

I.A.R.I.W.



Conference on
**Experiences and Challenges in Measuring Income,
Inequality, and Poverty in South Asia**

New Delhi

November 23-25, 2017

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**Structural Transformation of Employment and Income Inequality
in the High Growth Regime: A Study with Micro Level Data in
India**

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Paper prepared for the IARIW-ICIER Conference

New Delhi, India, November 23-25, 2017

Session 2A: Inequality II

Time: Thursday, November 23, 2017 [Afternoon]

Structural Transformation of Employment and Income Inequality in the High Growth Regime: A Study with Micro Level Data in India

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This study explores the distributional issues of growth by taking employment structure into account with micro level information from employment and unemployment survey in India. The study analyses employment status and wage inequality over the new growth regime in India that started in the early 1980s by decomposing Gini index and estimating quantile regression. While ‘within’ group inequality declined, the ‘between’ group inequality increased markedly during the 1990s. The incidence of inequality is higher in the urban economy as compared to the countryside. The ‘within’ group inequality increased at a higher rate among regular wage earners than the self-employed group during the initial decade of reforms. To locate the possible factors for inequality we have estimated conditional earnings at different quantiles. The estimated results suggest that the real earnings increased at higher proportional rate at the upper quantiles. The returns to education at a particular education level are also higher at the upper quantiles. Thus the wage distribution is more unequal because of unequal access to education and the effect is escalating over time. Earnings inequality between different groups of workers even at the same level of education increased over time during the post-reforms period.

JEL Classification: C29, D31, I21

Keywords: Employment Structure, Quantile Regression, Earnings Inequality, India

1. Introduction

This paper analyses how income inequality has changed with employment structure and human capital over the new growth regime in India that started in the early 1980s¹. A very few number of studies have attempted to look into the distributional content of growth in India. Banerjee and Piketty (2005) used the tax return data in India to compute the shares of the top 1 percent, 0.5 percent, 0.1 percent, and 0.01 percent of the distribution of total income and observed a U-shaped pattern of the income shares during 1922–2000. The study observed that the first three decades of planning (1950s to 1970s) was associated with a marked decrease in inequality that

¹ The structural break in economic growth appeared in the Indian economy in 1983, much before the 1991 reforms (Wallack 2003, Das 2007a).

had prevailed during the colonial period in India. But, the situation changed dramatically in the early 1980s, which marked the turning point for the dynamics of income inequality in India. While average income grew faster since the mid-1980s than it had in the planning period, inequality increased rapidly primarily because of an enormous increase in incomes at the top, particularly incomes at the very top (Basole, 2014). Chancel and Piketty (2017) very recently had tried to analyse income inequality in India by extending the database used in Banerjee and Piketty (2005) for the period 1922-2014 and observed a rapid increase of income at the top quantiles during the current decade.

Several explanations are provided in the literature for this growing inequality over the high growth regime in India, as in other transitional developing countries. The high technology sectors, particularly information technology and related sectors, have been exhibiting higher proportional growth as compared to the traditional sectors since the early 1980s in India. This kind of dualism in growth experience as well as the pro-business policies adopted by the government of India made faster growth of income and wealth for the upper end than for the lower end of the income distribution leading to an increase in the 'between' group inequality enormously. People with accumulated, or inherited wealth benefited the most from the openness of the 1990s and thereafter. In some studies, skill-biased technological change that appeared in the high growth phase after openness is an important factor for rising inequality experienced by the developing countries (Johnson 1997). This type of technological change has enhanced employment and wages of the high skilled workers while depressing the employment opportunities and earnings of the less-skilled or unskilled labour. In India, increasing trade openness has been associated with increasing labour productivity and also wage inequality between skilled and unskilled workers in the organised manufacturing sector (Galbraith et al. 2004, Dutta 2005, Das 2007).

Against this backdrop, the objective of this study is to explore the distributional issues of growth by taking structural transformation of employment into account with micro level information from employment and unemployment survey in India. As wage income is directly related to the types of employment, our analysis is restricted to the distribution of wage income. The analysis of Banerjee and Piketty (2005), or Chancel and Piketty (2017) is mostly related to the growth pattern of the top income groups consisting mainly the entrepreneurial class as well as high

skilled professionals. Our study looks into income distribution of the people who are engaged in wage employment. The study examines the nature of change of employment characteristics in terms of activity status as defined in the survey schedule of employment and unemployment prepared by the National Sample Survey Office (NSSO). The structural transformation of employment has serious implications on income inequality. The transformation of employment from low paid to high paid jobs depends highly on human capital of the workers along with their social and demographic characteristics, such as social status, family background, and gender. Thus, human capital, particularly education, is very much crucial in explaining structural transformation of employment and earnings inequality. The human capital theory suggests that education and training would improve workers' skills, enabling them to work in the high productive sector for higher wage. It is well documented that better-educated persons are able to earn higher wages, experience less unemployment, and work in more high-status occupations than their less-educated counterparts (Cohn and Addison 1997). But, in a developing economy like India, there is no guarantee that highly educated people will get high status job with higher pay. As the relationship between education and earnings is nonlinear, educational expansion can increase earnings inequality even if the educational distribution is unchanged (Goldberg and Pavcnik 2007). The seminal work of Neal and Johnson (1996) showed that controlling for educational achievement reduced the wage gap between blacks and whites.

In this study we have analysed how the types of employment and the level of workers' education are associated with earning distribution by applying quantile regression model using survey data taken from different survey rounds during the past three decades (1983 – 2012). The study observes positive effect of education on within group inequality. However, the impact differs significantly across different types of workers with different education levels. The differences across quantiles are substantially higher for workers with graduate and above than for less educated workers. The rest of the study is organised as follows. Section 2 describes, in short, the data and methodological issues used in this study. Section 3 examines the nature of structural transformation of employment with workers' education. Section 4 analyses the changing pattern of earnings inequality in terms of weekly wages earned by the workers. The Gini inequality index is decomposed into 'within' group and 'between' group components. Section 5 interprets in detail the estimated results of quantile regression equation. Section 6 summarises and concludes.

2. Data and methodology

2.1 The data

We have used unit level data from 38th, 50th, 61st and 68th rounds survey on employment and unemployment situation in India (Schedule 10) for the period 1983, 1993-94, 2004-05 and 2011-12 respectively provided by the NSSO. In schedule 10 of these survey rounds, activity status is classified into 13 groups consisting mainly different forms of self-employment, wage employment and other activities. Self-employed are those who operate their own farm or non-farm enterprises or are engaged independently in a profession or trade. The self-employed are further categorised into own-account workers, employers, and unpaid workers in household enterprises. Wage employment is divided into regular wage employment and casual employment. Regular wage workers are those who work in other's farm or non-farm enterprises of household or non-household type and get salary or wages on a regular basis, not on the basis of daily or periodic renewal of work contract. This category not only includes persons getting time wage but also persons receiving piece wage or salary and paid apprentices, both full time and part-time. On the other hand, a person working in other's farm or non-farm enterprises, both household and non-household type, and getting wage according to the terms of the daily or periodic work contract is a casual wage labour.

Wages are recorded in the survey both in cash and kind form valued at current prices on weekly basis. Nominal wages are deflated by the appropriate consumer price index with base year at 2000-01 to obtain real wages². Wage inequality is estimated in this study on the basis of wage total, the sum of wage in cash and wage in kind, for workers. Although there is no hard evidence that the rich are indeed being undercounted in the survey, there may be strong reason to suspect the under-representation of the elite in the survey. Thus, income inequality measured with employment and unemployment survey data by using wages underestimates the inequality as observed in reality. We have constructed Pooled sample of unit level information by taking four different samples drawn independently from the same population at four different time points.

² Consumer price index for agricultural labour (CPIAL) and consumer price index for industrial workers (CPIIW) are used to deflate nominal wages for workers in rural and urban areas respectively

We restrict the sample to wage earners aged between 15 and 65, the working age in the Indian labour market. Students and unpaid family worker have been excluded from the sample.

2.2 Econometric model

Quantile regression model is used to study the disproportional effect of education and employment characteristics on wages at different percentiles. Quantile regression is helpful in studying the conditional mean of income (y) depending on the covariates (x) at each quantile of the conditional distribution. It estimates the differential effect of a covariate on the full distribution and accommodates heteroscedasticity. This method enables one to explore potential effects on the shape of the distribution as well in addition to the shift of the distribution due to the shift of the covariates.

Differences in quantile response can be used to measure inequality within groups. In this study, the types of employment and education level are taken as the major predictors of the response variable, earnings. We consider levels of education below primary, primary, middle, secondary, and graduate and above for workers of different types by generating dummy variables at each level of education. We analyse the conditional quantiles of earnings depending on types of employment and levels of education of the distribution by using the model developed in Koenker and Bassett (1978).

For a random variable Y with probability distribution function $F(y) = P(Y \leq y)$, the p _{th} quantile of Y is defined as the inverse function

$$Q(p) = \inf \{y : F(y) \geq p\}, \quad 0 < p < 1 \quad (1)$$

In particular, the median is $Q(.5)$.

In Koenker and Bassett (1978), the quantile regression equation is specified as

$$y = X'\beta + \varepsilon \quad (2)$$

The linear conditional quantile function $Q(p | X = x) = x'\beta(p)$, can be estimated by solving

$$\hat{\beta}(p) = \arg \min_{\beta \in R} \sum_{i=1}^n \rho_k(y_i - x_i' \beta) \quad (3)$$

for any quantile $p \in (0,1)$

Here, $\hat{\beta}(p)$ is called p_{th} regression quantile. For, $p=.5$ which minimizes the sum of absolute residuals, corresponds to median regression, which is also known as L_1 regression.

For a random sample $\{y_1, \dots, y_n\}$ of Y , it is well known that the sample median is the minimizer of the sum of absolute deviations

$$\min_{\xi \in R} \sum_{i=1}^n |y_i - \xi|$$

Thus, the estimator for the median-regression model is obtained by minimising

$$\sum_i |y_i - \beta' x_i|$$

Under appropriate model assumptions, as the sample size is very large, we obtain the conditional median of y given x at the population level. The median-regression line, must pass through the pair of data points with half of the remaining data lying above the regression line and the other half falling below.

Formally, the p_{th} quantile regression estimators $\hat{\beta}^p$ are chosen by solving

$$\min_{\beta \in R} \left[\sum_{i \in \{i: y_i \geq x_i' \beta\}} p |y_i - x_i' \beta| + \sum_{i \in \{i: y_i < x_i' \beta\}} (1-p) |y_i - x_i' \beta| \right]$$

The p_{th} conditional quantile given x_i is

$$Q^p(y_i | x_i) = \beta'^p x_i \quad (4)$$

Thus, the conditional p_{th} quantile is determined by the quantile-specific parameters, β'^p , and a specific value of the covariate x_i .

Quantile regression inherits certain robustness properties of the ordinary sample quantiles. Quantile returns measure the wage effect of education at different quantiles, thus describing changes not only in the location but also in the shape of the distribution.

3. Structural transformation of employment and workers' education

Inequality is associated with the process of structural transformation (Lewis 1954, Kuznets 1955). The broad structural characteristics together with economic and political institutions have influence on employment and wage structure in the labour market, which in turn affect the distribution of income. The process of development of the OECD countries was experienced with increasing inequality in the initial stages and declining in the latter stages with the transfer of labour from low-productive agricultural activities to relatively high productive manufacturing (Kuznets 1955). Inequality increases in the first stage of growth partly because of rural – urban migration and differential access to finance and education and job opportunities (Lewis 1954). But, after the decades of growth, wages in low-income rural sector would increase possibly because of the adaption of better technologies in farming, leading to the fall in rural – urban inequality.

The development experience in Asian developing countries, however, is different from what was observed in the developed countries during the golden era of capitalist development. In the OECD countries the share of agriculture in total output and employment declined with growing importance of industries and then services. While structural change appears in GDP in the Asian economies by following roughly the similar pattern as observe in the OECD countries, there has been no significant in sectoral composition of employment matching with the change in output share in many Asian countries. In India, for example, the fall in output share of agriculture has not been accompanied by the proportionate fall in employment share. There has been no significant transference of labour from land based activities to manufacturing or services. The failure of manufacturing to absorb the growing labour force has likely consequences in income inequality in the Asian economy. The inherent differences in the structural characteristics between the Asian developing nations and the post-war Western European countries may lead to different distributional outcomes between these two groups of economies.

While the most of studies in the literature on income inequality and structural transformation are based on macro level data in a cross country framework³, this study re-examines the issue by taking structural transformation in employment in terms of job characteristics by using micro level information from India. In analysing income inequality we have focussed mainly on the structural transformation of employment from low paid informal employment to high paid formal jobs. The major structural transformation was emerged in Asian developing economies from planning based development to market oriented development through the growing integration into global trade and financial system⁴. Structural transformation of such type has a far-reaching impact on employment structure and income inequality.

In the employment and unemployment survey data, the employment structure is different in the rural economy from that in the urban sector. In the rural economy, employment is classified broadly into farm and non-farm employment. Farm employment is further categorised into self-employment in agriculture (a major part of them are cultivators), agricultural workers and other workers. Rural non-farm employment is classified again into self-employment in non-agriculture, casual workers and other workers. In the urban employment, on the other hand, employment is divided into self-employment, wage employment on regular basis and wage employment on casual basis. Tables 1a and 1b present the changing pattern of employment structure among the rural and urban households respectively over different rounds of employment and unemployment survey by the NSSO since the early 1980s.

The figures shown in Table 1a clearly suggest that the structural transformation occurred in the rural economy from the farm to non-farm sector, although very slowly. Non-farm employment in the rural economy assumes significance in creating new jobs as well as diversification of jobs away from agriculture in a transitional economy like India. While the agricultural households have been dominating in the rural economy, the share of employment in agriculture, both as self-

³ See for example, Bruno et al. (1998), Kanbur (2000), Ahluwalia (1976), Anand and Kanbur (1993), Bourguignon and Morrisson (1990), Deininger and Squire (1998), Dyson and Murphy (1985), Dahan and Tsiddon (1998)

⁴ Many countries in Asia, most notably India and China (PRC), are in a transition from planned economies to market-oriented economies. The structural transformation of the Indian economy from a socialistic to a pro-business path was well-underway before the 1991 reforms. China decided to liberalise its economy by the end of 1978 and towards the end of the 1980s China entered into a new phase of reforms with a massive programme of rapid integration of its economy into the world economy, while India charted out its new course of development based on neo-liberal reforms in the early 1990s.

employed and casual labour declined systematically since the early 1980s. The scope of getting job in the non-farm sector in rural India increased during the high growth phase in India. Both the shares of self-employment and wage employment on casual basis increased during this period (Table 1a).

Table 1a Changes in employment share in rural India

Employment type	Employment share			
	1983	1993-94	2004-05	2011-12
Self-employed in agriculture	55	47	44	41
Self-employed in non-agriculture	10	13	17	17
Regular wage earning				9
Casual labour in agriculture	25	24	22	17
Casual labour in non-agriculture	5	7	10	13
Others	5	9	8	3

Source: Author's calculation with data from 38th, 50th, 61st and 68th rounds of NSSO

The urban economy, on the other hand, has been dominated by self-employed followed by regular wage employment (Table 1b). Self-employment in the urban sector is more heterogeneous than in the rural sector. It ranges from street vending to high skilled professional in finance or information technology. While the share of self-employed declined and that of casual wage workers declined during 2004-05 and 2011-12, no significant transformation in employment has been observed in the urban economy.

Table 1b Changes in employment share in urban India

Employment type	Employment share			
	1983*	1993-94	2004-05	2011-12
Self-employed	45	43	48	46
Regular wage earning	0	41	37	37

Casual labour	0	12	11	13
Others	55	4	3	4

Note: In 38th round survey household types are categorised into self-employment and other workers.
Source: As for Table 1a

To understand the link between income inequality and employment structure we have looked at the changing pattern of distribution of wage workers by their levels of education over different survey periods. How the distribution has been changed is shown in Table (2). The share of workers in lower strata in terms of their education level had declined and the share of those with higher levels of education increased significantly over the different survey rounds. The share of graduate and post-graduate workers increased spectacularly from 4.5 percent in 1983 to 17.6 percent in 2011-12.

Table 2 Distribution of wage workers by levels of education in India (rural and urban)

Education level	1983	1993-94	2004-05	2011-12
Not literate	49.2	36.8	28.0	20.6
Below primary	23.0	11.1	9.8	8.2
Primary	12.2	12.1	12.7	11.2
Middle	10.8	13.5	16.9	17.1
Secondary	0.3	17.0*	19.3*	25.3*
Graduate and above	4.5	9.5	13.4	17.6

Note: * includes both secondary and higher secondary levels

Source: As for Table 1a

The accumulation of human capital through education, however, is no longer a guarantee of getting better job with higher earning. Many socio-economic and cultural factors actually restrict the people with higher education to enter into higher hierarchy employment. Tables 3a and 3b provide some idea about the distribution of workers by levels of education at different types of employment in 2011-12 in rural and urban areas respectively. Majority of the rural working people with no education or schooling up to primary education were absorbed as casual workers in non-farm activities followed by self-employment in farming and non-farm activities. Workers in rural areas with middle school level of education also were concentrated mostly in self-employment group either in the farm or non-farm sector. While the majority of the working age people in the rural economy with higher level of education (higher secondary, diploma, graduate,

post-graduate and above) absorbed as wage or salaried workers on regular basis in the non-farm sector, a notable shares of them engaged as self-employed or family workers.

Table 3a Distribution of educated working age people by types of employment in rural India: 2011-12

Employment status	Education level									
	Not literate	Below primary	Primary	Middle	Secondary	Higher secondary	Diploma course	Graduate	Postgraduate and above	All
Farm sector										
Self employed	27.2	26.7	23.6	22.9	22.1	18.4	8.4	12.4	8.5	22.7
Family worker	17.8	12.5	15.2	15.6	16.6	17.1	7.3	10.3	5.7	15.4
Regular wage worker	0.1	0.45	0.2	0.3	0.3	0.5	0.6	0.4	0.1	0.2
Casual wage worker	1.0	0.95	1.0	0.9	0.4	0.2	0.2	0.2	0.0	0.7
Non-farm sector										
Self employed	14.7	20.85	21.7	22.1	22.8	19.3	17.4	17.4	12.7	19.4
Family worker	4.2	3.85	4.9	5.8	5.5	5.9	2.9	4.2	2.0	4.8
Regular wage worker	4.4	7.35	9.0	12.8	19.8	31.5	58.0	52.9	69.9	16.6
Casual wage worker	30.6	27.35	24.5	19.7	12.7	7.0	5.2	2.3	1.1	20.1

Source: Author's calculation with 68th round unit level NSSO data

Table 3b displays the distribution of working age people with different levels of education by types of employment in urban India during 2011-12. Majority of the urban working people with no education or schooling up to primary education or middle school education were absorbed as own account workers in informal activities like small trading or street vending. More than one fourth of the working people without any formal or informal education worked very indecent activities including begging as indicated by the category other workers. Roughly one fifth of the working population were absorbed in wage employment on casual basis in the private sector activities. A significant part of the persons with schooling up to middle school level were either regular wage worker or casual wage worker of the private sector. The share of regular wage employment increased with the level of education. Nearly three fourth of the urban working people who have education at post-graduation or above were mostly engaged in wage employment on regular basis. The shares of this type of employment for graduate workers, and workers with diploma holders were just above 60 percent and 70 percent respectively. However, a significant part of the workers with higher level of education (higher secondary, diploma, graduate, post-graduate and above) were self-employed as own account worker.

Table 3b Distribution of working age people with different level of education by employment type in urban India: 2011-12

Employment status	Education level									
	Not	Below	Primary	Middle	Secondary	Higher	Diploma	Graduate	Postgraduate	All

	literate	primary			secondary	course		and above		
Own account worker	27.0	32.7	33.5	35.3	37.7	34.3	18.9	25.1	18.0	30.7
Employer	0.4	0.8	1.1	1.5	2.4	2.5	2.2	3.1	2.3	1.8
Unpaid family worker	7.1	8.3	9.1	10.4	9.1	10.4	3.8	7.4	4.2	8.4
Regular worker	17.5	22.1	29.1	33.2	38.3	46.1	70.1	61.7	74.1	39.3
Casual worker in public sector	0.7	0.6	0.7	0.5	0.2	0.2	0.1	0.0	0.0	0.4
Casual worker in private sectors	20.5	21.3	19.9	14.9	8.5	3.9	3.6	1.3	0.3	11.4
Others	26.8	14.3	6.7	4.2	3.8	2.4	1.2	1.4	1.1	8.0

Source: As for Table 3a

4. Wage inequality by workers' education

We use Gini index to measure inequality and decompose it into 'within' group and 'between' group components by workers' education at different survey rounds used in this study. The basic formulation of Gini index is shown in the appendix. Human capital, particularly education, is one of the major determinants of wage as well as the status of employment. Unequal access to education may be one of the major causes for earnings inequality. As wage is the primary source of income for workers, we use wage inequality as alternative to income inequality where income data are not readily available. The incidence of earnings inequality by workers' education is shown in Table 4.

The Gini index calculated from weekly wages at different level of workers' education suggests roughly inverted U shaped relationship between inequality index and education. Wage inequality increased up to primary school level or, middle school level of education and declined at higher levels of education. In 1983 (38th round survey), however, the relationship between wage inequality and workers' education is not so clear contrasting to the results as appeared in 1993-94, 2004-05 and 2011-12. But, the wage inequality is more among workers with primary or middle school level of education than inequality among post-graduate or illiterate workers in every survey round data on employment and unemployment. The overall wage inequality for all workers declined over time, but very slowly during the period between 2004-05 and 2011-12. While the incidence of wage inequality declined for all groups of workers till 2004-05, the incidence increased among workers with middle school and higher education levels of education during the period between 2004-05 and 2011-12.

The decomposition of wage inequality by workers' education reveals that a significant part of wage inequality as observed in India is accounted for by inequality 'between' group rather than inequality 'within' group for every type of working people. The result is similar if we take workers' group by sector, gender and activity status as shown in Das (2012). We have shown in Tables 3a and 3b that is highly heterogeneous of the workers with a particular education level, and it is expected that wage inequality persists among workers within the same education group but different employment status. The decomposition of wage inequality, however, as shown in the lower panel of Table 4 suggest that wage inequality has been driven primarily by growing dispersion among workers between education groups rather than within education group. In 2011-12, about 56 percent of the wage differences was attributed to between education groups variation. This part was even larger in 2004-05. While the 'within group' wage inequality declined or stagnant over time, the 'between' group inequality increased significantly till 2004-05. Thus, although overall inequality declined, the earnings inequality among workers between education groups increased.

Table 4 Gini index of weekly wages by workers' education

Education level	Survey years			
	1983	1993-94	2004-05	2011-12
Not literate	0.83	0.66	0.48	0.45
Below primary	0.83	0.71	0.51	0.48
Primary level	0.84	0.71	0.50	0.48
Middle school level	0.73	0.70	0.48	0.49
Secondary level	0.76	0.64	0.46	0.47
Graduate and above	0.83	0.51	0.38	0.40
All workers	0.84	0.73	0.53	0.51
Within group	0.21	0.12	0.10	0.10
Between groups	0.35	0.54	0.60	0.56
Overlapping groups	0.44	0.34	0.30	0.33

Source: As for Table 2

5. Effects of employment structure and education on earning inequality

In this section we analysed the pattern of wage inequality as described in section 4 in terms of employment structure and workers' education. To find out how the structure of employment and workers' education contribute to earning inequality we have estimated conditional earnings at quantiles 0.10, 0.25, 0.50, 0.75, and 0.90 denoted respectively by Q_{10} , Q_{25} , Q_{50} , Q_{75} , and Q_{90} . The sample observations used in estimating quantile regression are obtained by pooling of four independent samples at four different time points (1983, 1993-94, 2004-05 and 2011-12) taken from the same population. We have taken real weekly wage as a response variable (y). The predictors are the variables, both qualitative and quantitative, that capture different dimensions of employment characteristics and education. The regression model at quantile p is specified as

$$y = \beta_0^p + \sum_i \beta_{1i}^p D_{year} + \beta_2^p D_F + \beta_3^p D_R + \sum_j \beta_{4j}^p D_{ES} + \beta_5^p age + \beta_6^p D_{TE} + \sum_k \gamma_k^p D_{edu} + \sum_{l,j} \eta_{l,j}^p D_{year} D_{ES} + \sum_{i,k} \eta_{i,k}^p D_{year} D_{edu} + \varepsilon^p \quad (5)$$

Here, D_{year} is a time dummy measuring the effect over time, D_F is a female dummy used for detecting gender gap in earnings, D_R is a dummy variable for capturing rural - urban wage difference, D_{ES} is used to capture earnings difference for workers with different employment status, age is used as a proxy for work experience, D_{TE} is a dummy for workers with technical education, D_{edu} denotes education dummy. We also incorporate interaction dummies to estimate the change in earnings over time for different types of workers and different education level. Here, $0 < p < 1$ indicates the proportion of the population having scores below the quantile at p . The ε^p is independently and identically distributed random error.

The estimated results are shown in Table 5. The quantile regression allows to estimate the differential effects of employment structure and education on wages by taking distributional aspect into account. It compares how wages are affected by education and employment structure at different quantiles in the wage distribution. We have taken 1993-94 as a reference period in

constructing year dummies⁵. Thus, the intercept term shows the conditional mean wage for workers at different percentiles of the wage distribution in the sample in 1993-94 irrespective of their level of education and types of employment. The estimated results suggest that the real wage at 90th percentile was more than 2.5 times the median wage earnings and more than 8.5 times the wage at the 10th percentile in 1993-94 implying a significant wage gap in the Indian labour market. The estimated coefficients of the time dummies (D_1983, D_2004 and D_2011) measure the change in mean earnings in 1983, 2004-05 and 2011-12 compared with the earnings prevailed in 1993-94. The negative coefficients of D_1983 imply that the mean wage earnings were less at every quantile in 1983 than the respective values in 1993-94. The estimated coefficients suggest that real wages increased in 2004-05 and further in 2011-12 at an increasing rate as we move from lower quantile to upper quantile. Thus, the mean wage gap between different quantiles increased over time during the post-reforms period irrespective of the level of education and type of employment. The increasing growth differential of real earnings between different quantiles as observed in our study is similar to the major findings of Chancel and Piketty (2017) based on macro data.

We have analysed the growth divergence of real earnings of workers by estimating the effects of workers' employment characteristics and personal characteristics. Work experience has significant positive effect on wage at every quantile and the effect is significantly higher at higher quantiles implying further the divergence in mean wage across the quantile groups. In the rural economy the wage income is low as compared to the urban economy at every location of the wage distribution, but the rural-urban wage gap is higher at the upper quantiles than at the lower quantiles. The gender wage gap is also significantly high at the upper end of the wage distribution. Similarly, the wage premium for technical education is larger among high earning workers than among low earners. The wage gap among workers because of the differences in technical knowhow may be because of skill biased technological change during the post-liberalisation period.

The level of education has favourable effect on wage income as expected. To estimate how workers' education has had impact on wage earnings we have taken workers without any formal

⁵ In using year dummy we have taken 1993-94 the reference year to compare the differential effects on wage in the post-reforms period to the pre-reform period.

education as a reference group and compare wage earnings across workers with different levels of education by incorporating education dummies. The estimated results suggest that the level of education enhances wage, supporting the hypotheses put forward in the human capital theory. As shown in Table 5, the weekly wage increases with education at a higher proportional rate at higher quantiles in the wage distribution. For example, the conditional weekly wages for workers with education level graduate and above was higher by Rs.1359.15 than the wage for illiterate workers at 90th quantile, while the wage gap between the workers with similar education is only Rs.151.63 at 10th quantile. The estimated gap in the return education is increasing over the quantiles of wage distribution implying that education has inequality enhancing effect. As returns to education at a particular education level are higher at the upper quantiles, the wage distribution became more unequal because of the difference in access to education. The estimated results for quantile regression suggest that the wage gap across quantiles was relatively low at below primary level and remarkably high at the graduate or post-graduate level. The coefficients of interaction dummies for time and education at graduate and above demonstrate that the dis-equalising effect of higher education has been escalated over time. The effect of education at secondary or higher secondary level on wage reduced at 25th percentile point, but increased significantly at the upper percentile points over the period between 1993-94 and 2011-12. Thus, earnings inequality between different groups of workers even at the same level of education increased over time during the post-reforms period.

To find out the role of employment type on earning inequality we have taken casual wage workers as the reference group. The estimated figures shown in Table 5 suggest that workers employed as regular payment basis earn more than those employed on casual payment basis. Wage workers engaged on regular basis were better off at every location of wage distribution than casual workers. The wage difference between these types of workers at 90th quantile is more than 3 times higher the gap at 10th quantile. The wage gap because of type of employment is partly because of the differences in educational qualifications of the workers. However, the wage gap between regular paid workers and casual workers declined over the survey rounds.

Table 5 Quantile estimates of conditional earnings

Real wage	Quantile level				
	Q ₁₀	Q ₂₅	Q ₅₀	Q ₇₅	Q ₉₀

Intercept	50.89***	96.79***	173.67***	268.00***	442.55***
age	0.57***	1.11***	2.27***	4.53***	5.95***
D_1983	-4.52	-9.35	-28.92	-51.08	-96.65*
D_2004	94.72***	154.69***	254.59***	588.66***	1238.74***
D_2011	181.75***	289.56***	425.79***	809.44***	1812.05***
D_rural	-33.02***	-58.88***	-103.72***	-171.45***	-246.12***
D_female	-23.39***	-38.52***	-56.35***	-73.97***	-95.35***
D_tech_edu	60.24***	180.00***	330.61***	508.11***	749.15***
D_below_primary	9.56***	16.78**	31.37**	53.37***	66.56***
D_primary	13.07***	21.31***	43.42***	81.66***	108.41***
D_middle	25.40***	46.39***	94.44***	193.72***	217.97***
D_secondary	70.61***	162.04***	349.28***	456.38***	521.93***
D_graduate	151.63***	530.15***	777.76***	1032.14***	1359.15***
D_regular_wage	80.85***	146.29***	222.94***	277.10***	299.61***
D_1983_D_graduate	-105.38***	-480.50***	-553.98***	-588.59***	-734.27***
D_2004_D_graduate	61.34***	46.94***	415.22***	636.05***	639.66***
D_2011_D_graduate	90.08***	41.21***	689.69***	1151.88***	1024.16***
D_1983_D_se_hse	-43.52***	-133.61***	-261.74***	-244.97***	-241.62***
D_2004_D_se_hse	8.37*	-10.12	96.15***	382.63***	334.02***
D_2011_D_se_hse	17.65***	-28.24***	2.68	550.58***	404.77***
D_1983_D_regular_wage	-94.29***	-163.48***	-208.40***	-258.57***	-282.29***
D_2004_D_regular_wage	-78.58***	-153.93***	-276.34***	-493.69***	-825.58***
D_2011_D_regular_wage	-94.36***	-185.47***	-325.71***	-537.30***	-852.34***
Pseudo R ²	0.0634	0.1125	0.2025	0.2943	0.3532

Note: *** significant at less than 1 percent level, ** significant at 5 percent level, the rest are statistically insignificant

Source: Author's estimation with data from 38th, 50th, 61st and 68th rounds of NSSO by using STATA 14.2

6. Conclusions

In this study, we have analysed employment status and wage inequality by workers' education and how wage inequality has changed over the new growth regimes in India that started in the early 1980s. We observe that structural transformation of employment occurred in the rural economy from the farm to non-farm sector. The scope of getting job in the non-farm sector in rural India increased with growth and development mainly in the form of casual employment.

The casualisation of employment increased in the non-farm sector both among the rural and urban households. While a very few people are well-endowed for permanent wage employment, a very large proportion remained in low productive informal employment on casual basis. It results in widening wage gap between farm and non-farm sectors, and even between different segments within the non-farm sector in the economy.

Worker's education is important in explaining employment characteristics as well as earnings inequality. The major share of workers in the Indian labour market is either illiterate or educated at secondary or higher secondary level, but the share of highly educated workers increased over time. However, the accumulation of human capital through education is no longer a guarantee of getting better quality job. A notable shares of the working age people both in the rural and urban economy with higher level of education engaged as self-employed or family workers. Unequal access to education may be one of the major sources of inequality.

As wage is the primary source of income for workers, wage inequality is used in this study as alternative to income inequality. In terms of the gini index, wage inequality was the highest among workers with education at middle school level and the lowest among graduate or post-graduate workers in 2012. Wage inequality declined but at different rates for different groups by education. Wage inequality by education in Indian labour market has been driven primarily by growing dispersion among workers between education groups rather than within education group. To locate the possible factors for observed inequality as described above we have estimated conditional earnings at different quantiles. The wage gap between workers at different quantiles increased over time during the post-reforms period. The rural-urban earnings differential and gender gap in wage earnings were significantly high at the upper end of the wage distribution. The estimated results suggest that higher the level of education higher is the wage earned by the workers supporting the hypotheses put forward in the human capital theory. As returns to education at a particular education level were higher at the upper quantiles, the wage distribution became more unequal because of education and the effect was escalating over time. Earnings inequality between different groups of workers even at the same level of education increased over time during the post-reforms period.

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Appendix

The Gini index for subgroup j is given by

$$G_{jj} = \frac{\sum_{i=1}^{n_j} \sum_{r=1}^{n_j} (y_{ij} - y_{rj})}{2n_j^2 \bar{y}_j} \quad (1a)$$

The within group inequality index is the sum of Gini indices for all subgroups weighted by the product of population shares and wage shares of the subgroups:

$$G_w = \sum_{j=1}^k G_{jj} p_j s_j \quad (2a)$$

If the population share and wage share in sub group j are $p_j = \frac{n_j}{n}$ and $s_j = \frac{p_j \bar{y}_j}{\bar{y}}$ respectively, the contribution to total inequality attributable to the differences between the k population subgroups is

$$G_b = \sum_{j=1}^k \sum_{\substack{h=1 \\ j \neq h}}^k G_{jh} D_{jh} (p_j s_h + p_h s_j) \quad (3a)$$

If subgroups are non-overlapping, total inequality can be expressed as the sum of within group and between group indices. The groups are non-overlapping means each individual's wage income in one group is greater or lower than each individual in the other groups. But, if the subgroups are overlapping, Dagum (1997) suggests another component of inequality measuring the contribution of the intensity of transvariation. This component is a part of the between-group disparities issued from the overlap between the two distributions. The contribution of the transvariation between the subpopulations to G :

$$G_t = \sum_{j=1}^k \sum_{\substack{h=1 \\ h \neq k}}^k G_{jh} (1 - D_{jh}) (p_j s_h + p_h s_j) \quad (4a)$$

Thus Gini index can be decomposed into three components: within group inequality, between group inequality and inequality due to group overlapping:

$$G = G_w + G_b + G_t \quad (5a)$$