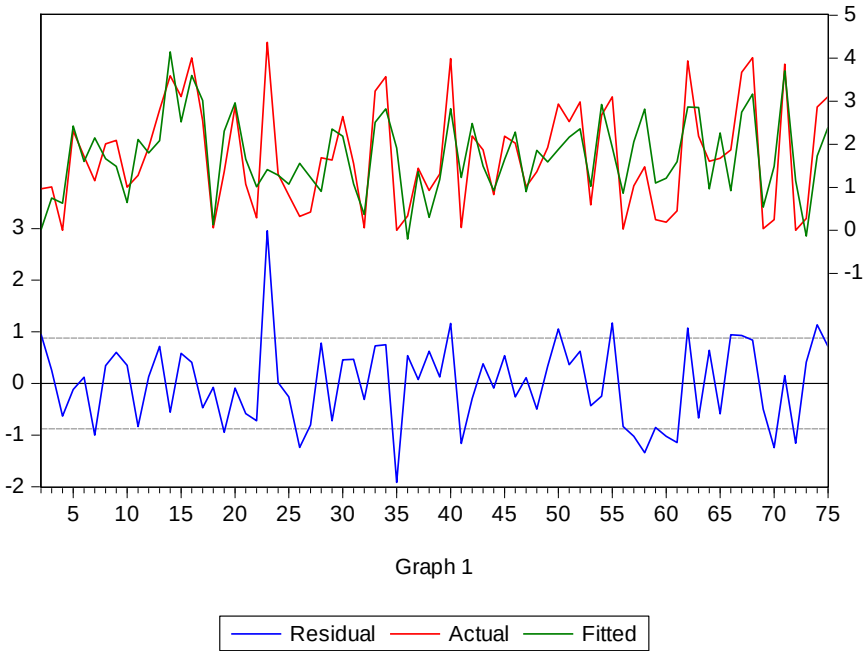


Figure 1. Residual Analysis of model 6

However, when implementing the Residual Analysis (See Figure 1 above), it has been noticed that there are two observations (23th and 35th) go far beyond the range [-1,1], so they tend to be outliers. To achieve a more accurate model, the rest of this paper would analyze two models; one rejects potential outliers and another one contains them.

Model 1 which rejects potential outliers is evaluated first. Compared with Table 1, the adjusted model (Table 2) still passes diagnostic tests and F-test for overall significance, and several apparent changes are marked.

Table 2. result of Model 1 which rejects potential outliers

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 04/26/17 Time: 19:35				
Sample (adjusted): 2 22 24 34 36 75				
Included observations: 72 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.22901	7.769506	3.890724	0.0002
Y12	0.051329	0.200506	0.255996	0.7988
AGRI	-0.020902	0.005403	-3.868406	0.0003
LGRANT	-3.480305	0.785105	-4.432916	0.0000
LGRANT^2	0.112802	0.021866	5.158837	0.0000
LFDI	-0.021758	0.119237	-0.182476	0.8558
LSTJ	-0.776013	0.352185	-2.203422	0.0314
LFDI*LSTJ	0.025460	0.015467	1.646033	0.1049
POLITICAL	-0.007186	0.012487	-0.575469	0.5671
POLITICAL*Y12	0.454240	0.229259	1.981339	0.0521
LABORF	-0.014889	0.014650	-1.016313	0.3135
R-squared	0.650795	Mean dependent var		1.715627
Adjusted R-squared	0.593549	S.D. dependent var		1.192787
S.E. of regression	0.760444	Akaike info criterion		2.429934
Sum squared resid	35.27475	Schwarz criterion		2.777758
Log likelihood	-76.47762	Hannan-Quinn criter.		2.568404
F-statistic	11.36827	Durbin-Watson stat		1.828303
Prob(F-statistic)	0.000000			

In terms of standard error, all the explanatory variables except Y_{12} have witnessed a slight decline along with R^2 raises to 0.651. Regarding significant level, although the p-value of *LABORF* stays insignificant at 5% level, it has reduced about 50 percent, from 0.6686 to 0.3135, which may result from deleting outliers. Based on t-test, *POLSTA* and *LABORF* are insignificant, since *POLSTA*$*Y_{12}$ is closely linked to POLSTA, F-test that intends to test the overall significance of the three variables is applied. According to Table 3, H0 cannot be rejected so they would be removed together.

Table 3. F-test for overall significance of *POLSTA, LABORF and POLSTA*Y12*

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	1.376550	(3, 61)	0.2584
Chi-square	4.129650	3	0.2478
Null Hypothesis: C(9)=0, C(10)=0, C(11)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(9)		-0.007186	0.012487
C(10)		0.454240	0.229259
C(11)		-0.014889	0.014650
Restrictions are linear in coefficients.			

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_3 LGRANTS^2 + \beta_4 LFDI + \beta_5 LSTJ + \beta_6 LFDI * LSTJ + e \quad (7)$$

The model (Table 4) without *LABORF, POLSTA and POLSTA*Y_{12}* fails Homoscedasticity test. Consequently, we made an attempt by using Weighted Leas Squares (WLS) to address the problem.

Table 4. result of model excluding *POLSTA, LABORF and POLSTA*Y12*

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 04/26/17 Time: 19:50				
Sample (adjusted): 2 22 24 34 36 75				
Included observations: 72 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	20.47270	7.905493	2.589680	0.0119
Y12	0.037140	0.225462	0.164727	0.8697
AGRI	-0.024121	0.006030	-4.000484	0.0002
LGRANT	-2.690570	0.867163	-3.102728	0.0029
LGRANT^2	0.091049	0.024121	3.774725	0.0004
LFDI	0.017904	0.050756	0.352743	0.7254
POLITICAL	-0.021149	0.013741	-1.539114	0.1287
POLITICAL*Y12	0.458051	0.237009	1.932634	0.0577
R-squared	0.528053	Mean dependent var		1.715627
Adjusted R-squared	0.476434	S.D. dependent var		1.192787
S.E. of regression	0.863075	Akaike info criterion		2.647809
Sum squared resid	47.67351	Schwarz criterion		2.900772
Log likelihood	-87.32113	Hannan-Quinn criter.		2.748514
F-statistic	10.22978	Durbin-Watson stat		1.898026
Prob(F-statistic)	0.000000			

Here we use $LGRANTS^2$ as it has the strongest relationship with the spread of the residuals (as evidenced on Table 4, p-value=0.00) each variable is multiplied by 1/ $LGRANTS^2$ (WGT), however the test cannot include $LGRANTS^2$as $LGRANTS^2 \times WGT$=1 so is collinear with intercept, therefore a potential explanatory variable is removed, the result may not be fully satisfactory.

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_4 LFDI + \beta_5 LSTJ + \beta_6 LFDI * LSTJ + e \quad (8)$$

The result (Table 5) shows that the Homoscedasticity test is insignificant at the 5% level but fails the RESET test (Table 6)

Table 5. homoscedasticity test of equation (8)

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 05/04/17 Time: 13:42				
Sample (adjusted): 2 22 24 34 36 75				
Included observations: 72 after adjustments				
Weighting series: 1/LGRANTS^2				
Weight type: Inverse standard deviation (EViews default scaling)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.239852	3.559954	-0.629180	0.5314
Y12	0.185476	0.210840	0.879698	0.3823
AGRI	-0.023271	0.005983	-3.889251	0.0002
LGRANTS	0.300298	0.056241	5.339470	0.0000
LFDI	-0.002125	0.146088	-0.014543	0.9884
LSTJ	-0.481221	0.435014	-1.106220	0.2727
LFDI*LSTJ	0.015851	0.019262	0.822892	0.4136
	Weighted Statistics			
R-squared	0.446664	Mean dependent var		1.614175
Adjusted R-squared	0.395586	S.D. dependent var		1.019485
S.E. of regression	0.894355	Akaike info criterion		2.706738
Sum squared resid	51.99161	Schwarz criterion		2.928080
Log likelihood	-90.44256	Hannan-Quinn criter.		2.794855
F-statistic	8.744872	Durbin-Watson stat		1.744691
Prob(F-statistic)	0.000001	Weighted mean dep.		1.495664
	Unweighted Statistics			
R-squared	0.425644	Mean dependent var		1.715627
Adjusted R-squared	0.372627	S.D. dependent var		1.192787
S.E. of regression	0.944770	Sum squared resid		58.01831
Durbin-Watson stat	1.756534			
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	1.914065	Prob. F(6,65)		0.0917
Obs*R-squared	10.81104	Prob. Chi-Square(6)		0.0944
Scaled explained SS	5.638491	Prob. Chi-Square(6)		0.4649

Table 6. RESET test result of equation

Ramsey RESET Test			
Equation: EQ01			
Specification: LPOVERTY1 C Y12 AGRI LGRANT LFDI LSTJ LFDI*LSTJ			
Omitted Variables: Powers of fitted values from 2 to 3			
	Value	df	Probability
F-statistic	10.70988	(2, 63)	0.0001
Likelihood ratio	21.07201	2	0.0000
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	13.19179	2	6.595895
Restricted SSR	51.99161	65	0.799871
Unrestricted SSR	38.79982	63	0.615870
Unrestricted SSR	38.79982	63	0.615870
LR test summary:			
	Value	df	
Restricted LogL	-90.44256	65	
Unrestricted LogL	-79.90655	63	

Therefore, Robust Estimation is implemented to the following equation instead.

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_3 LGRANTS^2 + \beta_4 LFDI + \beta_5 LSTJ + \beta_6 LFDI * LSTJ + e \quad (9)$$

General-to- specific process will continue now and Model 1 passes diagnostic tests by deleting AGRI. After that, removing any variable can cause the failure of RESET test. Finally, the model comes out whose AIC is 2.58, but it still contains one insignificant term LFDI (Table 7)

$$LPOVERTY_1 = 30.73 - .0986 Y_{12} - 3.46 LGRANTS + .109L + .065 LFDI + .899 LSTJ + .0304 LFDI * LSTJ \quad (10)$$

Table 7. Result Removing Agri

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 05/04/17 Time: 13:27				
Sample (adjusted): 2 22 24 34 36 75				
Included observations: 72 after adjustments				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.72952	5.358011	5.735247	0.0000
Y12	-0.098694	0.198861	-0.496299	0.6214
LGRANTS	-3.463486	0.523277	-6.618843	0.0000
LGRANTS^2	0.108985	0.015124	7.206041	0.0000
LFDI	-0.064574	0.106563	-0.605966	0.5466
LSTJ	-0.899250	0.316060	-2.845193	0.0059
LFDI*LSTJ	0.030365	0.013275	2.287317	0.0254
R-squared	0.546623	Mean dependent var		1.715627
Adjusted R-squared	0.504773	S.D. dependent var		1.192787
S.E. of regression	0.839392	Akaike info criterion		2.579888
Sum squared resid	45.79766	Schwarz criterion		2.801231
Log likelihood	-85.87598	Hannan-Quinn criter.		2.668006
F-statistic	13.06144	Durbin-Watson stat		1.929865
Prob(F-statistic)	0.000000	Wald F-statistic		21.28114
Prob(Wald F-statistic)	0.000000			

For now we will analyze Model 2. Back to Table 1 and ignore the biasness caused by potential outliers. Operating the same F-test for insignificant variables LABORF, POLSTA and POLSTA*Y_{12} altogether, the output finds it statistically insignificant at 5% level (Table 8).

Table 8. F-test

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	0.776253	(3, 63)	0.5116
Chi-square	2.328759	3	0.5070
Null Hypothesis: C(9)=0, C(10)=0, C(11)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(9)		-0.010252	0.014397
C(10)		0.374783	0.264130
C(11)		-0.007234	0.016820
Restrictions are linear in coefficients.			

Consequently, three variables are deleted at the same time, the result is documented in Table 9.

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_3 LGRANTS^2 + \beta_4 LFDI + \beta_5 LSTJ + \beta_6 LFDI * LSTJ + e \quad (11)$$

Table 9. Regression Result Of Equation(11)

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 04/26/17 Time: 19:11				
Sample (adjusted): 2 75				
Included observations: 74 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	28.63127	8.759758	3.268500	0.0017
Y12	-0.099132	0.207644	-0.477411	0.6346
AGRI	-0.017752	0.005857	-3.030617	0.0035
LGRANTS	-3.206788	0.893637	-3.588469	0.0006
LGRANTS^2	0.102457	0.024720	4.144645	0.0001
LFDI	-0.047632	0.136446	-0.349091	0.7281
LSTJ	-0.745845	0.395181	-1.887352	0.0635
LFDI*LSTJ	0.023765	0.017466	1.360620	0.1783
R-squared	0.545644	Mean dependent var		1.728277
Adjusted R-squared	0.497455	S.D. dependent var		1.232983
S.E. of regression	0.874067	Akaike info criterion		2.670487
Sum squared resid	50.42358	Schwarz criterion		2.919575
Log likelihood	-90.80803	Hannan-Quinn criter.		2.769852
F-statistic	11.32293	Durbin-Watson stat		2.107443
Prob(F-statistic)	0.000000			

Compared to Table 1, the coefficients and p-value of other variables do not have a dramatic increase or decrease. The process continues by removing another insignificant term LFDI and LFDI*LSTJ which closely related to it.

$$LPOVERTY_1 = \alpha_0 + \varepsilon_0 Y_{12} + \beta_1 AGRI + \beta_2 LGRANTS + \beta_3 LGRANTS^2 + \beta_5 LSTJ + e \quad (12)$$

Subsequently, LSTJ becomes significant at 5% level, deleting LFDI and LFDI*LSTJ address the problem of multicollinearity, which roots in the relationship between LFDI and LSTJ (ρ=0.56). Furthermore, it can be observed that all but the dummy variable Y_{12} included in the model now are statistically significant with AIC equals to 2.701. And the Final model (Table 10) is presented below.

$$LPOVERTY_1 = 24.813 - 0.065 Y_{12} - 0.017 AGRI - 2.96 LGRANTS + 0.096 LGRANTS^2 - 0.152 LSTJ \quad (13)$$

Table 10. Regression Result Of Final Model

Dependent Variable: LPOVERTY1				
Method: Least Squares				
Date: 04/26/17 Time: 19:12				
Sample: 1 75				
Included observations: 75				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	24.81333	8.276937	2.997888	0.0038
Y12	-0.065250	0.212248	-0.307421	0.7594
AGRI	-0.016858	0.005972	-2.822911	0.0062
LGRANTS	-2.959931	0.910858	-3.249606	0.0018
LGRANTS^2	0.095833	0.025203	3.802444	0.0003
LSTJ	-0.151742	0.044148	-3.437167	0.0010
R-squared	0.502020	Mean dependent var		1.714870
Adjusted R-squared	0.465935	S.D. dependent var		1.230116
S.E. of regression	0.898966	Akaike info criterion		2.701476
Sum squared resid	55.76167	Schwarz criterion		2.886875
Log likelihood	-95.30534	Hannan-Quinn criter.		2.775504
F-statistic	13.91198	Durbin-Watson stat		2.246144
Prob(F-statistic)	0.000000			

For now, a decision is needed to be made between Model 1 and Model 2. In this essay, we use the method of AIC to do the selection, simply choosing the model with smaller AIC, therefore, Model 1 is chosen ultimately.

Which is,

$$LPOVERTY_1 = 30.73 - .0986Y_{12} - 3.46LGRANTS + .109LGRANTS^2 + .065LFDI + .899LSTJ + .0304LFDI * LSTJ \quad (14)$$

Each explanatory variable will be evaluated separately in this section. LGRANTS being in a quadratic form, the partial effect of it depends on the value of LGRANTS (which is -3.46+2*0.109*LGRANTS) Laffer curve (Williamson, 2014) could explain its diminishing effect, which states that tax revenue depends on tax rate t as well as revenue base. It means that sufficient revenue can support government and ease poverty. Referring to Model 1, LGRANTS is the proxy variable of SW which can be part of government tax revenue, so a reasonable level of grants is a form of suitable tax revenue. Therefore, when LGRANTS reaches the inflection point, the poverty level reaches the lowest point and tax revenue is likely to reach the highest.

Regarding LSTJ and LFDI, they are likely to have interacting relationship since their partial derivatives contains each other. Finally, the Dummy variableY_{12} with coefficient -0.0986 measures the difference between year 2011 and 2012, holding other variables constant. When it comes to the format of these equations, all of them except dummy variable Y_{12} enters in with" log-log" form, so effect will be evaluated in a percentage level. In conclusion, one hypothesis is proved (LFDI) and the other is rejected (LABORF).

Limitation:

A major one is that many of poverty headcount ratio data from world bank of countries or areas are missing, which restrains the original sample size. Another limitation is that prior studies on the poverty theme is lacking, as most literature reviews only explain the relationship between these indicators and economic growth instead of poverty topic.

In terms of methodology, there are also some issues to be discussed. To start with, RESET is a general test which cannot detect the specific unobserved omitted variables and heteroskedasticity. It can only test whether the original model has ignored any important nonlinearities. If H0 is reject, the RESET could not provide any valid guidance about what to do in the next step (Wooldridge, 2016). Furthermore, according to Podesta (2000), serial correlation may exist in the error term which means that errors are correlated from one period to the next period. As a result, when pooling data from two years, the results might be biased, inefficient and inconsistent.

4. Conclusion

In summary, after several optimizations, our final model rejects one of the hypothesis that LABORF significantly influence poverty reduction. At the meanwhile, FDI remains to be significant. This report concludes that poverty is ultimately determined by grants (social welfare), FDI and the development of science (STJ) (Showed in table 7).However, the influence of grants (social welfare) on poverty reduction is considered to be the most compelling. The development of science also poses less strong yet considerate effect on poverty alleviation. While the final model shows that FDI only contributes negligible effect on reducing poverty. The results demonstrate that poverty alleviation depends heavily on financial assistance (grants) since it is the most effective approach to help the poor. For example, the poor people will use this money to accommodate themselves so less people suffer from starving and freezing. It also proves that the development of science can be helpful, our guess is that this action may increase employment and productivity thus alleviating poverty. FDI in this model is ineffective. One reason could be foreign capital is used in a wasteful way. From our analysis, some extremely poor countries may be restrained from its natural conditions such as poor agriculture land quality, frequent wars and a low social status of women (parameters that are deleted in the end). As a result, these seemly useful approaches regarding them could be much less effective. This report suggests that to improve the efficiency and capacity on reducing poverty, policy makers should be practical and have a deep understanding of what is the real reason behind poverty.

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