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Education as a way to reducing inequality: Evidence from India

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EDUCATION AS A WAY TO REDUCING INEQUALITY: EVIDENCE FROM INDIA

Abstract

Growing global inequality, particularly in developing countries, has become a major challenge before policy makers. Various policy measures have been suggested: redistributive taxation and transfers, fixing minimum wage, ensuring universal basic income, transferring assets, land reforms, increasing employment opportunities through government sponsored employment schemes and welfare-to-work schemes, and other such policies. Education has also been suggested as an important means to reduce inequality, particularly in developing societies. The impact of education on growth and human development has been well documented; it is also recognized to be a cornerstone for social justice and, hence, an important potential means for reducing inequality.

Empirical evidence on the relationship between improvement in educational attainments and earning based inequality, however, shows that the relationship between the two is not simple. If returns to education are convex, then improvement in educational attainments may lead to an increase in earning-based inequality (Lam et al., 2015).

In this study, we have used nationally representative unit level data from the Employment and Unemployment survey (68th round, undertaken in 2011-2012 by National Sample Survey Office), to examine the impact of expansion of education on inequality in Indian society. Analysis reveals that education has reduced inequality in the 1970s, and from the 1990s onwards.

Keywords: Earnings inequality; Schooling inequality; Convex returns to education; India.

Lam, D., Finn, A. & Leibbrandt, M. (2015) Schooling Inequality, Returns to Schooling, and Earnings Inequality: Evidence from Brazil and South Africa. WIDER Working Paper 2015/050. Helsinki: UNU-WIDER.

EDUCATION AS A WAY TO REDUCING INEQUALITY: EVIDENCE FROM INDIA

1. Introduction

Inequality may be defined as the uneven distribution of rights among individuals or groups, where rights encompasses rights to participate in the political process, rights over economic resources, rights over access to education, rights on healthcare, and so on.¹ Inequality can be broadly classified into horizontal inequality and vertical inequality. Horizontal inequality refers to inequality between socially constructed groups like religion, ethnicity etc. Vertical inequality is inequality among individuals belonging to different income or expenditure groups.

Income inequality between countries has always been an important feature of the global economy. Simultaneously, inequality within countries has attracted the attention of researchers. According to the World Inequality Report², after a historical decline in intra-country inequality from the 1920s to the 1970s in most parts of the world, inequality has risen in nearly all countries. In the industrialized world, the Anglo-Saxon countries and the North American countries have experienced a sharp rise in inequality after the 1970s. The growth in inequality has also been sharp in China, India, and Russia, as these highly regulated economies opened up and adopted market-based liberalization policies. In Brazil, the Middle East, and South Africa, the top 10% earners capture 55% to 65% of national income, making them one of the most unequal societies in the world. Only continental European countries were relatively successful in containing rising inequality.

The accentuation of global inequality can be attributed to the evolution of skill biased technology and corresponding skill premium, integration of national markets through trade and financial globalisation and, weakening of labour market institutions and other related factors.

In recent times, researchers, policy makers, and international funding agencies are gradually realizing the importance of inclusiveness for ensuring sustainable growth. An increase in inequality may have, for instance, the following adverse effects on the economy:

¹<https://wol.iza.org/key-topics/economic-inequality>, accessed on 12 March 2019

²<https://wir2018.wid.world/>, accessed on 12 March 2019

- (i) The influence of money in today's political system helps the rich to succeed in getting governments to adopt policies that favour them as a class (Jencks 2009, Stiglitz 2012). As a result, the inequality in the system is self-perpetuating. In an unequal society, the demand for redistribution can divert productive resources, thereby reducing growth (Ostry et al., 2014).
- (ii) Inequality leads to volatility and instability. Recent research suggests, for example, that the growing inequality in the US may have been responsible for the sub-prime mortgage crisis of 2007 and hence the global financial crisis of 2008 (Rajan, 2010).
- (iii) Inequality translates into envy and unhappiness (Brooks 2014). Someone who would have been happy at a given income is unhappy if he discovers that others are getting more. One persuasive version of this latter claim holds that top executives demand and receive outlandish compensation not because they value so much the money itself, but because they compete with each other for status (Frank 1993, 2010).

Although identity-based inequality is a pervasive problem in India, vertical inequality has also become an important issue in recent years. Research has shown that the adoption of socialist principles led to a significant decline in the incomes of the richest from the mid-1950s to the mid-1980 in India. But, from 1980s onwards, liberalization and deregulation which were part of the conditions attached to the International Monetary Fund's assistance to India in the 1990s, led to a sharp and persistent rise in inequality (Appendix Figure A1). Since the beginning of deregulation policies in the 1980s, the highest income earners have captured more growth than all of those in the bottom half combined. The desperation is evident as expressed:

“What is even more alarming is, the share of the top 1% has been steadily rising at a rate that is much higher than how average wealth or income has been growing. And commensurately, the share of the bottom 50% in both income and wealth has been steadily decreasing.” (Ghatak and Mukherjee, 2019).

The stark growth in inequality in India has given rise to a demand for policies to reduce income-based inequality. Original income can be adjusted through use of redistributive taxation and transfers (Tsounta, 2014) to either increase or decrease post-tax income; this can be supplemented by providing benefits in kind (see Appendix Figure A2). Other measures to reduce income inequality include fixing minimum wage (Engbom and Moser, 2017; Flinn, 2006), ensuring universal basic income (GoI, 2016), transferring assets, land reforms (Besley

and Burgess, 2000), increasing employment opportunities through government sponsored employment schemes and welfare-to-work schemes (Dutta-Gupta et al., 2018), and so on. Education has also been suggested as an important means to reduce inequality (Saint-Paul and Verdier, 1993), particularly in developing societies. Education increases capabilities (Sen, 1999), and facilitates access to remunerative jobs. The relationship between human capital and growth has also been well documented in endogenous growth models (Glomm and Ravikumar, 1992). It is also inextricably linked to the health, social, economic and security status of individuals and societies (Grossman, 1972, Fogel, 1994). Education is also a cornerstone for improving social justice and individual freedom (Sen, 1999).

In this paper, we use National Sample Survey Office data from the Employment and Unemployment survey (68th round, undertaken in 2011-2012) to examine whether education can play any role in reducing income inequality in the Indian context. To test our proposition, we use a theoretical framework developed by Lam et al. (2015) to provide the structure of our empirical analysis.

The study is structured as follows. We begin by describing the theoretical foundation of our work. This is followed by a review of empirical studies examining the relationship between education and inequality. Section 3 describes the data and methodology, and Section 4 presents the main findings of our study. The study ends with a concluding section that provides summary of our findings and identifies possible policy implications of our research.

2. Equalising effect of education

2.1 Conceptual framework

In this section we will show, using a theoretical model developed by Lam et al. (2015), how expansion in education affects earning-based inequality in society. We start with the proposition that income (or, rather, its log) is a function of years of schooling:

$$\log Y_i = \alpha + \beta S_i + \mu_i \quad (1)$$

Therefore,

$$V(\log Y) = \beta^2 V(S) + V(\mu) \quad (2)$$

where Y represents earnings of individuals, S represents years of schooling and V represents variance.

Variance in earning V is a measure of inequality of earnings and comprises of two parts namely, the variance in years of schooling, and the unexplained part of the variance of log earnings.

We consider a mapping from the initial distribution of schooling to a final distribution of schooling

$$S' \rightarrow S''$$

where S' denotes the initial distribution of schooling and S'' denotes the final distribution of schooling which is some linear transformation of the initial distribution

$$S_i'' = \gamma + \delta S_i' \quad (3)$$

The Lorenz dominance criterion is the following.

$$S'' \text{ Lorenz dominates } S' \text{ if } \frac{S_j''}{S_i''} < \frac{S_j'}{S_i'} \forall (i,j) \text{ such that } S_i' < S_j' \quad (4)$$

$$\text{Or, } \frac{S_j''}{S_i''} - \frac{S_j'}{S_i'} = \frac{\gamma + \delta S_j'}{\gamma + \delta S_i'} - \frac{S_j'}{S_i'} = \frac{\gamma(S_i' - S_j')}{S_i'(\gamma + \delta S_i')} \quad (5)$$

$$S'' \text{ Lorenz dominates } S' \text{ if } \gamma > 0, \delta > 0 \quad (6)$$

Equation (6) implies that S'' is equalising since relative difference in schooling outcomes has narrowed between any two individual i and j in the later distribution compared to the former. From now onwards, we will consider our attention to only equalising change in schooling outcomes.

Let us consider two individuals (i,j) such that $Y_i' < Y_j'$

$$Y' \text{ Lorenz dominates } Y'' \text{ if } \frac{Y_j'}{Y_i'} < \frac{Y_j''}{Y_i''} \forall (i,j) \text{ subject to } S_i' < S_j' \quad (7)$$

Since logarithmic transformation is monotonic, the following holds.

$$Y' \text{ Lorenz dominates } Y'' \text{ if } \log\left(\frac{Y_j'}{Y_i'}\right) < \log\left(\frac{Y_j''}{Y_i''}\right) \forall (i,j) \text{ for } S_i' < S_j'$$

$$\log(Y_j'') - \log(Y_i'') = \alpha + \beta S_j'' + \mu_j - \alpha - \beta S_i'' - \mu_i$$

$$\log(Y_j'') - \log(Y_i'') = \beta(S_j'' - S_i'') + \mu_j - \mu_i$$

$$\log(Y_j'') - \log(Y_i'') = \beta\delta(S_j' - S_i') + \mu_j - \mu_i \quad (8)$$

The initial difference in log earnings between any two individuals, i and j :

$$\beta(S_j' - S_i') + \mu_j - \mu_i$$

Change in difference in log earnings after transformation in schooling outcomes from S' to S'' :

$$\beta(\delta-1)(S'_j-S'_i)$$

Y' Lorenz dominates Y'' if $\delta > 1$ (9)

As evident from equation (9), equalising change in distribution of schooling will be reducing earnings inequality unless $\delta > 1$ when, even after equalising change in schooling outcomes, the relative earning for individuals i and j will diverge. Any convex relationship will result in a situation where, even if schooling inequality reduces, there can be unambiguous rise in earnings inequality.

The previous analysis considered a single rate of return to schooling, i.e., an increase in a year of education from four to five will have the same impact as an increase in a year of education from ten to eleven. Now we consider differential rate of returns to different schooling category, e.g., return to education for people completing primary education is considered to be different from return to education for those completing secondary education.

$$y_i \equiv \log Y_i = \alpha + \sum_j \beta_j S_{ji} + \mu_i \quad (10)$$

$$S_{ji} = \begin{cases} 1 & \text{if person } i \text{ is in the } j\text{th schooling category} \\ 0 & \text{otherwise} \end{cases}$$

$$V(\log Y) = \sum_j \beta_j^2 V(S_j) - 2 \sum_j \sum_{k \neq j} \beta_j \beta_k p_j p_k + V(\mu) \quad (11)$$

p_j denotes proportion of population belonging to j -th schooling category

$$V(S_j) = p_j(1-p_j)$$

$$\frac{\partial V(\log Y)}{\partial \beta_1} = 2\beta_1 p_1 (1-p_1) - 2p_1 \sum_{k \neq 1} \beta_k p_k \quad (12)$$

$$\beta_1 p_1 + \sum_{k \neq 1} \beta_k p_k = \bar{y} - \alpha$$

$$\alpha + \beta_1 = \bar{y}_1$$

$$\frac{\partial V(\log Y)}{\partial \beta_1} = 2p_1 (\bar{y}_1 - \bar{y}) \quad (13)$$

where \bar{y} denotes the mean log earnings and \bar{y}_j denotes the mean log earnings of the j -th schooling category.

Equation (13) denotes the effect of change in return of some arbitrary category 1 vis-à-vis other categories. The increase in return will be inequality increasing if the increased return is in a category whose mean income is greater than overall mean income.

Suppose distribution of schooling is shifted by taking people from schooling category 1 to schooling category 2 (so that $dp_2 = -dp_1$):

$$\begin{aligned} \frac{\partial V(\log Y)}{\partial p_1} &= \beta_1^2(1-2p_1) + \beta_1^2(1-2p_1) \frac{\partial p_2}{\partial p_1} - 2\beta_1 \sum_{k \neq 1} \beta_k p_k - 2\beta_2 \sum_{k \neq 2} \beta_k p_k \\ \frac{\partial V(\log Y)}{\partial p_1} &= (\beta_1 + \alpha)^2 - 2\beta_1 \bar{y} - (\beta_2 + \alpha)^2 + 2\beta_2 \bar{y} \\ \frac{\partial V(\log Y)}{\partial p_1} &= (\bar{y}_1 - \bar{y})^2 - (\bar{y}_2 - \bar{y})^2 \end{aligned} \quad (14)$$

Equation (14) gives us the impact such a change in distribution of schooling on the overall earnings inequality which depends on the mean earnings corresponding to both the categories as well as the overall mean earnings.

GE(0) denotes the Generalized entropy measure which is another measure for computing inequality. Unlike Gini coefficient, generalized entropy measure is subgroup decomposable.

$$\begin{aligned} GE(0) &= \frac{1}{n} \sum_{i=1}^n \log \left(\frac{\bar{Y}}{Y_i} \right) \\ \frac{\partial GE(0)}{\partial \beta_1} &= p_1 \left(\frac{\bar{Y}_1}{\bar{Y}} - 1 \right) \end{aligned} \quad (15)$$

As is evident from equation (15), if mean earnings of category 1 is higher than the overall mean earnings, an increase in return to schooling for that category will lead to increase in inequality of earnings. This also gives us one of the key element of our analysis which is education level corresponding to mean earnings.

2.2 Empirical Evidence

The empirical evidence for the impact of education on earning does not generate much optimism about its role in reducing inequality.

In Mexico, educational attainments for the labour force improved dramatically from 1980s. Lächler(1999), however, found that this improvement in schooling outcomes was followed by an increase in earnings inequality. This is further confirmed by the fact that less educated and poor people experienced a decline in real earnings. Similar educational outcomes were also observed in Brazil and South Africa, using South African October Household Survey, 1995 and Brazilian National Household Sample Survey (PNAD 1995). Lam (1999) reports

that lower schooling inequality in itself do not contribute to falling earnings inequality; this may be attributed to convex returns to schooling. The loss in potential earnings from having less educated parents is higher for Brazil than South Africa indicating the negative impact of intergenerational transfer of human capital in a stratified society. Gregorio and Lee (2002) uses an unbalanced panel for the period of 1960-1990 to find that inequality in earnings falls following a fall in inequality in education for countries across continents and for developing as well as developed countries.

China experienced unprecedented growth in real earnings and massive institutional changes during the 1980s. Meng et al., (2013) finds earnings inequality for males has worsened even after large expansion of schooling during 1988-2007 using Urban Household Income and Expenditure Survey (UHIES) 1988-2007. Tansel and Bircan (2010) studies evolution of male wage inequality in Turkey over the period of 1994-2002 using 1994 Household Income and Consumption Expenditure Survey and 2002 Household Budget Survey using OLS and quantile regression. They reported that

- a) The lower end of the wage distribution witnessed a decline in inequality;
- b) In contrast, the higher end saw rise in inequality;
- c) Overall, the fall in overall male wage inequality was small; and,
- d) The average returns to different schooling categories have declined significantly.

The decline in returns to education occurred despite a significant improvement in schooling in Turkey. It may be attributed to the economic crisis of 2001, which adversely affected the labour market. As a result, within group male wage inequality increased while between group wage inequalities declined.

Battistón et al. (2014) uses Socio-Economic Database for Latin America and the Caribbean to study impact of expansion of education on the earnings inequality for 13 countries for the period of 1990-2009 considering the working population between the age 14 and 65 years. All Latin American countries experienced expansion of schooling of varying proportions. The Gini coefficients of education for all the countries saw a drop. The authors performed two simulations taking levels of education and formal years of education. After the first simulation all the countries, except Uruguay, experienced an increase in inequality of earnings; results of the second simulation indicated that all the countries would experience worsening inequality.

Lam et al. (2015) use Brazil's National Household Sample Survey (PNAD 1976-2012), South Africa's Post-Apartheid Labour Market Series (PALMS 1994-2011) to find schooling outcomes improving swiftly from 1995 to 2012 for both Brazil and South Africa, where average level of schooling has gone up significantly although South Africa started with a higher level of schooling. The coefficient of variation, a standardised measure, of both the countries indicates that Brazil had higher levels of inequality in education than South Africa in 1990s. Brazil and South Africa started with similar levels of earnings inequality at 1990 but the evolution of earnings inequality diverged. While Brazil experienced a decline in earnings inequality as measured by Gini coefficient and General Entropy, South Africa saw a rise in earnings inequality. This was further confirmed by the declining average returns to education across schooling categories for Brazil while for South Africa, average return has gone up for schooling above twelve years and fallen for those with lesser years of education.

Coady and Dizioli (2017) use dynamic panel estimation for 103 countries for the period of 1990-2005. They find except for countries in Middle East and North African region and sub-Saharan region, all other regions experienced an increase in income inequality following an increase in educational attainments across all regions. Their simulation for 2025 suggests that except for the advanced economies, all the other economies are expected to see a decline in earnings inequality following expansion in education but the caveat is that with increase in average years of schooling, the rate of reduction is going to fall.

Widyanti (2018) uses data from national labour survey of Indonesia for the period of 2001-2016 to study the relationship between education and earnings inequality. They consider the working population aged between 15 and 65. Wage inequality has increased over time which is consistent with the empirical observation of increase in rate of returns to higher levels of schooling. However, the convex shape of the returns to education curve implies that education would be inequality enhancing.

3. Research objective and methodology

Our survey of previous efforts at studying the impact of improving educational attainments on inequality reveals that, in general, the relationship has been negative in nature. In other words, in most countries, the convex nature of returns to education—coupled with emphasis on higher levels of education—has led to a form of immiserising growth. Although such

studies have examined the experience in Latin America, Africa and Asia, there does not seem to be similar studies for India. The present study is an attempt to address this deficiency.

The objective of this study, therefore, is to examine whether progress in educational attainments has resulted in a reduction in inequality. Such a study is important on the following counts:

- (i) The shift from Nehruvian socialist economy to a market based liberalized and globally integrated economy
- (ii) The education policies introduced in the 1990s, in the form of District Primary Education Programme (subsequently *Sarva Shiksha Abhiyan*), and other schemes like Mid-Day Meal, *Kanyashree*, subsidies to girls and targeting of students from backward social groups.

3.1 Data

The study uses unit level data from the 68th round of the “Employment and Unemployment Survey” of National Sample Survey, with a survey period of 1st July, 2011 to 30th June, 2012. The survey is a nationally representative survey, based on a stratified multi-stage sampling strategy taking 2001 census villages for the rural region and urban frame survey blocks for the urban regions as first stage units (FSUs). The FSUs consisted of 7,508 villages and 5,276 urban blocks totalling 12,784 units which were considered for the survey which were proportionally allotted to each state on the basis of 2001 census population but only 12,737 FSUs (7,469 villages and 5,268 urban blocks) were surveyed. The sample consists of 398,025 observations from the rural region and 204,808 from the urban region. We consider only the urban populace for the analysis since, in rural areas, payments are often made in kind so that computing monetary value of earnings becomes difficult. Initially, we considered respondents in the 16 and 65 years, respectively; owing to certain problems to be discussed later, this was subsequently truncated to 23-65 years.

3.2 Data preparation

Our analysis is based on three variables—educational attainments, age and monthly earnings. The categories of education used in NSSO are recoded by us; further, the information is used to impute years of education for urban labour force (Table 1). The years of education are imputed as the mean years of schooling corresponding to the NSSO categories where people are classified as per the highest education completed during the survey.

Table 1: Educational categories, recoded categories, imputed years of education and their frequency (%) for Urban Labour Force (age 16-65)

NSSO educational categories	Imputed Years of education	Frequency (%)	Recoded education levels	Frequency (%)
Not literate	0.00	16.66	Below Primary Education	41.86
Literate without formal schooling:EGS/ NFEC/ AEC ³	2.00	8.63		
Total Literary Campaign				
Others				
Literate: Below primary				
Primary	5.50	13.09	Primary education	14.53
Middle	8.50	18.51	Middle and Secondary	26.16
Secondary	10.50	13.6		
Diploma/ Certificate course	12.50	3.65	Diploma	1.65
Higher secondary	13.00	8.97	Hr Sec education	7.09
Graduate	15.50	12.71	Graduate and Above	8.70
Postgraduate and above	17.00	4.17		

Age of a person is defined as his/her age in terms of number of years completed as on the date of the survey. Based on this information, the sample is divided into age cohorts (Table 2). We generate experience from age and years of education as follows:

$$\text{Experience} = \text{age} - \text{years of education} - \text{age of entry to school}$$

where age of entry to school is taken to be 6 years.

³EGS: Education Guarantee Scheme, NFEC: Non-formal Education Courses, AEC: Adult Literacy Centre

Table 2: Formation of age cohorts

Age Group (Years)	Cohort	Percentage of urban population	Average years of education	Work force participation	Average earnings (Rs./month)
16-25	2012	30.89	8.83	32.49	2303.49
26-30	2005	13.84	8.55	52.73	3920.01
31-35	2000	12.23	7.82	59.22	4454.51
36-40	1995	11.97	7.30	59.74	5190.22
41-45	1990	9.22	7.30	60.28	6469.54
46-50	1985	7.79	7.08	58.90	7364.26
51-55	1980	5.59	6.96	56.18	8306.44
56-60	1975	4.77	5.69	41.26	7531.53
61-65	1970	3.69	5.09	26.09	2278.38

The cohort of 2012, comprising of people aged 16 to 25 years, had to be dropped from the analysis. A large proportion of the respondents aged between 16 to 20 years are too young to complete highschool or graduation, so that they do not have the chance of enjoying the higher returns associated with higher levels of education. The non-random sample selection may lead to under reporting of educational attainments and earnings inequality, resulting in misleading results.

The labour force comprises of persons who are either engaged in productive activity or are unemployed but seeking work.⁴ Workers are defined as people engaged in any economic

⁴NSSO codes are 11 (worked in household enterprises (self-employed) as own-account worker), 12 (worked in household enterprises (self-employed) as an employer), 21 (worked in household enterprises (self-employed) as helper), 31 (worked as regular wage/salaried employee), 41 (worked as casual labour in public works other than MGNREG public works), 51 (worked as casual labour in Mahatma Gandhi NREG public works), 61 (worked as casual labour in other types of works), 62 (did not work owing to sickness though there was work in household enterprise), 71 (did not work owing to sickness but had regular salaried/wage employment), 72 (did not work owing to other reasons but had regular salaried/wage employment), 81 (sought work or did not seek but was available for work) and 82 (did not seek but was available for work).

activity or those who abstained due to various reasons (like sickness and festivals) in spite of having a job.⁵ Workers are classified according to three criteria, usual principal status, current weekly status and current daily status whose reference periods are a year, a week and a day respectively. If they are employed during the reference period, they are considered workers. Earnings referred to the payment received from being engaged in an activity.

Earnings were reported for a week. We generate monthly earnings for wage and salaried persons and daily workers as follows:

Wage and salaried: $(\text{weekly earning} \times 30) / 7$

Daily workers: $(\text{weekly earning} \times 30) / \text{No. of days engaged in an economic activity}$

4. Education and inequality in India

4.1 Findings

Figure 1 denotes how the composition of educational attainments (in years) has changed from 1970s onwards till 2005. Illiteracy of the workforce has gone down over the years from about 50 percent in 1970 to about 10 percent in 2005. The significant improvement in schooling outcomes can also be inferred from number of people completing 8.5 years to 10.5 years of schooling i.e. middle and secondary levels have gone up from 16.42% in 1970 to 39% in 2005. Another point to note is that of the evolution of diploma courses which were nearly non-existent in the 1970s to 5.79% in 2005.

⁵They correspond to codes 11, 12, 21, 31, 41, 51, 61, 62, 71 and 72.

Figure 1: Evolution of distribution of schooling for Urban Labour Force

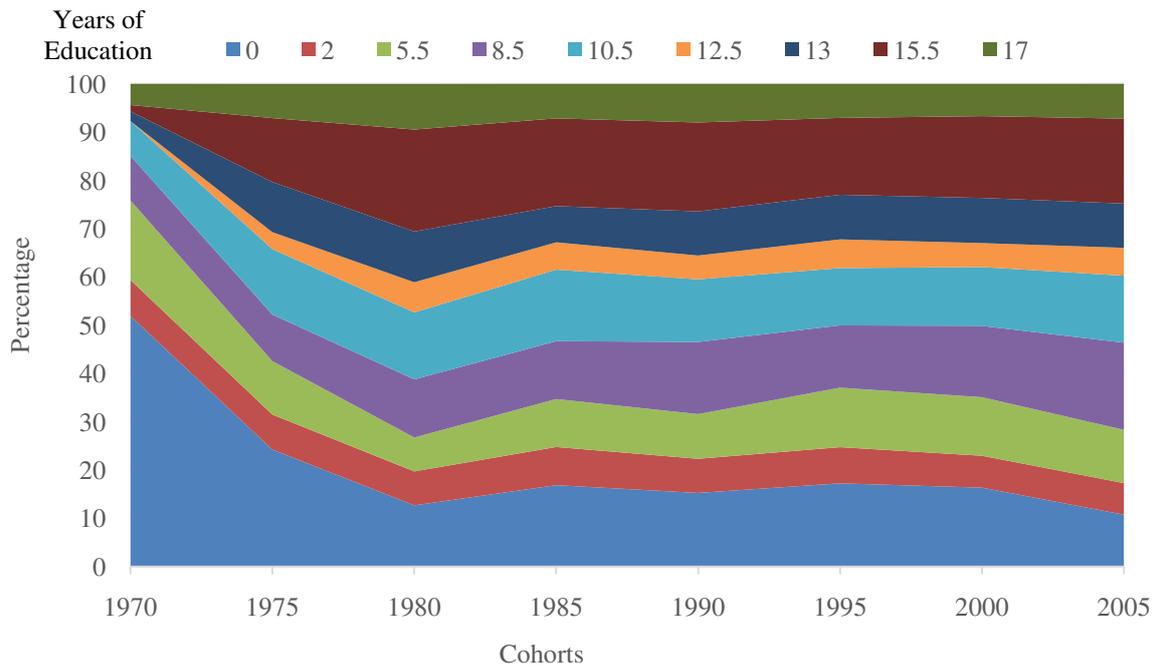


Figure 2 captures the evolution of educational attainments in terms of schooling levels. The stacked bar graph corroborates the results of Figure 1 that respondents with schooling below primary has seen a steady drop while there has been a bulging of the middle levels of schooling and a stable proportion of around 23-24% for graduation and above.

Figure 2: Evolution of distribution of education for Labour Force

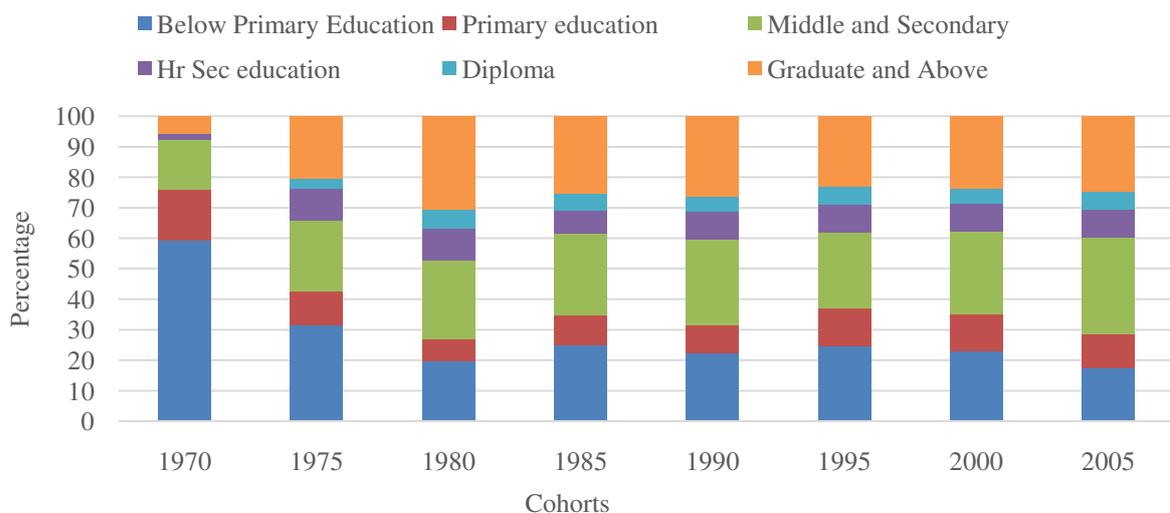
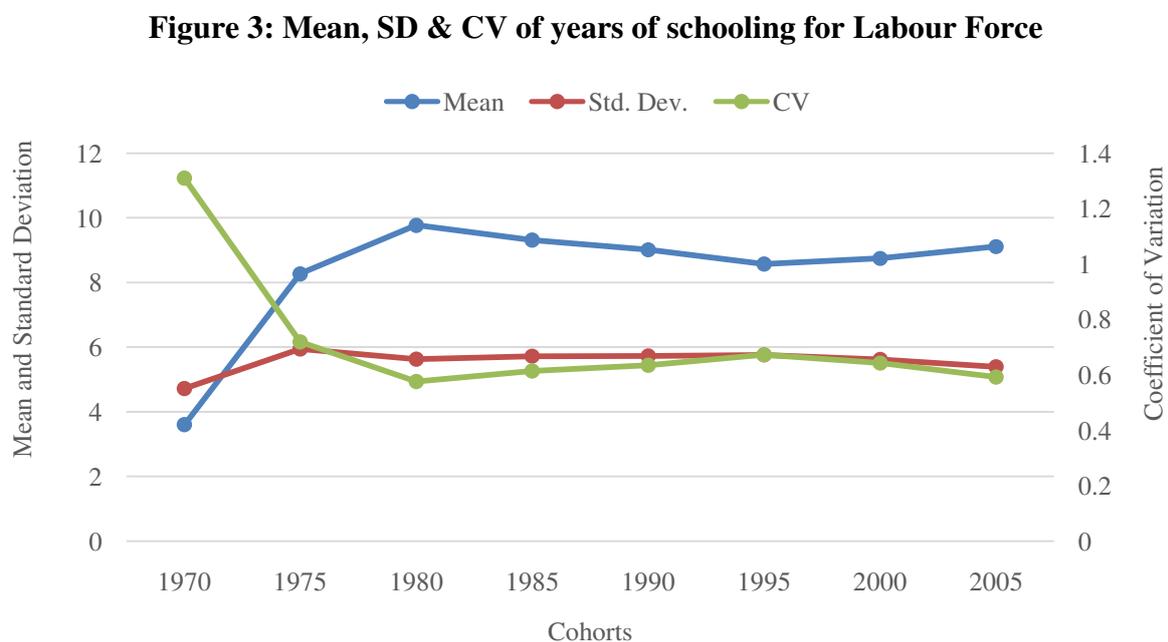


Figure 3 reports mean, standard deviation and coefficient of variation of years of education. Mean years of education has rapidly increased from the 1970s, to stabilise around 9 years

since 1980s. Standard deviation has remained stable during the time period, around 5.6 years, showing that inequality of educational attainments has not changed in absolute terms. The coefficient of variation, a standardised measure of dispersion, has seen a drop from the 1970s and has stabilised around 0.6 for the rest of the time period. Overall, therefore, inequality in educational attainments has fallen since the 1970s, and stabilised thereafter.



In the next step we estimate the regression:

$$y_i \equiv \log \text{Earnings}_i = \alpha + \beta \text{Years of Education}_i + \gamma \text{Experience}_i + \mu_i$$

for each cohort. The explained variance and total variance is reported in Figure 4. After a rise between 1970 and 1975, there is a steady fall in both total variance and explained variance

from 1.2 and 0.7, respectively, to 0.7 and 0.2, respectively, in 2005. The gap between total and explained variance has also remained steady throughout the period of study, indicating that equation (2) holds for our data.

Figure 4: Total and explained variance of log earnings

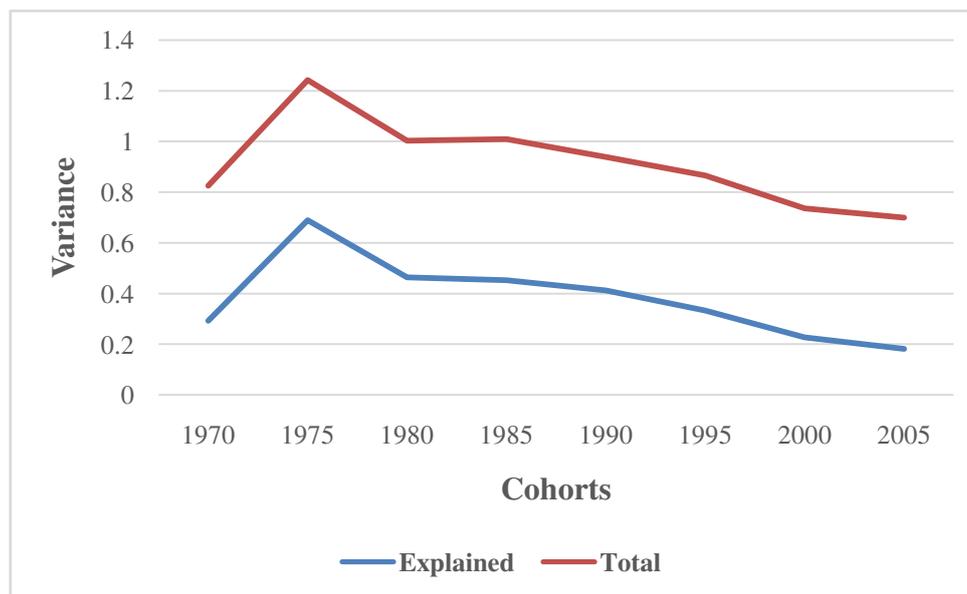


Figure 5 shows the Gini coefficient and General Entropy measure (0) for earnings of urban labour force across the cohorts. Results indicate that, apart from fluctuations in between, earnings inequality as measured by the Gini coefficient has gone down from 1970 to 2005. The drop in inequality in earnings is more pronounced when General Entropy measure is considered.

Figure 5: Gini coefficient and General entropy measure for earnings of urban labour Force

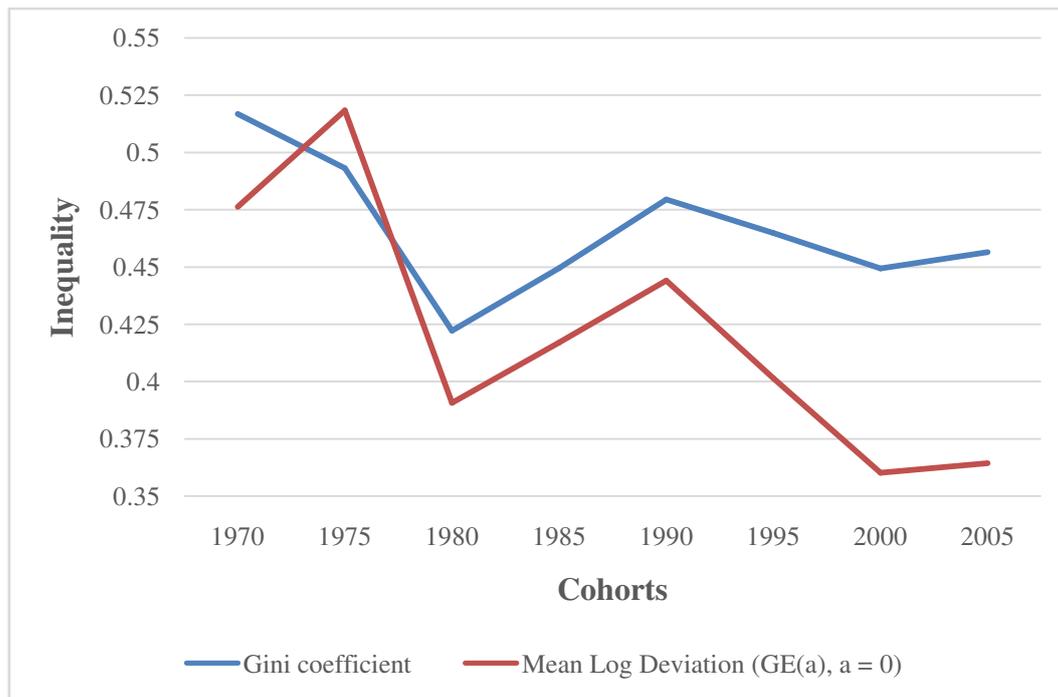
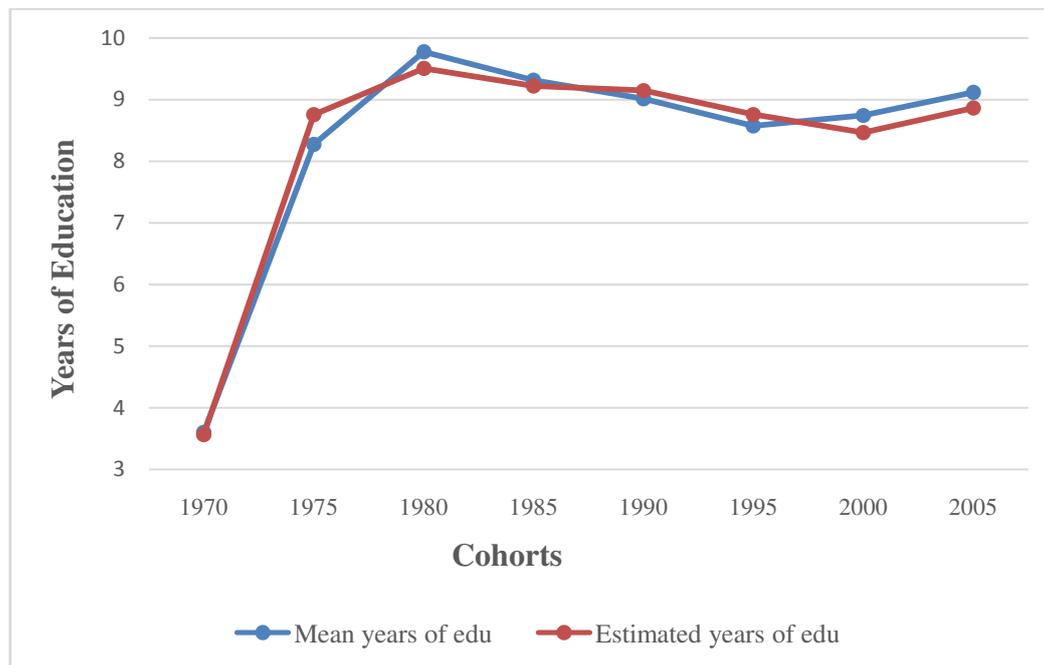


Figure 6 corresponds to the measure connecting years of education to earnings inequality referred in equation (13): $\frac{\partial V(\log Y)}{\partial \beta_1} = 2p_1(\bar{y}_1 - \bar{y})$. This can be interpreted as whether people are completing enough years of schooling so as to earn the mean income. When mean years of education is more than the years of education corresponding to mean log earnings, inequality will drop, and vice versa. The years of education corresponding to mean log earnings for each cohort is estimated using the coefficients computed in the regression referred in Figure 4 (reported in Appendix Table A1). As evident from Figure 6, although both curves have the same trajectory and have a narrow gap, there are crossovers. When estimated year of education corresponding to mean log earnings is *less* than mean year of education, and that change in returns to education is negative; in such a situation inequality will decrease. If estimated year of education corresponding to mean log earnings is *above* mean year of education, earnings inequality will increase. Figure 6 indicates that improvement in educational attainments increased inequality the 1970-1975 phase, and then again from the mid-1980s to the mid-1990s (labelled phase A and C for convenience). In the interim period (1975-1985) and from the mid-1990s onwards (phases B and D), on the other hand, education has reduced earning-based inequality. In the next section we explain these trends based on a discussion of education policy in India.

Figure 6: Mean years of actual education and estimated years of education level corresponding to mean of log earnings



4.2 Discussions

The second Five-year Plan had introduced an economic policy based on heavy capital intensive industries (the Mahalanobis plan). A key ingredient of this policy was the creation of a pool of highly educated and technically skilled labour force to meet the industrial demand. Accordingly, the Government invested heavily in higher and technical education, establishing institutes like Regional Engineering Colleges, Indian Institute of Technology, and Indian Institute of Science. This period corresponds to phase A, where educational progress *increased* inequality.

In the late sixties, it was increasingly being realised that the economic policies and power structures had brought about limited growth, without any equitable distribution of its benefit. It led to focus on weaker sections of the population and on providing basic education. The National Policy on Education, formulated from 1968, focussed on providing free universal schooling for those aged below 14 years. It led to improvement in enrolment and subsequent improvement in the average years of schooling during the 1970s throughout 1980s as is evident from Figures 1 and 2. In this stage (phase B), education *reduced* earning-based inequality.

The first phase of liberalisation, starting in the mid-80s, laid the foundations of a service sector led growth. The growth of the IT and ITES sectors stimulated demand for technically skilled workers. The focus also shifted to minimising the role of the state in the economy. In this period (phase C), educational progress had an adverse effect on equity.

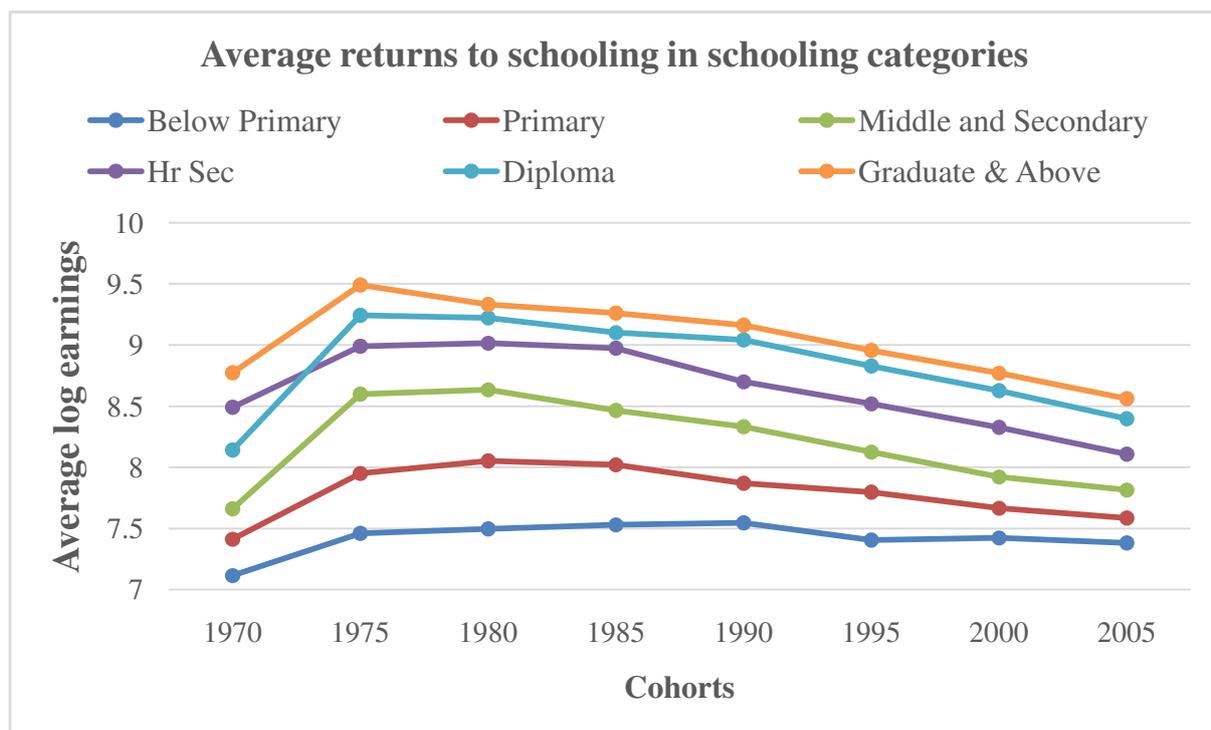
The subsequent National Policy of 1986 focussed on improving the access for the backward communities by means of increasing the number of scholarships, recruitment of teachers from the backward communities. Institutions of adult education were created particularly focussed on the backward areas. District Primary Education Program (1994) was launched for universalisation of primary education. The number of schools offering primary and upper primary education had gone up by 1.32 lakhs between 1990-91 and 2000-01. As primary enrolment increased, the average years of education also rose. The successor of DPEP, *Sarva Siksha Abhiyan* (SSA), was launched in 2000-01 with the aim of improving access and quality of education and retention through Mid-day meals program (Kingdon, 2007). Khera (2006) notes significant improvement in enrolment, attendance and retention following the introduction of mid-day meal program, especially for students belonging to disadvantaged sections.

The SSA had its limitations. The quality of education remains poor with students lacking basic reading and arithmetic skills (Bhattacharjea et al., 2013). The system is plagued by absenteeism of both student and teacher (Bhattacharjea et al., 2013). The expenditure on education by the government remains around 3.5-4% of GDP. The evidence also suggests that there is leakage in the system and concern over the quality of education. Nevertheless, it is hard to deny that the SSA played an important role in improving educational attainments at the school level. Schimd (2006) notes significant impact of DPEP on children from backward classes and female students, while Jalan and Glinskaya (1999) find significant impact, although not for females. The net effect of education in this period was, therefore, equalizing. This is also evident from Figure 7.

Figure 7 documents the path of average returns to education corresponding to the schooling categories. The returns for schooling categories till middle and secondary has improved from 1970 to 2005, the return has dropped for primary, middle and secondary since 1980. The return to diplomas has also improved. The returns from schooling categories from the higher secondary onwards has seen steady decline from 1975. Both the trend of stable returns to

schooling at the lower categories and falling returns at higher categories have contributed to the fall in earnings inequality as has been documented in Figure 4 and 5. The differential of average returns for Graduate and above with below primary has declined from 1975 to 2005.

Figure 7: Average returns to schooling (log earnings) in schooling categories for Urban labour force



5. Conclusion

India has experienced unprecedented growth since the 1990s, second only to that of China. Yet there have been growing concern that the fruits of this unprecedented rise in income are being too unevenly distributed. This has led to a society fractured by vertical and horizontal inequalities. This has created a demand to curb inequality through measures like subsidy and minimum income schemes. Such concerns were also reflected in the pre-Pulwama stage of the 2019 Parliamentary electoral campaign of both the Indian National Congress and Bharatiya Janata Party.

This paper argues that investing in education is another possible means of reducing earning-based inequality. However, the effectiveness of such investment depends upon the nature of such investment. In this paper we argue that if estimated year of education corresponding to mean log earnings is *less* than mean year of education the inequality will decrease. This, in

turn, requires investment in increasing mean years of education by focussing on primary and secondary levels of education. However, the demands of a rapidly growing industrial sector (under the Mahalanobis strategy) and service sector (after the liberalisation of the economy) had created demand for a highly skilled labour force. With education policy being directed towards serving these needs, education worsened earning-based distribution during the post-Independence period and from the mid-1980s. In contrast, the *Garibi Hatao* (Remove poverty) period of the 1970s and the drive to meeting Millennium Development Goals from the 1990s refocused education policy to school education, increasing mean years of education of the population. During these periods, education has played an important role in reducing inequality.

However, there is still much to accomplish to fully realise the potential of education in curbing earning-based inequality. The government expenditure on education. The government spending needs to be raised with focus on primary and secondary education which is found to be equity improving investments.

The investment in DPEP and subsequently Sarva Siksha Abhiyan have improved enrolment but concern remains over the quality of education as well as retention of children. Mid-day meal program was launched which has mixed success. The quality and quantity of the meal remains a concern. Thus expansion of nutrition quality of meal can improve outcome. The concern of such monitoring issues can be addressed better with the help of technology. Expansion of opportunities for students from the backward communities and girls through incentives like *Kanyashree* scheme is required so as to reduce the gap of access and subsequently horizontal inequality.

Before concluding, we should point out that the cohort-wise analysis was carried out using one period cross-section period. An interesting extension of the present study would be to use data from the available rounds and re-examine the relationship between education and earning-based inequality over time. This, however, is left as an exercise for the future.

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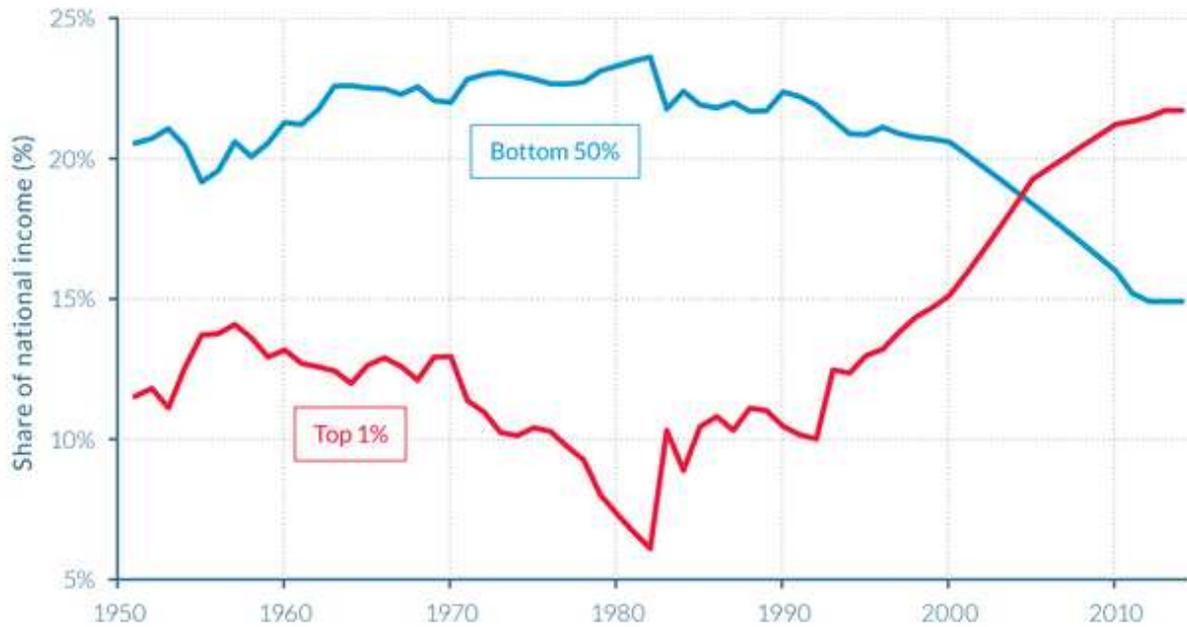
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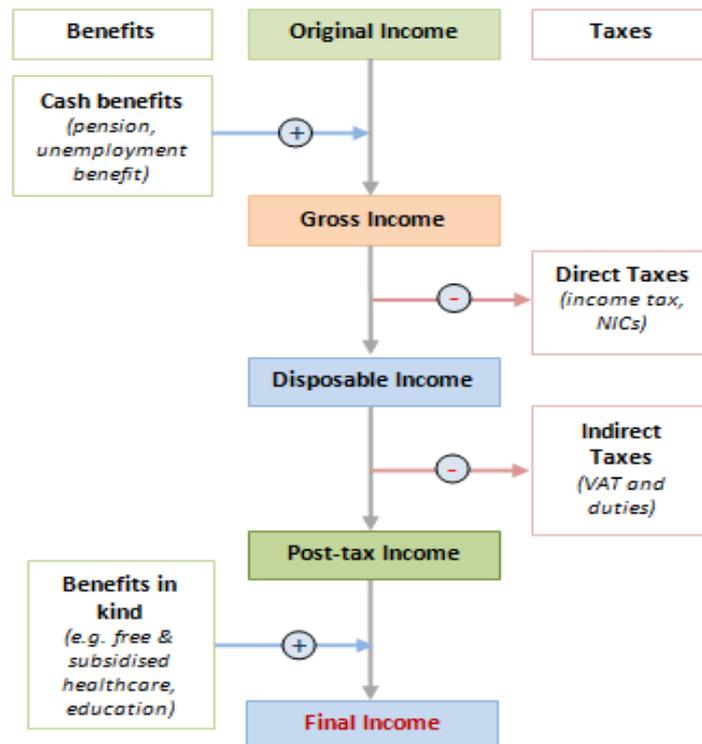
APPENDIX

Figure A1: Top 10% and Middle 40% income shares in India, 1951–2014



Source: Chancel & Piketty (2017)

Figure A2: Means to reduce income inequality



Source: ONS (2009) Economic and Labour Market Review, 3(1), January.

Table A1: Government Expenditure on Education as percentage of GDP

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brazil	..	4.76	3.80	3.95	3.84	3.75	..	3.97	4.48	4.87	4.97	5.27	5.46	5.65	5.74	5.86	5.84
India	3.41	3.62	4.48	4.38	..	..	3.66	3.40	3.23	3.19	..	..	3.31	3.42	3.84	3.87	3.84
Russian Federation	..	..	..	2.94	3.11	3.84	3.68	3.55	3.77	3.87	..	4.10	..	..	..	3.79	..
South Africa	..	..	5.88	5.44	5.16	5.07	4.86	5.07	5.06	5.07	4.97	4.87	5.25	5.72	5.96	6.37	6.01

Source: UNESCO (<http://data.uis.unesco.org/>)