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Re-Examine the Relationship Between Income Inequality and Economic Growth in Egypt in 2004 – 2015

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Abstract

This article aims to re-examine the link between income inequality and economic growth in Egypt between 2004 and 2015. Income inequality and economic growth are controversial issues. There are many views that inequality negatively affects economic growth. In contrast, some hybrid scientists argue that moderate-income inequalities positively affect economic growth. In the period 2004-2015, Egypt experienced an unstable growth rate and had many incidents during this period such as the Arab Spring. Income inequality has been considered as one of the causes of the Arab Spring revolution. The regression results of the test model in this paper show the correlation between income inequality and economic growth and several other factors in 2004 – 2015 in Egypt.

Keywords: Income inequality; Economic growth; Egypt.

1. Introduction

All countries in the world are aiming to achieve economic growth and equity in society, especially in developing countries. Therefore, economic growth and income inequality are closely related. In recent years, many empirical studies have tried to examine the relationship between income inequality and economic growth. Poverty is measured by income, so there is a strong connection between these two terms. Poverty reduction means increasing income for the poor households from which they can surpass in a certain threshold. There have been many studies tried to identify the complex relationship between income inequality and economic growth. Kuznet (1955), argued that income inequality tends to be widen in the early stages of development, becomes stable in the short term and then narrows as the economy develops. Subsequent studies as Psacharopoulos *et al.* (1995) supported the Kuznet's hypothesis. Cingano (2014); Ayub (2013); Dollar and Kraay (2002) has identified that economic growth has no impact on income inequality. Persson and Tabellini (1994), also stated that income inequality could be harmful to economic growth, while Li and Zou (1998) found that income inequality has a positive impact for economic growth.

Egypt is in the process of transferring power from which social equity and equality are controversial issues. The Egyptian Centre for Economic Research (ECES) also stated that "social inequality, not focusing on human development, lack of political reform" were the main causes leading to the outbreak of the revolution in Egypt Esposito *et al.* (2016). However, Egypt's Gini coefficient has tended to decrease over the past decade, from 0.361 in 2000 to 0.307 in 2009, 0.308 in 2013 and 0.318 in 2015 (CAPMAS, 2016).

This is an atypical trend for countries in the period of rapid growth. Egypt began its growth process in the 1980s, keeping a growth rate of 5% between 1996 and 2010 and achieving a growth rate of 7% between 2006 and 2008. The Spring Revolution in 2010 was one of the corollaries of income inequality phenomena in Egyptian society.

Income inequality can have a positive or negative impact on the economy and socio-politics of any country, including Egypt. This paper explores the relationship between income inequality and economic growth and several other related factors in Egypt based on a national dataset from 2004 to 2015. To explore this relationship, the author will develop regression models to find out the relationship between growth and income inequality in Egypt in the period of 2004 – 2015.

2. Literature Review

Economic growth and income inequality are two major economic aspects that having great concern of any country in the world, especially in fighting against poverty as well as the relationship between economic growth and income inequality. There are many different views in assessing this relationship. Some economists thought that unequal income distribution would stimulate economic growth. However, those are cristicques that income inequality impedes growth and increases the poverty rate of each nation. Brandolini and Smeeding (2008) suggested that to reduce poverty and promote growth, the government should promulgate policies to distribute income equally. Piketty and Saez (2003) also stated that countries with unfair income distribution cannot benefit from economic growth.

Barro (1996), has concluded that income inequality on growth can be positive or negative impaction depending on the level of economic development of the country. Income inequality in less developing countries may slows economic growth, while income inequality in developed countries could stimulates growth. He used array data to show a negative correlation between inequality and growth in the early stages of economic development. When the

economy reaches stable development, this relationship becomes positive again. Aghion *et al.* (1999) have also shown a positive relationship between income inequality and growth .

Banerjee and Duflo (2003), suggested that the effect of inequality on growth is inverted in the U-shape when inequality remains low in developing economies, then the developing economies can accept higher levels of inequality. However, income inequality too high will reduce the growth of the economy. Piketty and Saez (2003) have shown that countries with high poverty rates and high levels of income inequality would have a greater impact on economic growth than countries with low poverty rates and low levels of inequality.

BBnabou and Tirole (2014), have argued that Korea and the Philippines had similarities in major macroeconomic factors such as GDP per capita, population, urbanization, and primary and secondary enrolment in the early 1960s. However, the two countries have differences in income distribution. In 1965, the Philippines' Gini coefficient was 51.3 while the Korean's Gini coefficient was 34.3. For the next thirty years, the average annual growth of Korea was 6% while the average annual growth of the Philippines was only 2%. As a result, Korea's combined production level increased many times while the Philippines production level only doubled. Income distribution has strongly influenced economic growth in two countries, South Korea and the Philippines during the research period.

Thus, there are different views in studying the relationship between growth and inequality. Forbes (2000) has identified five factors that play an important role in explaining these conflicting results: different variables, different research samples, different data quality, and time intervals, differences and bias due to omission of variables cross data. From which, the most important reason for the difference of research's results is the national specificity, the difference in study time, the variance of abandonment and the length of the consideration period.

3. Research Methods and Methodology

This study has selected four typical indicators of income inequality from 2004 to 2015 in Egypt. The first is the Gini index, which measures the level of inequality in income distribution in society. The Gini coefficient can range from 0 -1. If the Gini coefficient equals zero, that country is in perfect equality. Based on the Gini coefficient, one can divide countries into 3 groups of income inequality. Countries with low levels of inequality when Gini <0.4, average income inequality when in the range of 0.4 to 0.5 and high inequality when Gini> 0.5.

The second variable used in this study is economic growth. GDP is a measure of the output of an economy. Most research papers on the relationship between economic growth and income inequality often use GDP per capita growth.

In this section, the paper will use a linear regression model to assess the impact of income inequality on economic growth in Egypt and a number of other factors. Knowles (2005), used the following model to estimate the impact of income inequality on growth:

$$\mathbf{Growth_i = Constant + \beta_1 GDP_i + \beta_2 MSE_i + \beta_3 FSE_i + \beta_4 PPPI_i + \beta_5 Ineq_i + e_i}$$

Where Growth is the GDP growth rate, *MSE* and *FSE* are the average number of years of schooling for both male and female, *PPPI* is the investment value based on purchasing power parity and *Ineq* is the income inequality. Referring to the model above, this paper will use the theory and situation of income inequality in Egypt with available data sources to estimate the impact of income inequality on economic growth in Egypt. The study uses data tables for the time series from 2004-2015 to explore the relationship between economic growth and income inequality in Egypt:

The correlation equation is as follows:

$$\mathbf{GDP = \beta_1 Gini + \beta_2 X + e_i}$$

In which:

GDP: an independent variable representing the economic growth of Egypt

Gini: the dependent variable measuring income inequality

X: the exogenous variables affecting economic growth and will be explained in the following table:

Table-1. Statistics of variables used in the model

No	Sign	Variable name	Type of variable
1	GDP	Egypt's economic growth (%)	Dependent
2	Gini	Degree of income inequality	Independence
3	Unem	Unemployment rate	Independence
4	HeEx	Health expenditure	Independence
5	PoR	Poverty rate	Independence

3.1. Estimation Method

To overcome the problem of missing or unobserved variables for some independent variables in the model, the author will use the regression method with panel data to measure the impact of income inequality and economic growth. Panel data need to choose the appropriate estimation method, that is, Pearson correlation method and linear regression estimation. After testing the correlation and linear relationship between the two variables, the author uses ANOVA test. ANOVA test will show the influence of the dependent variables on the independent variables. Finally, the author will use a linear regression model to assess the impact of each dependent variable on the independent variable.

Pearson correlation coefficient quantifies the rigor of the linear relationship between two quantitative variables. In general, "r" is used to check the relation between quantitative variables (distance or ratio). The formula for "r" is as follows

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

3.2. Data

In this study, the author will use monthly statistics from 2004 - 2015 published on the ECES (The Egyptian Center for Economic Studies)

Data on household income surveys in Egypt are found on ECES. The household living standards survey data provides information on poverty assessments and rich-poor divide to serve national policy making plans and other government programs.

3.3. Research Hypotheses

To examine the relationship between income inequality and growth, the author uses the regression model with the following research hypotheses:

Dependent variable: GDP

Independent variables: Gini, Unem, HeEx and PoR

Hypothesis 1: Increased economic growth will reduce the level of income inequality. GDP has a negative impact on Gini (-)

Hypothesis 2: Increasing economic growth will reduce unemployment. GDP has a negative impact on the variable Unem (-)

Hypothesis 3: GDP growth will increase the level of health spending (+)

Hypothesis 4: Increasing GDP will reduce the incidence of poverty (-)

4. Results and Discussions

Statistics and probability distribution of variables in the model

Table 2 presents some basic statistics about the variables in the model. Gini value calculated as a percentage, similar to other indicators Unem, HeEX, PoR.

Table-2. Basic statistics of variables in the model

Variables	Observations	Min	Maxi	Mean	Std. Deviation	Kurtosis	
						Statistic	Std. Error
GDP	144	1.80	7.20	4.5158	1.69468	-1.029	.401
GINI	144	3.00	31.90	30.1515	5.22927	23.443	.401
HeEx	144	4.10	5.20	4.6662	.32395	-.987	.401
PoR	144	19.58	27.80	23.8440	3.08795	-1.723	.401
UNEM	144	8.10	13.40	10.9644	1.65985	-1.459	.401

The average Gini of Egypt from 2004-2015 was 30.15, the smallest value was 3.00 and the largest value was 31.9 (table 2). Egypt's Gini has had got its major fluctuations in the research period. The average growth rate of Egypt (GDP) in this period was 4.5%. The fluctuation range of the GDP variable is relatively large with the smallest value being 1.8% and the largest value is 7.2%. The level of spending on health averages 4.6% of total GDP. The poverty rate is relatively high, reaching an average of 23.8%, the smallest value is 19.58% and the largest value is 27.8. The average unemployment rate is 10.9%.

4.1. Pearson Correlation Test

There are many types of relationships between two quantitative variables, either linear or nonlinear or without any connection. Therefore, the Pearson's correlation will quantify the degree of rigidity of the linear relationship between two quantitative variables (Wilcox, 2003). In Pearson's correlation, there will be no difference in roles between the two variables, the correlation between the independent variable and the dependent variable.

Table-3. Pearson correlation test results

		GDP	GINI	UNEM	HeEx	PoR
GDP	Pearson Correlation	1	.408**	-.612**	.264**	-.703**
	Sig. (2-tailed)		.000	.000	.001	.000
	N	144	144	144	144	144
GINI	Pearson Correlation	.408**	1	-.046	.023	-.236**
	Sig. (2-tailed)	.000		.582	.785	.004
	N	144	144	144	144	144
UNEM	Pearson Correlation	-.612**	-.046	1	-.355**	.668**
	Sig. (2-tailed)	.000	.582		.000	.000
	N	144	144	144	144	144
HeEx	Pearson Correlation	.264**	.023	-.355**	1	-.775**
	Sig. (2-tailed)	.001	.785	.000		.000
	N	144	144	144	144	144
PoR	Pearson Correlation	-.703**	-.236**	.668**	-.775**	1
	Sig. (2-tailed)	.000	.004	.000	.000	
	N	144	144	144	144	144

The Sig value in Pearson's correlation of GDP and other variables had received values of less than 0.05 respectively (Table 3). Thus, relationship between variables has been linear, especially between independent variables and dependent variables. The pairs of independent variables have been quite weak, so there have not had any multicollinearity phenomenon.

4.2. Results of Regression and Testing of Research Hypotheses

After Pearson correlation test to see the linear relationship between variables, this paper has conducted the linear regression analysis to illustrate the impact of independent variables on the dependent variable. Table 3 shows some criteria of the model.

Table-4. Influence results of the dependent variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.847[a]	.718	.710	.91275	.133
a. Predictors: (Constant), PoR, GINI, UNEM, HeEx b. Dependent Variable: GDP					

The adjusted R^2 value is 0.718 shows the independent variable in the regression affects 71.8% for the change of the dependent variable, the remaining 22.2% is due to non-model variables and random errors.

Table-5. Anova test results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	294.886	4	73.722	88.488	.000[a]
	Residual	115.804	139	.833		
	Total	410.690	143			
a. Predictors: (Constant), PoR, GINI, UNEM, HeEx b. Dependent Variable: GDP						

Anova Sig test value is 0.00 <0.05, the linear regression model has suitable for the data set and can be used.

Table-6. Results of regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	32.160	3.061		10.507	.000		
	GINI	.055	.016	.170	3.415	.001	.816	1.225
	UNEM	-.122	.068	-.119	-1.781	.077	.452	2.211
	HeEx	-3.080	.423	-.589	-7.287	.000	.311	3.217
	PoR	-.570	.058	-1.040	-9.848	.000	.182	5.492
a. Dependent Variable: GDP								

The analysis results show that the F-test value has Sig_test accepts values: Gini = 0.001, UNEM = 0.077, HeEX = 0.00 and PoR = 0.000 (table 6). The value of variable Unem is greater than 0.05, so it makes no sense to explain the dependent variable. This variable will be removed from the model. The model results after removing the Unem variable follows:

Table-7. Regression analysis results after eliminating variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	((Constant)	34.187	2.863		11.939	.000		
	GINI	.047	.016	.146	3.025	.003	.880	1.136
	HeEx	-3.384	.389	-.647	-8.690	.000	.372	2.690
	PoR	-.642	.042	-1.170	-15.276	.000	.351	2.848
a. Dependent Variable: GDP								

The analysis results show that the F-test has P-value is less than 0.05 illustrates that at least one variable in the model affects the dependent variable. The adjustment coefficient R^2 = 0.718 proves that the independent variables account for 71.8% of the change in the GDP dependent variable. Regression coefficients are all different from zero (table 4). The Gini variable is positively associated with the GDP variable and other variables negatively affect the GDP variable.

Among these 4 hypotheses, the GDP does not affect the unemployment rate. This is the Standardized regression equation:

$$GDP = 0.146Gini - 0.647HeEx - 1.17PoR$$

According to the equation, the economic growth has a positive (+) impaction on income inequality. In the case of Egypt, the economic development would lead to increase income inequality. Growth economic would not lead to increase spending on health, but on the contrary, economic growth reduce poverty but not significantly.

5. Conclusion

In overall, the regression results of the model are statistically significant with p <0.001 value. The level of explanation of the two models is over 71.8%. The direction of the impact of the independent variables in the two models is in line with expectations.

The research results show that income inequality changed GDP, or in other words, the change of income inequality had been the cause of GDP change in the period 2004-2015. Income inequality can make it difficult for economic development in many ways. The rising income inequality is often associated with rising poverty rates, poorer public health care programs and increased crime rates as burdens for the economy. In Egypt, economic development has led to an increase in income inequality, which may explain that economic growth is only beneficial to the wealthy class and not to whom poor people in Egypt.

Moreover, high levels of income inequality also lead to poor health, low living standards, high rates of orphans and many other social problems. For example, many studies have shown a relationship between inequality and mortality. Moreover, the evidence shows that income inequality has a negative impact on health and society, especially in countries where inequality tends to increase (Pickett and Wilkinson, 2015). In social welfare and income-generating mechanisms, health is an important factor. Public health can affect economic growth such as labor productivity, savings and investment and contribute to demographics (Bloom and Canning, 2008).

Some studies have also suggested that health factor was a variable which has positive effects on economic growth. Moreover, increasing income inequality can prevent people from accessing high quality or public health care (Bhattacharjee *et al*., 2017). As a result, income inequality can have a negative impact on economic growth through adverse effects on public health. In Egypt, although economic development, it did not increase spending on health but also decreased. That is the reason for the level of inequality has been growing in the meantime.

Another important factor affecting income inequality in the model is the poverty rate. If the percentage of poor households increases by 1%, the Gini index would also increase by 0.16%. The labor force ratio and the urbanization rate also have a positive impact on the GDP growth rate per capita of the localities. However, the extent of the impact of economic growth does not reduce the level of poverty in Egypt, whereas economic growth is proportional to the level of poverty due to income inequality.

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