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An Application of Distribution-Neutral Fiscal Policy

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An Application of Distribution Neutral Fiscal Policy

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Abstract

Distribution neutral fiscal policy refers to a structure of taxes and transfers that keep the income distribution unchanged even after positive or negative shocks to an economy. This is referred to as a Strong Pareto Superior (SPS) allocation which improves the standard Pareto criterion by keeping the degree of inequality, but not the absolute level of income intact. We apply this methodology to India to compute SPS tax rates and determine their proximity to actual tax rates. Limited available data on income and expenditure shows that the official policies so far are close to desired benchmark level. Our methodological contribution will be enriched further with more detailed income tax and transfer data.

JEL Classification Numbers: F11; J31; D63; H20; H23]

Keywords:Strong Pareto Superiority; Inequality; Compensation mechanism;

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Content

I. INTRODUCTION

Rising income inequality is now recognised as a major challenge facing many countries across the globe. Although policymakers have a menu of tools, fiscal policy is viewed as an important policy lever for addressing society's distributive concerns (See Clement, et al 2015). The purpose of this paper is to assess the feasibility of fiscal policy to neutralise the distributional impact of various positive or negative shocks faced by a society. These shocks could emanate from either internal or external sources. For this purpose, we revisit the well-known Pareto criterion and define a "better" state as the one where the degree of inequality remains unchanged with the use of taxes and transfers, but where every member of the society is better off. This allows us to introduce a new concept of Strongly Pareto-Superior (SPS) allocation. This approach is related to Burman et al (2006) in which they discuss how tax rates can be adjusted to keep the incidence of inequality contained to some extent. The SPS approach provides a theoretical foundation, welfare implications and a general distribution neutral mechanism of which the above paper will be a special case.[2]

In this regard, Marjit and Sarkar (2017) provide the theoretical background and examples from trade theory to illustrate the case of SPS. The underlying theoretical proposition is that whenever there is an increase in the value of income or utility with resultant distributional consequence, there would always be tax-transfer combinations which would keep the inequality at the level as before and make everyone better off relative to the initial situation.[3]This tells us that any Pareto efficient allocation can be manipulated through an appropriate tax-transfer mechanism into a distribution-neutral allocation.[4]

The empirical implication of the above proposition can be explained as follows. Given that there is always a fiscal policy mix that does not allow the inequality to worsen, the actual tax-transfer policies can be compared with a relevant counterfactual. This allows policymakers to assess the extent to which the actual policy deviates from an ideal counterfactual distribution. Such an experiment will reflect the difference between a neutral tax-transfer policy vis-à-vis the distributional consequence of changes in market income, or trade shocks. Bastagli, Coady and Gupta (2015) have discussed the effectiveness of fiscal policy by looking at the difference between market income Gini and disposable income Gini for a host of developing countries. In this paper, we work out the exact tax-transfer amount needed to replicate the Gini of a reference disposable income distribution. This is done by scaling up the initial income vector by the ratio of a mean of post change to pre-change distribution. Datt and Ravallion (1992) in a seminal contribution studied the decomposition of overall poverty in terms changes in growth and inequality. Our approach is somewhat similar.

Our paper is laid out as follows. In the next section, we provide a brief description on inequality measurement. In section 3 we provide discussions of some theoretical ideas of

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[2]In an interesting contribution Antras, Gortari and Itskhoki (2016) studies the welfare implications in the case when trade opening in a world raises not only aggregate income but also income inequality. The authors addresses the way in which redistribution needs to occur via a distortionary income tax-transfer system. Recently Ostry et al. 2014 have addressed this issue on the evolution of inequality and redistribution.

[3] We do not discuss the issues of social mobility in this paper. Interested readers are referred to Ravallion and Lokshin (2000).

[4] Also see Boadway et al (2010) and Kaplow (2011) for a discussion on related issues.

construction of SPS. In section 4 we provide two empirical examples. Finally, we conclude in section 5.

II. INEQUALITY MEASUREMENT

In this section, we provide a discussion on the measurement of income inequality. We begin with some well-known axioms or postulates that any income inequality measure must satisfy. We then discuss some standard inequality measures proposed in the literature. We also provide a discussion on the Lorenz curve that stands as a basic tool for inequality ordering.

Throughout this paper, we assume that a society has been observed for two time points. Let $Y_0 = (y_{01}, y_{02}, .., y_{0n})$ be the initial income distribution, where y_{0i}stands for the income of the i^{th}individual$\forall i \in \{1,2,..,n\}$. Similarly,$Y_1 = (y_{11}, y_{12}, .., y_{1n})$ denotes the income distribution at time point 1.

We denote time point as *t*, where *t* takes value 0 for initial time period and 1 for the final time period. The income of all individuals is observed for both the periods. The mean income at time period *t*is $\mu_t = \frac{\sum_{i=1}^{n} y_{ti}}{n}$.

Inequality index is a scalar measure of interpersonal income differences within a given population. The class of inequality measures can be classified in two broad types, namely the relative and the absolute inequality measures. The relative inequality measures satisfy the scale invariance property, i.e., the inequality measure should remain unchanged if we multiply income of all individuals by a positive scalar. The absolute inequality measures are translation invariant, i.e., these inequality measures should remain unchanged if we change the origin by a positive scalar. Kolm (1976 a, b) has referred the absolute and the relative inequality measures as the rightists and leftists inequality measures, respectively.

The leftist inequality measures assigns a higher weight to the bottom of the income distribution. This can be illustrated as follows: consider the following income distribution$Y = \{1,100\}$. Now following the relative inequality measure inequality should remain unchanged if we multiply the income of both individuals by a positive scalar. If we choose this scalar as 10, the new distribution becomes $Y^* = \{10,1000\}$. If we observe $Y\ and$ Y^* closely, the poorer individual has gained only 9, whereas the richer individual has gained 900. The relative inequality remains unchanged despite the fact that absolute income differences between individuals increase. Notwithstanding this problem, the relative inequality index is widely used. This is because it is simple and because income inequality measures do not depend on the choice of the units. That is income inequality measured in dollars or pounds will exhibit same values.

We now discuss the following axioms that both absolute and relative inequality measures are expected to satisfy. We begin with the transfer axiom.

Transfer Axiom (TRANS):

A progressive transfer of income is defined as a transfer of income from a person to anyone who has a lower income so that the donor does not become poorer than the recipient. A regressive transfer is defined as a transfer from a person to anybody with a higher income, keeping their relative positions unchanged. This axiom requires that inequality should decline and increase as a result of progressive and regressive transfer, respectively. If the income distribution is ordered either in an ascending or in a descending order, then the transfers cannot change the rank orders of the individuals. Hence, these transfers are sometimes referred as rank preserving transfers.

Symmetry (SYM)

This axiom requires that an income measure should not distinguish individuals by anything other than their incomes. This axiom is also referred as an anonymity axiom.

Normalization axiom (NOM)

This axiom states that if for a society income of all individuals are same then there is no inequality. Eventually any inequality index that satisfies this axiom should take the value zero. This axiom always ensures that an inequality measure takes non-negative values.

The population replication invariance axiom (PRI)

This axiom states that inequality measurement should be invariant for replication of incomes. This implies that any inequality measure satisfying this axiom should be invariant between $\mathrm{Y} = \{2,3\}$and $\mathrm{Y}^* = \{2,3,2,3,2,3\}$. This is because Y^* is obtained following three-fold replication of incomes of Y. Following this axiom, we can compare two income distributions with different population size. For example, consider $\mathrm{Y} = \{2,3\}$and$\mathrm{X} = \{1,2,3\}$. If the inequality index is population invariant, then we can compare $\mathrm{Y}^* = \{2,3,2,3,2,3\}$and $\mathrm{X}^* = \{1,2,3,1,2,3\}$.

We now discuss on the functional form of some well-known indices that satisfies these axioms. We begin with the Gini index which takes the following functional form:

$$\mathrm{G}ini(Y_t) = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}|y_{ti}-y_{tj}|}{2n^2\mu_t} \qquad (1)$$

$Gini(Y_s)$is a relative inequality measure. It satisfies TRANS, SY, NOM and RI.

Another widely used family of indices that satisfies all these axioms is the Atkinson (1970) index. The formula is the following:

$$I_A(Y_t,\theta) = 1 - \frac{\sum_{i=1}^{n}(\frac{y_{ti}^{\theta}}{n})^{\frac{1}{\theta}}}{\mu_t}, \text{ if } \theta < 1 \text{ and} \theta \neq 0.$$

$$=1 - \frac{\Pi_{i=1}^{n} y_{ti}^{\frac{1}{n}}}{\mu_t} \qquad (2)$$

The parameter θ in the above formula represents a transfer sensitivity parameter. Hence, a progressive transfer will reduce $I_A(Y_t,\theta)$ by a larger amount the lower the income of therecipient of the transfer.

Now we provide a discussion on the Generalized Entropy Index.

$$I_{GE}(Y_t,\alpha)=\frac{\sum_{i=1}^{n}[\left(\frac{y_{ti}}{\mu_t}\right)^{\alpha}-1]}{n\alpha(\alpha-1)},\text{ if }\alpha\neq 0,1$$

$$=\frac{\sum_{i=1}^{n}[\log\left(\frac{\mu_t}{y_{ti}}\right)]}{n}\text{if}\alpha=0$$

$$=\frac{\sum_{i=1}^{n}\frac{y_{ti}}{\mu_t}.\log\left(\frac{y_{ti}}{\mu_t}\right)}{n}\text{if}\alpha=1 \quad (3)$$

The parameter α represents different perceptions of inequality. We get the Theil (1972) meanlogarithmic deviation and the Theil (1967) entropy indices of inequality for $\alpha = 0$ and $\alpha = 1$ respectively. For$\alpha = 2$, becomes half the squared coefficient of variation. This index has an advantage among other indices in the sense that its subgroup is decomposable. That is overall inequality following this index can be decomposed into (i) inequality within each of the subgroups and (ii) inequality between subgroups captured by the variations in average levels of income across these subgroups.

In certain cases, it is possible that inequality ordering for two distributions may depend on the choice of indices. For example, consider the two income distributions $X = \{2,4,5,9,13\}$ and $Y = \{1,5,6,8,12\}$. Following the inequality measures discussed so far we have $Gini(X) = 0.33$, $Gini(Y) = 0.28$, $I_{GE}(Y,0) = 0.26$ and $I_{GE}(X,0) = 0.20$. Thus, following Gini index, inequality in X is higher than that of Y. On the other hand, following the Theil's measure inequality in Y is higher than that of X.

Researchers often expressed interest on whether different inequality indices can rank alternative distributions of income in the same way. One may consider the Lorenz curve in order to address this issue. Before we address this issue let us formally define Lorenz curve.

Assume that the income distribution $Y_t = \{y_{t1}, y_{t2}, .., y_{tn}\}$is designed in an ascending order, i.e., $y_{ti} > y_{tj}$wheneveri $>$ j. For any income distribution ordered in an ascending order Lorenz curve represents the share of the total income enjoyed by the bottom p% of population. The Lorenz curve is defined as the plot$L\left(Y_t,\frac{k}{n}\right)=\frac{\sum_{i=1}^{k}y_{ti}}{n\mu_t}$ against$p$where $p=\frac{k}{n}$.

Note that 0% of the population enjoys 0% of the total income. Further, 100% of the population possesses the entire income. Hence, the curve starts from the south-west corner with coordinates (0,0) of the of unit square and terminates at the diametrically opposite north-east corner with coordinates (1,1). In the case of perfect equality, Lorenz curve coincides with the diagonal line of perfect equality, which is also referred to as the egalitarian line. This follows from the fact that if everybody has equal income then every p% of the population enjoys p% of the total income. In all other cases the curve will lie below the egalitarian line. If there is complete inequality, i.e., in a situation where only one person has positive income and all other persons have zero income, the curve will be ***L*** shaped. That is the curve will run through the horizontal axis until we reach the richest person where it will rise perpendicularly. Lorenz curve is useful because it shows graphically how the actual distribution of incomes differs from the line of equality (i.e., the egalitarian line). Gini index of inequality is simply twice the area enclosed between the Lorenz curve and the diagonal line representing perfect equality.

In the context of Lorenz curve one important concept is that of Lorenz dominance. Any income distribution *Y* is said to be Lorenz dominant income distribution *X* if the Lorenz curve of *Y* lies strictly above X for at least one point and not below X at any of the point. In this context, we can also refer that inequality in *Y* is less than that of X, for all relative inequality measures that satisfies SYM, TRANS, and PRI. These class of measures is also referred as **Lorenz consistent** inequality measures.

III. THEORETICAL SET UP

In this section, we discuss the details of construction of SPS allocations. Recall that SPS allocations require everyone in time point 1 is better off than at time point 0. Further inequality should not worsen. We first construct SPS preserving relative inequality. Suppose $Y_0 = (y_{01}, y_{02}, .., y_{0n})$ is the initial and $Y_1 = (y_{11}, y_{12}, .., y_{1n})$is the the distribution after the change. We denote $\hat{Y} = \{\hat{y}_1, \hat{y}_2, .., \hat{y}_n\}$ as a counterfactual which qualifies as a relative SPS if and only if:

$\hat{y}_i > y_{0i}$for all $i \in \{1,2, .., n\}$(4a)

$$I_R(Y_0) = I_R(\hat{Y}) \qquad (4b)$$

$$\sum \hat{y}_i = \sum y_{1i}. \qquad (4c)$$

whereI_R stands for any relative inequality measure that remains invariant to choice of scale of income distribution. Following Marjit and Sarkar (2017) if there is growth in the economy one can always generate a tax transfer mechanism such that condition 4a and 4b are jointly satisfied. There are infinitely many ways under which equations 4a and 4b are satisfied. For example, if we choose$\hat{y}_i = \theta y_{0i}$, and consider $\theta > 1$. The parameter θ must be chosen such that $\hat{Y}$ is feasible i.e., $\sum \hat{y}_i \leq \sum y_{1i}$. Following Marjit and Sarkar (2017) $\theta = \frac{\mu_1}{\mu_0}$ turns out to be the unique solution of (4a), (4b) and (4c).[5]In order to derive $\hat{Y}$ we must tax a set of individuals and redistribute the collect tax to the rest. This tax transfer vector is denoted by$\hat{T} = \{\hat{T}_1, \hat{T}_2, .., \hat{T}_n\}$, where $\hat{T}_i = y_{1i} - \frac{\mu_1}{\mu_0} y_{0i}$. Now if $\hat{T}_i > 0$ then the individual *i* has to pay tax, else she receives subsidy. We compute the tax rates corresponding to relative SPS in the following fashion:

$$tax\_RSPS_i = 100 \times \frac{\hat{T}_i}{y_{1i}} \qquad (5)$$

There are several notable properties of $\hat{Y}$. The Lorenz curve of $\hat{Y}$ coincides with that of Y_0.Note that $\hat{Y}$ preserves only relative inequality. In order to preserve absolute inequality we

[5] Note that if $\theta < \frac{\mu_1}{\mu_0}$ one can better off such an allocation. This is because there remains some additional resources which can be further redistributed in order to make everyone better off. Thus whenever $\theta < \frac{\mu_1}{\mu_0}$ the allocation is not Pareto Optimal. Marjit and Sarkar (2017) refers the allocation with $\theta = \frac{\mu_1}{\mu_0}$ as the Best Strong Pareto Superior (BSPS) condition. In this paper by SPS we refer to the BSPS because we are only concerned with allocations on the frontier.

consider another counterfactual distribution $\bar{Y} = \{\bar{y}_1, \bar{y}_2, \dots, \bar{y}_n\}$. $\bar{Y}$ qualifies as an absolute SPS if and only if the following conditions are satisfied:

$$\hat{y}_i > y_{0i} \text{for all } i \in \{1,2,..,n\} \quad (6a)$$

$$I_A(Y_0) = I_A(\hat{Y}) (6b)$$
$$\text{and } \sum \hat{y}_i = \sum y_{1i}. \quad (6c)$$

where $I_A()$ is an inequality index which is independent of the choice of origin. Following Marjit and Sarkar (2017) the counterfactual distribution takes the following form

$$\bar{y}_i = \mu_1 - \mu_0 + y_{0i} \quad (7)$$

The tax transfer in this context is $T_A = \{\bar{T}_1, \bar{T}_2, \dots, \bar{T}_n\}$ where $\bar{T}_i = y_{1i} - \bar{y}_i = y_{1i} - \mu_1 - \mu_0 + y_{0i}$.

The absolute tax rates becomes

$$tax\_ASPS_i = 100 \times \frac{\bar{T}_i}{y_{1i}} (8)$$

In the next section, we show some empirical examples in order to compute tax_RSPS_i and tax_ASPS_i.

IV. Empirical Examples

In this section, we present some examples based on Indian data in to order to illustrate the applicability of the proposed methodology. We use two data sets for this exercise. The first one is National Sample Survey Office (NSSO) of India. The second example is from Indian Human Development Survey (IHDS).[6]

A. Example 1: NSSO Data

India began to liberalize in the 1980s. A structural change took place in policies, such as loosening of government regulations, especially in the area of foreign trade. Many restrictions on private companies were lifted, and new areas were opened to private capital. The Indian per capita GDP averaged between $350.67 in 1988 and $1,446.99 in 2012. It has been accompanied by rising inequality as measured by Gini; it rose from 0.35in 1988 to 0.40 in 2012 (see table A1). We use our approach to demonstrate how rising inequality can be mitigated while ensuring that the benefits of growth are widespread.

We use data from NSSO quinquennial rounds on consumption and expenditure to construct the SPS allocations. NSSO was established by the Government of India in 1950. NSSO provides a time series data on household surveys covering different socio-economic aspects of the population. In this exercise, we use the latest six rounds of quinquennial rounds of consumption and expenditure data. These rounds are the 43rd, 50th, 55th, 61st, 66th and 68th.

[6] Note that both these survey data grossly under represents the presence of individuals with very high income (say top 1%). This may actually underestimate the gross inequality of the society. We do not have scope to address this issue in the present paper.

The surveys have been conducted for the period June 1987–July 88, June 1993–July 94, June 2004– July 05, June 2009–July 10 and June 2011–July 12, respectively. The quinquennial rounds are also referred to as thick rounds, representing sample for the entire India. In the consumption and expenditure surveys one important variable is the monthly per capita expenditure (MPCE). Average MPCE of any region or population group is a single number that summarises the standard of living of that population. It is supplemented by the distribution of MPCE, which highlights the differences in standard of living across different population groups. MPCE reveals the proportion and absolute numbers of the poor with respect to a given poverty line. The distribution of MPCE can be used to measure the level of inequality, poverty and related development indicators. In the present study, we use MPCE to construct SPS tax rates. Note that an important aspect in the context of collecting data on consumption and expenditure is the recall period by respondents. In this study, we use uniform recall period, where data for all the items is collected on a uniform recall period of 30 days.[7] Note that MPCE is a monthly figure. Since, our objective is also to compare the government tax rates hence we convert this monthly figures to annual numbers, and label it "*Annual Per Capita Expenditure* (APCE)". Throughout this paper, we rely on nominal figures. Thus, any reference to APCE/MPCE in the rest of this paper would imply nominal APCE/MPCE.

In emerging economies such as India, there are several issues that arise in collecting income data. First, there is tax evasion that leads to an understatement of actual incomes. Second, many households have multiple sources of income, making it difficult for them to recall all of them. Third, measuring inequality with expenditure data can be problematic. The poorer groups save less compared to the rich and hence inequality will be underestimated. Notwithstanding these limitations, in this example we construct SPS based on the consumption data.

We use June 1987–July 88 (43rd round) as the reference period. We thus construct the SPS allocations that preserve the inequality of 43rd round. This reference period is the pre-liberalization period. We thus have the option to not only control inequality as that in the pre-liberalization period, but also to ensure that everybody enjoys the gains.

We first study how inequality in India has changed in the span of 20 years. We present different inequality measures discussed earlier for different NSSO rounds. We use sampling weights for these computations. In Figure 1, we plot inequality measures Gini and Variance in the vertical axis and time (NSSO rounds) on the horizontal axis. Thus we incorporate a relative (Gini) and an absolute (Variance) inequality measure. In the same figure we also present the mean APCE for all the rounds. In the appendix of this paper we present other inequality indices discussed in Section II of this paper. Following Figure 1, it is readily observable that Gini first declines (from round 43rd to 55th) and then starts increasing. However, variance and mean APCE is steadily increasing in this period.

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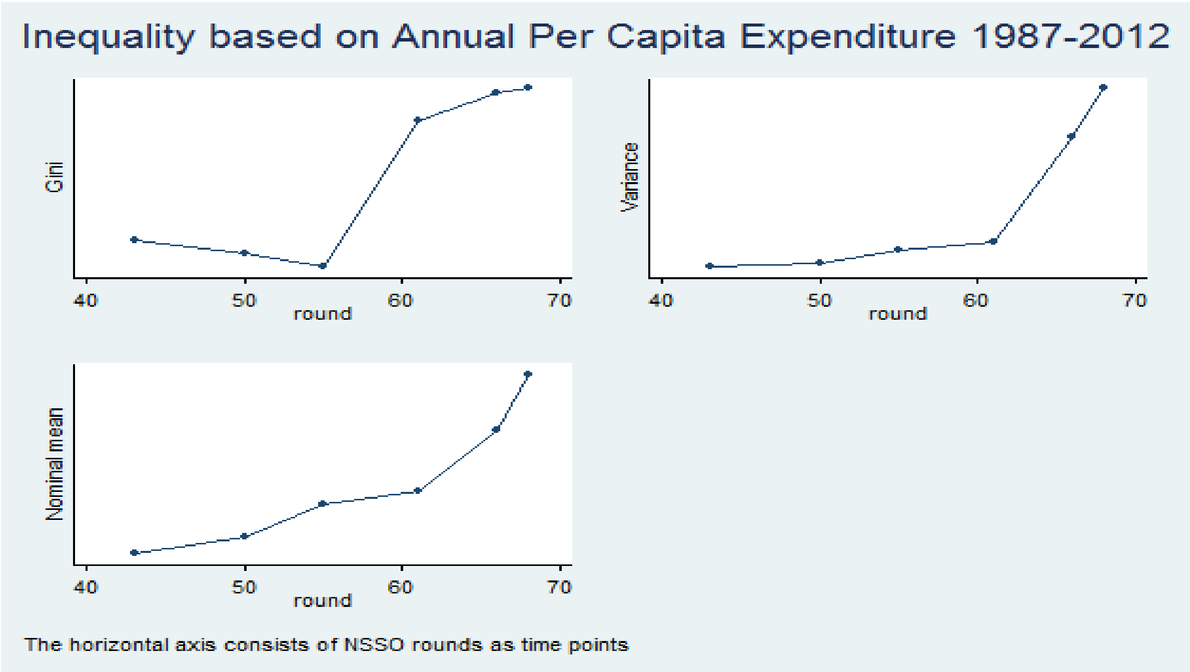
[7]NSSO use two types of recall periods, namely the Uniform Recall Period (URP) and the Mixed Recall Period (MRP). In a URP data on all items is collected on a recall basis of thirty-days basis. In a MRP data for frequently used items (food) are collected on a recall basis of 30 days. On the other hand, in a MRP data on less frequently items is collected on a thirty-days basis. However, for durable goods, expenditure on health, education, clothing, etc. are collected on a recall period of 365 days.

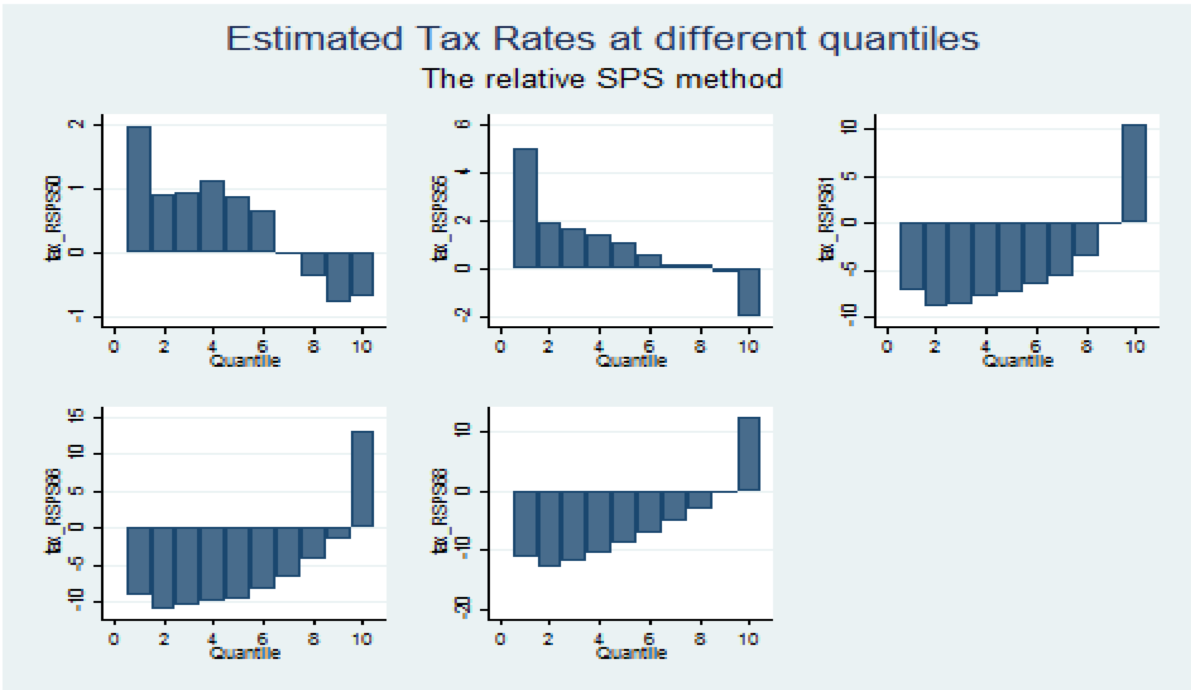
Figure 1. Inequality Based on Annual Per Capita Expenditure, 1987–2012



In order to compute SPS tax rates we divide the entire population (for a particular round) into 10 groups. These groups are formed on the basis of the position of an individual in the income quantile. Thus, if an individual lies in the i^{th}quantile, we assign her to the i^{th} group ($i \in \{1,2,..,10\}$). We create these groups for all the six NSSO rounds. In table A2 we present the mean APCE of individuals at different quantiles. We create the SPS allocations considering the mean incomes of these groups as representative income. We ignore any possible inter group inequalities. In all cases, we consider the reference frame or initial income distribution as round 43.

We have five NSSO rounds. For the computation of tax rates we need an initial time point and a final time point. For all the cases we consider 43^{rd} round as the initial time point. Now we define **tax rates_RSPS50** as the relative SPS tax rates with round 43 as the initial time point and 50^{th} round as the final time point. Similarly, we define RSPS55 considering 43^{rd} round as the initial time point and 55^{th} round as the final time point. The computational details have been provided in equations 9a and 9b (mathematical appendix). We present the relative SPS tax rates in Figure1. The bar's in this figure represents the tax rates at different quantiles. If the entries (bar) in the figure lie in the positive orthant it implies that the group has to pay tax. On the other hand, if the same entry lies in the negative orthant then the group will receive transfer. For exact figures on the tax and transfer rates see Table A4.

Figure 2. Estimated Tax Rates at Different Quantile: The Relative SPS Method



Note: tax_RSPS50, tax_RSPS55, tax_RSPS61, tax_RSPS66, tax_RSPS68imply relative SPS tax rates with round 43 as the initial distribution and round 55, 61, 66, and 68 respectively, as the final distribution. The formula for computations is provided in the mathematical appendix (equation 9a and 9b). Positive rates implies (above the horizontal line) tax and negative (below the horizontal line) implies transfer.

Following figure 2, tax rates "*tax_RSPS50*" and "*tax_RSPS55*" have positive entries at the bottom of the distribution and negative entries at the top quantiles. This implies that in the SPS allocation the poor pay taxes whereas the rich receive transfers. This occurs because most of the relative inequality measures show a decline of inequality from43rd through 50th rounds. Applying SPS in this context implies that inequality would increase as the rich receive transfers whereas the poor pay taxes turning the tax system regressive. Considering 43rd round as the initial distribution and 61st, 66th and 68th round as the final distribution we get tax rates tax_RSPS61, tax_RSPS66 and tax_RSPS68, respectively. Following figure 1 we find unlike tax_RSPS50 and tax_RSPS55 only the richest quantile has to pay tax, whereas the rest enjoys transfer. Also note that given inequality in round 61 is higher than that of round 68, hence the tax rates increase. That is while the tax rate is 10.51percent in round 61 it becomes 12.35 percent in round 68 (also see table A4).

We now move on to compute tax rates that preserve absolute inequality. That is, we use the absolute SPS rates given in equation 9c and 9d in the appendix. In figure 3 we present absolute SPS tax rates for different quantiles. Note that the entries tax_ASPS50, tax_ASPS55, tax_ASPS61, tax_ASPS66 and tax_ASPS68 are computed using 43rd round as the initial distribution and 50, 55, 61, 66, and 68th round, respectively as the final distribution. Incorporating these tax rates would imply that absolute inequality indices like variance for all rounds will be same as that of 43rd round. Following figure 3 (also see Table A4) we find that the for all cases the richest three quantiles (8, 9 and 10th) have to be taxed and the rest enjoy a transfer. If we observe closely the tax rates are much higher than under RSPS tax rates. Furthermore, the transfer to be made to the poor to keep variance same as the 43rd round is much higher than under RSPS transfers. For example, the transfer rate in the

68th round turns out to be 11 percent and 204 percent in tax_RSPS68 and tax_ASPS68, respectively. This is because from 1987–88 to 2011–12 variance has increased much higher compared to the Gini. is much higher than that of the relative inequality indices like Gini. Hence, in order to preserve absolute inequality the tax and transfer rates have to be relatively high.

Figure 3. Estimated Tax Rates at Different Quantile: The Absolute SPS Method

Note: tax_ASPS50, tax_ASPS55, tax_ASPS61, tax_ASPS66, tax_ASPS68 imply absolute SPS tax rates with round 43 as the initial distribution and round 50, 55, 61, 66, and 68 respectively, as the final distribution. The formula for computations has been provided in the mathematical appendix (equation 9c and 9d). Positive rates implies (above the horizontal line) tax and negative (below the horizontal line) implies transfer.

B. Example 2: India IHDS Data

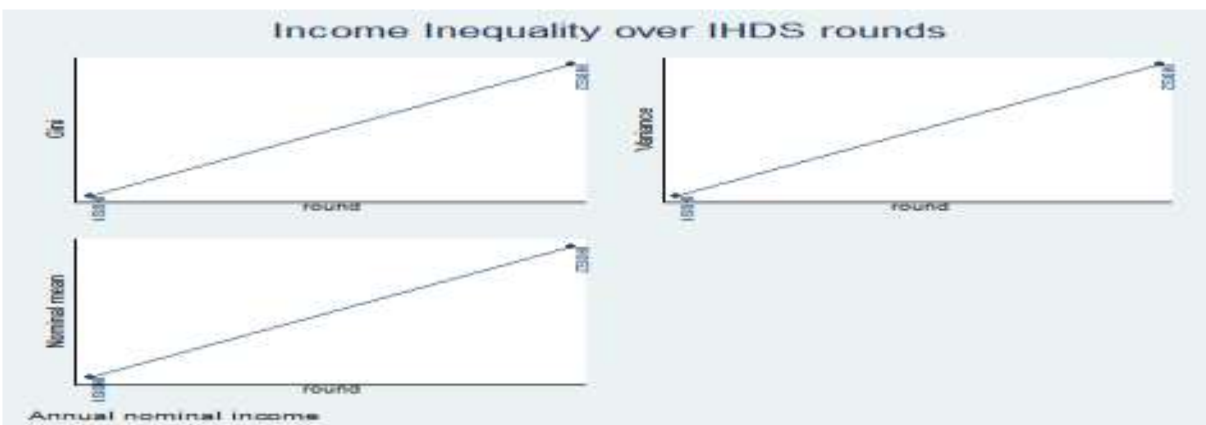
The India Human Development Survey (IHDS) is a nationally representative, multi-topic survey of households in India. The survey consists of two rounds. The first round was completed in 2004–05. The second round was conducted in 2011–12. This is a panel data. That is, in the second round most households in 2004–05 were interviewed again. From here onwards we denote IHDS data for 2004–05 and 2011–12 as IHDS1 and IHDS2, respectively. Throughout this exercise, we consider IHDS1 as the initial time point and IHDS2 as the final time point.

IHDS is one of the first Indian surveys to collect detailed income data. Income from 50 different sources is considered. In this survey, 0.9 percent of the households report negative incomes, reflecting crop failures and/or high expenses in certain cases. One of the most important component of income in this data set is farm income. Another important component is wage and salary income, which includes meals, housing benefits, and bonuses. IHDS divides wage and salary incomes into three sub-categories: **a)** salary income earned monthly or annually (rather than daily); **b)** agricultural daily wages; and **c)** nonagricultural daily wages. Combining all income sources (farm income, non-farm income, wage and salary etc.) IHDS presents annual income for households. Furthermore, data on several sources of cash and noncash support are included in the total income estimate. Market value of own products consumed by a household are included. It should be noted that IHDS contains information's on rich households (especially those engaged in agriculture) who do not pay taxes. Since we do not have information on whether a household pays tax or not we do not take this into account.

Our main objective in this exercise is compare SPS tax rates to tax rates set by the government of India. For this exercise we rely on total household income (unlike per-capita figures used in the previous case). This is because minors, housewife etc. usually do not pay taxes. Furthermore, IHDS reports only total income (instead of individuals). Nevertheless, this is limited to certain extent because we are assuming that there is only one tax-payer in the household. We also consider annual nominal total income, because income tax is imposed on an annual basis. We drop households that reports negative income.

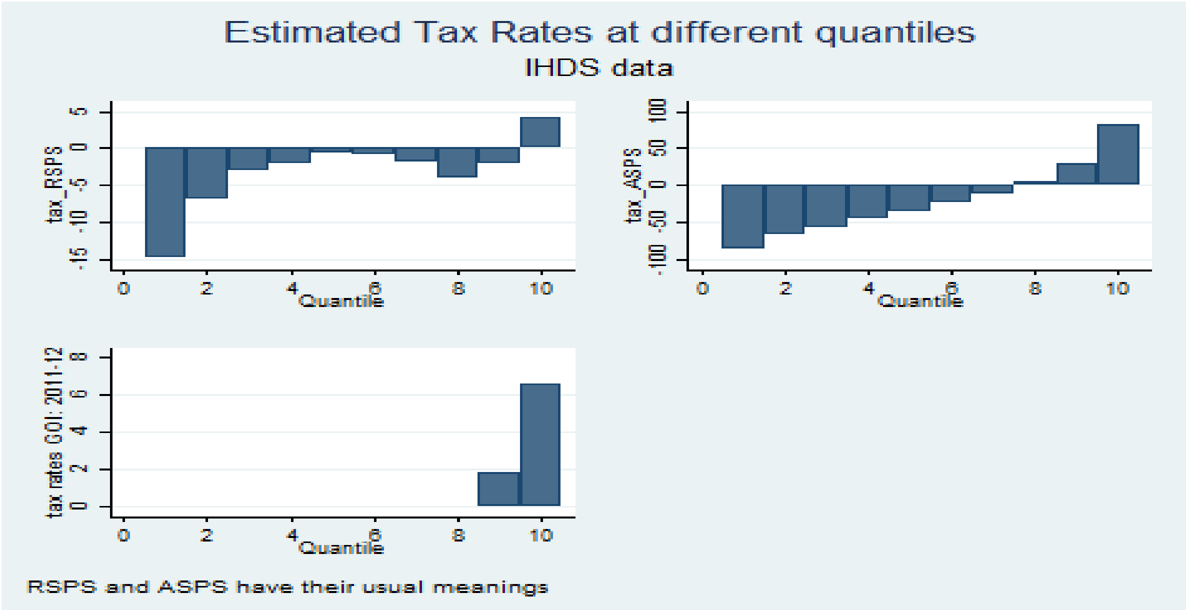
Before we move through the computation of SPS tax rates we focus on the issue how inequality has changed from IHDS1 to IHDS2. We present the inequality measures for these two rounds in figure 4. It is readily observable that relative and absolute inequality (i.e., Gini and Variance) has increased from 2004–05 to 2011–12. The nominal mean has also increased. A detailed table with some additional inequality measures is provided in Table A1 (appendix).

Figure 4. Income Inequality Over IHDS Rounds



We are now ready to compare the SPS tax rates to that of government tax rates. In continuation with the previous cases here also we neglect intra group inequality. We form 10 income quantiles and consider mean income of these ten groups as representative income. In Table A2 we present incomes for the two IHDS rounds. In the same table, we also present the SPS tax rates considering IHDS1 and IHDS2 as the initial and final distribution. We present the tax rates for ASPS and RSPS. The computation of these tax rates is almost similar to the NSSO example, except for the fact that here initial distribution is IHDS1 and final distribution is IHDS2.In order to compare the SPS tax rates to the Government of India tax rates we present the tax rates for the year 2011–12. We present the tax rates in figure 5.

Figure 5. Estimated Tax Rates at Different Quantile (IHDS data)



Notes: The computation of the relative and SPS tax rates is similar to the NSSO example, with initial distribution as IHDS1 and IHDS2 as the final distribution. GOI-tax 2011-12 represents the Government of India tax rates. The government tax rates is obtained as 100*total tax paid/total income.

In the above figure (also see Table A6), we denote tax RSPS and tax ASPS as the relative and absolute tax rates, respectively. It is readily observable that the relative tax rates are negative for the first 9 quantiles. This implies that this groups receives transfers. On the other hand, for the richest quantiles the tax rate is positive.[8] The richest quantile pays tax and the rate is 4.08%. For the sake of comparison, we also present the tax rates by the Indian government for the year 2011–12. We observe that the richest two quantiles fall in the tax slab Rs160000–500000 (see table 10). Following our computations, the tax rates for these two quantiles turns out to be 1.79% and 6.65%.[9]

In the context of absolute SPS tax rates we observe that the absolute tax rates are relatively high for the richer quantiles compared to the Indian government tax rates and also to that of the relative SPS tax rates. Further, the transfer rate is also higher for the poorer groups. Recall that this is to a large extent similar to the findings of the NSSO data example.

The future research could focus on the design of transfer programs, whether they should be direct cash transfers or in-kind transfers in the form of spending on education or health care.

[8] Note that a single tax rate adjustment at the uppermost quantile is not enough to preserve the overall inequality. The rest of the quantiles must receive a transfer.

[9] We compute the government tax rates as 100*total tax paid/annual income of the deciles that falls in the tax slab. For example, notice that the income of the richest deciles in the IHDS2 is 477512.1. If an individual earns this income he has to pay tax of 10% of income that exceeds 160000 (See Table A5). Thus the total tax to be paid is (477512.1-160000)*0.1=31751.12. Thus the tax rate turns out 6.65%.

V. Conclusion

In this paper, we provide an application of a distributional neutral fiscal policy whose foundation is provided by the Strong Pareto Superior (SPS) condition introduced in Marjit and Sarkar (2017). In order to focus on inequality-neutral or distribution neutral Pareto superior allocation we introduce SPS allocation which guarantees higher individual welfare keeping the degree of inequality same as before. Whenever the society experiences aggregate gain one can compute the SPS allocation by taxing a subgroup of population and redistributing the collected tax to the rest of the population. The construction of SPS is different when relative and absolute inequality is preserved. The SPS allocation preserving the relative inequality is obtained by redistribution of the aggregate gains among the individuals proportional to their utilities of the initial distribution. On the other hand, the SPS allocation which preserves absolute inequality is obtained by equally distributing the aggregate gains among all the individuals. SPS is a general condition and whenever there is growth in the society one can generate both relative and absolute SPS uniquely.

This paper provides an empirical illustration considering both expenditure and Income data. These data sets are obtained from National Sample Survey Office (NSSO) and Indian Household Development Survey (IHDS). Following NSSO data we observe that the Gini coefficient has increased nearly by 12.5 percent (0.35 to 0.40) from 1987–88 to 2011–12. In order to preserve the inequality, we need to tax the richest income quantile slightly higher than 10 percent. Further, the poorest quantiles must receive a transfer (subsidy) nearly at a similar rate. In the context of IHDS data the Gini increases from 0.5 to 0.51 from 2004–05 to 2011–12. We find that to preserve this inequality the tax rate for the richest quantile has to be 4%. Our computations show that Government of India tax rate (2011–12) for this quantile is 6.65%. In order to preserve absolute inequality indices such as variance, the tax and transfer rates both have to be very high. This is because the rate of variance (nominal) has increased nearly by 98 percentfrom 1987–88 to 2011–12.

Our findings show that the Indian tax rates is very close to that of the SPS tax rates that preserves relative inequality. However, we do not have information's on transfer rates. Such information's are required for this comparison.

Distribution neutral fiscal policy might entail a structure of taxes that is too high, which in turn might hurt incentives of productive agents. Given a relatively high degree of inequality and a skewed distribution of income in a post-growth or post-trade scenario, the fiscal authority may find it easier to design distribution neutral taxes and transfers because the required compensation is relatively small to preserve a high degree of initial inequality. But this may not work when the initial degree of inequality is not so high as the compensation there needs to be significant to restore inequality to the SPS level. At this stage, this seems to be valid at the level of a conjecture. We plan to address this issue in much more detail in our future research. This will have implications for cross country pattern of inequality and fiscal policy.

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Appendix

1) Formula for computations of SPS tax rates using NSSO data.

We summarize the relative and absolute SPS tax rates once again in the following equations (for details see Section III):

$$RSPS_{it} = \frac{meanincomeatround\,43}{meanincomeatroundt} \times incomeofroundtatdecilei \quad (9a)$$

$$tax\_RSPS_{it} = 100 \times \frac{incomeofroundtatdecilei - RSPS_{it}}{incomeofroundtatdecilei} \quad (9b)$$

$$ASPS_{it} = (meanincomeatround\,43 - meanincomeatroundt) + incomeofroundtatdecilei \quad (9c)$$

$$tax\_ASPS_{it} = 100 \times \frac{incomeofroundtatdecilei - ASPS_{it}}{incomeofroundtatdecilei} \quad (9d)$$

Where i is the income quantile and $i \in (1,2,..,10)$ and t stands for the NSSO rounds $t \in (50,55,61,66,68)$.

Here "income of round t at quantile i" is obtained from Table 2. For example if we set i=1 and t=50 we get this figure turns out 1496.11.$RSPS_{it}$denote the relative SPS distribution, computed using round 43 as initial distribution and round t (where t=50,55,61,66,68) as the final distribution. Clearly $RSPS_{it}$ is obtained following multiplication of all entries in round 43 by the ratio of mean (mean at round t/ mean at round 43). Naturally the inequality is same as that of round 43. Further, the mean is same as that of round t.

We now present the inequality figures. The following notations has been used: Gini: Gini Coefficient, p90p10: Average income ratio of top 90% and bottom 10% of population.p75p25: Average income ratio of top 90% and bottom 10% of population. A(0.5); Atkinson Inequality index with parameter e=0.5, A(1); Atkinson Inequality index with parameter e=0.5, A(2); Atkinson Inequality index with parameter e=0.5, GE(2): generalized entropy index with parameter a=2, GE(1): generalized entropy index with parameter a=1, GE(0): generalized entropy index with parameter a=0. Mean and Variance follows usual meanings.

Table A1: Income (Expenditure) Inequality Over Time in India

Variable	Data Source	Year	Gini	p90p10	p75p25	A(0.5)	A(1)	A(2)	GE(2)	GE(1)	GE(0)	Variance	Mean
APCE(NSSO)	**Round 43**	1987-88	0.35	4.25	2.08	0.10	0.18	0.32	0.56	0.25	0.20	6235995	2360.92
APCE(NSSO)	**Round 50**	1993-94	0.35	4.16	2.05	0.10	0.18	0.32	0.66	0.25	0.20	2.46E+07	4319.49
APCE(NSSO)	**Round 55**	1999-00	0.34	4.12	2.05	0.10	0.18	0.29	0.88	0.24	0.19	1.06E+08	7783.98
APCE(NSSO)	**Round 61**	2994-05	0.39	4.68	2.18	0.13	0.22	0.35	0.89	0.32	0.25	1.53E+08	9279.74
APCE(NSSO)	**Round 66**	2009-10	0.40	4.75	2.20	0.14	0.23	0.36	1.47	0.36	0.26	7.60E+08	16054.69
APCE(NSSO)	**Round 68**	2011-12	0.40	4.83	2.26	0.14	0.23	0.36	1.07	0.34	0.26	1.04E+09	22058.58
INCOME(IHDS)	**IHDS1**	2004-05	0.52	11.64	3.68	0.23	0.40	0.77	1.33	0.54	0.52	6.33E+09	48796.62
INCOME(IHDS)	**IHDS2**	2011-12	0.54	12.86	3.56	0.24	0.42	0.73	1.46	0.58	0.55	3.89E+10	115517.60

Table A2: Mean Annual Income for Different Quantiles

Variable	Data Source	Year	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
APCE(NSSO)	Round 43	1987-88	801.73	1100.95	1295.10	1480.14	1685.27	1926.70	2245.44	2707.61	3521.09	6846.22
APCE(NSSO)	Round 50	1993-94	1496.11	2032.46	2391.91	2738.88	3111.00	3548.08	4106.29	4936.11	6392.96	12442.06
APCE(NSSO)	Round 55	1999-00	2784.60	3704.57	4346.07	4954.40	5622.81	6392.28	7423.87	8945.72	11594.59	22140.49
APCE(NSSO)	Round 61	2994-05	2937.99	3973.65	4688.79	5392.74	6174.73	7103.06	8359.02	10279.67	13820.80	30068.53
APCE(NSSO)	Round 66	2009-10	5004.50	6745.31	7976.65	9162.80	10457.90	12101.24	14321.00	17662.72	23593.54	53556.40
APCE(NSSO)	Round 68	2011-12	6732.99	9106.72	10811.20	12516.55	14470.19	16805.36	19915.54	24535.90	32721.41	72983.90
INCOME(IHDS)	IHDS1	2004-05	5476.43	11479.75	15872.69	20373.34	25363.98	32273.29	42109.71	57485.99	84156.00	193973.80
INCOME(IHDS)	IHDS2	2011-12	11032.50	25289.74	36373.47	47210.36	59585.68	75598.38	97677.27	130455.70	194804.40	477512.10

Table A3: Tax Rates: Government of India at Different Time Periods

time	tax slabs	tax rates
2011-12	upto 160000	0
	1,60,001 to 5,00,000	10%
	5,00,001 to 8,00,000	20%
	Above 8,00,000	30%
2004-05	upto 150000	0
	1,50,001 to 3,00,000	10%
	3,00,001 to 5,00,000	20%
	Above 5,00,000	30%
1999-00	upto 50000	0
	50,000 to 60,000	10%
	60,000 to 1,50,000	20%
	Above 1,50,000	30%
1993-94	upto 28000	0
	28,001 to 50,000	20%
	50,001 to 100,000	30%
	Above 100001	40%
1987-88	Rs. 0 to 18,000	0
	Rs. 18,001 to 25,000	25%
	Rs. 25,001 to 50,000	30%
	Rs. 50,001 to 100,000	40%
	Above 100,001	50%

Table A4. Estimated Tax Rates: The Relative SPS Method

Quantile	tax_RSPS50	tax_RSPS55	tax_RSPS61	tax_RSPS66	tax_RSPS68
1	1.96	4.99	-7.26	-8.96	-11.26
2	0.90	1.93	-8.90	-11.01	-12.96
3	0.94	1.67	-8.56	-10.43	-11.93
4	1.13	1.42	-7.88	-9.87	-10.49
5	0.89	1.10	-7.27	-9.60	-8.82
6	0.65	0.54	-6.61	-8.29	-7.12
7	-0.04	0.19	-5.58	-6.64	-5.35
8	-0.36	0.12	-3.53	-4.26	-3.11
9	-0.77	-0.21	-0.14	-1.50	-0.54
10	-0.67	-2.04	10.51	13.06	12.35

Note: tax_RSPS50, tax_RSPS55, tax_RSPS61, tax_RSPS66, tax_RSPS68imply relative SPS tax rates with round 43 as the initial distribution and round 55,61,66, and 68respectively, as the final distribution. The formula for computations is provided in the mathematical appendix (equation 9a and 9b). A positive entry in this table implies that group has to pay tax. On the other hand, a negative entry implies that the group enjoys transfer.

Table A5: Estimated Tax Rates: The Absolute SPS Method

Quantile	tax_ASPS50	tax_ASPS55	tax_ASPS61	tax_ASPS66	tax_ASPS68
1	-84.50	-123.79	-162.79	-189.72	-204.48
2	-50.53	-76.29	-101.83	-119.38	-128.40
3	-36.03	-54.74	-75.18	-87.95	-94.19
4	-25.55	-39.47	-55.75	-65.64	-69.21
5	-17.13	-26.54	-39.34	-47.09	-47.78
6	-9.50	-15.09	-24.53	-29.11	-28.68
7	-2.38	-3.39	-9.63	-11.32	-10.19
8	5.47	9.03	6.35	7.12	8.68
9	14.29	22.80	24.46	27.02	29.04
10	29.23	44.55	54.22	61.64	63.63

Note: tax_ASPS50, tax_ASPS55, tax_ASPS61, tax_ASPS66, tax_ASPS68 imply absolute SPS tax rates with round 43 as the initial distribution and round 50, 55,61,66, and 68 respectively, as the final distribution. The formula for computations has been provided in the mathematical appendix (equation 9c and 9d). A positive entry in this table implies that group has to pay tax. On the other hand, a negative entry implies that the group enjoys transfer.

Table A6. Relative SPS Tax Rates, Absolute SPS Tax Rates and the Tax Rates of Government of India

Quantile	tax_RSPS	tax_ASPS	GOI-tax 2011-12
1	-14.82	-84.71	0.00
2	-6.86	-67.65	0.00
3	-3.11	-55.95	0.00
4	-2.03	-45.78	0.00
5	-0.67	-35.28	0.00
6	-0.96	-23.62	0.00
7	-1.93	-10.23	0.00
8	-4.05	5.05	0.00
9	-2.13	29.13	1.79
10	4.08	83.19	6.65

Notes: The computation of the relative and SPS tax rates is similar to the NSSO example, with initial distribution as IHDS1 and IHDS2 as the final distribution. GOI-tax 2011-12 represents the Government of India tax rates. The government tax rates is obtained as 100*total tax paid/total income. A positive entry in this table implies that group has to pay tax. On the other hand, a negative entry implies that the group enjoys transfer.