Optimal Sales Taxation in India

- A preliminary report

Abstract: India has very recently seen a major economic reform through implementation of GST, Goods and Services Tax across the whole nation. The tax reform through GST scheme removes multiple taxes like central taxes, state taxes, duties like excise duty, counter vailing duty, etc., and instead places a uniform tax, Goods and Services Tax (GST). Motivated by this economic reform, my research looks at the problem of optimal sales taxation in India. Using "large data" methods from current research work, the study aims to find if the current tax rates- 5%, 12%, 18% and 28%, employed under GST scheme are optimal or not. We will study the changes in tax revenue brought by optimal tax schedule, for a given societal welfare level and check if the economic growth fuelled by implementation of GST scheme can be further increased by finding optimal tax rates.

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Data

The data used in this study is IHDS (India Human Development Society) Survey II. The IHDS is a nationally-representative survey of 41,554 households collected from 1503 villages and 971 urban neighbourhoods across India. The survey is jointly organized by the National Council of Applied Economic Research (NACER) (India) and the University of Maryland (United States). The data is very much accessible from their website (https://ihds.umd.edu). "IHDS-II public data files are available from the Data Sharing for Demographic Research program of ICPSR, the Inter-university Consortium for Political and Social Research, at ICPSR Study 36151 (IHDS-II)."[1]

An important feature of IHDS Survey II is that it develops upon the previous survey, IHDS I. As there are households which are common to both the surveys, the study of economic changes in India becomes feasible. The researchers interview each household from the sample, covering range of topics like health, employment, education, marriage, economic status, etc. Within IHDS II data, there are multiple files catering to different topics at different levels: Household, Individual, Medical facilities, Wages, etc. This study uses the files and data available under the "Household" category.

Sample:

IHDS II sample had 42,152 households in total, out of which around 83% of the households were a part of IHDS I survey. In terms of geographic reach, IHDS II sample was spread across 33 states and union territories, hundreds of districts and thousands of villages and urban blocks from multiple towns and cities. The sample weights are provided with the data.

Variables of Interest:

Income: The survey had questions designed to measure household income, categorised into 8 different types: farm income, wage and salary income, etc. Crop failures and high cost of agricultural expenditures result in negative income for around 11% of the households. The data on households corresponding to negative income have been removed from this study.

[1] https://ihds.umd.edu/IHDS-II

Descriptive Summary: The average annual income is Rs. 129469, with the minimum income of Rs. 0, and maximum income of Rs. 11360000.

count	41700.000
mean	129469.631
std	217085.488
min	0.000
25%	40000.000
50%	74600.000
75%	145200.000
max	11360000.000

Consumption/Expenditure: The survey had questions about household consumption that were designed to estimate consumption expenditures of a household. It is an important variable as total expenditure is a good measure of household's current economic level. The survey had questions about both, frequently purchased goods like rice, pulses, etc, and also, goods like transport equipment, furniture, etc. which are purchased annually.

Descriptive Summary: The average monthly consumption expenditure is Rs. 9178, with minimum expenditure of Rs. 0 and maximum expenditure of Rs. 340063.

count	41700.000
mean	9178.887
std	9606.792
min	0.000
25%	4363.542
50%	6766.083
75%	10844.125
max	340063.333

Model

This study borrows the model selection and solution method approach from Baker et al. (2014). The households are characterized by type (η, w) where $\eta \geq 1$ is the elasticity of substitution and w is the wage. The goods are categorized into six different categories based on the different tax rates under Goods and Services Tax (GST) schedule. The six different tax rates are- Nil, 3%, 5%, 12%, 18% and 28%. There is no tax rate on essential items while the tax rate is highest for the luxury items, except for jewellery which attracts a tax rate of 3%.

Households maximize the constant relative risk aversion (CRRA) utility function, given a minimum level of consumption for each type of good. The elasticity of substitution, η and the coefficient of relative risk aversion, γ will not be calculated empirically but borrowed from current literature. The wage w is estimated using gamma distribution fitted to the income data obtained from IHDS II survey. The household's optimization problem is:

$$\max_{\boldsymbol{c}} u(\boldsymbol{c};\ \eta, w, \boldsymbol{\tau})\ \ s.t. w\ \geq\ \sum_{i=1}^{6}(1+\ \tau_i)c_i\ \ and\ c_i\ \geq \bar{c_i}\ \forall\ i$$

The policy maker's problem is to find a sales tax schedule for the six categories of goods mapped with the GST tax rates, that not only maximizes the utility of the economy, but is also greater than a fixed amount of revenue, $\bar{R}$.

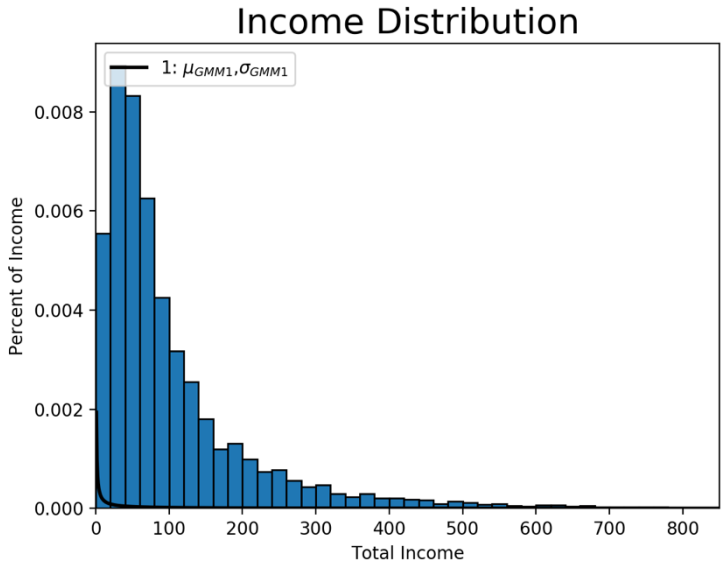
$$\max_{\boldsymbol{c}} \int_{\eta}\int_{w} f(\eta)f(w)u\big(\boldsymbol{c}(\eta, w, \boldsymbol{\tau})\big)\, d\eta dw\ \ s.t. \int_{\eta}\int_{w} f(\eta)f(w)\sum_{i=1}^{6}\tau_i c_i(\eta, w, \boldsymbol{\tau})\ d\eta dw\ \geq\ \bar{R}$$

$\boldsymbol{\tau}$ refers to the tax schedule for the six different goods categories.

Results

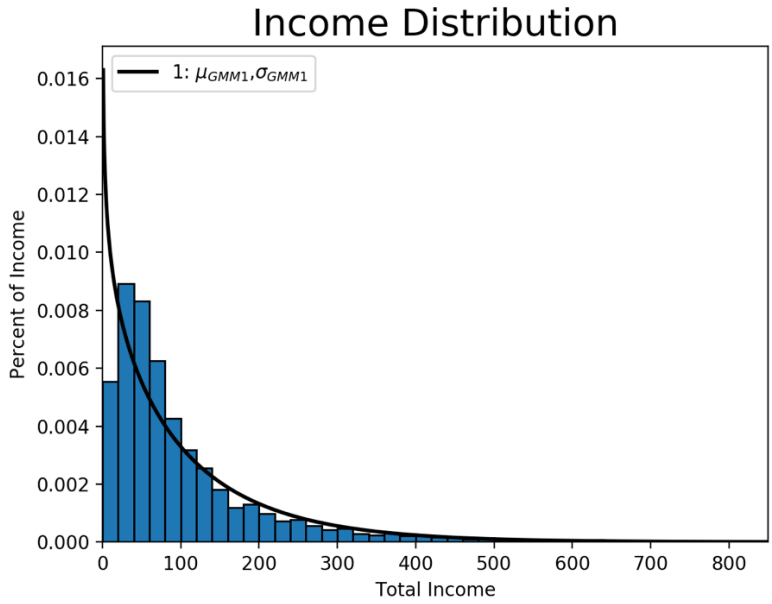
The 'income' variable from IHDS II survey was used to plot the histogram to capture the income distribution in India. As outlined in the earlier sections, the mean annual income. Is around Rs. 100,000. We have tried to fit the log-normal and gamma distribution to the income data. Note: The following plots have annual household income (Rs.000s)

Log-normal distribution (mu = 1.54, sigma = 622)



The gamma distribution had a better fit than log-normal distribution.

Gamma distribution (mu = 103 , sigma = 12358)

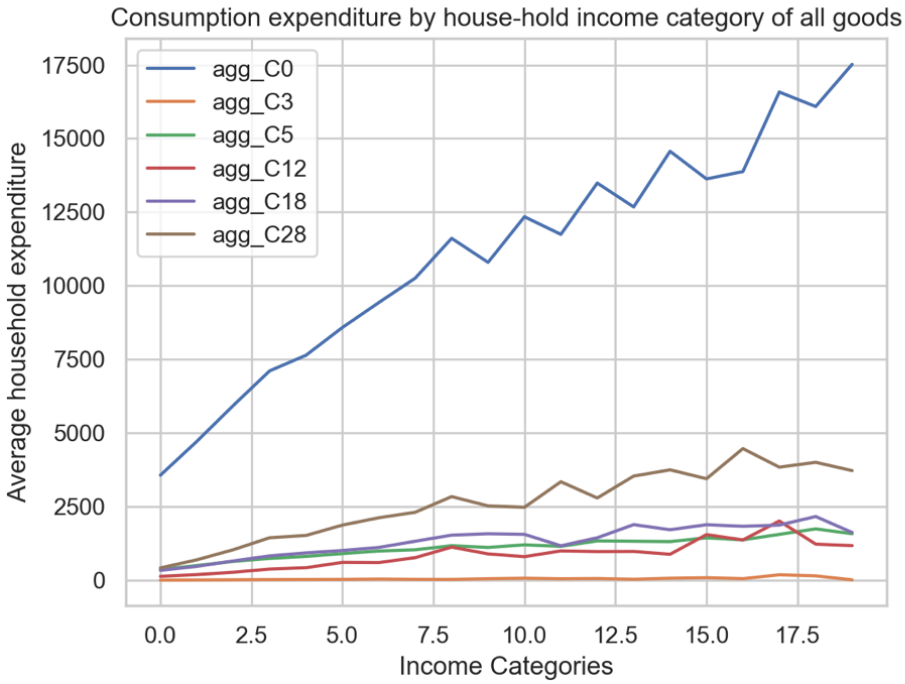


Next, average total consumption expenditure by a household, across different goods category was obtained. There are six good categories based on the tax rates imposed on them. The six different tax rates are- Nil, 3%, 5%, 12%, 18% and 28%.

Across all the households, the average household consumption expenditure was highest on the goods category which attracted nil tax rate. For goods categories which had positive tax rates, the average household expenditure increased with the increase in annual income.

Note: The income categories on the x-axis follows the bin size of Rs. 20,000 and ranges from Rs. 0 to Rs. 800000.

agg_C0, agg_C3, agg_C5, agg_C12, agg_C18 and agg_C28 corresponds to average household expenditures for goods categorised by tax rates: Nil, 3%, 5%, 12%, 18% and 28%, respectively.



The expenditure on jewellery by lower income households is almost nil as shown by “agg_C3” line. One reason for non-zero average household expenditure for goods category with highest tax rate, 28% could be the inclusion of diesel/petrol/CNG in this category. Next, we need to find the minimum consumption expenditure by each category of household for each of the goods category using regression. After that, the final step will be to solve for policy maker’s problem and find the optimal tax schedule for a given level of societal welfare.

Bibliography

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