Pakistan Journal of Applied Economics: Special Issue 2016, (85-103)

ECONOMIC GROWTH AND INCOME INEQUALITY IN DEVELOPING ECONOMIES: Theory and Evidence

Muhammad Tariq MAJEED*

Abstract

This study empirically analyses the impact of inequality on economic growth using a sample of sixty five developing economies. The results show that inequality causes a negative effect on economic growth. However, this negative effect is substantially influenced by the domestic context in terms of the degree of inequality and the stage of economic development. Alower degree of inequality increases economic growth while a higher degree of inequality decreases economic growth. Moreover, inequality affects economic growth negatively only in low-income developing countries while this effect turns out to be positive in high-income countries. These results are shown to be robust to different econometric techniques, alternative specifications, inclusion of additional control variables, exclusion of outliers and sub-samples.

JEL Classification: C23, D31, O40.
Key Words: Economic growth, Inequality, Developing economies.

I. Introduction

Theoretical and empirical research into the effect of inequality on economic growth has produced diverse results. The theoretical studies by Kaldor (1957), Saint-Paul and Verdier (1993) and Galor and Tsiddon (1997a, 1997b) suggest a positive growth effect of inequality on economic growth through the channels of incentives, physical capital accumulation, saving rates or investment indivisibility. In contrast, the theoretical studies by Galor and Zeira (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994), and del a Croix and Doepke (2003) predict a negative growth impact of inequality. The negative growth impact of inequality comes through the mechanisms of socio-political instability, imperfections in credit markets, fiscal redistribution and distortion, and fertility differential.

Similarly, the empirical literature on the impact of inequality on economic growth yield mixed evidence. The empirical studies by Alesina and Rodrik (1994), Persson and Tabellini (1994), Wan, Lu and Chen (2006), and Sukiassyan (2007)

* Assistant Professor of Economics, Quaid-i-Azam University, Islamabad, Pakistan.

The author is extremely thankful to the anonymous reviewer for his/her valuable input to improve quality of this manuscript.

show that high inequality causes lower economic growth. Contrary, the studies by Partridge (1997), Li and Zou (1998), Forbes (2000), and Lundberg and Squire (2003) provide evidence that high inequality causes higher economic growth. Nevertheless, Barro (2000) finds out evidence that the impact of inequality on growth is insignificant using a combined sample of developing and developed ecoomies. Another strand of empirical literature on growth impact of inequality asserts that the relationship between inequality and economic growth is likely to be non-linear. For example, Voitchovsky (2005) argues that growth impact of inequality depends on the quantiles of distribution. The inequality causes favourable impact on growth at the top quantiles of distribution while it causes negative impact on growth at the lower qunatiles of distribution. Another study by Partridge (2007) shows that growth impact of inequality changes depending upon the area of sample. In the case of urban area, inequality causes positive impact on growth while in the case of non-urban area inequality causes negative impact on growth. Similarly, Bjornskov (2008) argue that growth impact of inequality depends on the type of government. Using a sample of 178 countries from 1975 to 2000, Bjornskov (2008) confirms that inequality causes favourable impact on growth in the case of right-wing government while inequality leads to lower growth in the case of left-wing government.

In this study we argue that the existence of inequality is a natural phenomenon in the case market economy. According to Rousseau (1755), inequality was set when ancient man developed the first society. Similarly, Adam Smith (1776) argues that inequality is caused by differences among individuals which are inherent parts of economic systems. Similarly, Schumpeter (1942) considers incentives that influence economic performance of individuals. The differences of economic performance of individuals depend on skills, energy and work capacity. Since individuals differ in their skills and working capacities, uneven distribution of rewards is a natural outcome.

Since inequality is a natural phenomenon in a market economy, then question arises as to what is the optimal level on inequality. It necessitates the importance of non-linearity in growth-inequality nexus. This study specifies a non-liner relationship between growth and inequality and tests this relationship for a large set of developing countries. Moreover, we argue that non-monotonic nature of growth-inequality relationship is more important in the case of developing economies where inequalities are in general higher and the problems related to inequalities such as social unrest, market imperfections are widespread. Moreover, theoretical channels which predict positive impact of inequality on economic growth are also likely to persist in low-income developing countries.

This study contributes in to the existing literature on growth and inequality in following ways. First, for this study, a new panel data set was prepared over a long period (1965 to 2008) for 65 developing countries using various sources of data and manual calculation. Seeking high quality data, an effort has been made to ensure

that statistics are comparable across countries and over time by the use of similar definitions of variables for each country and year. The availability of long data series enabled us to test the very nature of long- term growth-inequality relationship that is missing in previous studies. Second, in this study we model a non-linear relationship between economic growth and inequality. Third, this study tests the growth-inequality nexus exclusively for developing economies as combing developing and developed economies may give biased results. The study addresses following research questions: First, does inequality boost economic growth? Second, does the impact of inequality on economic growth depend upon the degree of inequality? Third, does the relationship of inequality with economic growth vary depending upon the level of economic development?

After the Introduction (Section I) the rest of the discussion is structured as follows. Section II explains the channels through which inequality affect growth while Section III provides a discussion of data. Section IV presents an analytical framework for the study. Section V put forwards the results derived from the hypotheses and a discussion of these results. Finally, section VI provides a conclusion.

II. Channels through which Inequality can affect Economic Growth

The debate on inequality and economic development goes back to the pioneer study of Kuznets (1955) who predicted inverted U-shaped relationships between inequality (dependent variable) and economic development (independent variable). Many empirical studies have tested the presence of Kuznets Curve and produced mixed results. Ahluwalia (1976) support the Kuznets's point of view. However, some later studies do not find evidence to support the Kuznets Curve [see, for example, Deininger and Squire (1998)]. Some recent studies confirm the presence of Kuznets in the case of developing economies [see, for example, Majeed (2014), (2015), and (2016)].

The literature followed by Kuznets (1955) focuses on the causes of inequality. The present study follows an entirely different strand of the literature which focuses on the consequences of inequality. In particular, this study follows the literature which determines inequality consequences for economic growth. The pioneer empirical studies of Perotti (1996) and Forbes (2000) are considered benchmark in this stream of the literature. These studies are different from Kuznets (1955) in following ways: First, these studies focus on economic growth rather than on economic development. Second, most importantly, these studies consider inequality as independent variable rather than dependent variable.

The theoretical literature suggests various mechanisms through which inequality can determine economic growth. However, it is not yet clear whether inequality increases or decreases economic growth. An earlier theoretical study by Kaldor (1957) suggests that inequality increases economic growth. He argues that the marginal propensity to save of the rich is higher as compared to the poor. The persist-

ence of high inequality in a society implies that the rich can save more that causes more investment. Thus higher savings and investment cause more capital accumulation and high economic growth. In contrast, the theoretical studies by Persson and Tabellini (1994) and Alsenia and Rodrick (1994) predict negative growth effects of inequality. These studies suggest four channels through which inequality negatively impacts economic growth. First, a higher degree of inequality boosts rent-seeking activities in the society that, in turn, diminish the security of property rights. Second, the management of collective actions becomes difficult in more uneven societies. The lack of collective actions is observed in political instability, high volatility in policies or tendency towards redistributive policies. Such socioeconomic and political uncertainties cause adverse impact on economic growth. Third, the median voters in more uneven societies are relatively poor and they support redistributive policies though high tax burdens. Fourth, if high inequalities coexist with credit market imperfections then the poor may not be able to borrow from formal financial resources. Consequently, the poor may not be able to invest in physical and human capital which can adversely affect long-term growth.

Saint-Paul and Verdier (1993) studied the importance of median voters in shaping the growth-inequality nexus. They assert that median voters support high taxation to finance public spending for education.The investment in public education promotes human capital that is necessary for sustainable economic growth. Benabou (1996) predicts positive effect of inequality on growth using a theoretical model which is based on the assumption of heterogeneous individuals. He reveals that unequal or segregated societies can have higher rates of growth, at least in the short run, because the degree of complementarity between individuals' human capital is stronger in local interactions than global ones. In a recent theoretical paper, Foellmi and Zweimuller (2017) introduce non-homothetic preferences into an R&D based growth model to study how demand forces shape the impact of inequality on innovation and growth. Their model predicts positive growth effects of inequality.

Galor and Tsiddon (1997a, b) develop two theoretical models to support the argument that growth effect of inequality is positive. According to the first model, a home environment externality affects human capital of an individual. It means the level of an individual's human capital depends on the parents' education level or it is an increasing function of the parents' level of education. In the case of a less developed economy, when home environment externality is strong enough, this model predicts that high inequality is a prerequisite for growth to 'take off'. In their second model, they link growth-inequality nexus with technological inventions and show that inequality increases during major period of technological inventions. The highly skilled workers increase and concentrated in technological advanced sectors, thereby increasing technological progress and economic growth. These theoretical papers have received less attention in the literature in comparison to the studies which have established a negative relationship between inequality and growth.

Galor and Zeira (1993) and Fishman and Simhon (2002) argue that when inequality coexists with credit market imperfections then the poor face credit constraints as they lack collateral. In this situation, the poor are unable to borrow to finance investment in human and physical capital which, in turn, causes negative impact on long run growth. Another mechanism through which inequality determines economic growth works through fertility differentials. In more unequal economies fertility differentials are higher because the poor families prefer to have more children [De la Croix and Doepke (2003)]. Such preferences also cause a lower average education because in a society where fertility differential between the rich and the poor are higher, the poor invest less in education. Thus, the higher levels of inequality increase fertility differentials and lower investment in human capital, thereby causing lower growth.

The empirical literature shows both positive and negative impacts of inequality on growth. Persson and Tabellini (1994) found a negative growth impact of inequality using a sample of 67 economies from 1960 to 85. This study uses OLS for empirical analysis and do not addresses the issue of reverse causality. Alesina and Perotti (1996) use 2SLS and 3SLS to estimate the growth impact of inequality in a sample of 70 countries over the period 1960-85. They confirm negative growth impact of inequality. Herzer and Vollmer (2011) use panel cointegration techniques from 1970 to 1996 for 46 countries and found negative growth effect of inequality. Using a sample of 100 countries over the period 1965-95, Barro (2000) found insignificant impact of inequality on growth. Using a sample of 46 counties, Li and Zou (1998) found positive effect of inequality on growth over the period 1960-94. Similarly Forbes (2000) found positive growth effect of inequality in a sample of 45 countries over the period 1966-95.

Halter &Zweimuller (2014) introduces a simple theoretical model to study how changes in inequality affect economic growth over different time horizons. They suggest that higher inequality helps economic performance in the short term but reduces the growth rate of GDP per capita in the long term. Biswas, et al. (2017) links growth effect of inequality through the channel of tax policy. They argue that growth effect of inequality depends on tax policy. Taxation at different points of the income distribution has diverse varied effects on households' incentives to work, invest, and consume. Using US state-level data and micro-level household tax returns over the last three decades, Biswas, et al. (2017) found that reducing income inequality between low and median income households improves economic growth. However, reducing income inequality through taxation between median and high-income households reduces economic growth. Using a sample of 51 countries over the period 1970-2007, Castells-Quintana and Royuela (2017) found both positive and negative effects of inequality on growth. These studies ignore the non-linearity between economic growth and inequality. Moreover, the importance of stage of economic development is not focused by these empirical studies. The present study fills these gaps by incorporating non-linearity and the stage of economic development in shaping economic growth-inequality nexus.

III. Data Description

Panel data for 65 developing countries for the period 1965-2008 has been assembled. To make the data more comparable, we take data on variables in the form of averages between two survey years. The minimum number of observations for each country is three. That is, only countries with observations for at least three consecutive periods are included. We use the Gini coefficient, one of the most popular representations of income inequality, to measure income inequality. It is based on the Lorenz Curve, which plots the share of population against the share of income received and has a minimum value of 0 (perfect equality) and maximum value of 1 (perfect inequality).

The Gini index is defined as:
($i = 1,$..... N ; $t = 1,$ ..... T)

$$\frac{1}{2n^2\,\mu}\sum_{i=1}^{n}\sum_{j=0}^{n}|y_i - y_j|$$

where μ is the mean income, y_i and y_j are the individually observed incomes, and n is the number of observed incomes.The data set includes countries from all regions of the developing world, including 12 countries from South and East Asia, 24 countries from Central and Eastern Europe, 15 countries from Latin America, 12 countries from Sub-Saharan Africa and 7 countries from the Middle East and North Africa. The description of variables is given in Table A-1 (Appendix).

IV. Methodology

In order to estimate the links between inequality and growth in the data, we will follow a standard empirical growth equation:

$$(y_{it} - y_{it-1}) = \delta y_{it-1} + \beta g_{it-1} + \omega\, x_{it} + v_i + u_t + \varepsilon_{it,} \qquad (1)$$
$$(i = 1,..... \quad N\ ;\ t = 1,\ ..... \quad T)$$

where $(y_{it} - y_{it-1})$ is average growth rate of per capita GDP, g is a measure of inequality in the previous period; x represents a set of control variables other than lagged income, v_i is a country specific unobservable effect, u_t is a time specific factor and ε_{it} is an i.i.d. error term. The potential endogeneity of inequality implies that an OLS treatment of the data may yield biased coefficient estimates. To diminish such problems of the simultaneity bias, we follow the conventional wisdom of using the lagged (initial) inequality measure instead of the current level of inequality.

According to (1), growth depends on initial income, initial inequality, and current and/or lagged values of the control variables. Our primary focus is to assess

the nature and magnitude of the estimate of β in equation (1). If inequality has a positive impact on growth we should find $\beta > 0$, whereas if it has a negative impact on growth we may find $\beta < 0$. Similarly, if inequality has no impact on growth we may find $\beta = 0$. Having specified standard growth-inequality equation, we turn to the specification of the set of control variables included in X. There is a wide range of potential explanatory variables that can be used in this context. In this study, as a starting point, we introduce similar control variables to those introduced by Perotti (1996) and Forbes (2000). The former found a definite negative effect of inequality on growth and the latter found a definite positive effect of inequality on growth. Forbes (2000) specified a growth-inequality equation that is almost identical to that used by Perotti (1996). The only change from Perotti's model is the addition of the dummy variables. She included dummies to control for time-invariant omitted-variable bias, and the period dummies to control for global shocks, which might affect aggregate growth in any period but are not otherwise captured by the explanatory variables.

Forbes introduced all independent variables in lag form while in this study we introduce only two lag variables, initial inequality and initial income. Although the introduction of initial inequality and initial income will solve the problem of endogeneity, it may still persist and in order to remove it further we will use the instrumental approach of estimation.

$$(y_{it} - y_{it-1}) = \delta y_{it-1} + \omega x_{it} + \beta_1 g_{it-1} + \beta_2 Edu_{it} + \beta_3 Invit + \beta_4 Inf_{it} + \beta_5 x_{it} + v_i + u_t + \varepsilon_{it,} \qquad (2)$$
$$(i = 1,..... \quad N ; t = 1, ... \quad T)$$

where Edu_{it} is secondary school enrolment rate (as a percentage of the total secondary school-aged population). This variable is used as a proxy to human capital; $Investment_{it}$ is the share of gross capital formation in GDP, and; Inf_{it} is the annual averages between two survey years, calculated using the IFS's CPI data. Here, we will depart from Perotti (1996) and Forbes (2000) by incorporating the non-liner and interactive effects of inequality on growth. Furthermore, we include some additional control variables that play a key role in determining the growth-inequality relationship.

$$(y_{it} - y_{it-1}) = \delta y_{it-1} + \omega x_{it} + \beta_1 g_{it-1} + \beta_2 Edu_{it} + \beta_3 Inv_{it} + \beta_4 Inf_{it} + \beta_5 *ED_{it} + gx\beta_6 x_{it} + v_i + u_t + \varepsilon_{it,} \qquad (3)$$

In order to address non-linear dimensions of inequality, we introduce a square term for inequality. Here our basic hypothesis is that in a linear specification, inequality is positively correlated with economic growth. While in the case of non-linear specification, a moderate level of inequality positively affects the growth, while a high level of inequality is detrimental to economic growth.

$$(y_{it} - y_{it-1}) = \delta y_{it-1} + \omega x_{it} \beta_1 g_{it-1} + \beta_2 (g_{it-1})^2 + \beta_3 Edu_{it} + \beta_4 Invit + \beta_5 Inf_{it} + \beta_6 x_{it} + v_i + u_t + \varepsilon_{it,} \qquad (4)$$

The expected signs are for $\beta_1 > 0$ $\beta_2 < 0$.

V. Results and Discussion

The panel regression results regarding growth inequality relationship have been reported in tables ranging from Table 1 to Table 6. The results based on OLS suggest that the effect of initial inequality on growth is negative and statistically significant at 1% level of significance, while the combined effect of initial inequality and economic development is positive and significant at 1 per cent level of significance. This finding implies that an independent effect of inequality is harmful for economic growth and positive effects are produced through higher economic development. The results also show a negative and highly significant relationship between growth and initial income per capita. This implies that, keeping other factors constant, a country with less initial income per capita tends to grow faster than a rich country. The parameter estimate for macroeconomic instability (measured by inflation) is revealed as negative and significant, as expected. Our results show that the impact of human capital on growth is positive and consistently significant.

Columns (5 to 8) of Table 1 report the results of the non-linear effect of inequality on economic growth. The results for parameters β_1 and β_2 are revealed to be significant with correct signs, where former is positive and latter negative, at 1 percent level of significance. The threshold level of inequality is calculated as follows:

$$\frac{\partial(Economic\ Growth)}{\partial(Inequality)} = 0.004 + (2)(0.005)Inequality = 0$$

Solving the above expression for inequality shows that the optimal level of inequality holds at 0.4 value of Gini coefficient implying that inequality increases economic growth up to the 0.4 level of inequality. The positive effect of inequality on economic growth is consistent with the theoretical studies of Kaldor (1957), Saint-Paul and Verdier (1993) and Galor and Tsiddon (1997a, b). These studies argue that inequality boosts economic growth through the channels of incentives, physical capital accumulation, saving rates or investment indivisibility. In contrast the negative growth impact of inequality, which begins after surpassing the 0.4 level of inequality, is consistent with the theoretical studies of Galor and Zeira (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994), and de la Croix and Doepke (2003). These studies predict a negative growth impact of inequality through the mechanisms of socio-political instability, imperfections in credit markets, fiscal redistribution and distortion, and fertility differential. Thus, we can infer that inequality could be either beneficial or harmful for growth, depending on the existing level of inequality.

In Table 2, we report results using system-GMM method of estimations. The advantage of Arellano-Bond system GMM is that it also reports test-statistics on autocorrelation and on instruments validity. The AR (1) and AR (2) both test statistics are not rejecting the null hypothesis of no autocorrelation showing that there is no serial correlation. The P-statistics of Henson test of over identification restrictions (OIR) is also not rejecting the null hypothesis that "instruments as a group are exogenous". The high

TABLE 1

Parameter Estimates for Economic Growth and Income Inequality-OLS

Variables	-1	-2	-3	-4	-5	-6	-7	-8
Initial Income	-3.850***	-3.588***	-4.000***	-3.588***	-2.820***	-2.796***	-2.645***	-2.826***
	(-6.904)	(-6.549)	(-7.227)	(-6.295)	(-6.269)	(-6.410)	(-5.679)	(-6.111)
Inequality	-0.118***	-0.135***	-0.0888**	-0.115***	1.152***	0.978***	1.105***	1.149***
	(-3.204)	(-3.732)	(-2.342)	(-3.133)	-4.569	-3.928	-4.355	-4.47
Inequality Square					-0.0126***	-0.0107***	-0.0121***	-0.0126***
					(-4.258)	(-3.681)	(-4.048)	(-4.162)
Investment	0.205***	0.200***	0.202***	0.227***	0.365***	0.327***	0.355***	0.365***
	-6.636	-6.631	-6.599	-6.951	-7.168	-6.493	-6.928	-7.112
Inflation	-0.0338***	-0.0298***	-0.0367***	-0.035***	-0.0328***	-0.0312***	-0.0327***	-0.0328***
	(-7.269)	(-6.381)	(-7.786)	(-7.510)	(-5.136)	(-5.040)	(-5.145)	(-5.122)
Education	0.0529***	0.0477***	0.0348***	0.0547***	0.0692***	0.0401**	0.0841***	0.0689***
	-4.529	-4.159	-2.63	-4.695	-3.832	-2.092	-4.019	-3.685
Inequality*ED	0.794***	0.770***	0.784***	0.746***				
	-4.911	-4.879	-4.911	-4.585				
Government		-0.0809***				-0.106***		
		(-3.834)				(-3.692)		
Population			-0.732***				1.052	
			(-2.759)				-1.399	
Openness				-0.0107**				0.000759
				(-1.984)				-0.0633
Constant	7.227***	8.601***	9.834***	6.682***	-11.05*	-2.641	-13.72**	-10.97*
	-3.604	-4.327	-4.481	-3.32	(-1.774)	(-0.409)	(-2.111)	(-1.723)
Observations	271	271	271	271	271	271	271	271
R-squared	0.426	0.456	0.442	0.435	0.524	0.555	0.529	0.524

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

TABLE 2

Parameter Estimates for Economic Growth and Income Inequality-System GMM

Variables	-1	-2	-3	-4	-5	-6	-7	-8
Initial Income	-3.846***	-3.746***	-3.833***	-3.907***	-2.310***	-2.138***	-2.397***	-2.169***
	(-6.598)	(-6.515)	(-6.527)	(-6.199)	(-4.229)	(-3.836)	(-4.411)	(-3.900)
Inequality	-0.0986**	-0.111**	-0.0952**	-0.0988**	0.478*	0.602**	0.402	0.399
	(-2.221)	(-2.506)	(-1.967)	(-2.227)	-1.821	-2.209	-1.523	-1.483
Inequality					-0.00549*	-0.0067**	-0.0049***	-0.00444
Square					(-1.758)	(-2.088)	(-1.561)	(-1.378)
Investment	0.217***	0.216***	0.219***	0.212***	0.258***	0.241***	0.267***	0.256***
	-2.932	-2.985	-2.923	-2.767	-5.437	-4.962	-5.641	-5.402
Education	0.0650***	0.0586**	0.0611*	0.0643**	0.0865***	0.0806***	0.0652***	0.0946***
	-2.62	-2.368	-1.826	-2.572	-4.678	-4.264	-2.928	-4.855
Inflation	-0.0734***	-0.0664***	-0.0737***	-0.0728***	-0.0214	-0.00582	-0.0230*	-0.0232*
	(-6.982)	(-5.740)	(-6.923)	(-6.788)	(-1.536)	(-0.356)	(-1.664)	(-1.660)
Inequality*ED	0.708***	0.716***	0.706***	0.719***				
	-3.759	-3.886	-3.742	-3.724				
Government		-0.0474				-0.0594*		
		(-1.314)				(-1.851)		
Population			-0.0999				-0.653*	
			(-0.177)				(-1.684)	
Openness				0.00314				-0.0132
				-0.254				(-1.309)
AR(2)	-0.2	-0.15	-0.21	-0.22	-0.65	-0.55	-0.72	-0.53
Sargan-Test	-0.25	-0.29	-0.22	-0.12	-0.68	-0.68	-0.67	-0.51
Constant	8.915***	9.651***	9.077***	8.995***	20.97***	24.22***	21.76***	19.01***
	-2.937	-3.196	-2.863	-2.951	-2.948	-3.285	-3.081	-2.619
Observations	271	271	271	271	206	206	206	206
No of cross	65	65	65	65	65	65	65	65

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

F-value is indicating that model as a whole is significant. We have applied Sargan test to check the validity of instruments and the test statistics indicate that our instruments are valid thus we cannot reject the null hypothesis that instruments are exogenous.

Robustness Checks

In order to assess the robustness of our results we make various checks: estimation of sub-samples, alternative econometric techniques, inclusion of further control variables, five-year averages, and removal of outliers.

1. Sub-Samples

Table 3 reports results for different groups of countries according to their level of economic development. It is clear that growth-inequality nexus is negative and significant in low-income developing countries while it is positive in high income developing countries.

2. Econometric Techniques

We also use alternative econometric techniques in order to reduce bias. We use fixed effects and random effects for the basic model (Table 4). Our main results hold across different techniques. Although the level of significance for parameter estimates slightly fluctuates, our general findings hold across different econometric techniques.

TABLE 3

Growth- Inequality: Disaggregation by Income Levels

Variables	-1 Low Income Countires	-2 Low middle Income Countries	-3 High Income Countries
Initial Income	-1.232**	-1.232**	-1.784***
	(-2.187)	(-2.187)	(-3.329)
Initial Inequality	-0.0741*	-0.0741*	0.103***
	(-1.959)	(-1.959)	-3.049
Investment	0.182***	0.182***	0.208***
	-4.263	-4.263	-3.467
Education	0.0758***	0.0758***	0.111***
	-4.175	-4.175	-4.408
Inflation	-0.0918***	-0.0918***	-0.00366
	(-8.231)	(-8.231)	(-0.423)
Constant	8.565**	8.565**	1.204
	-2.496	-2.496	-0.213
Observations	80	80	81
R-squared	0.634	0.634	0.395

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

3. Including further Controls

In addition, we introduce some additional control variables such as government spending and population growth in order to remove omitted variable bias, and again our main findings hold although coefficients do fluctuate. In the growth literature, government consumption is considered an important determinant of growth. The estimated coefficient for government consumption is significant with the correct sign, while other control variables remain consistent in terms of signs and significance level. Therefore, our primary results are robust to the inclusion of further control variables.

4. Five-year Averages

Moreover, to assess whether the findings above are robust, we use data averaged over five periods. The estimation results are reported in Table 5. As can be seen, our benchmark findings are confirmed using these five-year-averaged data. The effect of inequality on growth is negative while the combined effect of inequality and economic development is positive. The signs and significance level of other control variables remain unaffected.

TABLE 4

Economic Growth and Income Inequality:
Fixed Effects and Random Effects

Variables	-1 Fixed-Effects	-2 Fixed-Effects	-3 Random-Effects	-4 Random-Effects
Initial Income	-4.697***	-2.820***	-3.870***	-1.692***
	(-7.251)	(-6.269)	(-6.912)	(-5.061)
Inequality	0.0838	1.152***	-0.0943**	0.458**
	-1.473	-4.569	(-2.507)	-2.565
Inequality Square		-0.0126***		-0.00495**
		(-4.258)		(-2.328)
Investment	0.310***	0.365***	0.223***	0.247***
	-5.548	-7.168	-6.535	-6.978
Education	0.0568***	0.0692***	0.0605***	0.0711***
	-3.043	-3.832	-4.742	-5.399
Inflation	-0.0313***	-0.0328***	-0.0363***	-0.0338***
	(-4.792)	(-5.136)	(-7.542)	(-6.612)
Inequality*ED	0.849***		0.739***	
	-3.825		-4.56	
Constant	1.499	-11.05*	7.233***	-2.948
	-0.332	(-1.774)	-3.235	(-0.646)
Observations	271	271	271	271
R-squared	0.516	0.524	0.47	0.49

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

TABLE 5

Year Average Parameter Estimates for Economic Growth

Variables	-1	-2	-3	-4
Initial Income	-3.719***	-3.408***	-3.797***	-3.390***
	(-6.806)	(-6.215)	(-6.975)	(-6.051)
Initial Inequality	-0.0907**	-0.101***	-0.0688*	-0.0861**
	(-2.488)	(-2.808)	(-1.814)	(-2.382)
Investment	0.197***	0.196***	0.197***	0.224***
	-6.192	-6.253	-6.225	-6.648
Inflation	-0.0288***	-0.0263***	-0.0309***	-0.0305***
	(-6.438)	(-5.856)	(-6.755)	(-6.787)
Education	0.0448***	0.0412***	0.0315**	0.0459***
	-3.666	-3.41	-2.264	-3.792
Inequality*ED	0.717***	0.677***	0.706***	0.662***
	-4.521	-4.323	-4.476	-4.167
Government		-0.0639***		
Expenditures		(-2.856)		
Population			-0.522*	
			(-1.939)	
Trade				-0.0124**
				(-2.263)
Constant	7.614***	8.347***	9.317***	6.746***
	-3.757	-4.154	-4.241	-3.302
Observations	219	219	219	219
R-squared	0.45	0.47	0.459	0.463

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

5. Removing Outliers

Finally, we also test for the effect of removing outliers (Tables 5 to 6). We estimate the basic model after removing the five countries with the lowest and highest average inequality, income or growth. In each case, although the values of the coefficients do fluctuate, the coefficients remain significant with same signs.

VI. Conclusion

The issue of the growth effects of income distribution has long been uncertain in the theoretical and empirical literature. Conventional wisdom suggests a positive growth effect of inequality through incentives, physical capital accumulation, saving rates or investment indivisibility mechanism. On the other hand, the endogenous growth literature predicts a negative growth effect of inequality through socio-political instability, market imperfections, fiscal redistribution and distortion, and fertility differential channels. This study contributes to the existing literature on income distribution and growth by answering the question as to why growth effects of income distribution are not definitely positive or negative.

TABLE 6

Adjusting Outliers Excluding 5 Extreme High and Low Values

Variables	-1	-2	-3	-4
	Excluding 5 Extreme Low Inequality Values	Excluding 5 Extreme High Inequality Values	Excluding 5 Extreme low Growth Values	Excluding 5 Extreme High Growth Values
Initial Inequality	-3.825***	-3.696***	-3.740***	-3.637***
	(-6.788)	(-6.775)	(-6.755)	(-6.578)
Initial Income	-0.118***	-0.126***	-0.125***	-0.108***
	(-3.182)	(-3.478)	(-3.402)	(-2.955)
Investment	0.206***	0.194***	0.214***	0.191***
	-6.632	-6.415	-7.09	-6.227
Education	0.0528***	0.0526***	0.0490***	0.0458***
	-4.513	-4.621	-4.293	-3.963
Inflation	-0.0339***	-0.0414***	-0.0268***	-0.0332***
	(-7.262)	(-8.396)	(-4.564)	(-7.279)
Inequality*ED	0.789***	0.763***	0.785***	0.756***
	-4.842	-4.821	-4.87	-4.719
Constant	7.175***	7.611***	6.859***	6.867***
	-3.561	-3.874	-3.502	-3.476
Observations	270	267	266	266
R-squared	0.426	0.456	0.376	0.402

*denotes statistically significant at the 10% level, ** denotes statistically significant at the 5% level, *** denotes statistically significant at the 1% level.

A new panel data set on inequality has been constructed that reduces measurement error and ensures comparability across countries and over time. The study finds a negative relationship between inequality and growth in all regressions. The positive growth effect of inequality has been explained by the degree of inequality, and the stage of economic development. The study finds a non-linear relationship between growth and inequality implying that a lower degree of inequality exerts a positive influence on growth while higher degree of inequality exerts negative effect. Our results have shown that the growth impact of inequality is positive and significant when economies belong to the group of high-income developing countries. Findings of the study are robust to alternative econometric techniques, specifications and sub-samples.

Quaid-i-AzamUniversity,
Islamabad, Pakistan.

Bibliography

Ahluwalie M.S., 1976, Income distribution and development: Some stylized facts, American Economic Review, 66: 1-28.

Alesina, Alberto, and D. Rodrick, 1994, Distributive politics and economic growth, Quarterly Journal of Economics, 108: 465-90.

Alesina, Alberto F., and Roberto Perotti, 1996, Income distribution, political instability, and investment, European Economic Review, 40(6): 1203–28.

Barro R.,2000, Inequality and growth in a panel of countries, Journal of Economic Growth, 5: 5-32.

Baumol, W.J., 2007, On income distribution and growth, Journal of Policy Modelling, 29: 545-548.

Benabou, Roland, 1996, Heterogeneity, stratification, and growth: Macroeconomic implications of community structure and school finance, American Economic Review, 86(3): 584-609.

Biswas, S., I. Chakraborty, and R. Hai, 2017, Income inequality, tax policy, and economic growth, The Economic Journal, 127(601): 688-727.

Bjornskov, C., 2008, The growth-inequality association: Government ideology matters, Journal of Development Economics, 82: 257-266.

Bouguignon, F., 1981, Pareto superiority of unegalitarian equilibrium in Stiglitz's model of wealth distribution and convex saving function, Econometrica, 49: 1469-75.

Castells-Quintana, D., and V. Royuela, 2017,.Tracking positive and negative effects of inequality on long-run growth, Empirical Economics, : 1-30.

Clarke G., 1995, More evidence on income distribution and growth, Journal of Development Economics, 47: 403-428.

Deininger, K., and L. Squire, 1998, New ways of looking at old issues: Inequality and growth, Journal of Development Economics, 57: 259-287.

De la Croix, D., and M. Doepke, 2003, Inequality and growth: Why differential fertility matters, American Economic Review, 93: 1091-1112.

Fallah, B. N., and M. Partridge, 2007, The elusive inequality-economic growth relationship: Are there differences between cities and the countryside? Annals of Regional Science, 41: 375-400.

Fishman, Arthur and Simhon, 2002, The division of labor, inequality and growth, Journal of Economic Growth, 7: 117-36.

Foellmi, R., and J. Zweimüller, 2017, Is inequality harmful for innovation and growth? Price versus market size effects, Journal of Evolutionary Economics, 27(2): 359-378.

Forbes K., 2000, A reassessment of the relationship between inequality and growth, American Economic Review, 90: 869–97.

Galor, 2000, Income distribution and the process of development, European Economic Review, 44: 706-12.

Galor, O., and Q. Moav, 2004), From physical to human capital accumulation: Inequality and the process of development, Review of Economic Studies, 71: 1001–1026.

Galor, Oded, and Daniel Tsiddon, 1997a, The distribution of human capital and economic growth, Journal of Economic Growth, 2(1): 93-124.

Galor, Oded, and Daniel Tsiddon, 1997b, Technological progress, mobility, and economic growth, American Economic Review, 87(3): 363-82.

Galor, Oded, and J. Zeira,1993, Income distribution and macroeconomics, Review of Economic Studies, 60: 35-52.

Halter, D., M. Oechslin, and J. Zweimüller, 2014, Inequality and growth: the neglected time dimension, Journal of Economic Growth, 19(1): 81-104.

Herzer, Dierk, and Sebastian, 2011, Inequality and growth: Evidence from panel cointegration, Journal of Economic Inequality, 1-15.

Iradian, G., 2005, Inequality, poverty, and growth: cross-country evidence, International Monetary Fund.

Kaldor N., 1957, A model of economic growth, Economic Journal, 57: 591-624.

Keefer, P., S. Knack, 2000, Polarization, politics and poverty rights: Links between inequality and growth, Policy Research working paper 2418, Washington: World Bank.

Kuznets, S., 1955, Economic growth and income inequality, American Economic Review, : 1-28.

Li, H., and H. Zou, 1998, Income inequality is not harmful for growth: Theory and evidence, Review of Development Economics, 2: 318-334.

Lundberg, M., and L. Squire, 2003, The simultaneous evolution of growth and inequality, Economic Journal, 113: 326-344.

Majeed, M.T., and G. Zhang, 2014, Inequality, trade and economic development: Evidence from developing countries, Pakistan Journal of Applied Economics, 24(1): 39-73.

Majeed, M.T., 2015, Inequality, FDI and economic development: Evidence from developing countries, The Singapore Economic Review, 1550067.

Majeed, M.T., 2016, Distributional consequences of remittances: Evidence from sixty-five developing countries, Pakistan Journal of Commerce & Social Sciences, 10(2): 274-295.

Partridge, M.D.,1997, Is inequality harmful for growth? Comment, American Economic Review, 87: 1019-1032.

Perotti, R., 1996, Growth, income distribution and democracy, Journal of Economic Growth, 1(2): 149-87.

Persson, Torsten and Tabellini,1994, Is inequality harmful for growth?,American Economic Review, 84(3): 600-621.

Rousseau, J.J., 1755, Discourse on the origin of inequality, Cress D.A. Indianapolis Cambridge.

Saint-Paul, Thierry Gilles and Verdier, 1993, Education, democracy, and growth, Journal of Development Economics, 42(2): 399-407.

Schumpeter, J.A., 1942, Capitalism, socialism and democracy, Harper and Row, New York.

Sukiassyan, G., 2007), Inequality and growth: What does the transition economy data say? Journal of Comparative Economics, 35: 35-56.

Voitchovsky, S., 2005, Does the profile of income inequality matter for economic growth? Distinguishing between the effects of inequality in different parts of the income distribution, Journal of Economic Growth, 10: 273- 296.

Wan, G., M. Lu and S. Chen, 2006, The inequality-growth nexus in the short and long run: Empirical evidence from China, Journal of Comparative Economics, 34: 654-667.

APPENDIX

TABLE A-1

Data Sources and Variable Definitions

Variable	Definitions	Sources
Per capita real GDP	GNP per capita at PPP.	[1]
Gini coefficient	It is a measure of income inequality based on Lorenz Curve.	[3]
Secondary school enrolment	The secondary school enrolment as % of age group is at the beginning of the period. It is used as a proxy of investment in human capital.	[1]
Inflation	Inflation rates, annual averages between two survey years.	[2]
Credit as % of GDP	Credit as % of GDP represents claims on the non-financial private sector/GDP.	[2]
Government expend.	Government expenditures as share of GDP.	[2]
Population	Population growth rates	[1]
M2 as % of GDP	It represents Broad money/GDP.	[2]
Trade openness	It is the sum of exports and imports as a share of real GDP.	[1]

Sources: (1) World Bank, World Development Indicators online data base, 2011; (2) International Financial Statistics online data base, 2011; (3) UNU-WIDER (2008); (4) Iradian(2005).

TABLE A-2

Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Per capita real GDP	337	4912.918	4178.002	260	25041.4
Gini coefficient	337	41.05875	9.862074	19.4	62.5
Secondary school enrolment	272	60.2252	23.4207	16	105.832
Population	272	1.45974	1.141321	-1	4.2
Government expenditures	272	21.25689	8.980756	5.184	56
Investment	271	22.48099	6.02846	7	45
Inflation	272	22.86816	38.7327	-1	310
Trade openness	336	71.35324	38.69602	10.795	228.875
Credit as % of GDP	312	28.17933	19.66596	3	120
M2 as % of GDP	313	37.01766	21.9277	5	146.577

TABLE A-3

Link Test for Equation 3 (Interactive Effect of Inequality)

Dependent Variable-economic Growth	Coefficients	Std. Error	T-Stats	Prob. Value>t
Hat	0.9428609	0.0821178	11.48	0
Hat-square	0.0182063	0.0133352	1.37	0.173
Constant	-0.083796	0.2575145	-0.33	0.745

Ramsey RESET test using powers of the fitted values of the dependent variable.

Ho: model has no omitted variables.

F(3, 261) =1.56Prob > F =0.1997.

TABLE A-4

Link Test for Equation 4 (Non-linear Effect of Inequality)

Dependent Variable-economic Growth	Coefficients	Std. Error	T-Stats	Prob. Value>t
Hat	0.9609009	0.0990365	9.7	0
Hat-square	0.0112672	0.0174233	0.65	0.518
Constant	-0.034463	0.274933	-0.13	0.9

Ramsey RESET test using powers of the fitted values of the dependent variable.

Ho: model has no omitted variables.

F(3, 261) =1.13Prob > F =0.3390.