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Analysing the Effect of Income Inequality on Poverty

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Abstract. Several researchers have done experiments trying to show the relationship that exists between income inequality and poverty. However, some studies have been done on distribution functions that give rise to a new philosophy as well as methods to analyze the issue. The aim of this research study is to strengthen the body of work that involves the relationship between income inequality and poverty. The major concern is to demonstrate how the percentage of individuals living below the poverty line is linked to the GINI coefficient, the changes in gross domestic product per capita, the rate of literacy, freedom of house score, and infant mortality rates well as the level of income that ranges in different countries and hence drawing some significant conclusions.

Keywords: income inequality, poverty, GDP per capita, GINI coefficient, income level.

1 Introduction

According to the Wealth-X company data which was released in 2018 concluded that there are more billionaires in the world than before. The capacity for sharing information around the world has enabled people to be aware of the wealth of ultra-rich in ways that were not recognized in the world previously. The articles of "Global billionaires, the wealth gaps as well as the potential income taxes overlook the news progressions hence uncovering the link between income equality as well as poverty making them more essential than before. There is an interest that surrounds the economic community. Economic growth more so in the emerging economies is not reflected in the incomes of massive swaths of populations (Fosu, 2010). Therefore, the GINI coefficient which is a statistical measure represents the income distribution of a state's residents. The analysis of the relationship between poverty, inequality as well as other variables will reveal the significant and important correlation and help us understand the information in order to deduce the potential methods by which the level of poverty can be reduced in the future (Chambers and Dhongde, 2011).

It is vital to reveal the relationship between income inequality and poverty because by understanding this connection, it will be easy to deal with income inequality in society, hence narrowing the income gap, as well as eliminating poverty (Channing, McKay and Tarp, 2016).

According to Lorenz's study on the measurement of income concentration ratio which was done in 1905 was considered as a revolution in economics and statistics that led to the publishing of thousands of publications about statistics and econometrics (Chambers and Dhongde, 2011).

Moreover, there are various ways of measuring income inequality but the Lorenz Curve and the GINI coefficient are the ones mostly used. The GINI coefficient is the most significant index that is used to measure or estimate the income inequality. Hence, in this paper, the GINI ratio is employed as the index to evaluate income inequality (Lorenz, 2012).

The relationship between income inequality and poverty, many scholars have carried out the important analysis and most of their investigations we're achieved by empirical research. According to Bouruignon's study that was carries out in 2000, he analyzed the internal connection between poverty, income inequality as well as economic growth and concluded that the reduction of income inequality is favorable to reduce poverty level in society. Besides, Want and Zhang in their studies which they did the year 2000, they empirically analyzed the effect of the changes of income inequality poverty by Shapley decomposition and concluded that the success of poverty reduction in rural regions has a positive influence on income level, hence it has the capacity to reduce income inequality. Some scholars analyzed theoretically the relationship

between income inequality and poverty. They deducted the mathematical relationship between GINI coefficient and poverty as they researched poverty, income inequality and deducing their measurements.

The hypothesis for the simple regression model on this research, which studies the impacts of the GINI coefficient on the percentage of people living below poverty line, helped to predict the percentage of people who are living below the poverty line would be high as the GINI coefficient increases. This projected correlation fulfills the economic intuition, that is if the distinction between the extremely poor and the rich increases, it implies that people living believe the poverty line will as well increase, but for the multiple linear regression it was projected that the percentage of people who are living below the poverty line will reduce as the gross domestic product per capita increases as a result of improvement on people's living standards due to the increase of gross domestic product per capita (Sousa-Brown and Gebremedhin, 2004).

Also, the number of people living in the poverty line is likely to reduce because of the increase in literacy rate. The literacy rate is a good indicator of the better and quality education system in society. Better education is associated with good job opportunities thus lowering poverty levels. Also, high freedom house score relates to a low percentage of people living below the poverty line, because a more open government accelerates development. Besides, the lower infant mortality rate projects the lower percentage of people living in poverty because infant mortality is one of the good measures of the effectiveness of a country's health care system. High income in society illustrates to a low number of people living below the poverty line (Ahmad, Batul and Saleem, 2019).

2 Literature Review

Several related studies on the effect of income inequality on poverty employed the headcount level of poverty as the dependent variables, GINI coefficient as well as purchasing power parity adjusted mean income as independent variables. Hence, the author aimed to find out how poverty is influenced by income inequality. The research studies found out that an increased income inequality stunts the potential of income growth as a way of reducing poverty. Also, the increase in inequality automatically, it increases the poverty level in society (Ahmad, Batul and Saleem, 2019).

Another study that aimed to find out how and why different levels of income inequality lead to a distinct poverty outcome. The exploration concluded that higher income inequality has low levels of growth elasticity of poverty. Therefore, there is a correlation concerning the impact of gross domestic product, Gini coefficient as well as the rate of literacy, infant mortality rate, and freedom house score on poverty.

3 Experimental

The country's level of poverty is deduced by combining some factors that are linked to the country's unique history as well as development. Therefore, to find the relationship between income inequality and poverty in this study, poverty is my dependent variable and the independent variable is income inequality which is measured using the GINI coefficient that helps to show the degree in which family income deviates from income in an economy along with equitable distribution.

Therefore, examining poverty level, literacy rate, was a significant variable in this study for it helps to evaluate the capacity of society's workforce so that to improve its intellectual growth and economic opportunities. The natural logarithm of gross domestic product per capita was very important for it evaluates the changes in the size of the economy associates to its population as well as its correlation with the poverty level. Besides, the freedom house score tries to assess an individual's level of freedom rather than the government level in order to find evidence that proves that individual freedom minimizes the number of people living below the poverty level. I used data from the World Bank's development research group; the poverty headcount ratio, the Gini coefficient, gross domestic product per capita, adult literacy rate and infant mortality rate.

Model

Simple linear regression:

$$y = \beta_0 + \beta_1 x + u$$

whereby:

y representation dependent variable: poverty
β_0, β_1 represent intercept coefficients
x represents Gini Coefficient
u represents the error term

The model assumes all the simple linear regression model assumptions are true. The Gauss Markov assumption for multiple linear regression is the same as that of the simple linear regression model but more independent variables are added.

$$Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_p x_{ip} + \varepsilon$$

For multiple linear regression, continue to use Poverty as the dependent variable and now use GINI, Literacy Rate, log(GDP per Capita), Freedom Score, Infant Mortality, and High Income as explanatory variables. The expression of multiple regression model are as follow:

$$Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_6 x_{i6} + \varepsilon$$

Y_i = dependent variable: poverty
x_{i1} = GINI coefficient
x_{i2} = Infant mortality rate
x_{i3} = Freedom House Score
x_{i4} = Literacy rate
x_{i5} = High income
x_{i6} = Income inequality
β_0 = y-intercept at time zero
β_1 = regression coefficient that measures a unit change in the dependent variable when x_{i1} changes - the change experienced in level of poverty when income inequality changes
β_2 = coefficient value that measures a unit change in the dependent variable when x_{i2} changes – the change in level of poverty when Infant mortality changes
u = the error term

Therefore, the multiple linear regression model assumes that there is a linear relationship between the level of poverty and income inequality. When none of the correlation coefficients are equal to one, then there is no perfect collinearity between independent variables.

For instance, a higher GINI coefficient will imply that the poverty level is high and in multiple regression models other independent variables such as literacy rate were included, Log(GDP per capita), and freedom house score were added to the Gini coefficient in order to clear bias that may exist in simple linear regression model.

Given the income distribution function, the relationship between poverty ratio and income inequality in the country can be easily deducted (Lorenz, 2012). For example, if the poverty line is L, poverty ratio expression can be:

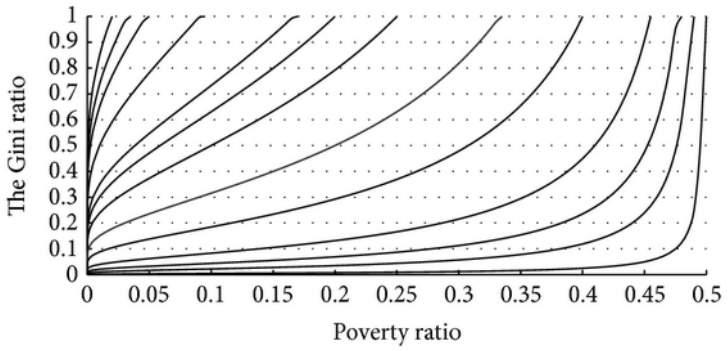
$$P_{\text{pov}} = \Pr(X \le L) = F(L;\, xm,\, \alpha) = 1 - (xm/L)\alpha.$$

Given that the income distribution is subjected to Lognormal Distribution and the poverty line is L, it can be deducted that

$$P_{\text{pov}} = \Pr(X \le L) = F(L;\, u,\, \sigma) = \Phi((\ln L - \mu)/\sigma).$$

As $G = 2\Phi\left(\sigma / \sqrt{2}\right) - 1$ is given, thus

$$\sigma = \sqrt{2}\Phi_{-1}\left(\left(G+1\right)/2\right) \text{ and } P_{\text{pov}} = \Phi\left(\left(\ln L - \mu\right)\Big/\sqrt{2}\Phi_{-1}\left(\left(G+1\right)/2\right)\right).$$



The chart above shows the relationship between the Gini coefficient and the poverty level. The right-leaning curve represents the link between the Gini coefficient and poverty ratio in which the median is infinity to the poverty line L, which is the same.

4 Results

The Gini coefficient was regressed on poverty as a way of demonstrating the effect of inequality on poverty. The table below shows the result for the simple regression of the Gini coefficient on poverty

Variable	Coefficient	Std. Err.	t-score	P > |t|
GINI	0.620799	.2009792	3.09	0.003
Intercept	-16.7198	7.615093	-2.20	0.031
R^2		0.1090		

Therefore, the regression equation for this model is:

$$y = \beta_0 + \beta_1 x + u$$

$$\text{Poverty} = -13.79 + 0.62\ \text{GINI} + u$$

For instance, the simple regression correlation should be positive between the Gini coefficient and poverty level implying that as the Gini coefficient increases, the level of poverty will increase as well in society. Therefore, according to this study, the correlation coefficient is positive, meaning that if the Gini coefficient is increased by 1 it will result a positive change in poverty, thus the number of people living in below poverty line will increase. Due the simple linear regression model assumptions, the result obtained by this model maybe biased, not unless there are no other variables. Therefore, multiple linear regression models helps to disclose a ceteris paribus impact on poverty. Hence, other important variables we're included in the model so that to analyze the impact of income inequality on poverty.

The table below shows the result of multiple regression model.

Variable Coefficient	Coefficient	Std. Err.	t-score	P > |t|
GINI	0.1895238	0.1532377	1.24	0.220
Literacy Rate	- 0.4133549	.113681	-3.64	0.001
log(GDP per Capita)	-5.054608	1.497127	- 3.38	0.001
Freedom Score	0.1368909	.0527581	2.59	0.011
Intercept	73.40045	11.53368	6.36	0.000
R^2		0.5849		

Hence, the equation of multiple coefficient is:

$$\text{Poverty} = 73.40 + 0.19\ \text{GINI} - 0.41\ \text{Literacy Rate} - 5.05\ \log(\text{GDP per Capita}) + 0.14\ \text{Freedom Score} + u$$

The equation above implies that an increase of 1 point in the Gini coefficient, it will result in a rise in the poverty ratio. Besides, the correction coefficient of the level of literacy is -0.41, which means that an increase in literacy rate in society by 1 point will result in a decrease in the poverty level by 0.41%. Also, the correlation coefficient on a log (gross domestic product per capita) is negative, -5.05. This is a strong negative correlation which illustrates that an increase of gross domestic product per capita by 1% in society, poverty level will reduce by 5.05 percent. The Freedom house score has a positive correlation which means that a high freedom house score implies that there is a high level of poverty.

5 Conclusion

In this paper, the expression of the Gini coefficient as expressed in simple and multiple linear regression it expresses the analysis and the relationship that exists between income inequality and level of poverty. The various variables that were used helped to understand the relationship. For instance, the literacy rate, changes in gross domestic product per capita as well as freedom house scores are significant in the multiple regression model. Despite the Gini coefficient's confidence level was not significant in the multiple linear regression, but in simple linear regression seemed to be significant. This study shows that income inequality

is a significant factor that is affecting poverty levels globally. For any nation to curb the challenge of poverty that has stagnated many countries, it should focus on improving literacy rates, ensure that there's gross domestic product per capita growth as well as reducing inequalities and freedom house score.

In effect, there is a massive amount of complicated aspects that influence the poverty level within a state. Although in this paper, I considered many variables that are associated with poverty in order to provide the potential policy outlets that the government would undertake. In order to determine the importance of income inequality, literacy rate, Freedom house score, and infant mortality rates they can help policymakers of the state as well he leaders of the state to set the most strategic and effective plan that will combat poverty efficiently hence improving their economic development.

Essentially, I recommend that that in future researchers research the relationship between poverty and other indicators of the healthcare system quality to get precise information on how these two correlate in that to link up with the infant mortality rate and other health care variables. The findings from this study will help the governments all over the world to determine which health care system should be enforced that is related to poverty reduction hence determining how resources can be allocated.

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