The Analysis of Income Inequality and Economic Growth Relationship: Evidence from Pakistan's Data

Saleem Khan[*]

Salman Azad Khan[†]

Muhammad Tariq[‡]

Abstract

This research gives a brief overview of Pakistan's economic growth and income inequality, and empirically assesses the relationship between these two variables of the country over the period of 1990 – 2015. In the empirical part, our study employs the augmented ADF test and simple regression analysis. ADF test results depict that both variables of the model are stationary at the level and exhibit no unit root at the level. Further, in regression results, the coefficient estimates are significant and reveal an inverted U linkage between economic growth of the country and distribution of income. The income level of the country alone explains a significant part of the income inequality. Instead, the lagged dependent variable coefficient is significant and partly explains variation in inequality.

Key Words*:*   Economic Growth, Income Inequality, ADF Test, Regression Analysis

JEL Classification: O40, F43.

Introduction

Pakistan's economic growth rate exhibits considerable variations in the last few decades:the economy experienced both impressive and disappointing growth rates. As in the last decade, the country's output or GDP growth rate was 5.57 in the year 2005-06, then decreased to 0.36 in the year 2007-08 and again gradually accelerated to 4.24 percent in the year 2014-15 (Economic Survey, 2014-15). In **Figure 1** the trend in the country's growth rate has been shown for the last one and half decade. It is obvious that in initial after 1997 there was a gradual increase in growth. Since 2005 there is a declining trend and later of 2010 again experience a rising trend in growth rate.
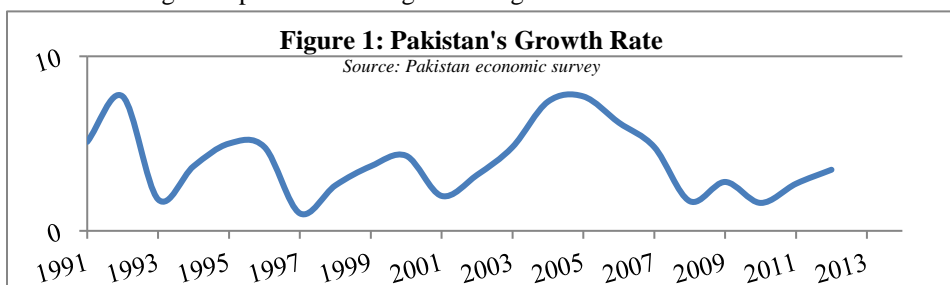

Figure 1: Pakistan's Growth Rate
Source: Pakistan economic survey

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[*] Assistant Professor, Department of Economics, Abdul Wali Khan University Mardan, KP, Pakistan.

[†] MS Scholar, Department of Economics, Abdul Wali Khan University Mardan, KP, Pakistan. Email: drsaleem.eco@gmail.com

[‡] Assistant Professor, Department of Economics, Abdul Wali Khan University Mardan, KP, Pakistan.

Moreover, to observe for the GDP per capita income of the country, data is showing an increase in the number of the income level (see **Figure-2**). As in 1990, Pakistan's per capita income was just around 300 US$ that is now around 1500 US$. But this is not interesting from the perspective of the country's development. Once economic growth occurs in a country then question arise that how the income earned from growth is now being distributed, either it will benefit all segment of the population equally or not. If the distribution is more or less equal then it ensures to enhance economic growth and hence the living standard of the common man. In contrast, the rising economic growth has no guarantee for reducing income inequality and so poverty. In the 1990s, the world output grew enormously but the number of people below the poverty line also increased in a similar way which is the outcome of unequal distribution of income.

Figure-2: Per Capita GDP in US$, 1992-2015
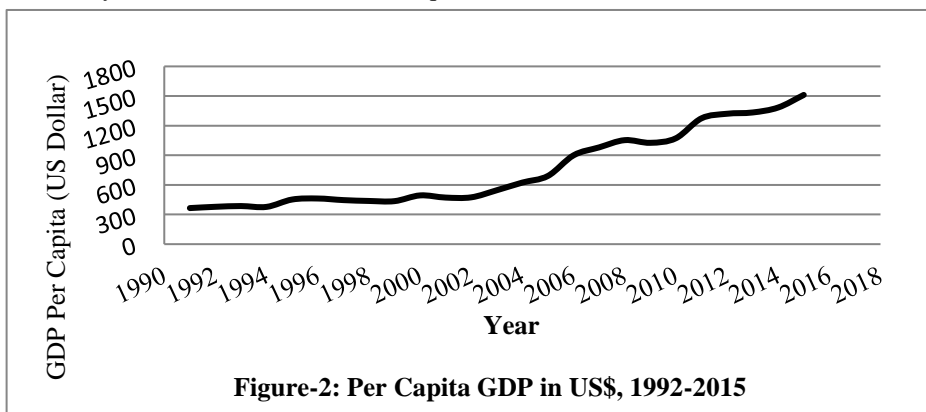
Data Source: Pakistan Economic Survey

Figure-3 shows income inequality across selected countries in the world, in 2016 per capita income of Australia is 49755 US$, in Bangladesh 1358 US$, in Canada 42183 US$, in China 8123 US$, in India 1709 US$, in Pakistan 1443 US$, and in Singapore is 52962 US$. This income difference is not only prevailed internationally but the country has also internally the problem of the income distribution.

Source: Data is extracted from the website of the World Bank
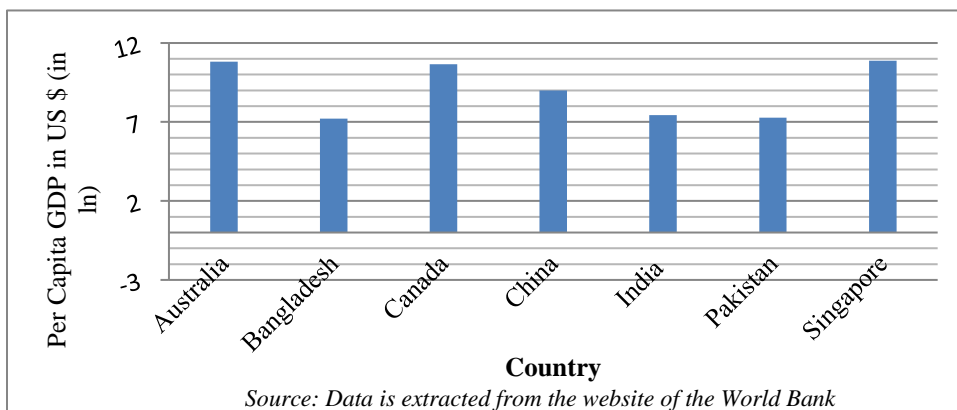
Figure 3: Per Capita GDP in US$ of Selected Countries

This problem of income disparity prevails nationally as well as internationally, such that the rising trend of income differences or the disproportionate distribution of income widen the gap between rich and poor of the society. If we look at the data, in Pakistan's economy the distribution of income is not uniform as well because the Gini index values are greater than zero or positive. For example, the Gini-index was 33.2 percent in the year 1990 and come down to 29.1% in the year 1995, and then grew to 32.7% in the year 2005. Thus, economic growth is not necessary for fair distribution of income. What effect does a country's economic growth have on the distribution of income within the country? Kuznets (1955) was one of the first who presents his theory to the readers. He said that during a country's economic development, it first goes a period where inequality increases and later decline. Weriemmi and Ehrhart (2004) have analyzed the relationship between economic growth and inequality for European and Mediterranean nations by taking cross-sectional data. In results, they concluded that fast economic growth first root to strengthen income inequality and which farther hasten economic growth. Some other studies have also shown that there is empirical evidence of the Kuznets curve (Chen & Ravelion, 1996; Nimati & Raisi, 2015). However, findings of some other studies do not support for U-shaped relationship between the two variables.

Considering the contradictory evidence on the relationship between income distribution and income inequality, our study tests the relationship between the two variables for the period 1990-2015 in context of Pakistan. There is insignificant research that has been tested for the empirical evidence of an inverted U-shaped relationship in Pakistan. Therefore, the core objective of our research is to investigate for the impact of economic growth on the income distribution of the country and assess the relationship between growth rate and income inequality over the period of analysis. The remaining section of the study is structured as follows. Since then after introduction, section-2 presents related literature. The discussion about data sources and possible econometric techniques is given in section-3. Section-4 reports empirical results as well as discussion. The last section-5 provides concluding remarks.

Literature Review

In literature, different research has been analyzed empirically the association between economic growth and income inequality using data for different countries of the world. In this part of the study, we give a brief overview of earlier studies related the connection between two subject variables. Normally, it is considered that an increase in income of a country is vital to the annihilation of the outright poverty and diminishing income disparity. However, fair income distribution along with high economic growth is of great importance and debatable. The most powerful hypothesis which has gotten huge consideration for empirical examination of the relationship between income circulation and economic growth in literature is known as the Kuznets hypothesis (see Kuznets, 1955). The basic statement of the Kuznets hypothesis is that in initial phases of development there is an addition in both growth rate and income inequality of a country and then inequality diminishes with high economic development. It is because of the moving from low-income agricultural class to high-income industrialist society. This move prompted the "modified U-formed" connection between growth and inequality.

Strassman (1956) have used per capita income, the share of lower and higher income group of selected nations as to compare the correlation between per capita income and

income distribution of different countries. By examining, the share of the top twenty percent and lowest sixty percent for selected countries of the study, the data demonstrate the opposite relation between per capita income and income distribution in different countries. Further, the study has compared per capita income and productivity between Australia and Argentinian for the year 1948-49. It has shown that during the period, Australia's income was three times higher than Argentina but in productivity, Argentina was less than half. Veeck and Pannell (1989) examined 167 farms in order to find out the main income origins of the rural population in the agricultural ones in the Suzhou province of China for 1986-1987. In the selected region the normal overall farming income was under 15% as compared with normal all-out pay of 34 families studied. They find that most of the workers prefer to work in industries due to high income which is a bad impression for the agricultural country. Chen and Fleisher (1995) tested the link betwixt income disparity and economic growth using the Solow growth model.

Chen (1996) highlighted the impact of inequalities on economic growth in China by taking annual data for the period of 1978 to 1993. In order to estimate the analysis, he used Solow growth along with time series and cross-sectional data. He further analyzed the impact of regional inequalities in China. His finding suggests that in the short run the total inequalities plainly decreases. However, the coastal and non-costal income disparities increase little about. In the given period these income inequalities have been dropped to some extent and GDP and per capita income has shown some rising trend. Chen and Ravelion (1996) have tested the connection between economic growth and the distribution of income using data for many countries of the world. They concluded that there is no uniform relationship across the countries. For Europe and the Middle East their results confirm the inverted U relationship, but for the rest of the world, this relationship does not exist. They are of the view that the structural conditions are important in the country's distribution of income.

Deninger and Squire (1998) have used time series data for the period of 1960-1990 for different countries of the world by region as to provide a valid basis for inferences on issues of growth and inequality nexus. They concluded that the data do not support the Kuznets hypothesis regarding growth and inequality using cross-sectional data. Panizza (2002) examined the impact of income imbalance on growth using American data for the period of 1940 to 1980. For this purpose, he used GMM and fixed effect techniques. The finding shows that such studies that use cross country analysis shows that there is a negative relation while such studies that utilize panel data shows a positive relationship between income disparity and growth. However, this study confirms for "negative relationship between the income disparities and growth", and also finds some proofs of other studies that support the negative relationship. The results further shows that this relationship is not robust and mainly depends upon the estimation techniques that are used in finding the relationship between the income disparity and growth.

Scully (2003) in his study tested the behavior of income inequality and economic growth rate. He confirmed a clear exchange-off relation between these variables and confirmed a statistically significant relationship between them. He concluded that a 1 percent increase in economic growth rate will increase the income inequality by 0.00075 percent because there is a positive link between them. On the other hand, it can be stated that greater the income inequality then greater or high will be the growth rate. Duflo and Banerjee (2003) examined inequality and growth for cross countries adopting

nonparametric techniques. The main focus of the study was to find relevance linear correlation between inequality and growth. They are of the view that changes inequality are directly linked with growth and are inverted U shaped in nature. The results further show that it is due to the type of data used that makes the studies different from another.

Gomez and Foot (2003) have comparatively examined the behavior of income inequality and growth rate for South Korea, Philippines and Japan. Because countries experienced the same economic index as GDP, growth rate, education rate etc. for decades. They suggest that however the GDP of Japan increased as compared with South Korea and Philippine but still the ratio on income inequality was the same as South Korea and was less than that of Philippine. They confirmed that income disparity is directly linked with economic growth; an increase in the income disparity will decrease the growth rate. Additionally, no causal relationship was found between economic development and inequality using data for different Latin American and Caribbean economies (Garcia & Bandera, 2004)

Shari (2008) investigated the link between growth and income equality in Malaysia by taking yearly time series data from 1970 to 1995. This study has inspected manners by which the fast financial growth in Malaysia amid the period 1971-95 has added to achieving value in human development. The dialog demonstrates that fast growth of the economy established the essential framework that empowered neediness mitigation and decreases of income inequality amid this period. Tridico (2010) has tested for the impact of economic growth on poverty and inequality in a sample of 50 emerging and transition economies using data over the period of 1995-2006. The author has used cross-section regression model and found that growth did not contribute to a reduction in poverty. Further, growth occurred during a long period, worsened inequality and did not reduce as predicted by the Kuznets hypothesis. This study concluded that the results did not identify U-shaped Kuznets curve for the sample countries. Huang et al. (2012) have been revisited to test the Kuznets hypothesis using annual data for the US economy over the period of 1917-2007. They found that the results are inconsistent with the hypothesis of inverted U-shaped, and reject the inverted U-shape hypothesis between the two variables. They concluded that the distribution of income first get improves and then worsens, as the development take place. Nemati and Raisi (2015) studied the behavior of economic growth and income equality for 28 developing countries. He adopted F-Limer test and Hausman test to investigate their relationship. They concluded a significant effect of per capita income on inequalities and in results confirmed the hypothesis of U-shaped that in initial steps of growth the inequalities first rises and later on decreases.

Methodology and Data Source

Sources of Data and Econometric Techniques

This research has used secondary data for the period of 1990 to 2015. There are the different source from which data have been collected. Gini coefficient is used as a proxy to represent the income inequality. Broadly, the data for economic growth and Gini coefficient is taken from the sources as given below.

- Pakistan Economic Survey (various issues)
- A Handbook of Statistics, by SBP
- World Development Indicators (WDI),

In the empirical analysis, this study uses different econometrics tests and techniques. First of all this study using descriptive statistics, and then augmented Dickey Fuller (ADF) test. The purpose of the ADF test is to check for stationarity in series of the model. Since then after the ADF test, this study has employed the method of ordinary least square (OLS) to investigate the relationship between variables of the model. The empirical analysis is made using statistical software Eview-9.

Model for Estimation

The Kuznets hypothesis reports that during initial steps of development or growth, the relative distribution of income first worsens or inequality rises and then starts to decline in the path of development. To analyze this relationship between economic growth and income inequality using data for the economy of Pakistan, we use the following log-linear regression model based on previous research:

$$INE = \alpha + \beta EG + \delta EG^2 + \pi INE_{t-1} + \epsilon \qquad (1)$$

Where

        INE = Income inequality
        β & δ= coefficient of variables
        EG = Economic Growth
        EG^2 = Square of economic growth
        INE_{t-1} = lagged of dependent variable
        ε = Error term

The expected signs of β are> 0, δ < 0 and of π is > 0

Results and Discussions

The analysis of the model of the study is made using regression analysis and ADF test statistic. In the regression model, the dependent variable is income inequality while economic growth is the independent variable. However, before going to regression analysis, we first here provide the basic information about each series using descriptive statistical analysis and then make unit root analysis as to find that the series is stationary or non-stationary at the level.

Descriptive Statistics

The descriptive statistics results are reported in table 1. The results in table 1 indicate that mean of inequality (INE) is 30.76 and of economic growth (EG) is 1.67; the mean of inequality is greater than economic growth. Maximum and minimum of INE are 33.2 and 28.7 respectively, while of EG is 5.47 and -1.44, respectively. Variations are looking more or less the same between the maximum and minimum of both variables. The standard deviation of INE is 1.24 and this for EG is 1.86, in both cases its value is greater than 1 and less than 2. It reflects that positive variations occur in the two series from their mean values. There are total of 26 observations in each series of the study.

Table 1. Descriptive Statistics Overview

	INE	**EG**
Mean	30.76792	1.670690
Median	30.65000	1.399709
Maximum	33.20000	5.478160

Minimum	28.70000	-1.449514
Std. Dev.	1.243204	1.864841
Skewness	0.364949	0.467046
Kurtosis	2.295706	2.599017
Jarque-Bera	1.028782	1.033315
Probability	0.597865	0.596511
Sum	738.4300	40.09656
Sum Sq. Dev.	35.54780	79.98553
Observations	24	24

Source: Authors' calculations

Unit Root Results

Next, to the results of the descriptive statistics, we test for unit root to find that either variable of the model is stationary or non-stationary at the level. For this, the augmented test developed by Dickey and Fuller (1981) is widely applicable in literature. Thus, the results of the ADF test are reported in Table 2 and Table 3. Table 2 shows unit root result for economic growth variable and table-3 shows results for income inequality variable.

Table 2 represents the results of Augment-Dicker Fuller test for economic growth. The test null hypothesis assumes that EG has no unit root. The value of test statistics for economic growth or EG is **-3.026**. The p-value is 0.047 which is significant at 5%. Thus, the test results reject null and accept the alternative hypothesis. It is concluded that the data of economic growth is stationary at level.

Table 2. ADF Test Result with Constant, Economic Growth

Null Hypothesis: **EG**[1] has a unit root			
Alternative Hypothesis: **EG** has no unit root			
		t-Stat.	Prob.*
ADF test Result		**-3.026**	**0.047**
Test critical values:	At 1%	-3.7529	
	At 5%	-2.9980	
	At 10%	-2.6387	

EG stands for Economic Growth

Similarly, we have used the ADF test to check that either series of income inequality is stationary at level or non-stationary. Unit root results of income inequality are given in table 3 as following.

Table 3. ADF Test Result with Constant, Income Inequality

Null Hypothesis: **INE**[1] has a unit root			
Alternative Hypothesis: **INE** has no unit root		t-Statistic	Prob.*
ADF test statistic		**-3.5207**	**0.018**
Test critical values:	At 1%	-3.7529	
	At 5%	-2.9980	
	At 10%1	-2.6387	

INE stand for income inequality

Again, results in table 3 show that the ADF test value is greater than 5 percent critical value. As the test value for INE is -3.520 and the critical value at 5 percent is -2.99. The test value is greater i.e. **-3.520 > -2.99.** Therefore, we reject the null and accept the alternative hypothesis in cases of income inequality as well. This is concluded that INE is also stationary at level and there is no unit root in the series at level. Thus, both variables are stationary at level. Next to unit root analysis, we can now estimate the model using regression analysis as both series of the model are stationary at level.

Discussion of the Regression Results

To empirically assess the hypothetical relation between income inequality and economic growth, that the relationship is significant or not, this study uses the following selected regression model.

$$INE = c + \alpha EG + \beta EG^2 + \pi INE(-1) + \varepsilon \qquad (2)$$

In the above regression (2), INE is the dependent variable, the EG or EG-square are independent variables. INE (-1) represent a one year lag of the dependent variable. The coefficient of variables represents the percentage change in the dependent variable due to the change in the independent variable. According to literature, there are different possibilities from this regression model, as given.

a)   There is positive relationship i.e. $\alpha > 0$ and $\beta = 0$,
b)   There is negative relationship i.e. $\alpha < 0$ and $\beta = 0$,
c)   There is a U-shaped relationship i.e. $\alpha < 0$ and $\beta > 0$,
d)   There is an inverse U-shaped relationship i.e. $\alpha > 0$ and $\beta < 0$,

For the existence of any possible relationships, we estimated the above regression model where Table 4 reports the results as given:

Table 4. Regression Results of the Model in Equation (2)

INE (Income Inequality) = Dependent variable

Time Period: 1990- 2015

Variable	coefficient	Std. Error	t-Statistic	Prob.
C	18.953	5.889	3.218	0.0054
EG	0.475	0.280	1.694	0.1095
EG^2	-0.134	0.0586	-2.288	0.0361
INE(-1)	0.376	0.193	1.946	0.0694
R^2	0.389	Mean dep. var		30.656
Adj. R^2	0.274	S.D. dep. var		1.242
S.E. of regression	1.058	AIC		3.127
D-W stat	2.183	SC		3.326
F-statistic (Prob.)	3.395 (0.043)	HQC		3.166

In the results of table 4, column-1 represents variables of the model and column two represents coefficient estimates of the independent variable. The last column 4 & 5 represents t-test and p-values against the coefficient values. The values of t-test and p-values are used to determine that the relevant coefficients are statistically significant or insignificant. Usually, estimates of parameters are tested at 1%, 5% or 10% level of significance. The rule of thumb states that the value of t-test ≥ 2 indicates that the coefficient of a variable is statistically significant, otherwise insignificant. In column-2 of the table, it is obvious that the value of t-test is greater than 2 or equal around two for the coefficient of EG^2 and INE (-1) variables, respectively. The coefficient of EG is with a positive sign and significant around at 10 percent level of significance as the t-test and p-value indicate. However, the coefficient of EG^2 is with a negative sign and statistically significant even at 5 percent. The estimated value of the coefficient of economic growth and economic growth square is 0.47, and -0.13, respectively. This implies that initially, economic growth increases inequality and later on inequality falls with economic growth or development. Consequently, the results confirm the last proposition of the Kuznets hypothesis related to the inverted U-shaped association between economic growth and income inequality. Also, the coefficient of one year lagged inequality i.e. INE (-1) is positive and of value 0.37, and significant at 10 percent. This is used to capture the lagged dependent variable effects or the effect of previous year income inequality.

In diagnostic test results, the value of R-square is 0.389, indicates that the total variation independent variables explained by independent variables is 38 percent. The regression model in equation (2) accounts for 38 percent of the variance. The adjusted R-squares value is 0.27 which is less than the value of R-square where adjusted R-square is needed to be less than the R-square value. The significant F-statistics indicates that the coefficient estimates of the model are jointly statistically significant. The value of Durbin-Watson is 2.18 which shows that the model is free from the problem of serial correlation. Thus, the regression results prove the existence of an inverted U connection in income inequality and economic growth. The moderate value of R-square indicates that some portion of the country's inequality can be explained by the economic level alone rather than the lagged effects of the dependent variable.

Conclusion

The impact of income inequality has occupied a central place in the theoretical and empirical economics literature. In this paper, we revisited the causal relationship between income inequality and independent variables such as economic growth and square of economic growth. The paper has empirically tested for the nexus between economic growth and income inequality of Pakistan from 1990 – 2015. At first, the variables of the model are tested for unit root and hence found all variables of the model stationary at level, exhibit no unit root at the level. Therefore, the ordinary least square regression is employed to estimate the required parameters in the model.

The results suggest that initially, economic growth has a positive impact on income inequality through its effect is not highly statistically significant. However, high economic growth with negative sing has a statistically significant impact on income disparity. Apart from the other variables, income level or economic growth of the country has significant effects on income inequality. The results support an inverted U relationship between growth and inequality of the country. On the basis of findings, it is suggested that economic

growth is an important variable that can affect the distribution of income in the country. The inequality can partly be decreased with high economic development. Further, the model explanatory power is not stronger which indicates that some other important variable is also affecting the level of income distribution in the country. Therefore, the present research can be extended by taking large time-series data and including the other important variable as an explanatory variable rather than income level to predict the closer picture of income inequality or distribution of income in the country.

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