Economic Growth and Income Inequality Nexus: An Empirical Analysis for Pakistan

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Abstract

This study investigates the impact of income inequality on economic growth in Pakistan using annual time series data from 1975 to 2013. The empirical analysis for the effect of income inequality on economic growth is based on the ARDL approach to cointegration. The empirical findings show that inequality exerts significantly positive influence on annual economic growth of Pakistan. It implies that annual growth is not driven by the poor which is also confirmed by the negative influence of poverty on growth. Though inequality exerts positive influence on growth but such type of growth cannot be sustained as the poor are not part of the growth process.

Key Words: economic growth, income inequality, poverty, Pakistan

JEL Classification: D31, O40

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1. Introduction

The theoretical and empirical literature on the impact of income inequality on economic growth has provided very mixed results. There are various theoretical mechanisms through which inequality affect economic growth. The theoretical literature, on the one hand, suggests a favourable growth impact of inequality through the channels of incentives, physical capital accumulation and investment indivisibility (Kaldor, 1957; Saint-Paul and Verdier, 1993; Galor and Tsiddon, 1997a, 1997b). The theoretical literature, on the other hand, also suggests an adverse growth impact of inequality through the channels of socio-political instability, credit market imperfections, fiscal redistribution, and fertility differentials (Galor and Zeira, 1993, Alesina and Rodrik, 1994, Persson and Tabellini, 1994, and de la Croix and Doepke, 2003).

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In the same way, the empirical literature also provides mixed results on the impact of inequality on growth. On the one hand, some empirical studies show that the growth effect of inequality is positive and significant (Partridge (1997), Li and Zou (1998), Forbes (2000), and Lundberg and Squire (2003). On the other hand, many empirical studies find negative growth impact of inequality Alesina and Rodrik (1994), Persson and Tabellini (1994), Wan, Lu and Chen (2006), and Sukiassyan (2007). Nevertheless, in a large sample of developed and developing economies, Barro (2000) finds out insignificant growth effect of inequality.

Pakistan is a low-middle income developing country where more than 60 million people live under poverty line. The high levels of income inequality are not only contributing in increasing poverty but also influencing growth process of the economy. However, it is not clear that in which direction inequality influences economic growth in the case of Pakistan. This study contributes in the literature by empirically determining the growth effect of inequality for Pakistan. The analysis is based on annual time series data from 1975 to 2013 and we use ARDL approach to cointegration.

The rest of the discussion is structured as follows. Section 2 explains the channels through which inequality affect growth while section 3 provides a discussion of data. Section 4 presents an analytical framework for the study. Section 5 puts forward the discussion of empirical findings. Finally, section 6 provides a conclusion.

2. Economic Growth and Inequality: Theoretical Mechanisms

How does inequality impact economic growth? The theoretical literature has identified a number of channels through which inequality impact economic growth, though the direction of impact remains inconclusive. In an earlier study, Kaldor (1957) predicts a positive impact of inequality on economic growth. The argument is that the marginal propensity to save of the rich is higher as compared to the poor. A higher degree of inequality implies that the rich can save more and therefore invest more, thereby increasing capital accumulation and economic growth.

While Persson and Tabellini (1994) and Alsenia and Rodrick (1994) suggest four channels through which inequality adversely impacts economic growth. First, a higher level of inequality promotes rent-seeking activities in the society that, in turn, negatively influence the security of property rights. Second, in more unequal societies it is difficult to manage collective actions which reflect in political instability, high volatility in policies or tendency towards redistributive policies, all of which can have adverse impact on economic growth. Third, in highly unequal societies the median voters are comparatively poor and support redistributive policies via increasing tax burdens. Fourth, if high level of inequality coexists with credit market imperfections then the poor will not be able to borrow and may not be able to invest in physical and human capital that can adversely affect long-term growth.

Saint-Paul and Verdier (1993) analyzed the importance of median voters in shaping the growth-inequality relationship. They point out that median voters favor high taxation to finance public spending and investment in public education that, in turn, helps to increase human capital and economic growth. Benabou (1996) develops a theoretical model based on the assumption of heterogeneous individuals and shows that growth effect of inequality is positive. He argues that the degree of complementarity between individuals' human capital is stronger in local interactions than global ones and therefore unequal or segregated societies can have higher rates of growth at least in the short run.

Galor and Tsiddon (1997a, b) present two theoretical models to support the positive association between inequality and growth. In the first model, a home environment externality determines human capital of an individual. 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, their model suggests that a high level of inequality is a prerequisite for growth to "take off". In the 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 received less attention in the literature than that of the studies which 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.

Therefore, the poor are not able to invest in human and physical capital which, in turn, hampers long run growth.

Another mechanism of growth-inequality nexus works through fertility differentials. De la Croix and Doepke (2003) argue that the poor families prefer to have more children and low investment in their education. In a society where fertility differential between the rich and the poor are higher, such preferences cause a lower average education. Furthermore, they point out that the fertility differentials depend on inequality. The higher levels of inequality increase fertility differentials and lower investment in human capital, thereby leading to lower growth. Using a sample of 45 countries, Forbes (2000) finds a positive growth effect of inequality in the short run and negative in the long run.

We argue that if inequality inhibits growth process, then countries with higher initial inequality likely to grow less rapidly as compared to countries with lower inequality. On the other way, if inequality helps to increase economic growth in a less developed economy then a high level of inequality is a prerequisite for growth to “take off”. Nevertheless, the favourable impact of inequality on economic growth may intersect with the adverse impact of poverty on growth. In other words, inequality in its essence may not harm growth, however it’s coexistent with poverty may adversely influence economic growth. Therefore, increasing growth through income inequality may not sustain in the long run.

The available literature generally focuses cross-country analysis to determine the consequences of inequality on growth and provides conflicting findings. In cross-country analysis country specific heterogeneity is not captured and, therefore, it is important to test this relation in a country specific setting. The present study is different from the literature as we focus on the economy of Pakistan to address the questions: 1) Do higher levels of income inequality hamper the growth process; 2) Does the growth impact of inequality depend on the existing poverty levels? Economy of Pakistan is not showing a sustainable pattern of economic growth and it is important to understand that what hinders or supports growth process in the case of Pakistan.

3. The Data and Modeling

We incorporate Gini coefficient in the growth model to estimate the inequality impact of economic growth. Some other variables are also important for growth model that need to be controlled to avoid the specification bias. These are labour, physical capital, human capital, trade and inflation.

In this study data is extracted from Government of Pakistan (various issues) and from World Development Indicators (WDI) over the period 1975-2014. The annual time series data on inequality, poverty and labour force is derived from Government of Pakistan while the data on GDP, physical capital, trade and inflation has been derived from WDI (2015).

The general functional form of our model is as follows:

$$Y_t = L_t \, K_t \, GINI_t \, F_t TR_t \, Edu_t \qquad (1)$$

We use log-liner specification for empirical purpose because it provides efficient results and also convenient to interpret parameters estimated. The functional form of growth model is constructed as follows:

$$lnY_t = \gamma_0 + \gamma_1 lnL_t + \gamma_2 lnK_t + \gamma_3 lnGINI_t + \gamma_4 lnF_t + \gamma_5 lnTR_t + \gamma_6 lnEdu_t + \varepsilon_i \qquad (2)$$

Where, lnY_t is the natural log of real GDP per capita, $lnGINI_t$ is the natural log of Gini coefficient, Ft is the inflation rate, and $lnTR_t$is the natural log of trade openness as percentage of GDP, $lnEdu_t$ is the natural log of education, and ε_i is the error term which is normally distributed with zero mean and constant variance.

It is also likely that inequality captures the effect of poverty. To assess the exclusive impact of inequality we also control for poverty in a separate regression. In equation 3 $lnPov_t$ is added an additional term to capture the true growth effect of inequality.

$$lnY_t = \gamma_0 + \gamma_1 lnL_t + \gamma_2 lnK_t + \gamma_3 lnGINI_t + \gamma_4 lnF_t + \gamma_5 lnTR_t + \gamma_6 lnEdu_t + \gamma_6 lnPov_t + \varepsilon_i \quad (3)$$

4. Econometric methodology

For empirical analysis we use ARDL approach to cointegration. One of the advantages of the ARDL approach is that it does not require same level of integration for all variables. It does not matter whether variables are integrated of order zero or they are integrated of order one or they have mix order of integration. This feature of ARDL gives it an edge over standard cointegration techniques. In the case of mixed order of integration standard cointegration techniques become unstable because the power of test to determine cointegration becomes low. The only condition for ARDL is that no variable should be integrated of order two.

The ARDL method is based on two steps. First, the log run relationship between variables is tested using F-statistic. F-statistic is used to test the significance of the lagged levels of the variables in the unrestricted error correction model (ECM). Second, the parameter estimates of the error correction model of the long-run relationship are obtained. The ECMs corresponding to the inequality-growth relationship (2) and (3) are provided below as equations (4) and (5).

$$\Delta lnY_t = \gamma_1 + \gamma_T T + \gamma_Y lnY_{t-1} + \gamma_L lnL_{t-1} + \gamma_K lnK_{t-1} + \gamma_p lnGINI_{t-1} + \gamma_F lnF_{t-1} + \gamma_{TR} lnTR_{t-1} + \gamma_{ED} lnEdu_{t-1} + \sum_{i=1}^{r}\gamma_i \Delta lnY_{t-i} + \sum_{j=0}^{s}\gamma_j \Delta lnL_{t-j} + \sum_{k=0}^{t}\gamma_k \Delta lnK_{t-k} + \sum_{p=0}^{q}\gamma_p \Delta lnGINI_{t-p} + \sum_{l=0}^{u}\gamma_l \Delta lnF_{t-l} + \sum_{m=0}^{v}\gamma_m \Delta lnTR_{t-m} + \sum_{s=0}^{t}\gamma_s \Delta lnEdu_{t-s} + \varepsilon_i \quad (4)$$

where Δ is the first difference operator or change between two consecutive periods.

$$\Delta lnY_t = \gamma_1 + \gamma_T T + \gamma_Y lnY_{t-1} + \gamma_L lnL_{t-1} + \gamma_K lnK_{t-1} + \gamma_G lnGINI_{t-1} + \gamma_F lnF_{t-1} + \gamma_{TR} lnTR_{t-1} + \gamma_{Edu} lnEdu_{t-1} + \gamma_{Pov} lnPov_{t-1} + \sum_{i=1}^{r}\gamma_i \Delta lnY_{t-i} + \sum_{j=0}^{s}\gamma_j \Delta lnL_{t-j} + \sum_{k=0}^{t}\gamma_k \Delta lnK_{t-k} + \sum_{p=0}^{q}\gamma_p \Delta lnGINI_{t-p} + \sum_{l=0}^{u}\gamma_l \Delta lnF_{t-l} + \sum_{m=0}^{v}\gamma_m \Delta lnTR_{t-m} + \sum_{g=0}^{h}\gamma_g \Delta lnPov_{t-g} + \varepsilon_i \quad (5)$$

We test the presence of the long-run relationship between variables using-F statistics. We test the following hypothesis. The null hypothesis that the long-run relationship does not hold between variables meaning that that the coefficients of the lagged variables are simultaneously equal to zero. While the alternative hypothesis is that the long-run relationship holds between variables suggesting that at least one of these coefficients is not equal to zero.

$H_0 = \gamma_k = 0$ for all k

$H_1 = \gamma_k \neq 0$ for at least one k

The distribution of F-statistics is non-standard which depends on the orders of integration of the variables comprised in the ARDL model. The critical values given by Pesaran et al. (2001) are used to compare with the computed F-statistics. This gives three possible outcomes of the long-run relationship between variables. First, if F-statics is lesser than the lower-bound critical value the null hypothesis of no long-run relationship is accepted. It implies that variables included in the ARDL model do not have a long-run relationship. Second, if F-statics is larger than the upper-bound critical value then the null hypothesis of no long-run relationship is rejected suggesting that the long-run relationship holds between variables included in the ARDL model. Third, if F-statics is larger than the lower bound but smaller than the upper-bound then null hypothesis of no long-run relationship remains indecisive.

5. Empirical Results

5.1. Unit root test

As a first step of estimation procedure, we test time series properties of the data using the standard unit root tests the augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. The basic purpose of unit root tests is to ensure that no series is integrated of order two. Table 1 exhibits the results of ADF and PP test.

The results reported in Table 1 show that all variables are integrated of order one at 5 % level of significance except the variables of inflation which is level stationary at 1 % level of significance. Nevertheless none of the series is integrated of order two suggesting that the basic requirements of ARDL procedure are met and we can safely move on the next step of the estimation.

Table 1: Results of ADF and PP tests

Variables	ADF test statistics		PP test statistics		Order of integration (at 5% level of significance)	Order of integration (at 10% level of significance)
	Level	First difference	Level	First difference		
GDP per Capita	-2.09 (0.53)	-4.67* (0.003)	-1.79 (0.68)	-4.67* (0.003)	I(1)	I(1)
Capital	-2.59 (0.28)	-6.51* (0.000)	-2.62 (0.27)	-6.57* (0.000)	I(1)	I(1)
Labor	-0.75 (0.96)	-6.21* (0.000)	-0.75 (0.96)	-6.22* (0.000)	I(1)	I(1)
Inequality	-2.12 (0.51)	-5.59* (0.000)	-2.21 (0.47)	-5.61* (0.000)	I(1)	I(1)
Inflation	-4.53 (0.004)	-8.89* (0.000)	-4.58** (0.004)	-8.94* (0.000)	I(0)	I(0)
Trade	-2.90 (0.17)	-7.24** (0.000)	-2.91 (0.17)	-9.01** (0.000)	I(1)	I(1)
Poverty	-2.38 (0.39)	-4.57* (0.004)	-2.20 (0.47)	-4.55* (0.004)	I(1)	I(1)

Note: The test statistics significant at 5% and 10% levels of significant are indicated by * and ** respectively.

5.2. Bound test for cointegration

In the next step of ARDL model, we estimate equations (3) and (4) to determine the long-run relationship between variables. To determine the optimal number of lags, we use Schwarz Bayesian Criterion (SBC). Our estimated model satisfies different diagnostic tests which have been reported in Table 2. The LM test for serial correlation indicates our empirical findings are not plagued with the problem of serial correlation. For heteroscedasticity the White test is applied which also shows that our results are not suffering from the problem of heteroscedasticity. The Ramsey RESET test is applied to check the functional form and it is clear from the test that our model is clearly specified. Finally, we apply Jarque–Bera test to test the normality of residuals which also shows that the residuals are normally distributed.

The results of bounds tests for equations 2 and 3 are reported in Table 3. The F-statistics of bound tests indicate that in the inequality growth specification the calculated F-statistics is larger than the upper bound critical value. It implies that the long-run relationship exists in growth inequality equation.

Table 2: Results of diagnostic tests

Test statistics	Model 1 (Eq. 2)		Model 2 (Eq. 3)	
	F-statistics	Probability	F-statistics	Probability
Lagrange multiplier test for serial correlation	1.72	0.20	2.91	0.11
White test for heteroscedasticity	0.62	0.71	0.45	0.94
Ramsey's RESET for functional form	1.72	0.20	0.05	0.96
Jarque–Bera test for normality	0.58	0.75	1.45	0.48

Table 3: F-Statistics for cointegration relationship

The model	Computed F-statistics	Critical F-statistics at 5% level*		Outcome
		Lower bound	Upper Bound	
Fy (GDP/ Ineq, L, K, INF, TR, Edu)	5.53	2.84	4.29	Cointegration
Fy (GDP/ Ineq, L, K, INF, TR, Edu, Pov)	6.44	2.48	3.7	Cointegration

*The critical values are taken from Pesaran et al. (2001), Table CI (iii), Case 111: unrestricted intercept and no trend.

5.3. Real GDP growth and inequality

Our growth inequality model confirms the long run relationship. In the next step of empirical analysis, we present short run and long run parameter estimates for growth models developed in equations 3 and 4.

The parameter estimate on inequality is positive and significant at one percent level of significance in the long-run. This empirical finding is consistent with the theoretical studies on inequality and poverty (Gilles Saint-Paul and Thierry Verdier (1993; Benabou (1996); Oded Galor and Daniel Tsidddon (1997a, b); Baumol (2007). This finding implies that economic growth process is enhanced by increasing inequality. The coefficient of ECM term is -0.38 and statically significant at 1 percent level of significance. It implies that 38% error correction will take place towards equilibrium each year.

Table 4: Short-run relationship (Model 1)

Variables	**Coefficient**	**t-Statistic**	**Prob.**
Constant	0.016380	3.283962	0.0027
D(Capital)	0.099011	2.009695	0.0538
D(Labor)	0.147540	1.138390	0.2643
D(Education)	0.032160	1.912936	0.0657
D(Inequality)	0.029957	0.683850	0.4995
D(Inflation)	-0.000658	-0.868926	0.3920
D(Trade)	0.023874	0.536808	0.5955
Residuals(-1)	-0.380435	-3.133150	0.0039
R-squared	0.395890	Akaike info criterion	-5.203767
Adjusted R-squared	0.250070	Schwarz criterion	-4.855461
F-statistic	2.714929	Hannan-Quinn criter.	-5.080973
Prob(F-statistic)	0.027075	Durbin-Watson stat	2.108886

Table 5: Long-run relationship (Model 1)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
Capital	0.264964	0.075679	3.501144	0.0014
Labor	0.707859	0.052573	13.46441	0.0000
Education	0.055789	0.023399	2.384280	0.0234
Inequality	0.208149	0.062339	3.338993	0.0022
Inflation	-0.002660	0.001366	-1.947589	0.0606
Trade	0.039540	0.092722	0.426432	0.6727
Constant	-6.889750	0.900172	-7.653814	0.0000
R-squared	0.987366	Akaike info criterion		-4.046856
Adjusted R-squared	0.984920	Schwarz criterion		-3.745195
F-statistic	403.7692	Hannan-Quinn criter.		-3.939527
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.254522

Table 6: Long-run relationship (Model 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Capital	0.203384	0.059068	3.443202	0.0018
Labor	0.751352	0.042734	17.58224	0.0000
Education	0.035481	0.020956	1.693153	0.1011
Inequality	3.068399	0.574287	5.342971	0.0000
Inflation	4.63E-05	0.001206	0.038395	0.9696
Trade	-0.079608	0.077731	-1.024144	0.3142
Poverty	-0.977604	0.194130	-5.035815	0.0000
Poverty*Inequality	-0.865532	0.173244	-4.996045	0.0000
Constant	-3.755607	0.922978	-4.069013	0.0003
R-squared	0.993263	Akaike info criterion		-4.570442
Adjusted R-squared	0.991405	Schwarz criterion		-4.182593
F-statistic	534.4697	Hannan-Quinn criter.		-4.432448
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.548939

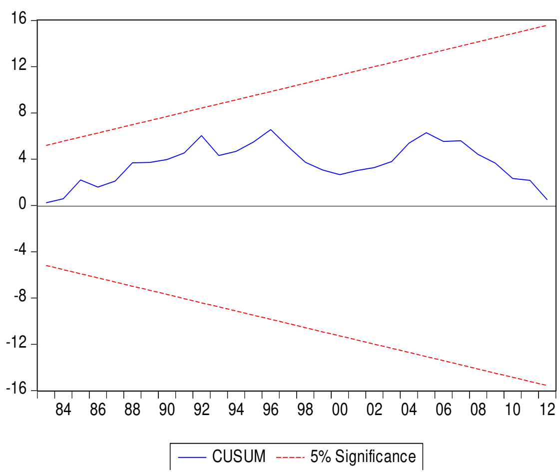

Figure 1 CUSUM Test

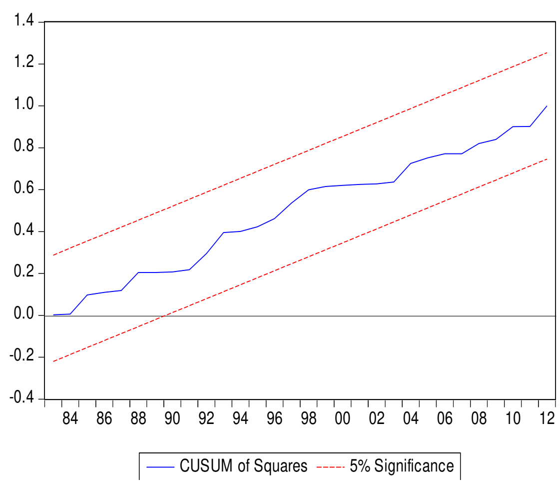

Figure 2 CUSUM Square Test

5.4. Stability Tests

We apply cumulative sum of recursive residual (CUSUM) and the cumulative sum of square of recursive residual (CUSUMSQ) tests to check the stability of the model. The figures 1 and 2 show the plots for CUSUM and CUSUMSQ, respectively. Both figures show that the estimated line is well within the critical limits at a 5 percent level of significance implying that model is stable and reliable.

6. Conclusion

A growing body of the theoretical literature has developed a variety of channels through which inequality may affect growth process of an economy. Similarly a large body of the empirical literature has empirically examined the impact of inequality on economic growth. Nevertheless, neither theoretical nor empirical literature provides conclusive results.

Most of the empirical studies use panel data to explain the growth effect of inequality. The empirical findings using panel data may hide country specific information. For this reason, we conduct an empirical analysis for Pakistan using annual time series data from 1975 to 2013.

The empirical findings show a consistently positive and strongly significant impact of inequality on growth. In particular, our empirical estimates suggest that a 1 percentage-point increase in inequality increases annual economic growth by 0.20 percentage point. When we add poverty as an additional control variable then sign and significance of the inequality impact remain essentially similar. Since the independent effect of poverty on economic growth is negative, we can argue that the positive impact of inequality on growth cannot sustain over a long period. It is also confirmed by the negative growth impact of interactive effect of inequality and poverty.

Since inequality is not bad for economic growth while poverty is a drag on growth. These findings together have implications for the choice of growth-oriented policies. The largest impact on economic growth can be resulted from policies which not only boost economic growth but also cause an independent negative effect on poverty, thereby making the poor part of growth process and ensuring inclusive growth.

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