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ECONOMIC GROWTH AND INCOME INEQUALITY: EXAMINING THE LINKS IN INDIAN ECONOMY

SAMARJIT DAS[1]
GOURANGA SINHA[2]
T. K. MITRA[3]

Abstract

In this paper we attempt to examine the Kuznets' U curve hypothesis with balanced panel data of Indian states using two-way fixed effects model. From the findings, it is evident that Gini coefficient shares a positive relationship with real economic development measured by per capita real consumption expenditure. It also supports the hypothesis. Unidirectional causality is found from economic development to inequality.

Keywords: Inequality, Kuznets's hypothesis, Causality in panel data, panel unit root test.

JEL Classification: C23, O40.

1. Introduction

The relationship between growth and inequality is a topic of interest to development economists and policy makers in developing countries. This is so because economic growth and income distribution are closely related to people's lives and social stability. This relationship between inequality and development was first discussed by Kuznets (1955). According to the Kuznets' law, the relationship between inequality and per capita income may be described by a curve in the shape of inverted 'U'. In other words, Kuznets' law advocates that as income rises, first inequality rises then improves, implying that as economic development occurs, income inequality first increases and after a certain 'turning point' starts declining. Kuznets argues that this is due to a shift of labor from low-productivity to high-productivity sectors in the early stage of development, which results in an increasing disparity in wages. Later, however, the high-productivity sector comes to dominate the economy, and wage inequality decreases. There have been a large number of studies regarding the above hypothesis with contradicting and non-conclusive conclusions (see Lecaillon et al. 1984 for a survey of literature). Studies in the 1960s and 1970s in general supported the hypothesis, the centerpiece of such studies comprising articles by Ahluwalia (1976) and Ahluwalia et al. (1979). However, this hypothesis has been

[1] Corresponding author: Economic Research Unit, Indian Statistical Institute, 203 B. T. Road, Kolkata-700108, and India. e-mail: samarjit@isical.ac.in

[2] University of Kalyani, Kalyani, West Bengal.

[3] University of Kalyani, Kalyani, West Bengal.

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challenged and several empirical studies found that there is no significant relationship between inequality and per capita income (see, for example, Anand and Kanbur, 1992). Li et al (1998a, b) find that Kuznets's curve works better for a cross-section of countries at a particular point of time rather than for the evolution of inequality over time within countries. There are few studies on Indian economy as well (see for example, Andrew and Pal, 2004; and the references therein). A number of econometric concerns are quite evident in cross section based study. In particular, cross section based methods fail to allow for unobserved (and persistent) differences across countries/states, and they are susceptible to endogeneity biases and spatial autocorrelation. Therefore, it necessitates testing the hypothesis using panel data as panel data models circumvent all these well-known problems involved in studies based on cross sectional data.

Earlier empirical studies in the literature investigating this relationship primarily focus on unidirectional, that is to say, how a country's economic growth influences its income distribution. However, after the endogenous economic growth theory has been introduced since the mid-1980s, economists' interests have altered to the opposite direction, that is how income distribution affects economic growth. Recent studies on income distribution and endogenous growth by Alesina and Perotti (1993), Bertola (1991), Perotti (1993, 1994), and Persson and Tabellini (1994) return to the old debate. The new literature looks at the impact of inequality on growth rather than the reverse, as was the case with the earlier literature influenced by Kuznets (1955). In fact, economic development and income distribution both may be endogenous variables in the empirical model. Treating one as a dependent variable and other one as an independent variable could cause a biased estimation. The present paper tries to examine the hypothesis for Indian economy using panel data models with a special emphasize on the direction of causality.

The plan of the paper is as follows. Section 2 provides a brief description of data and also discusses the econometric model. Empirical findings are depicted in Section 3. Section 4 concludes the paper summarizing the major findings.

2. Data and Model

This study is based on long consistent time-series data across 14 major states[4] of India using 34 national sample surveys (NSS) conducted by N.S.S.O, Govt. of India spanning the period from 1958 to 2005. It may be noted that the total population in these states under study accounts to 65% of the total population in India (2001). Datt (1998) earlier constructed comparable, consistent summary information about consumption expenditure data based on the survey data provided by NSSO up to 1993-94. We have then updated these data up to 2004-05 using the same method as followed in Datt (1998). A consistent set of price indices across states and survey periods, using monthly data on consumer price indices from the Labour Bureau has been constructed. The primary deflators were the appropriate Consumer Price Index (CPI). The standard of living is measured by average monthly per capita consumption expenditure (MPCE) at 1973-74 prices. Here economic growth has been measured in terms of per capita consumption instead of per capita state GDP since it directly captures the well-being at the household level.

[4] The 14 states are Andhra Pradesh(Ap), Assam(As), Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh (M.P), Maharastra(Mhr), Orissa, Punjab, Rajasthan, Tamil Nadu (T.N), Uttar Pradesh (U.P) and West Bengal (W.B).

Also, the preference for consumption reflects the present practice in the poverty and inequality measurement literature (Lipton and Ravallion, 1995). The Gini coefficient measuring inequality has also been evaluated in terms of MPCE. The state levels MPCEs are the weighted averages of rural and urban MPCEs. The state level Gini's are obtained by decomposition method following Atkinson (1970).[5] There are some data gaps and they have been cemented by the method of interpolation as developed by Milton Friedman (1962). Various robustness checks have been conducted to gauge overall performances of the interpolated data. Then by following the argument of Perotti (1996), Forbes (2000) and Li et al (1998), panel data set was constructed by computing average values of variables over periods of six years resulting in 8 time points. This averaging has some advantages. These six-year averages help us to ensure that we are not dependent on annual changes in variables where measurement error is likely to be most serious (Alsop and Teal, 2004). It is also to be noted that there have been used interpolation to overcome data gaps and thereafter we only need one observation in a six year period to appear in our estimating equation. Besides, since yearly growth rates incorporate short run disturbances, growth is averaged over six year periods. This reduces yearly serial correlation from business cycles (Forbes, 2000). Therefore, effectively, we have used a panel with fourteen states (N=14) and eight time periods (T=8). So the sample contains 112 observations.

The basic form of the Kuznets hypothesis suggests a quadratic relation between income inequality and the level of development, in which inequality increases with the level of development at early stages and, after reaching a peak, declines with economic growth. A natural specification in panel data with a very general form can be hypothesized as:

$$Gini_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 Y_{it}^2 + \alpha_i + \lambda_t + u_{it} \;,\; i=1,\ldots\ldots, N;\ t=1,\ldots.,T, \qquad \ldots (1)$$

where, Y_{it} denotes ln(MPCE) and α_i and λ_t are the state and time specific unobserved heterogeneity effects, respectively; and u_{it} is the disturbance term. Initially, we have considered both fixed effect and random effect model. However, Hausman test as presented in Table 4 strongly suggest for the use of fixed effect model. We have also considered the model without state and time specific effects (the pooled model):[6]

$$Gini_{it} = \beta_{0i} + \beta_1 Y_{it} + \beta_2 Y_{it}^2 + u_{it} \qquad i=1,\ldots\ldots,N;\ t=1,\ldots.,T \qquad \ldots (2)$$

3. Empirical Findings

At the outset, it may be meaningful to study stationary/non-stationary status of all the underlying variables used in this study. It may be noted that stationary property of time series variables is a prerequisite for causality exercise. To this end, we have used several popularly used panel unit root tests, viz., Levin *et al* (2002), IM *et* (2003)---these tests are known as first

[5] For state level Gini, we use Aitkinson's (1970) formula:

$$I(\theta) = \sum_{k=1}^{K} \varphi(k) \left(\frac{\mu(k)}{\mu}\right)^{\theta} I(k;\theta) + \overline{I(\theta)}$$

where $\varphi(k)$ is the share of the population found in subgroup k, $\mu(k)$ is the mean income of subgroup k, $I(k;\theta)$ is inequality within subgroup k and $\overline{I(\theta)}$ is the between group inequality.

[6] Usually most empirical studies tested the invereted U hypothesis by estimating the simple regression model of the following form:

$$Gini_i = \beta_0 + \beta_1 Y_i + \beta_2 Y_i^2 + u_i \;, \qquad i=1,\ldots.,N$$

generation panel unit root tests; and few tests from second generation panel unit root literature, viz., Moon and Perron (2004), Breitung and Das (2008) and Pesaran (2007). As states are expected to be interdependent due to common currency, common fiscal and monetary policy, and common agro-climatic conditions, panel data is expected to be contemporaneously correlated. It is known (Breitung and Das, 2008) that first generation tests are not robust to cross-sectional dependence. To this end, we have used tests developed by Moon and Perron (2004), Breitung and Das (2008) and Pesaran (2007) which are known to be robust to cross sectional dependence. Empirical findings from panel unit root tests are depicted in Table 1. The estimating equation for all panel unit root tests includes heterogeneous state specific intercepts. Heterogeneous deterministic time trend was also tried. However, we have provided results corresponding to intercept-only model. Stationarity status of variables does not get changed for deterministic time trend models. Lag selection is a tricky issue. For panel unit root literature, optimal lag selection method is not well developed. We have tried with both lag 1 and lag 2. Zero lag is also tried. We could not try with other lag as number of time points is only 8. We have checked autocorrelation structure of each individual series. The results provided in Table 1 correspond to lag 1. Lag 1 provides residuals which are free from any trace of autocorrelation. From the values of the test statistics given in Table-1, it is found that the null hypothesis of joint panel unit root test is strongly rejected. This, in effect, implies that all the variables under considerations are stationary variables.

Table 1. Panel Unit Root tests

Variables	Test Statistics				
	LLC	*IPS*	*MP*	*BD*	*Average CADF*
ln(Gini)	-3.16	-2.99	-2.32	-3.21	-5.76
$\Delta \ln y$	-7.60	-7.96	-5.35	-7.76	-8.43
$(\Delta \ln y)^2$	-3.74	-3.68	-2.13	-5.59	-4.57
$(\Delta \ln y)^3$	-7.08	-6.08	-5.97	-4.63	-5.01
5 % Critical values	-1.96	-1.96	-1.96	-1.96	-2.37

1. Y =(MPCE), LLC, IPS, MP, BD, and Average CADF denote tests by Levin et al , Im et al and Moon and Perron, Breitung and Das (2008), and Pesaran (2007), respectively.

As all the underlying variables are stationary, panel regression analysis can now be conducted in standard stationary panel framework. Finding suitable well-specified model is of utmost important. To this end, we have tried several specifications for the equation (1) including the cubic and fourth order income variable on the right hand side. It turns out that both cubic and fourth order variables are insignificant. Throughout the whole exercise we have considered two-way error component model to take into account both unobserved individual and time specific effects. It may be noted that the time effect, λ_t is individual–invariant and accounts for time-specific effects, such as *common shocks*, fiscal policy, monetary policy, industrial policy and labour law etc. We have also conducted poolability test for slope parameters. Standard F-test suggests that there is no slope heterogeneity. Table 2 suggests that significant presence of both unobserved individual and time effects. This suggests the use of two-way error component models.

Table 2. Estimates of individual and time effects

Variable	*DF*	*Parameter Estimate*	*Standard Error*	*t-Value*	*Pr>|t|*
Intercept	1	-237.77	54.35	-4.37	0.0001
Yit	1	128.63	25.16	5.11	0.0001
$(Yit)^2$	1	-15.37	2.91	-5.28	0.0001
Andhra Pradesh	1	0.26	0.52	0.5	0.618
Assam	1	-7.84	0.53	-14.73	0.0001
Bihar	1	-1.81	0.59	-3.05	0.003
Gujarat	1	-1.62	0.52	-3.11	0.0025
Karnataka	1	0.78	0.52	1.5	0.137
Kerala	1	4.54	0.57	7.9	0.0001
Madhya Pradesh	1	1.55	0.53	2.95	0.0041
Maharashtra	1	2.93	0.53	5.57	0.0001
Orissa	1	-1.18	0.58	-2.05	0.0435
Punjab	1	0.84	0.71	1.18	0.2414
Rajasthan	1	2.30	0.53	4.37	0.0001
Tamil Nadu	1	1.04	0.52	2	0.0481
Uttar Pradesh	1	-0.58	0.53	-1.09	0.2769
West Bengal	1	-1.20	0.53	-2.26	0.0262
t1	1	0.45	0.42	1.06	0.2927
t2	1	-0.77	0.44	-1.73	0.0879
t3	1	-0.67	0.61	-1.1	0.2724
t4	1	1.00	0.47	2.11	0.0376
t5	1	-0.88	0.41	-2.16	0.0332
t6	1	-1.77	0.42	-4.17	0.0001
t7	1	0.11	0.56	0.19	0.846
t8	1	2.52	0.71	3.53	0.0007

$R^2=0.81$, $\bar{R}^2=0.76$, F=16.99

Note: 1. The time periods considered are: t1:(1958-1963), t2:(1964-1969), t3:(1970-1975), t4:(1976-1981), t5:(1982-1987), t6:(1988-1993), t7:(1994-1999) and t8:(2000-2005).

2. The estimation has been done by a programme written in SAS and restrictions have been applied to parameter estimates. The restrictions are : $\left(\sum \alpha i = 0 \forall i\right)$ and $\sum \lambda_t = 0 \forall t$.

As we have noted earlier, it is important to examine the direction of causality for any valid inference. To obtain the direction of causality, we apply the method as suggested by Hurlin and Venet (HV), 2001. The HV method is conducted in three sequential steps. First, it examines stationary/non-stationary status of all the variables under study. The Table 1 suggests that all the variables are stationary. In second step, one conducts a test for Granger non-causality (HVNC) for at least one pair of cross-sectional units. If the test rejects the null hypothesis of Granger non-causality, one proceeds to the next step. In step 3, one examines whether Granger causality (HVC) holds for the entire cross sectional units. The results of causality exercise are given in Table 3. We attempt to study for both the directions of causality, viz., from growth to inequality and also from inequality to growth. From Table 3, it is found based on the HVNC (an F-test for non-causality) test that the null hypothesis of Granger non-causality is rejected for the direction from growth to inequality. On the other hand, the null hypothesis of Granger non-causality is accepted for inequality to growth. Since there is no causality from inequality to growth for any pair of individuals, there is no point to testing for Granger causality for all the individuals. However, the rejection of HVNC for growth to inequality stipulates the testing for causality for all the individuals together. The null hypothesis of Granger causality for the entire set of individuals is tested based on *F*-test and is denoted by HVC. From Table 3, it is found that HVC accepts the null hypothesis of Granger causality from growth to inequality for all the individuals. Therefore, one may strongly conclude that direction of causality is unidirectional and that is from growth to inequality. There is no apparent evidence of causality from inequality to growth.

Table 3. Test Results for Causality Hypotheses

Sl. No	*Hypothesis*	*Y to GINI*	*Y^2 to GINI*	*Y^3 to GINI*	*GINI to Y*	*GINI to Y^2*	*GINI to Y^3*
1	HVNC	3.84*	6.48*	1.96	.43	.48	2.60
2	HVC	0.37	1.12	-----	-------	--------	--------

Note: 1. Y =ln(MPCE), HVNC means Non-Causality hypothesis and 'HVC' means Causality hypothesis.

2.* implies rejection of H_0 at 5% level of significance.

Now we turn to examine Kuznets hypothesis. Here it may be noted that the economic theory on growth-inequality nexus is quite non-conclusive. The reason of positive relationship may be found in Aghion *et al* (1999). The primary reason for such positive relationship is that if the growth rate is positively related to the proportion of national income that is saved, more unequal economies are bound to grow faster than economies with a high level of income distribution, since the marginal propensity to save of the rich is higher than that of the poor. In a democratic political set-up, the inverse relationship between income inequality and growth would be expected to be stronger if the income distribution is tilted to the left, giving lower-income groups more political power (Persson and Tabellini, 1994). From the Table 2, it is found that the slope coefficient corresponding to the growth variable is significantly positive. On the other hand, the slope coefficient corresponding to square of growth variable is significantly negative. The signs of both the slope coefficients favour the conjecture of Kuznets. Thus, the empirical results indicate that one should not reject the U-hypothesis. We have also used several forms of robust standard errors. It is needless to mention that overall conclusion remains unchanged across various forms of standard errors. We have also used Hausman specification test (see Table4 in appendix) to decide between fixed or random effects. In this test the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects (see Green, 2008, chaper9). We see that the null hypothesis is significant.[7] It may be interesting to look into the plot given Figure 1. The plot visibly and unambiguously shows that growth-inequality relationship is in

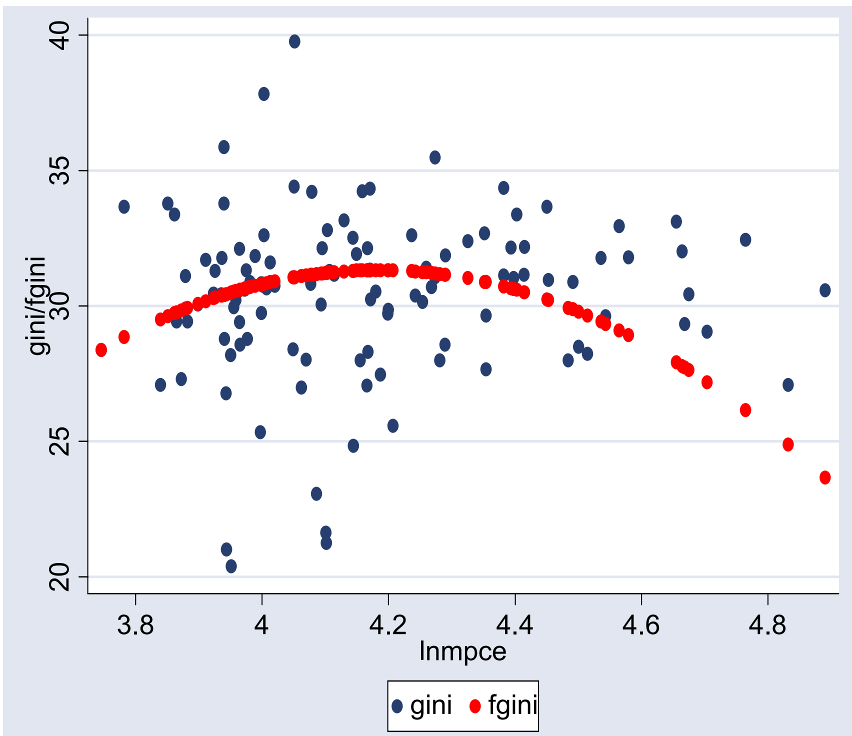
[7] We have also tested the significance of all time effects i.e t1=t2=t3=t4=t5=t6=t7=t8=0 and obtained the $\chi^2(8)$= 1904.30. So, the null that all time period coefficients are jointly equal to zero is rejected.

inverted U shape and strongly evidences in favor of the hypothesis. The empirical findings and the fitted plot strongly signify the efficacy of economic growth in improving income distribution.

Table 4. Hausman Test or FE vs RE Models

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Y_{it}	69.79306	65.57448	4.218581	1.49673
Yit^2	-8.20568	-7.700488	-.5051922	.175584

b = consistent under Ho and Ha; obtained from FE
B = inconsistent under Ha, efficient under Ho; obtained from RE
Test: Ho: difference in coefficients not systematic
chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 14.17
Prob>chi2 = 0.0008
So, the null hypothesis in favor of the random effect model is rejected.



Note: *lnmpce* denotes *ln(mpce)* and *fgini* denotes fitted *Gini* values. The red dotted line is based on the fitted Gini values obtained by two-way panel data model.

Figure1. Inequality versus Per Capita Consumption Expenditure

Indian policymakers have always been concerned with the reduction of poverty and inequality. Indian economic policy making went through a sea of change since independence, staring from central planning system with an interventionist approach to market-oriented economic reform policies. During various stages of development, a structural shift from agriculture to manufacturing or from manufacturing to service or labour mobility from rural to urban may be responsible for the turning points in the Kuznets'–U-process. Another possible reason for such strong existence of the Kuznets' curve may be found in political economics literature. As argued in Acsmoglu and Robinson (2002), which may be the case for India, democratization leads to institutional changes which encourage redistribution and reduce inequality. The redistribution is necessary to contain social and political unrest or to contain the threat of revolution. With high growth, government can afford to spend on food subsidies and on various social welfare schemes which might have positive impact on inequality.

4. Concluding Remarks

In this paper we have tested the Kuznets' U curve hypothesis with balanced panel data of 14 Indian states for the period 1958 to 2005 using two-way fixed effects model. First we have examined the direction of causality between inequality and growth. We found that there was unidirectional causality from growth to inequality. This finding suggested us to fit for a single equation based model where inequality measure (Gini) may be taken as the sole endogenous variable. Data failed to find any causal relationship from inequality to growth. We then tried to test for the conjecture of Kuznets' U curve hypothesis. We found based on the estimated model that one should not reject the conjecture. Income inequalities were highly explained by level of development along with state and time specific factors. The fitted curve (Kuznetz) evidenced that inequality has started to come down as income level increases after reaching a peak. Democratic system, land reforms, social welfare schemes, several redistribution schemes and inequality-reducing measures might have contributed to trickle down the high growth to the bottom quartile of the population. Once the growth reaches a critical level, inequality is reduced due to multiplier and trickle down effects.

Future research may commence to unearth the more specific causes for such reduction of overall inequality across income trajectory or the existence of inverted U shaped Kuznetz curve. It may also be useful to employ various other measures of development indicators and also various income inequalities along with other dimensional inequalities to examine robustness of such empirical findings.

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