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Income Inequality in Rural India: Decomposing the Gini by Income Sources

Mehtabul Azam
World Bank and IZA

Abusaleh Shariff
National Council of Applied Economic Research

Abstract

This paper examines income inequality in rural India in 1993 and 2005. It attempts to ascertain the contribution of different income sources to overall income inequality, and change in their relative importance between 1993 and 2005 through decomposition of Gini coefficient. The paper finds that income inequality has increased between 1993 and 2005. Agriculture income continues to contribute majorly in total income and income inequality; however its share in total income and total income inequality has declined significantly. A marginal increase in agriculture and salaried income leads to increase in inequality; however, a marginal increase in labor income (both agriculture and non-agriculture) lead to reduction in the income inequality.

At the time of writing, Mehtabul Azam was a graduate student at the Department of Economics, Southern Methodist University. The findings, interpretations, and conclusions expressed in this paper are those of the authors. They do not necessarily represent the views of the World Bank or National Council of Applied Economic Research.

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1 Introduction

A number of studies in recent years have tried to pinpoint the contribution of different sources of income to income inequality in developing world.[1] Such empirical studies help the policy makers to identify nature and character of income inequality within a society and devise policies to improve the distribution of income. A key rational for studying decompositions by source is to learn how changes in particular income source will affect overall inequality. What impact does a marginal increase in a particular income source have on inequality?

However, there exists no study for India which pinpoints the contribution of different income sources to income inequality (to our best knowledge). One of the possible reasons may be that incomes are not usually measured in developing country surveys and rarely in India. Instead, surveys in India have measured consumption expenditures or counts of household assets.

This paper uses a unique data from National Council of Applied Economic Research (NCAER) to study the income inequality in rural India in 1993 and 2005. The paper contributes to the existing literature in two ways. First, it provides a measure of income inequality for rural India for two years separated by more than a decade using nationally representative household surveys. Second, it estimates the contribution of different income sources to overall income inequality, and attempts to ascertain how the relative importance of these income sources have changed between 1993 and 2005. The time span between 1993 and 2005 is very important from policy perspective as India went through liberalization during the 1990s; however, no attempt is made in this paper to attribute the changes to liberalization.

In this paper we use the Gini coefficient as our preferred measure of inequality. This measure not only satisfies all the desirable properties of an inequality measure, but it is also decomposable by income source, which is something we are interested in.[2] Our concentration on rural India is motivated by two reasons. First, seventy two percent of the population resides in rural areas indicating that rural income inequalities must constitute an important source of overall income inequality. Second, the 1993 survey was implemented only in rural areas, and one of our objectives is to ascertain how contributions of different income sources have changed between 1993 and 2005?

The inequality in rural India, as measured by Gini index based on consumption expenditure, changed from 0.29 in 1993-94 to 0.30 in 2004-05 indicating that inequality has changed only marginally during the last decade.[3] However, the paper finds that inequality in rural India has increased from 0.46 to 0.50 between the same time period, once inequality is measured based on income rather than consumption expenditure.[4] The income inequality observed in rural India are comparable with income inequality observed in many developing

[1] For example, Kung and Lee (2001), Leibbrandt et al. (2000), Adams and Alderman (1992).

[2] These principles are: 1) Adherence to the Pigou-Dalton transfer principle, 2) Symmetry, 3) Independence of scale, 4) Homogeneity, and 5) Decomposability.

[3] Authors' calculation from the 50th and 61st rounds of National Sample Survey Consumption Expenditure data.

[4] The higher Gini based on income compared to based on consumption is not surprising as the difference occurs mainly because households at upper income do not spend all they earn and those at the lower income levels often consume more than they earn, hence consumption looks more equal than income.

countries such as Brazil (0.57), South Africa (0.62), Bolivia (0.42), Malaysia and Philippines (0.50) (Deininger and Squire, 1996).

The paper finds that farm income continues to be the most important source of income and income inequality in rural India; however, its importance has decreased significantly between 1993 and 2005. The decomposition in both years agree that two income sources – farm income and salaries – represent the inequality increasing sources of income, i.e., a marginal increase in these income will lead to increase in inequality, while income from casual labor – both from agricultural and non-agricultural activities – represents inequality decreasing source, i.e., a marginal increase in income from these sources will lead to reduction in inequality. The findings suggest that generation of labor opportunities outside agricultural activities can serve as a instrument to reduce income inequalities in rural India.

The remainder of the paper is organized as follows: Section II presents the framework which will be used to analyze the role of different income sources in determining income inequality as measured by Gini. Section III describes the data used, section IV presents the results, and section V summarizes the main findings and offers some conclusion.

2 Framework

Following Lerman and Yitzhaki (1985), the Gini coefficient for total income inequality, G, can be represented as:

$$G = \sum_{k=1}^{K} S_k G_k R_k \tag{1}$$

where S_k represents the share of component k in total income, G_k is the source Gini corresponding to the distribution of income from source k, and R_k is the Gini correlation between income from source k and total income ($R_k = cov\{Y_k, F(Y)\}/cov\{Y_k, F(Y_k)\}$), where $F(Y)$ and $F(Y_k)$ are the cumulative distributions of total income and income from source k.

Equation (1) permits us to decompose the influence of any income component upon total income inequality into three terms. As noted by Stark, Taylor, and Yitzhaki (1986), the relation among these three terms has a clear and intuitive interpretation; the influence of any income component upon total income inequality depends on:

- how important the income source is with respect to total income (S_k);
- how equally or unequally distributed the income source is (G_k);
- how the income source and the distribution of total income are correlated (R_k)

If an income source represents a large share of total income, it may potentially have a large impact on inequality. Even if the income from a source is equally distributed ($G_k = 0$), it can influence inequality: the larger the share, other things being given, the lower is the overall inequality. On the other hand, if the income source is large and unequally distributed (S_k and G_k are large), it may either increase or decrease inequality, depending on which households (individuals), at which points in the income distribution, earn it. If the income source is unequally distributed and flows disproportionately toward those at the top of the

income distribution (R_k is positive and large), its contribution to inequality will be positive. However, if it is unequally distributed but targets poor households (individuals), the income source may have an equalizing effect on the income distribution.

Lerman and Yitzhaki (1985) show that by using this particular method of Gini decomposition, one can estimate the effect of small changes in a specific income source on inequality, holding income from all other sources constant. Consider a small change in income from source k equal to eY_k, where e is close to 1 and Y_k represents income from source k. It can be shown that the partial derivative of the Gini coefficient with respect to a percent change (e) in source k is equal to

$$\frac{\partial G}{\partial e_k} = S_k(R_k G_k - G) \tag{2}$$

where G is the Gini coefficient of total income inequality prior to the income change. The percent change in inequality resulting from a small percent change in income from source k equals the original contribution of source k to income inequality minus source k's share of total income:

$$\frac{\partial G/\partial e_k}{G} = \frac{S_k R_k G_k}{G} - S_k \tag{3}$$

3 Data

Our data comes from two large scale household surveys conducted by the National Council of Applied Economic Research (NCAER). The first wave of the data (HDIP-I) was collected in 1993-94, and the second wave (HDIP-II) was collected in 2005. While the HDIP-I was a random sample of 33,230 households from rural India, located in 16 major states, 195 districts and 1,765 villages, the HDIP-II was administered across all over India covering both rural and urban areas.[5] We use only rural sample of the HDIP-II and restrict our attention to 16 major states which were part of 1993 sample to maintain comparability between 1993 and 2005.[6] The number of households in HDIP-II sample after restrictions is 25,294.

The total income is divided into six categories: 1) **Farm income (farminc)**: Value of production for sale and own consumption, and income generated from allied agricultural activities like cattle tendering 2) **Salaries**: Salaries from regular employment 3) **Agricultural wages (agrwage)**: Wages from casual employment in agriculture activities 4) **Non agricultural wages (nonagrwage)**: Wages from casual employment in non agriculture activities 5) **Self Employment (selfempl)**: Income from self employment 6) **Other sources (othersources)**: Income from rent, pension, remittances etc.

Although, both salaries and wages are generated through labor, the distinction arises from the nature of employment. While salaries comes from regular employment, wage income is generated through casual labor.[7]

[5]HDIP-II was jointly organized by the University of Maryland and the NCAER. The data collection was funded by grants R01HD041455 and R01HD046166 of the National Institute of Health and Human Development, Bethesda, MD, USA.

[6]Around 97% of total rural population reside in these 16 major states.

[7]Regular employed workers are defined as individuals who worked in others' farm or non-farm enterprises, and in return received salary or wages on a regular basis (i.e., not on the basis of daily or periodic renewal of work contract, which is defined as causal employment).

Each component of household income is normalized by household size to get per capita, and analysis is done on the per capita of income from different sources. Table 1 shows proportion of households receiving income from different sources, however it does not tell us importance of different sources which will be explored in next section.

4 The Decomposition Estimates

Despite the land reforms implemented in India, the land is not distributed in egalitarian manner. In addition, there is a substantial variation across India in terms of agricultural productivity. Given that majority of households derive income from agricultural activities, ex ante one would expect that farm income should be one major cause of income inequality. With liberalization, one would expect that importance of non agricultural activities should increase.

Table 2 and Table 3 present an ex-post, 'snapshot view' of the components of income inequalities in 1993 and 2005, respectively. As expected, the farm income is the major source of income in rural India in both the years; however, the share of farm income in total income has declined from 54 percent to 34 percent between 1993 and 2005. Importantly, the contribution of farm income in total inequality has decreased more than its share in total income. While farm income's contribution to inequality was 67 percent in 1993, it reduced to 39 percent in 2005. While the farm income has become more unequal in 2005, its share in total income (S_k) and its Gini correlation (R_k) has decreased leading to lower contribution in total inequality. Farm income has the highest and second highest Gini correlation in 1993 and 2005 (0.79 and 0.71, respectively), which implies farm income favored the rich more than any other income in 1993; however, in 2005 the salary income favor the rich more than farm income.

Agriculture wage labor income has the lowest Gini correlation followed by non-agricultural wage labor in both the years indicating that labor income benefits the poor more. Importantly, the share of agriculture and non agricultural wage labor income has increased significantly between 1993 and 2005. The share of non agricultural wage labor income almost doubled between 1993 and 2005. This may be due to many rural development schemes implemented by the government. The high level of inequality in agriculture and non agriculture wage labor income is because of large number of households have zero income from both these sources (if we calculate Gini index only for households who have access to these two sources of income, the inequality observed in 2005 is the lowest among these two groups, see Table 1). Both incomes have negligible contribution to income inequality in 1993, however in 2005, their shares in total inequality has increased to 3% and 7%, respectively. The share of salaries in total income has gone up between 1993 and 2005 and its share in total inequality has also gone up from 21% to 25%.

Next we move to explore what impact a marginal increase in a particular income source will have on the inequality and how the magnitude and direction of the marginal impact has changed between 1993 and 2005? A 1% increase in farm income, all else being same, increases the overall Gini by 0.13% in 1993. However, magnitude of the marginal impact of farm income has decreased between 1993 and 2005. In 2005, 1% increase in farm income, all else being same, increases the overall Gini only by 0.05%. A 1% increment in salary increases

the Gini by 0.06% in 1993 and 0.08% in 2005. The agricultural and non-agricultural labor income have negative marginal impact in both the periods and the magnitude of impact has increased marginally. Most importantly, self employment, which had a negative marginal impact in 1993 (1% increase in self employment income reduced Gini by 0.04%), has a positive marginal impact in 2005 (1% increase in self employment income increases Gini by 0.02%). This may be because of increased requirement of capital for self employed activities. This is also reflected in a much higher Gini correlation for self employment income in 2005. The Gini correlation for self employment income increased from 0.36 to 0.62, indicating that the self employment income is more correlated with total income in 2005, favoring relatively better off.

5 Conclusion

The paper examines the sources of income inequality in rural India in 1993 and 2005. It also attempts to ascertain the change in relative importance of different sources between 1993 and 2005. The paper uses Gini as a measure of inequality and finds that income inequality in rural India has increased from 0.46 to 0.50 between 1993 and 2005. Farm income continues to be the most important source of income and income inequality in rural India; however, its importance has decreased significantly between 1993 and 2005. The importance of salaried income has increased both as a source of income and income inequality.

The decomposition in both years agree that two income sources – farm income and salaries – represent the inequality increasing sources of income, i.e., a marginal increase in these income will lead to increase in inequality, while income from casual labor – both from agricultural and non-agricultural activities – represents inequality decreasing source, i.e., a marginal increase in income from these sources will lead to reduction in inequality. Importantly, the inequality decreasing effects of labor income has increased marginally between 1993 and 2005.

The findings have important policy implications. From the standpoint of government, it is easier to generate non-agricultural labor opportunities through public works leading to provision of better infrastructure in rural areas. Providing labor opportunities outside agricultural activities can serve multiple objectives: first, it can act as a poverty reduction intervention and provide safety net for the income shocks; second, it will help to reduce unemployment and under-employment in rural areas, and most importantly, it will reduce the income inequalities observed in rural areas.

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Table 1: **Households Characteristics**

	1993			**2005**		
	Proportion of households receiving income from source(P_k)	Gini(G_A)	Gini(G_k)	Proportion of households receiving income from source(P_k)	Gini(G_A)	Gini(G_k)
farminc	0.681	0.576	0.711	0.684	0.683	0.783
salaries	0.164	0.426	0.906	0.178	0.529	0.916
agrwage	0.321	0.452	0.824	0.394	0.453	0.785
nonagrwage	0.205	0.458	0.889	0.291	0.458	0.843
selfempl	0.222	0.444	0.877	0.167	0.557	0.926
othersources	0.065	0.524	0.969	0.288	0.753	0.929
total income	**1.000**	**0.455**	**0.455**	**1.000**	**0.496**	**0.496**

Notes : 1. G_A is the Gini income for income source when we only consider households with positive income from that source.
2. G_k is the Gini of the income source k when we consider all households, i.e., we include those households with zero income from that source. It is related to G_A as follows: $G_k = P_k * G_A + (1 - P_k)$.

Table 2: **Gini Decomposition by Income Source, 1993**

Income Sources	**Income Share** (S_k)	**Gini Correlation** (R_k)	**Gini Index** (G_k)	**Absolute Contribution** ($S_k * R_k * G_k$)	**Relative Contribution** ($S_k * R_k * G_k/G$)	**Relative Marginal Effect**
farminc	0.540	0.792	0.711	0.304	0.669	0.129
	(0.004)	(0.004)	(0.003)	(0.005)	(0.008)	
salaries	0.158	0.680	0.906	0.097	0.214	0.056
	(0.004)	(0.008)	(0.002)	(0.003)	(0.007)	
agrwage	0.092	-0.026	0.824	-0.002	-0.004	-0.096
	(0.002)	(0.012)	(0.002)	(0.001)	(0.002)	
nonagrwage	0.066	0.077	0.889	0.005	0.010	-0.056
	(0.002)	(0.015)	(0.002)	(0.001)	(0.002)	
selfempl	0.115	0.361	0.877	0.036	0.080	-0.035
	(0.002)	(0.011)	(0.002)	(0.002)	(0.004)	
othersources	0.029	0.495	0.969	0.014	0.031	0.002
	(0.001)	(0.015)	(0.001)	(0.001)	(0.002)	
total income	**1.000**	**1.000**	**0.455**	**0.455**	**1.000**	
			(0.003)	(0.003)		

Notes : Standard errors are in parenthesis. See text for further details.

Table 3: **Gini Decomposition by Income Source, 2005**

Income Sources	**Income Share** (S_k)	**Gini Correlation** (R_k)	**Gini Index** (G_k)	**Absolute Contribution** ($S_k * R_k * G_k$)	**Relative Contribution** ($S_k * R_k * G_k/G$)	**Relative Marginal Effect**
farminc	0.344	0.712	0.783	0.192	0.388	0.044
	(0.009)	(0.014)	(0.008)	(0.011)	(0.017)	
salaries	0.180	0.764	0.916	0.126	0.254	0.075
	(0.006)	(0.007)	(0.002)	(0.005)	(0.011)	
agrwage	0.130	0.132	0.785	0.013	0.027	-0.103
	(0.003)	(0.011)	(0.003)	(0.001)	(0.003)	
nonagrwage	0.129	0.308	0.843	0.033	0.068	-0.061
	(0.004)	(0.017)	(0.004)	(0.003)	(0.005)	
selfempl	0.116	0.619	0.926	0.067	0.135	0.018
	(0.004)	(0.015)	(0.002)	(0.004)	(0.008)	
othersources	0.101	0.673	0.929	0.063	0.128	0.027
	(0.004)	(0.013)	(0.002)	(0.004)	(0.008)	
total income	**1.000**	**1.000**	**0.495**	**0.495**	**1.000**	
			(0.007)	(0.007)		

Notes : Standard errors are in parenthesis. See text for further details.