Is Value Added Tax (VAT) Reform in India Poverty Improving?
An Analysis of Data from Six Major States\textsuperscript{1}

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Abstract
Value Added Tax (VAT) has been introduced in India in place of Sales Tax with effect from April 1, 2005. These taxes are in the domain of different state governments within the federal set up in India. Although VAT is widely acclaimed to be a better system than the sales taxes on grounds of efficiency and tax collection, there is no study undertaken which has addressed the direction of this tax reform from the angle of its possible impact on poverty reduction. This paper analyses this question with the help of concentration curves, Lorenz curve and consumption dominance curves of various orders. The conclusions reached from six major states in India, namely Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and West Bengal using National Sample Survey Unit Level data for the 55\textsuperscript{th} round is that there are scopes of improvement in the design of VAT reform with respect to some items predominantly consumed by the relatively poorer groups.

Key Words:
Poverty Alleviation, Value Added Tax, Marginal Tax Reform, Pro-poor Taxation, Concentration curve, Lorenz ratio, Marginal Efficiency Cost of Funds, Consumption Dominance, Poverty and Social Impact Analysis.

JEL Codes: D12, D63, H21, H22, H71, I32

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1. Introduction

One of the most popular instruments of the Governments in developing countries is to raise indirect taxes (particularly Sales Tax/VAT), because commodity taxes dominate the tax revenues in developing countries. Changes in indirect taxes such as Sales Tax/VAT affect the price of the goods consumed by both poor and rich people and thus can change distribution of consumption of goods among different income groups.

It is true that in developing countries very a few taxes are directly incident on the poor. In India for example, only 3.5% of the population are covered under the Income Tax (a direct tax). But certain consumption (indirect) taxes, particularly Sales Tax affect the prices of goods that the poor (as well as the rich) consume.

Indirect taxes dominate the tax system of the developing countries in general and the sub-national governments in particular. In India, Sales Tax is the single largest source of revenue (constitutes 29% of the revenue receipts) for the State (sub-national) governments (Kurian and Dasgupta, 2003). Since rich and poor often purchase broadly similar consumption bundles, it may appear that it is difficult to make these taxes strongly progressive (i.e. to ensure that those on higher incomes pay relatively more tax). However, recent evidence (Sahn & Younger, 1999; Gemmel & Morrissey, 2002) suggests that some indirect taxes, particularly taxes such as Sales Tax or VAT, can be quite strongly progressive or regressive and can potentially affect poverty or inequality in developing countries.

As per the Constitutional provisions of the federal fiscal structure of India, Sales Tax was the main source of revenue of the State Governments (Kurian & Dasgupta, 2003). However, the State Sales Tax systems were inefficient, highly complex and low revenue yielding. The Sales Tax Laws were highly complex, with too many rates of tax (even with multiple rates on same commodities) and too many exemptions and concessions. Also as per the Constitution of India, the States are not entitled to levy tax on services, which are often an integral part of manufacturing and trade. Since, the tax base was narrow with many exemptions and concessions, to raise revenue the States resorted to levy of additional levies like Turnover Tax, Additional Sales Tax, and Surcharges etc. which only rendered the tax system more in-efficient. This also provides incentives for evasion and avoidance of tax. Complex Sales Tax laws also led to very high cost of compliance and enforcement.

As part of the broader fiscal restructuring plan of the Central and State Governments in India, reforms have been initiated to raise revenue and cut deficits. Particular emphasis has been placed on radical reforms in direct and indirect taxes both in terms of Tax Policy
Reforms (base broadening, elimination of tax concessions and reduction in the number of tax rates and rationalization of tax structures) as well as Tax Administration Reforms (modernization of tax administration and extensive use of Information and Communication Technologies (ICT) etc.).

After repeated interactions and discussions, most of the States have finally agreed and implemented VAT in India with effect from 1.4.2005. One major feature of the tax policy reforms in the implemented VAT system in India is significant restructuring of tax rates on major commodities. Thus VAT reform may have some distributional impact. Any increase in tax on commodities consumed by the poorer section of the population will distribute against poor.

As can be seen from the White Paper on VAT in India, the main reason behind the introduction of VAT was to enhance the efficiency and transparency of the commodity tax system and increase buoyancy of such tax revenue. The policy makers did not consider poverty alleviation or income redistribution as a critical component of such a reform process. **In this paper we have addressed this question.**

It is very important to design the indirect tax structure optimally so that it can reduce poverty on the one hand and also satisfy the revenue efficiency criterion. **The main objective of this paper is to identify the direction of tax changes that will reduce poverty for a range of poverty lines and for classes of poverty indices of some ethical order.**

Some incidence studies have tried to estimate the progressivity /regressivity of consumption taxes and distributional effects of marginal tax reform in some countries. Notable among them are studies by Sahn & Younger (1999) for Africa; Sahn, Younger & Dorosh (1999) for Madagaskar; Younger (1996) for Ghana; Yitzhaki & Lewis (1996) for Indonesia; Yitzhaki (1994) for Israel; Jantti (2005) for Finland; Pahan Prasada (2005) for Sri Lanka and Munoz & Cho (2003) for Ethiopia. However, there is no empirical study on pro-poor implications of the indirect tax reform by switching over to VAT in India. This is the first major attempt to measure empirically the pro-poor implications of the reform process in terms of poverty and inequality.

In this paper we will follow the social efficiency approach developed by Bibi and Duclos (2005) and Duclos, Makdessi and Woodon (2004). Following Bibi and Duclos (2005) we will estimate the demand elasticities to estimate the marginal efficiency cost of raising public funds (MECF) of various taxable commodities. Using the methodology developed by them
we have empirically assessed the impact of VAT reform on poverty in some selected commodities in six selected states considering a few selected commodities.

Basic questions that have been addressed in this paper are:

(i) Is the direction of VAT reform in India right? and (ii) Is there any scope of further improvement in the design of VAT reform in India when revenue neutrality of government budget is satisfied?

2. Data and Methodology for Analysing VAT Reform on Poor

A. Data

All the consumption data are taken from Unit level dataset obtained from the National Sample Survey Organisation (NSSO) of India. The household-wise data available in India from the National Sample Survey (NSS) on consumption expenditure for the 55th round (1999-2000) is used here for the study. The data have all the details about household size, monthly per capita expenditure, details about per head consumption of goods both in value and if available, in physical units terms. Note that the latest household level consumer expenditure data is available for different states in India only for the year 1999-2000 (NSS - 55th Round Data), although Data for aggregative All-India level is available for 2003-04. However, for measuring the poverty and social impact analysis (PSIA) of transition to VAT we are considering the Sales Tax rates as applicable up to 31st March 2005 and current VAT rates effective from April 1, 2005. All Tax data are taken from INSTAVAT Data bank.

We are assuming that the consumption pattern remained more or less the same over the period 1999-2000 and 2004-2005 during the Sales Tax regime in India. Thus it is truly an analysis of Marginal Tax Reform.

B. Selection of Commodities

Commodities were chosen based on three criteria (details are given in the appendix Table 2 and Table 3) -

First, the weight of the commodity in the basket of consumption in the aggregate across income groups gives an idea about the importance of the commodity in the consumption in a particular region. The rice (non-PDS), wheat (non-PDS), spice, sugar (non-PDS) and milk (liquid) are the major food item across states in India.

Second, those commodities were chosen for which we can compare a rise in tax on commodity j along with a fall in tax on commodity k. This helps us to stay close to the theoretical hypotheses in the consumption dominance literature which always assumes poverty reduction with revenue neutrality. We have considered biscuit, one of the important
beverage items, whose tax has increased in most of the states. Liquefied Petroleum Gas (LPG) is major fuel item consumed by the richer households and whose tax has reduced. Two fuel items kerosene (non-PDS) and LPG are compared. Third, we have also taken at least one commodity on which tax is not imposed to check whether such a policy of the government to impose nil tax on certain goods is correct or not.

C. Selection of States

Regarding choice of states, we have somewhat arbitrarily chosen. We have chosen two high growth states from west coast of India, namely, Maharashtra and Gujarat. From southern part of India we have considered the state, Karnataka. From the east coast of India, West Bengal is chosen. West Bengal is also one of the fastest growing states. Two low performing states, Bihar and Madhya Pradesh were chosen from west and middle of India.

D. Tools for Poverty Analysis

In our study we propose to consider commodities more consumed by both the poorer and richer section of the population. Any decrease in taxes on commodities consumed by richer households with no change or increase in taxes on commodities consumed by poorer households will increase inequality. We have used concentration and Lorenz curves to check whether the direction of tax change in Indian states is right in terms of progressivity of the taxes and thus whether there is a possibility of increasing inequality or not.

The pair-wise study of combinations of commodities will help us to formulate the distributional as well as the efficiency impact of tax change on poverty. For this we used the normalised consumption dominance curve analysis. Our analysis is based on the revenue neutrality of the government budget. The marginal efficiency cost of raising marginal funds is calculated. The adjusted CD curves that is, the normalized consumption dominance (CD) curves are multiplied by marginal efficiency cost of raising public funds (MECF) is used as a tool of analysis. MECF of a commodity will be calculated using the quadratic almost identical demand system method (QAIDS).

The CD curve analysis will help us to find out the critical poverty level upto which any increase in tax on one commodity and decrease in tax on another commodity will poverty reducing among girls while budget deficit of the government will remain unchanged. The tools that have been used in our current study for poverty measures are stated below.
1. **Engel Curve:**
Engel curve shows the how the shares of expenditure on a particular commodity changes as the income of the household increases.

2. **Lorenz Curve**
The Lorenz curve is one of the most popular graphical tools for illustrating and comparing income inequality. It provides complete information on the whole distribution of income relative to the mean, and therefore gives a more comprehensive description of the relative standards of living than any of the traditional summary statistics of dispersion pertaining to income distribution. The Lorenz curve has the advantage of being able to establish orderings of distributions in terms of inequality.
The Lorenz curve is defined as follows:

\[
L_{(p)} = \frac{\int_0^p Q(q)dq}{\int_0^1 Q(q)dq} = \frac{1}{\mu} \int_0^p Q(q)dq
\]  

(1)

Where \( Q(q) \) is the net income function of those with net income rank equaling \( q \). The numerator \( \int_0^p Q(q)dq \) sums the incomes of the bottom \( p \) proportion (the poorest \( 100p\% \)) of the population. The denominator sums the incomes of all. Since population size is normalized to 1, the denominator gives average income \( \mu \). \( L(p) \) thus indicates the cumulative percentage of total income held by a cumulative proportion \( p \) of the population, when individuals are ordered in increasing values of their income. For instance, if \( L(0.5) = 0.3 \), then we know that the 50% poorest individuals hold 30% of the total income in a population.

3. **Concentration Curve**
The concentration curve is an important normative and descriptive tool, used in evaluating the impact of tax and transfer policies. It can capture the horizontal and vertical equity concepts related to tax impacts on poverty reduction. Concentration curve shows the proportion of total taxes paid by the \( p \) bottom proportion of the population.
The concentration curve is defined as,

\[
C_{T(p)} = \frac{1}{\mu_T} \int_0^p \overline{T}(q)dq
\]

(2)

Where \( \mu_T = \frac{1}{\mu} \int_0^1 Q_T(p)dq = \mu_X - \mu_N \) is average ‘taxes’ across the population, noting that \( Q_T(p) \) is the \( p \)-quantile function of net taxes and \( \overline{T}(q) \) is expected net tax for \( q \)th quantile.
Since population size is normalized to 1, X and N signify the gross and net incomes respectively.

The concentration curve, like the Lorenz curve, passes through the origin. But unlike the Lorenz curve, it need not always be increasing, and its curvature depends on the income elasticity of the commodity for expenditure concentration curves.

For an indirect tax, these concentration curves can be compared to the concentration curve for total expenditures, the relevant tax base (the equivalent, in the indirect tax case, to the pre-tax Lorenz curve). If an indirect tax is unambiguously progressive, its concentration curve will lie wholly outside the concentration curve for expenditures (the Lorenz curve). This implies that the poor pay proportionately less tax than their share of expenditure.

If the concentration curve is above the Lorenz curve and below the 45-degree curve, the tax instrument is classified as regressive, that is, the impact of taxed consumption of the particular item concerned is concentrated more on the lower income classes. Similarly, for the progressive tax if the concentration curve crosses the Lorenz curve, the share of the tax burden borne by both rich and poor groups is either higher than their share of income or lower.

**4. Consumption Dominance Curve:**

As mentioned earlier we are interested in identifying the direction of poverty reducing tax reform that decrease poverty for a wide range of poverty line and class of poverty indices. The first derivative of the class of poverty indices with respect to tax on a particular commodity will be used to find such a poverty reducing direction of tax reform. For this we will first discuss how consumption dominance curves are related with poverty dominance curves. Following Bibi and Duclos (2005) we have used the class of FGT indices. The family of FGT index is defined as

$$P^{s-1}(z) = FGT^{s-1}(z) = \int_0^\infty \left( \frac{z - y}{z} \right)^{s-1} dF(y)$$

(3)

Where \(f^+ = \max (0; f)\) and where \(F(y)\) is the distribution of income \(y\). The parameter \(S\) indicates the ethical order of dominance or the “aversion to poverty”.

The dominance curves are therefore sums of powers of poverty gaps. Dominance curves can be interpreted as the ethically weighted cost of taxing \(k\). As value of \(s\) increases it means that more weights are attached to the largest poverty. \(FGT^0(z)\) gives the poverty
headcount ratio, while $FGT^i(z)$ gives the normalized (by average expenditure) poverty gap. Similarly, $FGT^2(z)$ gives the weighted normalized poverty gap.

The poverty dominance curves are therefore sums of powers of normalized poverty gaps. As value of $S$ increases it means that more weights are attached to the largest poverty.

Similar to Bibi and Duclos (2005) we are interested in identifying whether the direction of tax reform is right in reducing poverty for a class of poverty indices and poverty lines. The consumption dominance curves are used as a tool for this purpose as the consumption dominance curves are defined as the change in dominance for changes in prices. Assuming full shifting of taxes, we have:

$$CD_s^k(z) = \frac{\partial P^{s-1}(z)}{\partial t_k}, s = 1, 2, 3, \ldots \ldots$$

(4)

CD curves describe the ethically weighted cost of taxing $k$. Thus the vertical axis of the CD curves measure the ethically weighted cost of taxing $k$. The normalized CD curves are defined as

$$\overline{CD}_s^k(z) = \frac{CD_s^k(z)}{X_k(p)}$$

Where, $X_k(p)$ is the average consumption of good $k$ at post tax price vector $p$, which is also interpreted as average welfare cost of consumption of $k$. These curves thus can be interpreted as the ethically weighted (or social) cost of taxing $k$ as a proportion to the average welfare cost.

Let $\bar{x}_k(y, p)$ be consumption of $k$ relative to average consumption, that is, $\bar{x}_k(p) = x_k(y, p)/x_k(p)$. Using Roy’s identity we can derive that

$$\overline{CD}_s^k = \bar{x}_k(p)f(z) \text{ if } s=1$$

$$=sz^{-s}\int_0^\infty \bar{x}_k(p)(z-y)^sF(y) \text{ if } s>1$$

(5)

where $f(z)$ is the density of income at $z$.

5. Marginal Efficiency Cost of Raising Funds (MECF)

Let government revenue from indirect taxation be denoted by

$$R(t) = \int_0^\infty \sum t_k x_k(y, p) \, dF(y)$$

(6)

1 See Appendix IV
where \( x_k(p) \) denotes the expected consumption of commodity \( k \) at income \( y \), and where \( F(y) \) is the distribution of nominal expenditures. Here we have assumed that the revenue neutrality of the government budget is maintained.

Now all taxes are not equally efficient the marginal efficiency cost of raising fund by taxing commodity \( k \) is defined as:

\[
E^k = \frac{x_k(p)}{\partial R/\partial t_k}
\]

where \( x_k(p) \) is the per capita consumption of good \( k \). \( p \) is the post tax price vector. After suitable manipulation we can show that

\[
E^k = \frac{x_k(y,p)}{\partial R(t)/\partial t_k} = \frac{1}{1 + \frac{t_k}{1 + t_k} e_{kk} + \sum_{i,j \neq k} \frac{t_k}{1 + t_k} e_{kj}}
\]  

(7)

6. Normalised Consumption Dominance Curves Adjusted by MECF

Normalised consumption dominance curves adjusted by MECF are used to examine the impact of tax change on poverty. The overall poverty cost of raising revenue by one unit by increasing tax on commodity \( k \) is defined as

\[
\lambda^k_s(y,p) = E^k \overline{CD}_k^s = \frac{\partial P^{s-1}(z)/\partial t_k}{\partial R/\partial t_k}
\]  

(8)

Thus ultimate impact of tax change on poverty is the product of distributive cost and the efficiency cost. Higher the value of \( \overline{CD}_k^s \) greater of the distributive cost of increasing tax on commodity \( k \). Again higher value of \( E^k \) indicates lower revenue effectiveness of tax change. In other words larger the value of \( E^k \) higher is the economic efficiency cost of raising fund by increasing tax on commodity \( k \).

A necessary and sufficient condition for a tax reform to be s-order poverty improving (condition 5) can be represented by

\[
\nabla^{s-1}_i(y) - \gamma \nabla^{s-1}_j(y) \geq 0 \quad \forall y[0, z]
\]

(9)

The poverty test is limited to the range of potential poverty line \( \forall y[0, z^1] \). Here \( \gamma \) is the ratio of MECF of commodity \( j \) to MECF of commodity \( i \).

Suppose tax on commodity \( i \) is reduced and that on commodity \( j \) is increased, all marginally, assuming the consumption pattern of households does not undergo any drastic change. Such a marginal tax reform will reduce poverty if \( \overline{CD}_i \) multiplied by its MECF lies above the \( \overline{CD}_j \) multiplied by its MECF for every poverty line under \( z^1 \). The multiplied \( \overline{CD}_j \)
values are really poverty cost per marginal dollar of tax raised from increasing tax on commodity \( j \) (Bibi and Duclos, 2005). When the range is unbounded and the normalized CD curves adjusted by its own MECF lies above that of another commodity then the poverty improvement extends to global welfare improvement.

At any \( z = z^\ast \) the height of the normalized CD curve for commodity \( l \) measures how much poverty falls per rupee of welfare benefit if tax on \( l \) is reduced. Similarly height of the normalized CD curve of commodity \( j \) measures the increase in poverty due to increase in tax on \( j \). The difference between the two measures the net fall in poverty per rupee of welfare benefit.

To calculate \( E^k \) one has to estimate the elasticites. The estimation of own-price and cross price elasticities is done by using the Quadratic Almost Identical Demand System (QAIDS). We have estimated the following demand system where budget shares are linear in \( \beta_{jk}, \gamma_j \) and \( \theta_j \). The estimation strategy follows Bibi and Duclos (2005). We have used the 1999-2000 household survey data published by NSSO for different commodities. We have commodity wise data on expenditures and quantities, as well as data on many other demographic characteristics such as education, region of residence, age, sex, number of child, household size and income.

7. Quadratic Almost Identical Demand System

To calculate \( E^k \) one has to estimate the elasticites. The estimation of own-price and cross price elasticities is done by using the Quadratic Almost Identical Demand System (QAIDS). We have estimated the following demand system where budget shares are linear in \( \beta_{jk}, \gamma_j \) and \( \theta_j \). The estimation strategy follows Bibi and Duclos (2005). We have used the 1991-2000 household survey data published by NSSO for different commodities. We have commodity wise data on expenditures and quantities, as well as data on many other demographic characteristics such as education, region of residence, age, sex, number of child, household size and income.

We estimate the following demand system

\[
  w_j = \alpha_j + \sum_{k=1}^{K} \beta_{jk} \ln p_k + \gamma_j \ln (y/z) + \theta_j \left[ \ln (y/z) \right]^2 + v_j \tag{10}
\]

subject to \( \sum_{k=1}^{K} \alpha_k = 1 \), \( \beta_{jk} = \beta_{kj} \), \( \sum_{j=1}^{K} \beta_{jk} = \sum_{j=1}^{K} \gamma_j = \sum_{k=1}^{K} \theta_k = 0 \)
where $w_j$: the budget share of commodity $j$ at $y$, $y$: the monthly per capita consumption expenditure (proxy of income), $z$: the poverty line, $v_j$: a residual term

The model described by equation (A2) was used to estimate a demand system of six goods. Actual combination of six goods differs from state to state. For a particular state we have selected five commodities from the following list of commodities:

rice (non-PDS), wheat (non-PDS), sugar (non-PDS), kerosene (non-PDS), spice, milk (liquid), tea, sandal, biscuits. The other commodity includes all the marketed commodities except these five commodities. Here we should also mention that from the expenditure figure we have excluded the expenditure on four PDS commodities such as rice, wheat, kerosene, sugar. The expenditure shares of others commodity is obtained by subtracting expenditure share of five selected commodities from one. It should be mentioned here that to avoid the problem of identification we have excluded one equation that is equation for others commodity.

We have employed the three stage least square (3SLS) method to estimate the elasticities. In our calculation we have specified additional exogenous variables such as log of household size, sex, sector, log of age, square of log of age, literate upto primary level, literate upto middle level, literate upto secondary level, literate upto higher secondary level, graduate and above in agriculture, graduate and above in medicine and engineering and graduate and above in other subjects. These exogenous variables are not included in any of the system equations. These implicit exogenous variables are used as instruments for endogenous variables ( $\ln(y/z)$ and $\ln(y/z)^2$ )in the “first stage”. In the second stage we replace the matrix of observations on explanatory endogenous variables by its estimate derived from stage one and apply OLS to the reformulated equation. In the third stage the residuals of regression of all the structural equations are obtained using two-stage least square estimators of the coefficients. Using these residuals we estimate the elements in the variance covariance matrix of all structural disturbances. Then transform the structural equations in the model by the prime of matrix of observation of per-determined variables and applying least square to the reformulated system using the estimated error variance covariance matrix. This gives us the three stage least square estimator of the coefficients in the model. Coefficients of the equation of others commodities are estimated using the estimated coefficients obtained from the first stage.
(7) Estimation of Elasticities
Having estimated $\beta_{ij}$'s we have estimated the own and cross price elasticities using the following formula:

$$e_{ii} = \frac{\beta_{ii}}{w_i} - 1 \text{ and } e_{ij} = \frac{\beta_{ij}}{w_i}$$  \hspace{1cm} (11)

Appendix TableA1-TableA6 presented below lists the own and cross price elasticities of nine goods. Table 5 below shows the calculated MECF values. Since we do not have data on income and we have used monthly per capita expenditure as a proxy of income. The MECF of a commodity is calculated using equation A1 above. MECF of others is used as the MECF of LPG in all the six states. In Maharashtra and West Bengal biscuits is also included in others commodity list.

5. Results
In this paper we have tried to assess empirically the impact of VAT reform on poverty for six selected states in India. On the basis of a few selected commodities we have tried to address whether the direction of VAT reform in India right or wrong and whether there is any further scope of improvement in the design of VAT reform in India while considering the revenue neutrality of the government budget. We now present the empirical results state by state.

A. Bihar

1. Descriptive Statistics

1.1 Shares: Commodities that we have considered for Bihar are rice (non-PDS), LPG, Spice, Sandal, Milk (liquid) and kerosene (non-PDS). We find that in Bihar on an average share of expenditures on rice (non-PDS), milk (liquid) and spice are 17.98 percent, 6.32 percent and 2.34 percent respectively. Expenditure on Liquefied Petroleum Gas (LPG), sandal and kerosene (non-PDS) are found to be less than one percent but tax on sandal and kerosene (non-PDS) has increase while there is a decrease in tax on LPG. We considered milk (liquid) which exempted from taxation. TableA1 indicates the shares and tax rates in the pre and post reform period for six commodities in Bihar. (See Table 2-Table3)

1.2 Engel Curves: To find the importance of commodities in the consumer budget among the poor and rich households As income increases shares of expenditure on milk (liquid) and LPG increases but the shares of expenditure on rice (non-PDS), spice and sandal fall. This
implies that poor households spend more on rice (non-PDS), spice and sandal compared to the rich households. On the other hand, milk (liquid) and LPG are proportionately more consumed by the rich households. Shares of expenditure on kerosene (non-PDS) remained more or less stable with the change in income of the households. (See Fig (A1)-Fig (A2))

1. **Progressivity of VAT**

Commodity wise comparison of expenditure concentration curves with the Lorenz curve indicates that in the sales tax system rice (Non-PDS), spice, sandal and kerosene (non-PDS) were regressive taxes whereas LPG and milk (liquid) were progressive taxes.

As the state has moved from the sales tax system to the VAT system we find that out of these six selected commodities only tax on spice has moved in the direction that will benefit the poorer section of the households. Taxes on all other selected commodities have moved in the opposite direction of desired direction of tax change. Thus the direction of reform is not largely poverty reducing in this state. (See Fig (A3))

2. **Design of Revenue Neutral Poverty Reducing Reform**

In this section we have identified four pairs of commodities such as: Rice (non-PDS) – LPG, Kerosene (non-PDS) –LPG, Sandal – LPG and Spice –Milk (liquid), any decrease in tax on first commodity and increase in tax on second commodity in each pair is found to be first, second and third order poverty reducing at least up to certain level of income while keeping revenue neutrality of the government budget. All such critical poverty lines (see Table A2) are greater than the official poverty line (z=1). Thus the reform suggested here will improve the condition of the larger number of poor households than those who are below official poverty line.

For example, if we consider the sandal and LPG combination then we find that it would be first order poverty improving to reduce tax on sandal by increasing tax on LPG with budget deficit of the government remaining unchanged for those whose income is below 1.3008. But in reality tax on sandal has increased under VAT system but tax on LPG has reduced. Thus the actual direction of tax change contradicts the poverty decreasing direction of reform for these two commodities.

Similarly we find that there should be decrease in tax on kerosene (non-PDS), which is mainly consumed by the poorer households and increase in tax on LPG, which is mostly consumed by the richer households. For fuel items we find in Bihar tax on kerosene (non-PDS) which is mainly consumed by the poorer section of the population, is increased whereas
tax on LPG which is consumed by the people who are above poverty line, is reduced. Thus for fuel items direction of tax change is not poverty reducing.

To sum up, it is suggested that like spice there should be also decrease in tax on rice (non-PDS), sandal and kerosene (non-PDS). Increased revenue from increase in tax on LPG and milk (liquid) can be used to give subsidy to above mentioned commodities. This indicates that there is a scope of improvement in the design of VAT system in Bihar that will decrease poverty and on the basis of these selected commodities we find that reform is not so pr-poor in Bihar. (See Fig (A4))

B. Gujarat

1. Descriptive Statistics

1.1 Shares: Again using the same criteria we have selected wheat (non-PDS), LPG, spice, sandal, milk (liquid) and sugar (non-PDS) in Gujarat. Share of expenditure on Milk (liquid) in Gujarat is very high, 11.18 percent and this is also exempted from taxation. It is observed that households on an average spend on wheat (non-PDS), spice, sugar (non-PDS) and LPG respectively 4.59 percent, 2.25 percent, 1.53 percent and 1.20 percent. Shares of expenditure on sandal are less than one percent. Among these seven commodities that we have considered tax on LPG has reduced where as tax on wheat (non-PDS), spice, milk (liquid) has remained unchanged. Tax on sugar (non-PDS) and sandal has increased after the introduction of VAT. (See Table 2-Table3)

1.2 Engel Curve: It is observed that sugar (non-PDS), spice and sandal are consumed more by the poorer households whereas wheat (non-PDS), milk (liquid) and LPG are more consumed by the richer section of the population. Fig (B1)-Fig (B2) shows how average shares of expenditure changes as the income of the household changes in Gujarat.

2. Progressivity of VAT

Having understood the importance of the commodities in consumer budget and the direction of tax change for the commodities we will now check whether the such a direction in tax change is justified or not. Lorenz curve and the concentration curves are used as tools for the analysis.

It is found that in Gujarat under sales tax regime spice, sugar (non-PDS) and sandal are regressive taxes where as an increase in tax on LPG is a progressive tax. Any increase in tax wheat (non-PDS) and milk (liquid) will be progressive for only lower 45 percent (approximately) and 65 percent (approximately) of the population respectively. Thus from
Fig (B3) – Fig (B4) along with the actual direction of tax change it appears that on the basis of six selected commodities we can say that the direction of reform under VAT system is such that it will fall more on the poorer section of the population. (See Fig(B3))

3. Design of Revenue Neutral Poverty Reducing Reform

Again in this section we have made the pair-wise comparison of a few selected commodities to find out whether the direction of tax change is right in terms of reduction in poverty while maintaining the revenue neutrality of the government budget. Thus we have considered both the distributive as well as efficiency criteria.

Sugar (non-PDS), wheat (non-PDS), sandal and milk (liquid) in Gujarat were exempted from taxation under sales tax system. But after VAT tax reform the tax on sugar (non-PDS) and sandal have increased to 4 percent while that on wheat (non-PDS) and milk (liquid) remain unchanged. In this paper we have first compared sugar (non-PDS) and sandal with milk (liquid).

It is observed that any increase in tax on wheat (non-PDS) in order to give subsidy to sugar (non-PDS) will be first order poverty improving with revenue neutrality condition being satisfied for all poverty lines until 1.6723. It would be second order poverty improving for all poverty lines below 3.2810.

Again if we consider the sandal and wheat (non-PDS) combination we find that any increase in tax on wheat (non-PDS) in order to give subsidy to sandal with budget deficit remaining unchanged will reduce poverty at order one for those whose income is below 1.6013. For income levels below 2.7759 it would be second order poverty improving.

In Gujarat after VAT reform sugar (non-PDS) has been eliminated from exempted commodity list where as milk (liquid) is still exempted from taxation. It is observed that the increase in tax on milk (liquid) to give subsidy to sugar (non-PDS) again reduces poverty at order one until the poverty line 1.8295. Thus direction of reform is just opposite to poverty reducing tax reform for these two commodities.

On the other hand, if we consider the spice and LPG combination then it is found that decrease in tax on spice by increasing tax on LPG will be first order poverty efficient for those whose income is below 2.1203. It is second order poverty improving for all poverty lines below 4.8181.

In Gujarat, increase in tax on sugar (non-PDS) and sandal while keeping wheat (non-PDS) and milk (liquid) in the exempted commodity list are found to be not poverty reducing reform. The decrease in tax on LPG which is consumed by the richer households
is again not found to be poverty decreasing reform rather the increased revenue from 
increase in tax on LPG could have been used to give subsidy to other commodities. Tax on 
spice should be reduced. The VAT reform is not in the direction of poverty reducing 
reform. (See Fig (B4))

C. Karnataka

1. Descriptive Statistics

1.1 Shares: The commodities that have been considered for Karnataka are wheat (non-PDS), 
LPG, spice, sandal, milk (liquid) and biscuits. Out of these six selected commodities, share of 
expenditure on milk (liquid) is largest and its value is 6.15 percent. Shares of expenditure on 
wheat (non-PDS), LPG, sandal and biscuits are less than one percent. Expenditure share of 
spice is 2.5 percent. The basis of selection of commodities for Karnataka was mainly the tax 
change criteria. For our analysis we have chosen a non-taxed commodity: milk (liquid), two 
tax increased commodities: wheat (non-PDS) and sandal, and three tax decreased 
commodities: LPG, spice and biscuits. (See Table 2-Table3)

1.2 Engel Curve: Engel curve is the popular tool of finding the importance of commodity in 
consumer budget as income of the households increase. We find that in Karnataka milk 
(liquid), wheat (non-PDS) and LPG are more consumed by the richer households. Engel 
curves for spice and sandal are downward sloping where as that of biscuits remained more or 
less stable. Thus spice and sandal are the commodities of the poorer section of the population. 
(See Fig (C1)-Fig(C2))

2. Progressivity of VAT

Comparing Lorenz and concentration curves we find that any increase in tax on sandal, spice 
and sugar (non-PDS) will make the tax structure regressive in nature. The tax system will be 
progressive if there is an increase in tax on LPG. The increase in tax on milk (liquid) will fall 
more or less proportionately to the income level. The expenditure concentration curve of rice 
(non-PDS) cuts the Lorenz curve at around 0.50 percentile point. Our findings in this section 
suggest that the direction of change in tax on spice and sugar is found to be right whereas the 
direction of change in tax on milk (liquid), LPG and sandal are not right kind of reform. (See 
Fig(C3))

3. Design of Revenue Neutral Poverty Reducing Reform

In VAT regime it is found that the tax on sandal, sugar (non-PDS) and LPG are 4 percent. 
The tax on LPG and sugar (non-PDS) has reduced while tax on sandal and has increased.
We have compared sugar (non-PDS) and sandal with LPG. We find that any decrease in tax on sugar (non-PDS) combined with increase in tax on LPG will be first order poverty improving for those whose income is below 2.0282. It would be second order poverty reducing for all poverty lines below 3.8183.

Again we find that any reform that increases subsidy on sandal and increases tax on LPG with budget deficit of the government remaining unchanged will be first order poverty reducing for all whose poverty line is below 2.2847. Again we observe that such a change in taxes not only reduces poverty among those who are below official poverty line but also above the official poverty line.

Again increase in tax on milk (liquid) with fall in tax on spice keeping budget deficit of the government constant will be poverty reducing at order one for all poverty lines below 1.9545. On the other hand, marginal fall in tax on spice and marginal increase in tax on sugar will reduce poverty at order one for those whose income is below 3.7929 when revenue neutrality of the government budget is maintained. Thus with these changes in direction of reform we find that it will improve the condition of the poor those who are at the official poverty line that is z=1 but also above the official poverty line.

Considering rice (non-PDS) and LPG condition again we find that any increase in tax on LPG in order to give subsidy to rice (non-PDS) with revenue neutrality of the government budget will be first order poverty reducing for those whose income is below 2.4866 and second and third order poverty reducing for wide range of poverty lines.

*Thus decline in taxes on spice, sugar (non-PDS) and rice (non-PDS) are found to be poverty reducing. But increase in tax on sandal and decrease in tax on LPG and no change in tax on milk (Liquid) are found to be not the poverty reducing direction of tax change. (See Fig(C4))*

**D. Madhya Pradesh**

1. **Descriptive Statistics**

1.1 **Shares:** For Madhya Pradesh the commodities that we have considered are wheat (non-PDS), LPG, spice, sandal, milk (liquid) and biscuits. Expenditure share of wheat (non-PDS) is very high, 9.25 percent. The shares of expenditure on milk (liquid) are also high, 7.04 percent. The Shares of expenditure on spice and sandal are 2.33 percent and 1.61 percent respectively. Less than one percent expenditure shares are recorded for LPG and biscuits in Madhya Pradesh. Out of these commodities only tax on sandal has increased in VAT system.
Tax on all other selected commodities either decreased or remained unchanged. (See Table 2-Table3)

1.2 Engel Curve: In Madhya Pradesh we find that on an average poor people spend more on wheat (non-PDS), spice and sandal and the average shares of expenditure on milk (liquid), biscuits and LPG increase with the increase in income. (See Fig (D1)-Fig(D2)). Thus rice (non-PDS), spice and sandal are more consumed by the poorer section of the population where as LPG, milk (liquid) and biscuits are more consumed by the richer households.

2. Progressivity of VAT

If we compare the Lorenz curve and the commodity wise expenditure concentration curves we find that any increase in tax on rice (non-PDS), spice and sandal will make tax system regressive whereas increase in tax on milk (liquid), biscuits and LPG will fall more on the richer households than the poorer households. Thus on the basis of the concentration and Lorenz curves we observe that it would be better if there is an increase in tax on milk (liquid), biscuits and LPG and decrease in tax on rice (non-PDS), spice and sandal. But in reality we observe that tax on spice has reduced and rice (non-PDS) kept in the exempted commodity list even in the post reform period. Tax on sandal has increased. On the other hand, tax on milk (liquid) has remained unchanged and tax on LPG and biscuits has reduced. This indicates that the direction of tax change is not right other than spice out of six selected commodities in Madhya Pradesh. (See Fig (D3))

3. Design of Revenue Neutral Poverty Reducing Reform

Now we will consider the consumption dominance curve normalized by mean expenditure and adjusted by MECF to judge the impact of marginal tax reform on poverty with revenue neutrality. Table 1 indicate the critical poverty line until which decrease in tax on first commodity and increase in tax on the second commodity will be poverty improving with revenue of the government remaining unchanged.

In Madhya Pradesh we find that before reform sandal and milk (liquid) were in the exempted commodity list. After introduction of VAT tax on sandal has increased from 0 percent to 4 percent but tax on milk (liquid) is still 0 percent. In order to judge whether the direction of this reform right or not in terms of reduction in poverty we consider the sandal-milk (liquid) pair. It is observed that it would be first order poverty reducing to decrease tax on sandal and increase tax on milk (liquid) for those whose income is below 1.3992. Such a reform would be second order poverty improving for all poverty lines below 4.0509. Thus considering sandal and milk (liquid) combination the direction of reform is not right.
Again if we consider the rice (non-PDS) and milk (liquid) as both of them were in the exempted commodity list then again we observe that a tax reform that increases tax on milk (liquid) marginally in order to reduce marginally tax on rice (non-PDS) keeping budget deficit constant will be first order poverty reducing for all poverty lines until 1.2839 and second order poverty improving for poverty line below 2.6031. It would be third order poverty reducing for all ranges of poverty lines.

After VAT we observe that taxes on spice LPG have been reduced in the post reform period. We find that for poverty lines below 1.7505 marginal reductions in tax in spice and marginal increase in tax on LPG will be first order poverty reducing with budget deficit of the government remaining constant. Thus decrease in tax on spice is right kind of reform but tax on LPG could have been increased.

If we consider the biscuits and sandal combination where tax on biscuits is reduced in the post reform period and tax on sandal is increased. We find that any marginal increase in subsidy on sandal and marginal increase in tax on biscuits by keeping budget deficit constant will be first order poverty reducing for all poverty lines below 1.4709.

Thus reduction in tax on spice is a right kind of reform but fall in tax on LPG and biscuits are not right kind of pro-poor reform. Again keeping milk (liquid) in the exempted commodity list and increasing tax on sandal is not poverty reducing tax reform. Government of Madhya Pradesh is doing right thing exempting rice (non-PDS) from taxation. Any increase in subsidy to rice (non-PDS) taxing milk (liquid) will improve condition of the poor not only who are at urban/rural poverty line but who are slightly above the official poverty line. (See Fig (D4))

E. Maharashtra

1. Descriptive Statistics

1.1 Shares: In Maharashtra rice (non-PDS), jowar and bajra are the major food items and shares of expenditure on them are more or less same though share of household expenditure on rice (non-PDS) is higher than others. Expenditure on rice (non-PDS) covers 4.76 percent of total expenditure in Maharashtra. Shares of expenditure on milk (liquid), spice and LPG are 6.33 percent, 2.15 percent and 1.25 percent respectively. Tax on biscuits has increased and its share in total expenditure is very low, less than one percent. (See Table 2-Table3)

1.2. Engel Curve: The Engel curves of rice (non-PDS), spice, sandal (plastic footwear or hawai chappal) are downward sloping whereas that of petroleum gas (LPG), biscuits, tea and milk
(Liquid) are upward sloping. This indicate that poor people spend proportionately more on rice (non-PDS), spice and sandal and rich people spend proportionately more on LPG, biscuits, milk (liquid) and tea. (See Fig (E1)-Fig (E2))

2. **Progressivity of VAT**

The desired direction of reform is such that there is an increase in tax on LPG, biscuits and milk (liquid) and decrease in tax on rice (non-PDS), spice, sandal and tea. In reality we find decrease in tax on spice, tea and LPG, no change in tax on milk (liquid) and rice (non-PDS) and increase in tax on biscuits and sandal. Thus direction of tax change is right for spice, tea and biscuits. Increase in tax on sandal and decrease in tax on LPG are not desirable. Any increase in subsidy to rice (non-PDS) will improve the condition of poor and there can be increase in tax on milk (liquid) as it is not so much consumed by the poor people. (see Fig (E3))

3. **Design of Revenue Neutral Poverty Reducing Reform**

Two non-taxed goods both in the pre and post reform period, namely, rice (non-PDS) and milk (liquid) are considered for Maharashtra also and we find that it would be first order revenue neutral poverty improving reform to increase tax on milk (liquid) in order to give subsidy to rice (non-PDS) for the poverty lines until 1.2405 (Figure (9) below), which again is higher than the official poverty line drawn at 1 (as in West Bengal, dividing MPCE by rural or urban poverty lines). We find that such a change in tax rates will be second order poverty improving for poverty lines at 2.1233 and third order poverty improving for income levels until 3.0472.

In Maharashtra though both sandal and milk (liquid) were on the exempted commodity list, in the post reform period sandal’s tax is increased to 4 percent but tax on milk is not increased. If we consider the sandal –milk (liquid) combination we observe that the decrease in tax on sandal combined with the increase in tax on milk (liquid) with budget deficit remaining constant will be first order poverty reducing for those whose income is below 1.9964. It would be second and third order poverty reducing for a larger range of poverty lines.

Again for the spice – LPG combination it is found that it would be first order poverty reducing if there is an increase in tax on milk (liquid) and decrease in tax on spice when budget deficit remains unchanged for all poverty lines upto 1.8716. It would be second order poverty reducing for all poverty lines below 4.4410.
There is a fall in tax on tea and rise in tax on biscuits under VAT reform and we find that any marginal reduction in tax on tea and increase in tax on biscuits with budget deficit of the government remaining unchanged will be first order poverty reducing for all whose income below 2.1595 and second and third order poverty reducing for a wide range of poverty lines.

Thus, by decreasing tax on spice and tea and keeping rice (non-PDS) in the exempted commodity list, the government of Maharashtra has done the right thing in terms of revenue neutral pro-poor reform. But the increase in tax on sandal is not pro-poor. The tax on milk (liquid) could have been increased in order to give subsidy to rice (non-PDS) or sandal. The rise in tax on biscuits is also a right kind of reform. (See Fig (E4))

F. West Bengal

1. Descriptive Statistics

1.1 Shares: The six commodities that we have considered for West Bengal are rice (non-PDS), LPG, spice, sandal, milk (liquid) and biscuits. The shares of expenditure on rice (non-PDS), milk (liquid) and spice are 20.86 percent, 3.11 percent and 2.06 percent respectively. Tax on rice (non-PDS), spice and LPG has reduced under VAT system. There is an increase in tax on sandal and biscuits but tax on milk (liquid) is still nil after the introduction of VAT at the state level. (See Table 2-Table3)

1.2 Engel Curve: Here also poorer households spend more on rice (non-PDS), spice and sandal where as rich households spend proportionately more on LPG, biscuits, milk (liquid), sugar (non-PDS). Fig (F1) – Fig (F2) plot the shares of expenditure on a particular commodity as the income of the household increases.

2. Progressivity of VAT

Increase in tax on rice (non-PDS), spice and sandal will make the tax system regressive. On the other hand, any increase in tax on LPG, sugar (non-PDS), milk (liquid) and biscuits will make it progressive in nature. Fall in tax on rice (non-PDS), spice and rise in tax on biscuits will help the poor people more. Fall in tax on LPG and tea will help the richer section of the population. Elimination of milk (liquid) from the exempted commodity list will not make the tax system regressive. (See Fig (F3))

3. Design of Revenue Neutral Poverty Reducing Reform

First we consider two goods, rice (non-PDS) and milk (liquid) that are exempted from taxation in VAT regime. Comparing rice (non-PDS) and milk (liquid) in West Bengal we
find that any increase in tax on milk (liquid) and decrease in tax on rice (non-PDS) with revenue neutrality of the budget will be first order poverty improving for those whose income is below 1.6865, which is higher than the official poverty line which is drawn at the value 1 (MPCE divided by either rural or urban poverty lines). Considering second and third order of dominance it is observed that the marginal increase in tax on milk (liquid) for a decrease in tax on rice (non-PDS) will be poverty improving for a larger range of poverty lines.

In the pre reform period sandal was taxed and milk (liquid) was on the exempted commodity list. In the post reform period though tax on sandal has increased slightly from 3.45 percent to 4 percent but milk (liquid) is still in the exempted commodity list. We find that it will be first order poverty improving to increase the tax on milk (liquid) in order to reduce the tax on sandal so that budget deficit of the government remains unchanged for all poverty lines below 1.8527. It would be second and third order poverty improving for a wide range of poverty lines.

Thus we observe that with revenue neutrality though the decrease in tax on rice (non-PDS) is pro-poor, the increase in tax on sandal and keeping milk (liquid) in the exempted commodity list are not pro-poor.

The adjusted normalised CD curve of LPG lies below the adjusted normalised CD curve of all other commodities (see Fig (8) below) at least upto a certain range of poverty line. This clearly indicates that there should have been an increase in tax on LPG and that more fund should have been allotted to give subsidy to spice and it will reduce poverty at order one all poverty lines below 2.0675.

In the post reform period we have observed that tax on spice has reduced to 4.4 percent from 4 percent and tax on sugar (non-PDS) has increased from 0 percent to 4 percent. Such a change in tax rates found to poverty reducing keeping budget deficit of the government unchanged. It is observed that any marginal reduction in tax on spice combined with marginal increase in tax on sugar (non-PDS) will be first order poverty reducing for all poverty lines below 1.1470 and second and third order poverty reducing for a wide range of poverty lines. Thus reduction in tax on sugar (non-PDS) is justifiable from the pro-poor angle if we consider the spice and sugar (non-PDS) combination.

Again it is found that tax on both sandal and biscuits have increased in the post reform period but with revenue neutrality of the government budget any increase in tax on biscuits by reduction in tax on sandal will be first order poverty reducing for all poverty lines below 1.7214 and second and third order poverty declining for all levels of poverty lines.
Thus the increase in tax on biscuits, sugar (non-PDS) is in the right direction but the decrease in tax on LPG is not a pro-poor revenue neutral reform. (See Fig (F4))

6. Comparative Study

The comparison of selected six states in India suggest that in all the six states increase in tax on sandal, decrease in tax on LPG and no change in tax on milk (liquid) are found to be not poverty efficient reform. On the other hand decrease in tax on spice appears as a pro-poor kind of tax change in all the chosen states. Our study suggests that instead of same rates of taxes for different commodities it would be better to charge different tax rate in different states for the same commodity. Thus uniformity of taxes is not desired for pro-poor reform of taxes. We find that tax on sugar (non-PDS) is 4 percent over the states in India. For this there is an increase in tax on sugar in Gujarat and West Bengal and decrease in tax in Karnataka. Increase in tax on sugar (non-PDS) in Gujarat is not pro-poor reform but in Karnataka and West Bengal for sugar (non-PDS) tax has moved in the desired direction. Again 12.5 percent tax is imposed on biscuits over the states. This leads to fall in tax on biscuits in Madhya Pradesh but rise in tax on biscuits in West Bengal and Maharashtra. Increase in tax on biscuits in Maharashtra and West Bengal is pro-poor kind of reform but decrease in tax on biscuits in Madhya Pradesh found to be not poverty reducing.

Our study suggests that the decline in tax on rice (non-PDS) in West Bengal and Karnataka is a right direction of reform. On the other keeping rice (non-PDS) in the exempted commodity list in Maharashtra and Madhya Pradesh governments are doing right kind of thing. No change in tax on rice (non-PDS) is found to be not the right kind of reform in Bihar. Any increase in subsidy to rice (non-PDS) by taxing milk (liquid) or LPG would be poverty efficient reform. Again fall in tax on sugar (non-PDS) in Karnataka is a poverty efficient change in tax where as rise in tax on sugar (non-PDS) in Gujarat is not pro-poor tax reform. The reform is largely poverty reducing in Karnataka, Maharashtra and West Bengal but there is further scope of improvement in the design of VAT system in India.

(7) Conclusion

The present work is an effort to understand the nature of marginal tax reform undertaken by different state governments in India, when they switched over to VAT from sales tax regime. Although VAT is known to be a better tax regime in general since it avoids cascading, does it benefit the poor more than the rich? The present paper has specifically addressed this question with six important states in India, namely, Bihar, Gujarat, Karnataka, Madhya Pradesh, Maharashtra and West Bengal. This study finds that the design of the VAT in these
states are generally pro-poor in Karnataka, Maharashtra and West Bengal since those commodities are taxed less which are consumed more by people under certain poverty line. In Bihar, Gujarat and Madhya Pradesh the actual change in tax found to contradict the desired direction of tax change. The poverty lines differ from commodity to commodity, but pair-wise comparison of taxes with the help of normalized consumption dominance curves give an unambiguous answer regarding who benefits from increase and decrease in tax rates if the government wants to maintain its revenue target.

In order to answer the question of progressivity of taxes we have used the Lorenz and expenditure concentration curves. In general we have identified LPG, milk (liquid), and biscuits as the item tax on which will make the tax system progressive. Though there was an increase in tax biscuits in most of the selected states but tax on LPG has been reduced and tax on milk (liquid) is found to be nil under VAT system. This reduction in tax on LPG and no tax on milk (liquid) definitely will improve the condition of the richer households than poorer households. The observed rise in tax on sandal on the other hand will make the tax system regressive in nature.

With the consideration of revenue neutrality we have tried to analyse the impact of reform on poverty when there is an increase in tax on one commodity and decrease in tax on another commodity. For this purpose we have considered the different combinations of two commodities and checked whether the direction of reform is pro-poor, by using consumption dominance curves of various orders. In general we observe that a reform to be poverty efficient there should be fall in tax on spice, rice (non-PDS) and sandal and increase in tax on LPG, biscuits and milk (liquid). In all the six states considered tax on sandal has increased and tax on LPG is reduced. It is found that such a change in taxes on LPG and sandal are not poverty efficient reform. The direction of changes in taxes on spice and biscuits are found to be pro-poor in majority of the selected states.

One of the important components of VAT reform was that instead of multiple rates of taxes there will be three or four rates of taxes all over the economy. Our analysis suggests that instead of same rate of taxes for a single commodity there should different rates of taxes over the states. For example, if we consider the case of sugar (non-PDS) on which 4 percent tax is imposed under VAT. This has led to increase in tax on sugar (non-PDS) in Gujarat and West Bengal and decrease in tax in Karnataka. It is found that increase in tax on sugar (non-PDS) in West Bengal and decrease in tax in Karnataka are right kind of tax change but increase in tax in Gujarat is found to be not poverty reducing direction of tax change.
The analysis here fulfils a gap in the literature on taxes like VAT in India, but the analysis is in partial equilibrium framework. In many cases revenue neutrality is maintained by increase in taxes on products which are finished products but are used by industries and not consumed. Thus many of the tax reductions are not pair-wise truly comparable for revenue neutrality. However, the analysis done here gives some indications about the design of VAT in India. The political economy factor clearly shows up in case of petroleum product, LPG. LPG is a rich man’s item but its tax is reduced, while kerosene is taxed more despite being consumed more by the relatively poorer groups. In the latter case, the poorest benefit from a higher tax, but not the other in the ‘poor’ class. Hopefully, more such comparative studies among more states in India, along with additional dimensions like gender, region and castes will throw more information on the Poverty reducing dimensions in the design of VAT.

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Appendix (I)

Table 1: Official Poverty Line (in Rupees) in 1999-2000

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
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</thead>
<tbody>
<tr>
<td>Bihar</td>
<td>3333.07</td>
<td>379.78</td>
</tr>
<tr>
<td>Gujarat</td>
<td>318.94</td>
<td>474.41</td>
</tr>
<tr>
<td>Karnataka</td>
<td>309.59</td>
<td>511.44</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>311.34</td>
<td>481.65</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>318.63</td>
<td>593.71</td>
</tr>
<tr>
<td>West Bengal</td>
<td>350.17</td>
<td>409.22</td>
</tr>
</tbody>
</table>

Source: http://www.nic.fi/~otammile/povindia.htm

Table 2: Average Share of Expenditure on Good

<table>
<thead>
<tr>
<th>Commodity</th>
<th>BIH</th>
<th>GUJ</th>
<th>KAR</th>
<th>MP</th>
<th>MAH</th>
<th>WB</th>
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<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>0.1798</td>
<td></td>
<td>0.0903</td>
<td>0.1024</td>
<td>0.0476</td>
<td>0.2086</td>
</tr>
<tr>
<td>Milk (liquid)</td>
<td>0.0632</td>
<td>0.1118</td>
<td>0.0615</td>
<td>0.0704</td>
<td>0.0633</td>
<td>0.0311</td>
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<tr>
<td>Spice</td>
<td>0.0234</td>
<td>0.0225</td>
<td>0.0249</td>
<td>0.0233</td>
<td>0.0215</td>
<td>0.0206</td>
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<tr>
<td>Sandal</td>
<td>0.0031</td>
<td>0.0030</td>
<td>0.0021</td>
<td>0.0161</td>
<td>0.0036</td>
<td>0.0026</td>
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<tr>
<td>LPG</td>
<td>0.0035</td>
<td>0.0120</td>
<td>0.0092</td>
<td>0.0071</td>
<td>0.0125</td>
<td>0.0078</td>
</tr>
<tr>
<td>Biscuits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0028</td>
<td>0.0039</td>
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<tr>
<td>Tea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0152</td>
</tr>
<tr>
<td>Sugar (non-PDS)</td>
<td></td>
<td></td>
<td></td>
<td>0.0153</td>
<td>0.0109</td>
<td></td>
</tr>
<tr>
<td>Wheat (non-PDS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0459</td>
<td></td>
</tr>
<tr>
<td>Kerosene (non-PDS)</td>
<td>0.0080</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.2810</td>
<td>0.2105</td>
<td>0.1989</td>
<td>0.2221</td>
<td>0.1676</td>
<td>0.2851</td>
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</table>

Table 3: Direction of Tax Change from Sales Tax to VAT Regime

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Direction of Tax Rate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>4→4, 1.15→0, 0→0, 0→0, 2→0</td>
</tr>
<tr>
<td>Milk (liquid)</td>
<td>0→0, 0→0, 0→0, 0→0, 0→0</td>
</tr>
<tr>
<td>Spice</td>
<td>4.45→4, 4→4, 4.6→4, 4.6→4, 4.4→4, 8.05→4</td>
</tr>
<tr>
<td>Sandal</td>
<td>0→4, 0→4, 0→4, 0→4, 0→4</td>
</tr>
<tr>
<td>LPG</td>
<td>13.125→4.14→4, 13.8→4, 13.8→4, 8.8→4, 17→4</td>
</tr>
<tr>
<td>Biscuits</td>
<td>13.8→12.5, 8.8→12.4, 10→12.5</td>
</tr>
<tr>
<td>Tea</td>
<td>8.8→4</td>
</tr>
<tr>
<td>Sugar (non-PDS)</td>
<td>0→4, 4.6→4</td>
</tr>
<tr>
<td>Wheat (non-PDS)</td>
<td>0→0</td>
</tr>
<tr>
<td>Kerosene (non-PDS)</td>
<td>6.3→12.5</td>
</tr>
</tbody>
</table>

Note: Tax Rate Data are collected from INSTAVAT CD, Tax Data Set, published by Instavat Info Private Limited, Mumbai.
Table A1: Estimated Own and Cross Price Elasticity (Bihar)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>-1.4784</td>
<td>-0.5162</td>
<td>-0.1423</td>
<td>1.7281</td>
<td>0.1100</td>
<td>-0.7013</td>
</tr>
<tr>
<td>Spice</td>
<td>-3.7513</td>
<td>-2.1055</td>
<td>0.4464</td>
<td>7.2435</td>
<td>1.0292</td>
<td>-3.8623</td>
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<tr>
<td>Kero(non-PDS)</td>
<td>-2.8543</td>
<td>1.2325</td>
<td>-1.1281</td>
<td>-6.2654</td>
<td>-1.4598</td>
<td>9.4752</td>
</tr>
<tr>
<td>Milk (Liquid)</td>
<td>4.7223</td>
<td>2.7236</td>
<td>-0.8533</td>
<td>-10.5580</td>
<td>-2.0012</td>
<td>4.9665</td>
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<tr>
<td>Others</td>
<td>-0.2518</td>
<td>-0.1908</td>
<td>0.1696</td>
<td>0.6527</td>
<td>0.2176</td>
<td>-1.5972</td>
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</table>

$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column

Table A2: Estimated Own and Cross Price Elasticity (Gujarat)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Wheat (non-PDS)</td>
<td>-0.0462</td>
<td>0.0050</td>
<td>-0.2853</td>
<td>-0.2605</td>
<td>-0.0271</td>
<td>-0.3859</td>
</tr>
<tr>
<td>Sugar (non- PDS)</td>
<td>0.0150</td>
<td>-0.5280</td>
<td>-0.3621</td>
<td>0.0689</td>
<td>0.0297</td>
<td>-0.2235</td>
</tr>
<tr>
<td>Spice</td>
<td>-0.5457</td>
<td>-0.2313</td>
<td>-0.5237</td>
<td>0.0275</td>
<td>-0.0293</td>
<td>0.3025</td>
</tr>
<tr>
<td>Milk (liquid)</td>
<td>-0.1330</td>
<td>0.0117</td>
<td>0.0073</td>
<td>-0.4864</td>
<td>-0.0117</td>
<td>-0.3879</td>
</tr>
<tr>
<td>Sandal</td>
<td>-0.3337</td>
<td>0.1219</td>
<td>-0.1885</td>
<td>-0.2830</td>
<td>-0.6011</td>
<td>0.2844</td>
</tr>
<tr>
<td>Others</td>
<td>-0.0300</td>
<td>-0.0058</td>
<td>0.0123</td>
<td>-0.0591</td>
<td>0.0018</td>
<td>-0.9191</td>
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$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column

Table A3: Estimated Own and Cross Price Elasticity (Karnataka)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>-0.2958</td>
<td>-0.0678</td>
<td>-0.0899</td>
<td>-0.0602</td>
<td>-0.0193</td>
<td>-0.4670</td>
</tr>
<tr>
<td>Sugar (non-PDS)</td>
<td>-0.3960</td>
<td>-3.4202</td>
<td>-0.2352</td>
<td>-0.4287</td>
<td>-0.3177</td>
<td>3.7979</td>
</tr>
<tr>
<td>Spice</td>
<td>-0.2633</td>
<td>-0.1180</td>
<td>-0.7048</td>
<td>-0.1647</td>
<td>-0.0773</td>
<td>0.3281</td>
</tr>
<tr>
<td>Milk (liquid)</td>
<td>-0.0842</td>
<td>-0.1027</td>
<td>-0.0787</td>
<td>-0.3039</td>
<td>0.0022</td>
<td>-0.4328</td>
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<tr>
<td>Sandal</td>
<td>-0.4260</td>
<td>-1.2003</td>
<td>-0.5823</td>
<td>0.0344</td>
<td>-0.3202</td>
<td>1.4944</td>
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<tr>
<td>Others</td>
<td>-0.0551</td>
<td>0.0767</td>
<td>0.0132</td>
<td>-0.0365</td>
<td>0.0080</td>
<td>-1.0063</td>
</tr>
</tbody>
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$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column
Table A4: Estimated Own and Cross Price Elasticity (Madhya Pradesh)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>-2.1762</td>
<td>0.0368</td>
<td>-0.3595</td>
<td>0.5848</td>
<td>0.0105</td>
<td>0.9036</td>
</tr>
<tr>
<td>Biscuits</td>
<td>0.9141</td>
<td>-0.9650</td>
<td>-0.3196</td>
<td>0.1925</td>
<td>-0.1701</td>
<td>-0.6518</td>
</tr>
<tr>
<td>Spice</td>
<td>-1.5724</td>
<td>-0.0563</td>
<td>-0.7728</td>
<td>0.4960</td>
<td>0.0232</td>
<td>0.8824</td>
</tr>
<tr>
<td>Milk (liquid)</td>
<td>1.2425</td>
<td>0.0165</td>
<td>0.2410</td>
<td>-0.9546</td>
<td>0.0232</td>
<td>-1.5684</td>
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<tr>
<td>Sandal</td>
<td>0.2038</td>
<td>-0.1328</td>
<td>0.1026</td>
<td>0.2114</td>
<td>-0.7956</td>
<td>-0.5894</td>
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<tr>
<td>Others</td>
<td>0.1837</td>
<td>-0.0053</td>
<td>0.0410</td>
<td>-0.1500</td>
<td>-0.0062</td>
<td>-1.0631</td>
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$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column

Table A5: Estimated Own and Cross Price Elasticity (Maharashtra)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>-3.4414</td>
<td>-0.0144</td>
<td>-0.2387</td>
<td>0.1859</td>
<td>-0.0097</td>
<td>2.5182</td>
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<td>Tea</td>
<td>-0.0593</td>
<td>-0.6261</td>
<td>-0.1408</td>
<td>0.0953</td>
<td>-0.1051</td>
<td>-0.1640</td>
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<tr>
<td>Spice</td>
<td>-0.6371</td>
<td>-0.0910</td>
<td>-0.9236</td>
<td>-0.0308</td>
<td>-0.0423</td>
<td>0.7249</td>
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<tr>
<td>Milk (Liquid)</td>
<td>0.2317</td>
<td>0.0288</td>
<td>-0.0144</td>
<td>-0.2596</td>
<td>0.0230</td>
<td>-1.0095</td>
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<tr>
<td>Sandal</td>
<td>-0.1399</td>
<td>-0.3674</td>
<td>-0.2288</td>
<td>0.2663</td>
<td>-0.6134</td>
<td>0.0831</td>
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<tr>
<td>Others</td>
<td>0.2698</td>
<td>-0.0043</td>
<td>0.0291</td>
<td>-0.0868</td>
<td>0.0006</td>
<td>-1.2085</td>
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$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column

Table A6: Estimated Own and Cross Price Elasticity (West Bengal)

<table>
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<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>-0.3927</td>
<td>0.0017</td>
<td>-0.0129</td>
<td>-0.0625</td>
<td>-0.1914</td>
<td>-0.3422</td>
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<tr>
<td>Sandal</td>
<td>0.0948</td>
<td>-0.6196</td>
<td>-0.0670</td>
<td>-0.1948</td>
<td>0.4597</td>
<td>-0.6732</td>
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<tr>
<td>Sugar (non-PDS)</td>
<td>-0.2855</td>
<td>-0.0260</td>
<td>-0.5428</td>
<td>0.2948</td>
<td>1.4758</td>
<td>-1.9163</td>
</tr>
<tr>
<td>Spice</td>
<td>-0.6088</td>
<td>-0.0332</td>
<td>0.1296</td>
<td>-0.3910</td>
<td>-0.1819</td>
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<tr>
<td>Milk (Liquid)</td>
<td>-0.8461</td>
<td>0.0355</td>
<td>0.2943</td>
<td>-0.0825</td>
<td>-1.5463</td>
<td>1.1451</td>
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<tr>
<td>Others</td>
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<td>-0.0045</td>
<td>-0.0331</td>
<td>0.0034</td>
<td>0.0993</td>
<td>-0.9338</td>
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$e_{ij}$: Elasticity of demand for ith commodity (row) with respect to price of jth column
Table 8: State-wise Calculated Marginal Efficiency Cost of Public Fund (MECF)

<table>
<thead>
<tr>
<th></th>
<th>Bihar</th>
<th>Gujarat</th>
<th>Karnataka</th>
<th>M.Pradesh</th>
<th>M.Rashtra</th>
<th>W.Ben</th>
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<tbody>
<tr>
<td>Rice (non-PDS)</td>
<td>1.1965</td>
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<tr>
<td>Wheat (non-PDS)</td>
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<td>1.0546</td>
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</tr>
<tr>
<td>Sugar (non-PDS)</td>
<td>1.1043</td>
<td>0.7728</td>
<td></td>
<td></td>
<td></td>
<td>1.2214</td>
</tr>
<tr>
<td>Kerosene (non-PDS)</td>
<td>0.6010</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tea</td>
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<td></td>
<td></td>
<td></td>
<td>1.0838</td>
<td></td>
</tr>
<tr>
<td>Sandal</td>
<td>0.2796</td>
<td>0.9650</td>
<td>0.9120</td>
<td>1.0645</td>
<td>1.0298</td>
<td>1.0894</td>
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<tr>
<td>Spice</td>
<td>2.4932</td>
<td>1.0127</td>
<td>1.0003</td>
<td>0.9673</td>
<td>0.9575</td>
<td>1.0333</td>
</tr>
<tr>
<td>Biscuits</td>
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<td></td>
<td>1.2218</td>
<td>1.1769</td>
</tr>
<tr>
<td>Milk (Liquid)</td>
<td>0.5711</td>
<td>1.0417</td>
<td>1.0658</td>
<td>1.1359</td>
<td>1.1423</td>
<td>0.9129</td>
</tr>
<tr>
<td>LPG</td>
<td>1.1626</td>
<td>1.1094</td>
<td>1.1349</td>
<td>1.0970</td>
<td>1.1769</td>
<td>1.1094</td>
</tr>
</tbody>
</table>

Appendix (III)

III.A. Bihar

Expenditure shares vs per capita expenditures - Bihar

(Fig (A1) & Fig (A2))

Lorenz and Concentration Curves

(Fig (A3))
Consumption Dominance Curves (s=1)
(Normalised by the mean)

III.B. Gujarat

Share of Expenditure vs Per Capita Expenditures
(Linear Locally Estimation Approach | Bandwidth = 1.284)

Lorenz and Concentration Curves
Consumption Dominance Curves (s=1)
(Normalised by the mean)

Poverty line (z)

Fig (B4)

III.C.Karnataka

Share of Expenditure vs Per Capita Expenditures
(Linear Locally Estimation Approach | Bandwidth = .1295)

Fig (C1)

Fig (C2)

Lorenz and Concentration Curves

Fig (C3)
III.D. Madhya Pradesh

Fig (D1) and Fig (D2) show expenditure shares vs per capita expenditures in Madhya Pradesh. The figures display data for various commodities including rice, sandalwood, lpg gas, milk, biscuits, and spices. The graphs illustrate the distribution of expenditure shares across different per capita expenditure levels, highlighting disparities in consumption patterns.

Fig (D3) presents Lorenz and Concentration Curves for the commodities mentioned. These curves are used to assess income inequality and concentration patterns in consumption. The curves are normalized by the mean to provide a standardized view of consumption distribution across different percentiles.
Consumption Dominance Curves (s=1) (Normalised by the mean)

Fig (D4)

III.E.Maharashtra

Expenditure Shares vs Per Capita Expenditures-Madhya Pradesh
(Linear Locally Estimation Approach | Bandwidth = .0852)

Fig (E1) Fig (E2)

Lorenz and Concentration Curves

Fig (E3)
III.F. West Bengal

Consumption Dominance Curves (s=1)
(Normalised by the mean)

Expenditure shares vs per capita expenditures
(Linear Locally Estimation Approach | Bandwidth = .0792)

Share of Expenditure vs Per Capita Expenditures - West Bengal
(Linear Locally Estimation Approach | Bandwidth = .0792)

Lorenz and Concentration Curves

Fig (E4)

Fig (F1)

Fig (F2)

Fig (F3)
Appendix IV

The FGT class of poverty measures can be written as:

\[ P_{s-1}(z) = \int_0^\infty \frac{1}{g^{s-1}(z, y)} \cdot dF(y) \]

where \( g^{s-1}(z, y) = \left( \frac{z - y}{z} \right)^{s-1} \) and \( F(y) \) is the distribution of nominal income.

For \( s \neq 1 \), the impact of a marginal variation of \( t_k \) on poverty is given by

\[ \frac{\partial P_{s-1}(z)}{\partial t_k} = \int_0^\infty \frac{\partial g^{s-1}(z, y)}{\partial t_k} \cdot dF(y) \]

with

\[ \frac{\partial g^{s-1}(z, y)}{\partial t_k} = -(s-1)g^{s-2}(z, y) \cdot \frac{\partial y}{\partial t_k} \]

Using Roy’s identity it can be shown

\[ \frac{\partial y}{\partial t_k} = \frac{\partial v}{\partial t_k} / \frac{\partial v}{\partial y} = -x_k(y, P), \]

where \( v \) is the indirect utility function and \( P \) is the post tax price vector.

When \( s=1 \), a limiting argument shows that

\[ \frac{\partial P^0(z, y)}{\partial t_k} = -\frac{\partial F(y)}{\partial t_k} = -x_k(z, P)f(z) \]