Economics Bulletin

Volume 38, Issue 1

Macro-determinants of Income Inequality: An Empirical Analysis in case of India

Aadil Ahmad Ganaie
University of Hyderabad

Sajad ahmad Bhat
University of Hyderabad

Bandi Kamaiah
University of Hyderabad

Abstract

In this paper, we have used ARDL cointegration approach to analyse the relationship between income inequality and its various determinants for the period 1963 to 2007. Besides data on Estimated Household Income Inequality (EHII), we have used income share of top 1% of the population as an alternative measure of inequality. The results reveal that while real GDP per capita is negatively associated with overall inequality, it has a positive impact on the income share of the top 1%. The estimates for government expenditure and trade openness reveal that they have a significant positive impact in improving the distribution of income in the long run. For both the models, the results showed that increase in the price level leads to increase in inequality. Moreover, the estimates for the share of agriculture in the total GDP indicate that an increase in its proportion leads to an improvement in the distribution of income.

Citation: Aadil Ahmad Ganaie and Sajad ahmad Bhat and Bandi Kamaiah, (2018) "Macro-determinants of Income Inequality: An Empirical Analysis in case of India", *Economics Bulletin*, Volume 38, Issue 1, pages 309-325
Contact: Aadil Ahmad Ganaie - aadilganaie@uohyd.ac.in, Sajad ahmad Bhat - sajadeco@gmail.com, Bandi Kamaiah - kamaiahbandi@gmail.com.
Submitted: February 03, 2017. **Published:** February 09, 2018.

1. Introduction

Since from the beginning developing economies have tried to cope up with the problem of high poverty besides facing other challenges. But the rising global trend of inequality has posed a new threat to these economies to allocate resources in a manner that benefit all the sections of the population. The unequal distribution of income has alarmed the policymakers to think about the prospects of growth. Many studies confirm that income inequalities have once again started to move in an upward direction. Thus, different questions have been raised about the ongoing development strategy and the forces that are working in the background to accentuate this dynamism.

With respect to India, the fastest growth on the economic forefront over the last two decades is indeed a big achievement for a country which had been stuck in near-stagnation for centuries under the colonial rule, followed by slow progress for decades after independence (Dreze and Sen, 2013). However, the real success of accelerated growth needs to be judged in relation to the impact it has on the lives and standards of the people. Though millions of people in India were pulled off from the clutches of the severe poverty with a marvellous decline in the poverty rates, the economy failed to narrow down the gap between the rich and the poor. So mainly the fruits of the high growth are reaped by the people from privileged elite classes, and a large mass of people continue to lead a precarious and underprivileged life. The growing disparity has restricted India's advancement in terms of development indicators when compared with other developing economies. The big threat is that high-income inequality limits the access of the people even to some basic economic opportunities like education and health. So having a vast potential in the form of the massive labor force or demographic dividend, worsening distribution of income will pose severe damage in terms of the failure to develop the human skills and capabilities of the many. The resultant effect will be a threat to the sustainability of the high growth level that is important for the future progress and prosperity. So there exists a need to bring such a policy framework that besides providing a push to the output growth will work out a path to narrow down the widening gap between top and the bottom tail of the distribution. However, to improve the distribution of income, it is crucial to locate various factors that affect it.

From a macroeconomic perspective, the present study tries to explore how GDP per capita (RGDPC), trade openness (TO), Price level (CPI), government expenditure (GEXP) and share of agriculture in GDP (AGR) affects income inequality in India. For inequality, the study has used two different indicators. One of the indicators is Gini coefficient which takes into account whole distribution, and the other is income share of top 1% that describes only top tail of the distribution. The relationship between inequality and the level of development is a hot topic in the development economics. The basic thinking was that economies would witness an improvement in the distribution of the income with the increase in GDP per capita (taken as a proxy for development) in the long run. However, over the period this has proved doubtful, as in many developed countries inequalities have once again started to move upward. The process of growth in India has followed a different path when compared with other economies of the world. Beginning with an agricultural economy, over the period it is service sector that has

contributed most to the output growth. In between this transition manufacturing sector has lagged behind to develop to the maxim. One notable feature is that despite the shift of the labor from the agricultural sector to other segments, the largest proportion is concentrated within this sector. So, much of the distribution of income can be explained in terms of the returns to the agricultural sector. Considering that, the study has included share of agriculture in the total value added as an important determinant of inequality.

The basic theory of international trade advocates that trade will increase the relative share of the abundant factor (Stopler-Samuelson, 1941). So in case of India labor being plentiful might have witnessed an increase in their income share. However, considering the huge competition in the world economy, exporting firms mostly rely on skilled labor (Bensidoun et al., 2005). Thus liberalization in this respect may increase the income of the skilled at the cost of the unskilled, which may worsen the distribution of income. However, growing market space for the domestic products may create job opportunities for the local workers, increasing their chances of improvement in income levels.

The redistribution of resources from rich to the poor is an important function of the government. In a study, Salloti and Trecroci (2015) find that government spending improves the distribution of the income and fiscal consolidation worsened it. Judging different types of problems faced by the domestic economy after independence, the policymakers found it as a cure to rely much upon the growth of government sector. So heavy dose of public expenditure both consumption as well as investment was released over the period. Though it helped in the development of industrial base and infrastructure in both urban and rural areas, huge losses were incurred by the government in certain industrial segments. Many programs launched for the upliftment of the bottom sections failed to achieve the proposed targets. These happenings drew a massive critique from different corners and government was forced to look for an alternative strategy. Besides that, the world movement of Washington Consensus of 1980's provided a further blow to the rising government dominance in the economic front. So instantly like other countries, India tried to lessen its dependence on the public sector, to provide a push to the limited private segment. The level of prices plays an important role in the macroeconomic framework. It shows the purchasing power of the money income available to an individual. Higher inflation leads to a decline in the relative share of income of the poor thereby worsens the distribution of income (Datt and Ravallion, 1998; Feirriera et al., 2007).

This study will mainly focus on the dynamics of income distribution in the case of India and will try to investigate the relationship between the degree of income inequality and various economic forces that have their share in influencing the noisy process of income inequality as revealed by the past research.

Table 1 shows the shares of income for five quantiles for six years in the case of India. Quantile fifth, i.e., top 20% was holding about 45% of total income in 2011, and that of bottom 20% (Q1) the share was about 8%. Though between 1987 and 1993 some decline was noticed for the top Quantile (Q5), however after 1993 there was a steady increase in its share. Besides that, all the other four quantiles are showing a decline in their share after 1993.

Table 1: Quantile Distribution of Income in India for Some Specific Years

Quintiles	1983	1987	1993	2004	2009	2011
Q1	8.69	8.84	9.09	8.63	8.54	8.20
Q2	12.76	12.58	12.82	12.22	12.14	11.79
Q3	16.65	16.26	16.45	15.81	15.69	15.24
Q4	21.76	21.24	21.51	20.97	20.81	20.54
Q5	40.14	41.08	40.14	42.35	42.82	44.22

Source: World Bank, Development Research Group. Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. Data for high-income economies are from the Luxembourg Income Study database. For more information and methodology, please see https://data.worldbank.org/indicator/SI.DST.FRST.20 .

Table 2 shows the relative shares of different income groups. The estimates show that share of highest 10% (H10) relative to lowest 10% (L10) witnessed a higher change than the other two.

Table 2: Relative Income Shares in India for Some Specific Years

Year	H10/L10	H20/L20	H40/L40
1983	6.822	4.619	2.886
1987	6.895	4.647	2.909
1993	6.577	4.416	2.814
2004	7.536	4.907	3.037
2009	7.802	5.014	3.077
2011	8.517	5.393	3.240

Source: Based on Data from World Bank, Development Research Group. Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. Data for high-income economies are from the Luxembourg Income Study database. For more information and methodology, please see https://data.worldbank.org/indicator/SI.DST.FRST.20.
Note: H10/L10 = Ratio of Income share of Highest 10% to Lowest 10%.
H20/L20 = Ratio of Income share of Highest 20% to Lowest 20%.
H40/L40 = Ratio of Income share of Highest 40% to Lowest 40%.

In a study, Jha (2002) showed that the post-reform period in India is characterised by the sharp rise in rural and urban inequality. The main factors responsible for the increase in inequality are the rise in the income share of capital, decline in labor absorption and the fast growth of service sector. Pal and Ghosh (2007) surveyed comprehensively about the recent trends in the inequality in India. After careful analysis, they concluded that after economic liberalization in the 1990's, there seems evidence regarding the increase in inequality (horizontal as well a vertical) as well as persistent poverty. In a study, Motiram and Naraparaju (2015) concluded that while economic growth has trickled down in the case of India but it has not been in favour of poor. Even considering different castes and disadvantaged groups the results hold. Subramanian and Jayaraj (2015) by using centrist measures of inequality concluded that distribution of consumption expenditure had worsened over time, and growth had failed to be

inclusive. Chatterjee et al. (2016) in a cross-section study in case of India found that inequality is positively correlated with growth.

Kumar and Mishra (2008), found that the increased integration led to an increase in the relative incomes of the unskilled labour, so narrowed the wage gap. Krishna and Sethupathy (2011) while analysing the effect of tariff and non-tariff measures of protection on income inequality in the case of Indian states found that no correlation exists between the two. They argued that trade can improve the distribution of income by increasing the share of the abundant factor, but certain factors may not allow this to happen. The improvement in distribution is limited by the differences that exist within the developmental level of the different regions of India and the restricted access for poor states to integrate with the external sector of the economy. The increased integration with the world economy led to design policies and agreements with the trading partners in a new framework. Previously many agreements were put in place to protect the domestic industries. The increase in openness forced economies to disband many agreements that were hindering smooth flow of goods and services. Such changes besides influencing the production affected the structure of the employment within industries. So the net effect was a disturbance in the distribution of the income. Kar and Kar (2016) found that the eradication of multi-fibre agreement has created some sort of inequality due to an unprecedented concentration of firm-level activity.

Even though from the beginning India followed the path of the welfare state and accordingly adopted different programmes to cater the needs of the poor. However, the success has remained limited even considering only the provision of the some of the essential services like health and education. The services have remained both insufficient and of poor quality (Motiram and Osberg, 2012). Cain et al. (2010) found that inequality in India is mostly an urban phenomenon. And the rise in inequality has been typically contributed by the increases in returns to education that happened mainly in industries which experienced greater liberalization in the 1990's. Studying the link between inequality and sectoral growth Pieters (2010) found that growth in agriculture only reduces inequality, while industrial and service sectors increase it. The study argued that just employment creation will not lead to an equitable distribution of growth unless opportunities are not provided for the low skilled workers.To investigate how financial development and financial reforms affects inequality Ang (2010) using time series data for India, found that underdevelopment of the financial system results in higher income inequality. Taking the same stand like Ang (2010), from a different perspective Tiwari et al. (2013) used ARDL bounds testing approach to cointegration for the annual data from 1965 to 2008. The study found that in the long run financial development, economic growth, and inflation have a negative and highly significant impact on rural-urban inequality, meaning that these factors aggravate rural-urban income inequality in the long run. Economic growth and inflation lower rural-urban income inequality in the short run and trade openness increases it.

The rest of the paper is planned as: Section 2 describes the data and methodology used for the study. Section 3 carries a thorough examination of empirical results. Section 4 concludes.

2. Methodology and Model Specification

There are many techniques in econometric literature to analyse the long-run relationship and dynamic interactions among various macroeconomic variables of interest empirically. For bivariate analysis, Engle-Granger (1987), and Fully Modified Ordinary Least Square (FMOLS) procedure of Hansen and Phillips (1990) have been prominent. For multivariate co-integration, the techniques of Johansen (1988); Johansen and Juselius (1990); and Johansen's (1995) have been popular. These approaches require that all variables be integrated of the same order. If the order of integration among variables is different, it will create inefficiency and hence affecting the predictive powers (Perron, 1997). Pesaran *et al*. (2001) developed the Autoregressive Distributive Lag Model (ARDL) or ARDL bounds testing approach to cointegration that has certain econometric advantages in comparison to other methods of cointegration. First, the bounds test procedure is simple. As opposed to other multivariate cointegration techniques it allows the cointegration relationship to be estimated by Ordinary Least Square (OLS) once the lag order of the model is identified. Second, ARDL approach has the advantage that it does not require all variables to be $I(1)$ as the other methods require and it is still applicable if we have $I(0)$ and $I(1)$ variables in our data set. Third, ARDL approach is relatively more efficient in small or finite sample data sets. Fourth, this method effectively corrects for possible endogeneity of explanatory variables. Finally, both short run and long run estimators can be simultaneously estimated.

As time-series data is used in this study, it is important to check for stationarity of variables before running the causality tests. The ARDL bounds test is based on the assumption that the variables are $I(0)$ or $I(1)$. So, before applying this test, we determine the order of integration of all variables using the unit root tests. The objective is to ensure that the variables are not *I(2)* to avoid spurious results since ARDL is not applicable in the presence of $I(2)$. In this study we have used conventional Augmented Dickey-Fuller (ADF) tests, the Phillips-Perron test following Phillips and Perron (1988). The ARDL model used in this study is expressed as follows :

$$\Delta LGINI_t = C_0 + \delta_1 LGINI_{t-1} + \delta_2 LRGDPC_{t-1} + \delta_3 LCPI_{t-1} + \delta_4 LGEXP_{t-1}$$
$$+\delta_5 LTO_{t-1} + \sum_{i=1}^{p} \phi_i \Delta LGINI_{t-i} + \sum_{j=1}^{q} \omega_j \Delta LRGDPC_{t-j} + \sum_{l=1}^{q} \varphi_l \Delta LCPI_{t-l} +$$
$$\sum_{m=1}^{q} \gamma_m \Delta LGEXP_{t-m} + \sum_{p=1}^{q} \eta_p \Delta LTO_{t-p} + \varepsilon_t \qquad (1)$$

where δ_i are the long run multipliers, c_0 is the drift and ε_t are the white noise errors.

The first step in the ARDL bounds testing approach is to estimate equation (1) by ordinary least squares (OLS) to test for the existence of a long-run relationship among the variables. To investigate the presence of long-run relationships among variables, bound testing under Pesaran, et al. (2001) procedure is used. The bound testing procedure is based on the F-test. The F-test is a test of the hypothesis of no cointegration among the variables against the existence or presence of cointegration among the variables, denoted as:

$$H_N: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$$

i.e., there is no cointegration among the variables, against the alternative,

$$H_A: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$$

i.e., there is cointegration among the variables.

The ARDL bounds test is based on the Wald-test (F-statistic). The asymptotic distribution of the Wald-test is non-standard under the null hypothesis of no cointegration among the variables. Two critical values are given by Pesaran et al. (2001) for the cointegration test. The lower critical bound assumes all the variables are $I(0)$ meaning that there is no cointegration relationship between the examined variables. The upper bound assumes that all the variables are $I(1)$ meaning that there is cointegration among the variables. When the computed F-statistic is greater than the upper bound critical value, then H_N is rejected (the variables are cointegrated). If the F-statistic is below the lower bound critical value, then H_N cannot be rejected (there is no cointegration among the variables). When the computed F-statistics falls between the lower and upper bound, the results are inconclusive.

In the second step, once cointegration is established the conditional ARDL $(p, q_1, q_2, q_3, q_4 \ldots\ldots q_k)$ long-run model for $GINI_t$ can be estimated as:

$$LGINI_t = c_0 + \sum_{i=1}^{p} \delta_1 LGINI_{t-i} + \sum_{i=0}^{q_1} \delta_2 LRGDPC_{t-1} +$$

$$\sum_{i=0}^{q_2} \delta_3 LCPI_{t-i} + \sum_{i=0}^{q_3} \delta_4 LGEXP_{t-i} + \sum_{i=0}^{q_4} \delta_5 LTO_{t-i} + \varepsilon_t \qquad (2)$$

The above specification is also based on the assumption that the error terms are serially uncorrelated. It is, therefore, important that the lag order *(p)* of the underlying VAR is selected appropriately. There is a delicate balance between choosing *p* sufficiently large to mitigate the residual serial correlation problem and, at the same time, sufficiently small so that the conditional Error Correction Model (ECM) is not unduly over-parameterised, particularly given the limited time series data. Therefore, the robustness of results is determined by the appropriate lag length considering the autocorrelation problem. The orders of variables in the ARDL $(p, q_1, q_2, q_3, q_4, \ldots\ldots q_k)$ model are selected using different information criteria widely used in the literature like Akaike Information Criteria (AIC), Schwarz Bayesian Criterion (SBC), etc.

In the third and final step, we obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta LGINI_t = \mu + \sum_{i=1}^{t} \phi_i \Delta LGINI_{t-i} + \sum_{j=1}^{q} \omega_j \Delta LRDPC_{t-j} + \sum_{l=1}^{q} \varphi_l \Delta LCPI_{t-l} +$$

$$\sum_{m=1}^{q} \gamma_m \Delta LGEXP_{t-m} + \sum_{p=1}^{q} \eta_p \Delta LTO_{t-p} + \zeta ecm_{t-1} + \varepsilon_t \qquad (3)$$

Here $\phi, \omega, \varphi, \gamma$, and η are the short-run dynamic coefficients of the model's convergence to equilibrium and ζ is the speed of adjustment. The coefficient of the ecm_{t-1} shows the percentage of correction that takes place in every period after there is deviance from

the long run equilibrium. A highly significant negative value of ecm_{t-1} provides a further evidence about the stable long run equilibrium relationship (Banerjee et al., 1998). The error correction term is the residuals derived from the long run cointegrating regression. Its absolute value ranges between 0 and 1. The higher value of ecm_{t-1} indicates quick adjustment towards long run equilibrium.
The diagnostic tests check for serial correlation, Autoregressive Conditional Heteroscedasticity (ARCH), the functional form of the model, normality of residual term. The stability test of long run and short run parameters is done by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares (CUSUMsq) of recursive residuals.

In our study for the inequality index, we will wholly rely on the dataset from UTIP- UNIDO, which contains a time series account of the augmented Gini coefficient created by the Galbraith and Kum (2005) for a number of countries. The inequality measure available exists under the name of Estimated Household Income Inequality (EHII) for a period from 1963-2007. The calculation of EHII is based on a regression of overlapping observations on the original Deininger-Squire dataset of Gini coefficients, published by the world bank around 1996 (Galbraith et al. 2014). Revealing the merits of the index, Galbraith et al. notes that the measure is a useful alternative to other available inequality measures from different studies; it is more consistent than the comprehensive compilations of the World Bank and WIDER. They concluded that EHII works very well in analyzing the trend of inequality and is close to the survey based measures as an estimate of the gross income inequality. The only demerit according to them is that it does not capture fluctuations in capital mainly a problem in the US case. In our study, we will take EHII as Gini coefficient.

Besides that to measure the robustness of the results to be derived from using EHII, we will use income share of top 1% as an alternative measure of inequality available with the World Top Income Database for a period from 1963-1999. Among independent variables we will use real per capita GDP as a proxy for development, consumer price index to capture the effect of increase in prices, General Government Total Expenditure to see the influence of government intervention in the economy; Trade openness to measure the effect of globalization and the share of agriculture in the total GDP. The annual data for real GDP per capita with $ as a unit of measurement (RGDPC), Trade openness (TO) & consumer price index (CPI), with the base year 2005 has been taken from World Bank. For Total Government expenditure (GEXP) as a share of GDP, we have wholly relied on International Monetary Fund. Data for percentage share of agriculture (AGR) is taken from RBI. The study utilizes annual time series data from 1963 to 2007 for the variables Gini Coefficients, real GDP Per Capita, consumer price index, trade openness, general government total expenditure and share of agriculture. But for the share of income of top 1% (TOP1) of population data is taken from 1963 to 1999. We have made use of Eviews9 for estimation purposes.

We have plotted the data for Gini and income share of top 1% to have some background inference about the change over the period considered. Figure 1 shows that overall inequality has increased over the period. Though there seems a decline following the year 1980, it does not last for long. The Figure 2 shows that income share of the top 1% declined from 11.58 %

in 1963 to 4.39 % in 1981, mainly attributed to the socialistic approach of the government and the presence of progressive taxation. However, from 1981 onwards the data shows a reversal trend, with share of top 1% rising towards the levels in the past. The rising share is mainly attributed to the process of privatization and liberalization and the decline in the marginal tax rates since 1980's.

Figure 1: Estimated Household Income Inequality (EHII). Source: UTIP.

http://utip.lbj.utexas.edu/data.html

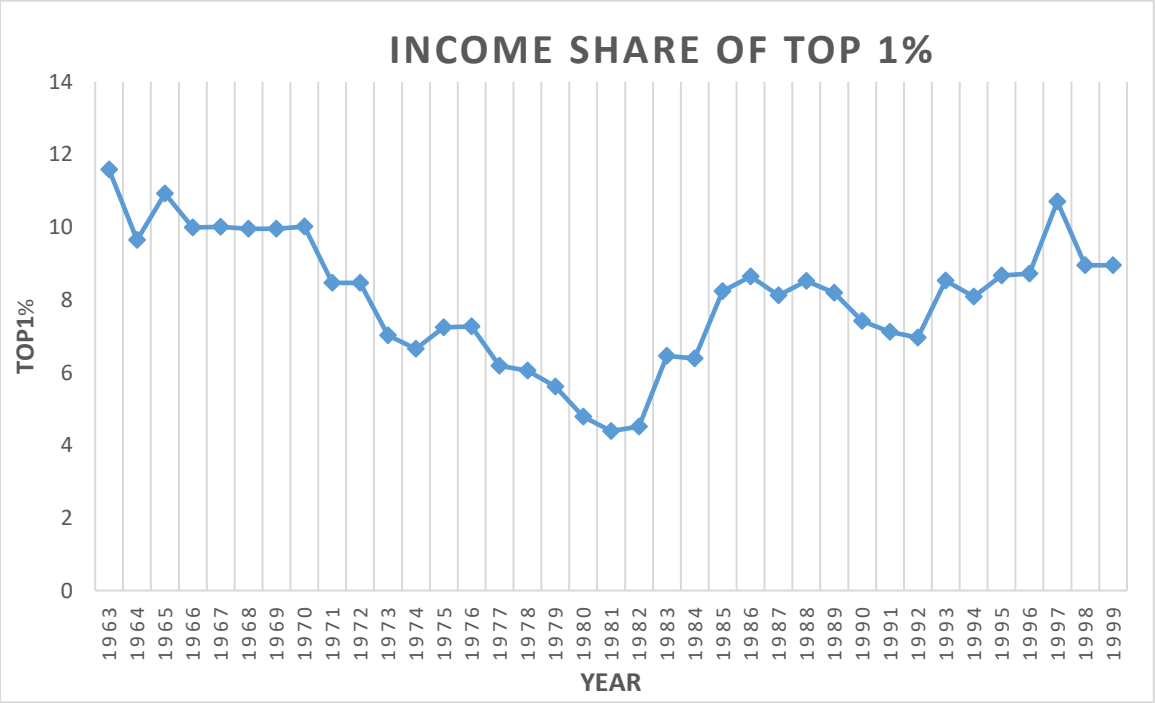

Figure 2: Income share of Top 1%. Source: Data available at http://wid.world/.

3. Empirical Analysis

We have used two models to carry out the empirical analysis. Model (I) uses LGINI as the dependent variable, Model (II) takes income share of Top 1% of the population as the regressand. To assess the stationarity of the variables, we have used two alternative unit root tests viz, ADF (Augmented Dickey-Fuller) and PP (Phillips- Perron). This step is used in order to ensure that no variable is integrated of order I (2). If any variable is integrated of order I (2) then ARDL approach for cointegration is not applicable due to invalid calculated F statistics (Ouattara, 2004). The results are reported in Table 4 which reveal that all variables are first difference stationary.

Table 5 reports the F-statistics from the ARDL Bounds test to confirm the cointegration between variables. The results show that in both cases there exists long-run equilibrium relationship among the variables.

Table 3: Correlation Matrix

Correlation	LGINI	LRGDPC	LTOP1	LAGR	LCPI	LGEXP	LTO
LGINI	1.00						
LRGDPC	0.474	1.000					
LTOP1	-0.718	0.039	1.000				
LAGR	-0.514	-0.975	0.024	1.000			
LCPI	0.610	0.970	-0.138	-0.976	1.000		
LGEXP	0.412	0.892	-0.052	-0.913	0.915	1.000	
LTO	0.602	0.894	-0.199	-0.911	0.915	0.825	1.000

Table 4: Unit Root Tests

Variables	*ADF*		*PP*	
	Level	***First Difference***	***Level***	***First Difference***
LGINI	-1.972	-5.722***	-1.975	-5.733***
	(0.297)	(0.000)	(0.296)	(0.000)
LRGDPC	3.132	-5.573***	5.989	-5.584***
	(1.000)	(0.000)	(1.000)	(0.000)
LTO	2.161	-4.762***	1.770	-4.740***
	(0.999)	(-0.000)	(0.999)	(0.000)
LGEXP	-1.002	-5.891***	-1.015	-5.885***
	(0.744)	(0.000)	(0.739)	(0.000)
LCPI	-0.718	-5.289***	-1.000	-4.565***
	(0.830)	(-0.000)	(0.744)	(0.000)
LTOP1	-1.713	-6.451***	-1.763	-6.415***
	(0.416)	(0.000)	(0.391)	(0.000)
LAGR	2.753	-10.088***	4.477	-9.828***
	(1.000)	(0.000)	(1.000)	(0.000)

Notes: (i) The values in the parenthesis are *p*-values for ADF and PP. *** indicates significant at 1% level of significance.

Table 5: ARDL Bounds Test

Null Hypothesis: No long-run relationships exist								
Model	F-stat.	k	I(0)	I(1)	level of Sig.	Cointeg.	Lags	Sel. Crit.
Model I	4.403	5	2.62	3.79	5%	YES	(1, 0, 3, 3, 3, 2)	AIC
Model II	6.925	5	3.5	4.63	1%	YES	(1, 0, 0, 1, 0, 0)	SBC

Note: I(0) and I(1) shows Lower bound and upper bound Critical values from Pesaran et al. (2001).

After the affirmation of cointegration, we calculated long run and short run coefficients for the two models. Table 6 reports the estimated coefficients for Model I. The results show that in the long run real GDP Per capita is negatively associated with income inequality. That means with the increase in per capita GDP inequality comes down. The coefficient of government expenditure is statistically significant at 1% level of significance with a negative sign indicating that the increase in government expenditure results in the reduction of income inequality. The positive and significant coefficient for CPI shows that increase in price level generates more income inequality. Trade openness shows a negative and significant impact on the inequality. So it suggests that more integration with the global economy improve the distribution of income. It may be due to the expansion of employment opportunities possible because of access to global market and wide technological spillovers, providing different avenues for a large working population. To consider the importance of agriculture in the Indian economy as a large chunk of population is involved in this sector we have taken share of agriculture in the total GDP as a control variable. The estimate for agriculture shows that it is negatively related with the LGINI and is significant at 1% level of significance. The results are in accordance with the present state of economy, where we have seen a decline in its output share and not in the employment share from last some decades. It confirms the importance of agriculture sector in the Indian economy. So an increase in its share will improve the distribution of income.

Table 6: Long Run & Short Run Coefficients

Model I					
Dependent Variable LGINI					
Long Run Coefficients		Short Run Dynamics			
LRGDPC	-0.341***	Δ(LRGDPC)	-0.166***	Δ(LCPI(-2)	-0.045*
std. Error	[0.074]		[0.045]		[0.026]
LGEXP	-0.164***	Δ(LGEXP)	-0.044**	Δ(LTO)	0.002
	[0.020]		[0.021]		[0.015]
LCPI	0.113***	Δ(LGEXP(-1))	0.066**	Δ(LTO(-1))	0.038**
	0.014		[0.021]		[0.015]
LTO	-0.047**	Δ(LGEXP(-2))	0.035	Δ(LTO(-2))	0.034**
	[0.022]		[0.022]		[0.015]
LAGR	-0.374***	Δ(LCPI)	-0.026	Δ(LAGR)	0.028
	[0.101]		[0.033]		[0.040]
C	4.076***	Δ(LCPI(-1))	-0.055	Δ(LAGR(-1))	0.136***
	[0.627]		[0.033]		[0.041]
				ECM(-1)	-0.537***
					[0.083]

Note: ***, **, * used for 1%, 5% and 10 % level of significance respectively. Brackets contain standard errors and below them are the *p*-values.

With respect to the short run, the estimates show the same relationship for GDP per capita, thereby implying that level of development improves the distribution of income both in the short run and long run. The level of government expenditure may fail to bring down the inequality in the short run as long time horizon may be needed to reap fully the fruits of the policies and the programs of the government aimed at increasing the incomes of the poor. Likewise, the effect of the reduction of the saving power of the bottom may not be realized in the short run. The sign of ECM coefficient is negative with a high level of significance which in turn provides the further proof of stable long-run relationship (Banerjee et al., 1998). The coefficient of ECMt-1 is equal to -0.537, implying that any deviation in the short run is corrected by 53.7 % over each year in the long-run.

.

Model II

The study uses an alternative measure of inequality to assess whether growth is pro-poor or pro-rich. In this model the share of GDP of top 1 percent of population is taken as a measure of inequality or the dependent variable with same set of independent or control variables as used in model (I). The intuition behind the use of this measure is that any decline in the share of top 1% will show that income is redistributed towards the rest 99% of poulation. At least at the top end, this will be taken as an improvement in the distribution. And on the other side, the increase in the share of top 1% means income distribution has become more unequal. The econometric methodology used for the estimation of model II is same as of model I. However, as the graph of the top 1% shows a complete shift in the slope and intercept, we used multipoint break method of Bai-Perron (2003) to detect the break in the series. The test showed the presence of 1 break in the series at the year 1983. So accordingly dummy variable was used to take care of that structural change.

The estimated long run and short run coefficients for the model (II) are reported in **Table 7**. The results show that real GDP per capita is positively associated with the income of top one percent of the population. That implies increase in GDP per capita increases the share of rest of the population less than the share of the top one percent of the population. In other words, we can say that growth is relatively pro-rich. The coefficient of consumer price index (CPI) is positive and significant. The coefficient for trade openness is negative and significant, implying that as the country approaches more and more towards free trade, income inequality tends to decrease. The coefficient for government expenditure is insignificant. The estimate for agricultural share is negative, that means any increase in its share will improve the distribution of income.
In the short run, only the coefficient of trade openness and agricultural share is significant with the same sign as witnessed in the long run. The coefficient of error correction term is negative and highly significant, implying that any deviation from the long run equilibrium is corrected by 68% per year.

Table 7: Long Run & Short Run Coefficients

Dependent Variable LTOP1			
Long Run Coefficients		Short Run Dynamics	
LRGDPC	1.123***	Δ(LRGDPC)	0.545
std.Error	[0.280]		[0.463]
LGEXP	-0.214	Δ(LGEXP)	-0.072
	[0.270]		[0.205]
	0.434		0.729
LCPI	1.337***	Δ(LCPI)	-0.119
	[0.210]		[0.288]
LTO	-0.419**	Δ(LTO)	-0.265*
	[0.165]		[0.148]
Lagr	-1.956***	Δ(Lagr)	-1.167**
	[0.465]		[0.420]
Break	0.474**	ECM(-1)	-0.689***
	[0.172]		[0.114]
C	1.849***	Trend	-0.166***
	[0.319]		[0.015]

Note: ***, **, * used for 1%, 5% and 10 % level of significance respectively. Brackets contain standard errors and below them are the *p*-values.

3.1 Discussion

From above results, we can infer that there exists a difference in the impact of level of development (increase in per capita income) on the distribution of income with regard to two different measure of inequality used in the study. From the whole distribution point of view (which the measure of Gini coefficient takes into consideration), an increase in GDP per capita improves the distribution of income. On the other hand, considering only the top end of the distribution, the results indicate that the improvement in the whole distribution of income does not happen because of a decrease in the income share of the top 1% of the population in the GDP. Looking at the general trend of data, we see that during slow growth period the share of top 1% declined, and it was only after 1980's onwards, it started to move in an upward direction. So growth has remained relatively pro-rich with also some trickling down effect as corroborated by its negative association with LGINI as a measure of inequality.

In both models the effect of variables other than GDP per capita is similar. The results showed that an upward movement in government expenditure, trade openness and share of agriculture improve the distribution of income. Keeping in view the present scenario of the Indian economy, the backlog of the agricultural sector has depressed the incomes of the people associated with the sector. The actual failure happened in terms of the small migration of workers from agriculture to other sectors. The unskilled nature of labor force in agriculture has restricted their movement towards the growing industrial and service sector of the economy which demands skilled hand. Though different types of welfare programs of the government are seen as a mere failure, the results warn about the halt of such programs. Having different loopholes, their role in the redistribution of income from rich to the poor cannot be denied easily. It was because of these policies including others that India witnessed a decline in the

poverty rates. These programs open different opportunities of earnings for the poor who own meagre assets.

The estimates for consumer price index showed that an increase in it deteriorates the distribution of income. That happens because bottom strata of the population fail to adjust their income during an inflationary period. Also, as much of the assets of the poor households are in the form of cash, the decline in the real value of money due to price increase will lead to the decline in their asset value. So inequality will increase (Erosa and Ventura, 2002). Further, they experience decline in their savings because of rising consumption expenditure which restricts their investment opportunities available before the price increase. However, at the top end, the rich proportion finds it easy to protect themselves from the negative shocks of inflation because of diverse investment opportunities available to them.

Table 8 reports the various diagnostic checks to verify the reliability of the estimates. In case the disturbance term (ε_t) is autocorrelated, the ARDL coefficient estimates will be biased besides being inconsistent. So, we have to confirm that the estimates are free from autocorrelation. For that we have used Breusch-Godfrey (LM) Lagrange multiplier test. The null of the test is that there is no serial correlation. The results show that the estimates are free from serial correlation which is empirically verified by accepting the null of LM test for residual serial correlation. To check whether the model is perfectly specified or not we have used Ramsey's RESET test, whose null is "There is no misspecification". With F-values of 0.267 and 2.532 for the two models respectively we failed to reject the null of the test. That suggests there is no issue of functional misspecification. And similarly as the probability values for Jarque-bera test are high, the assumption of normality is satisfied. Moreover, the ecm(-1) term shows a negative and significant coefficient, so providing further support for the long run feedback relationship.

The existence of long-run relationship does not guarantee that the parameter estimates are stable. And in case coefficients happened to be unstable, the results are not reliable. To verify the stability of parameters Pesaran and Pesaran (1997) suggested to use CUSUM and CUSUM square tests. The cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) tests are applied to the residuals of the estimated error correction models to check the stability of coefficients over the sample period. The figures (**Figure 3**, **Figure 4**) show that CUSUM and CUSUM square statistics lie within the 5 percent confidence interval bands. That indicates the stability of parameters. That is estimates do not suffer from structural instability.

Table 8: Results of Some Diagnostic Tests Based on Residuals

Model	Ramsey RESET		LM (B-G)		Normality	
	F -stat.	(Prob.)	F -stat.	(Prob.)	J-B	(Prob.)
I	0.267	0.611	2.247	0.129	1.729	0.421
II	2.532	0.124	2.357	0.137	0.428	0.807

Note: (J-B) Jarque-Bera test for Normality. Breusch-Godfrey (LM) Lagrange multiplier test for residual serial correlation. Ramsey's RESET test using the square of the fitted values for functional misspecification.

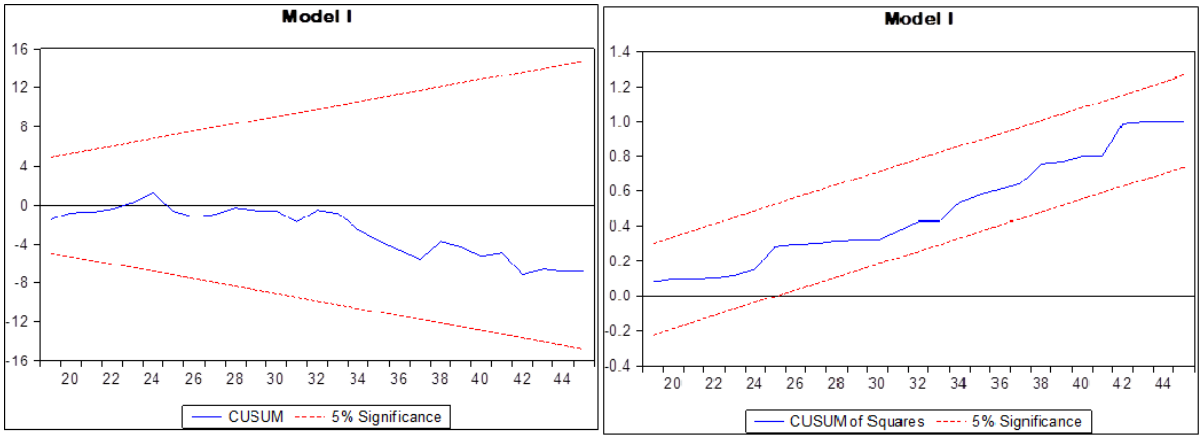

Figure 3: Model 1; Stability Tests

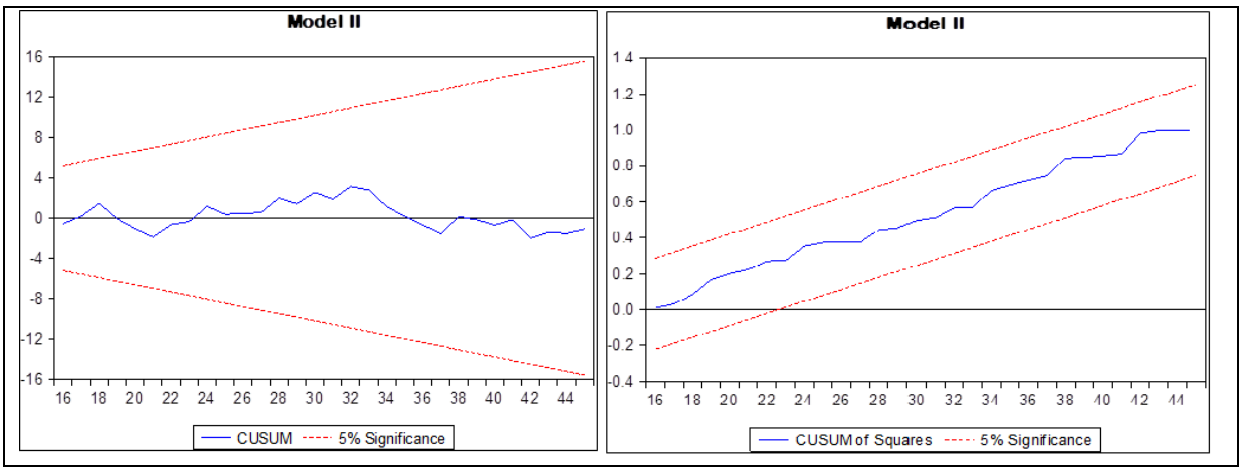

Figure 4 : Model II; Stability tests

4. Conclusion

This study mainly focused on to investigate the relationship between income inequality and its various determinants. For the measure of income inequality, the study relied on the data set on Estimated Household Income Inequality (EHII) from Galbraith et al. (2014). Moreover, Income Share of Top 1% was taken as an alternative measure of inequality. To empirically verify the relationship, ARDL Bounds test of cointegration was used, and due consideration was given to the functional form, serial correlation, normality assumption and heteroskedasticity. The results showed that while Real GDP Per Capita is negatively associated with overall inequality, it has a positive impact on the income share of the top 1%. So it suggests that the process of development has remained favourable for the elite class. The estimates for government expenditure and trade openness show that they have a significant impact in improving the distribution of income in the long run. For both the models, the results showed that increase in the Price level (CPI) leads to increase in inequality. This suggests that increase

in the price level leads to decrease in the income share of the bottom strata of the population. Moreover, the estimates for the share of agriculture in the total GDP indicate that an increase in its proportion leads to a more equal distribution of income. The results are in accordance with the present structure of the Indian economy, where despite transformation from the agricultural sector to service sector, same was not realized in terms of workforce absorption.

References

Ang, J. B. (2010). Finance and inequality: the case of India. *Southern Economic Journal , 76* (3), 738-761.

Banerjee, A., Dolado, J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of time series analysis,19*(3), 267-283.

Bai, J., & Perron, P. (2003). Computation and analysis of multiple structural change models. *Journal of applied econometrics*, *18*(1), 1-22.

Bensidoun, I., Jean, S., & Sztulman, A. (2005). *International trade and income distribution: reconsidering the evidence* (No. 2005-17). CEPII.

Cain, J. S., Hasan, R., Magsombol, R., & Tandon, A. (2010). Accounting for inequality in India: Evidence from household expenditures. *World Development*, *38*(3), 282-297.

Chakravarty, S. (1987). *Development planning: the Indian experience.* Clarendon Press Oxford.

Chatterjee, A., Chakrabarti, A. S., Ghosh, A., Chakraborti, A., & Nandi, T. K. (2016). Invariant features of spatial inequality in consumption: The case of India. *Physica A: Statistical Mechanics and its Applications*, *442*, 169-181.

Datt, G., & Ravallion, M. (1998). Farm productivity and rural poverty in India. *The Journal of Development Studies*, *34*(4), 62-85.

Drèze, J., & Sen, A. (2013). *An uncertain glory: India and its contradictions*. Princeton University Press.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society* , 251-276.

Erosa, A., & Ventura, G. (2002). On inflation as a regressive consumption tax. *Journal of Monetary Economics*, *49*(4), 761-795.

Ferreira, F. H., Leite, P. G., & Wai-Poi, M. (2007). Trade liberalization, employment flows, and wage inequality in Brazil.

Galbraith, J. K. (2007). Global inequality and global macroeconomics. *Journal of Policy modeling , 29* (4), 587-607.

Galbraith, J. K., & Kum, H. (2005). Estimating the inequality of household incomes: a statistical approach to the creation of a dense and consistent global data set. *Review of Income and Wealth , 51* (1), 115-143.

Galbraith, J. K., Halbach, B., Malinowska, A., Shams, A., & Zhang, W. (2014). The {UTIP} Global Inequality Data Sets 1963-2008.

Hansen, B. E., & Phillips, P. C. (1990). Estimation and inference in models of cointegration: A simulation study. Advances in Econometrics, 8(1989), 225-248.

Johansen, S. (1995). Identifying restrictions of linear equations with applications to simultaneous equations and cointegration. *Journal of econometrics , 69* (1), 111-132.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control , 12* (2), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegrationâ€"with applications to the demand for money. *Oxford Bulletin of Economics and statistics , 52* (2), 169-210.

Kar, M., & Kar, S. (2016). Multi-Fibre Arrangement and Wage Inequality: Firm and State-level Evidence from India and a Theoretical Model. *The World Economy*.

Krishna, P., & Sethupathy, G. (2011). *Trade and inequality in india* (No. w17257). National Bureau of Economic Research.

Kumar, U., & Mishra, P. (2008). Trade liberalization and wage inequality: Evidence from India. *Review of Development Economics*, *12*(2), 291-311.

Motiram, S., & Naraparaju, K. (2015). Growth and Deprivation in India: What does Recent Evidence Suggest on "Inclusiveness"?. *Oxford Development Studies*, *43*(2), 145-164.

Motiram, S., & Osberg, L. (2012). Demand or supply for schooling in rural India?. *electronic International Journal of Time Use Research*..

Ouattara, B. (2004). Foreign aid and fiscal policy in Senegal. Tech. rep., Mimeo University of Manchester Manchester.

Pal, P., & Ghosh, J. (2007). Inequality in India: A survey of recent trends. *Economic and Social Affairs Working Paper , 45*.

Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of econometrics , 80* (2), 355-385.

Pesaran, M. H., & Pesaran, B. (1997). *Working with Microfit 4.0: interactive econometric analysis;[Windows version]*. Oxford University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics , 16* (3), 289-326.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika , 75* (2), 335-346.

Pieters, J. (2010). Growth and inequality in India: analysis of an extended social accounting matrix. *World Development*, *38*(3), 270-281.

Raghbendra, J. (2002). *Reducing poverty and inequality in India: Has liberalization helped?* Oxford University Press.

Salotti, S., & Trecroci, C. (2015). Can fiscal policy mitigate income inequality and poverty?

Stolper, W. F., & Samuelson, P. A. (1941). Protection and real wages. The Review of Economic Studies, 9(1), 58-73.

Subramanian, S., & Jayaraj, D. (2015). *Growth and inequality in the distribution of India's consumption expenditure 1983 to 2009-10* (No. 2015/025). WIDER Working Paper.

Tiwari, A. K., Shahbaz, M., & Islam, F. (2013). Does financial development increase rural-urban income inequality?: Cointegration analysis in the case of Indian economy. *International Journal of Social Economics , 40* (2), 151-168.

Torsten, P. & Guido, T. Is Inequality Harmful for Growth? *The American Economic Review,*84(3) (Jun., 1994), 600-621.

Zhou, X., & Li, K.W. (2011). Inequality and development: Evidence from semiparametric estimation with panel data. *Economics Letters , 113* (3), 203-207.