

# Measuring Incidence of GST on the Households of Newzealand<sup>1</sup>

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In order to restructure the economy of Newzealand many radical changes in economic policies were proposed and implemented since 1985. The major emphasis of these policy reforms has been to liberalize the economy of Newzealand in order to allow international market forces to dictate the allocation and distribution of income. Many changes in taxation policies were introduced as an integral part of fundamental changes in economic policies. These reforms implemented in order to shift the existing tax mix in favour of indirect tax rather than direct tax for the purpose of tax revenue receipts. In search of more practical and feasible direct and indirect tax-mix, the government of Newzealand reduced the rates of direct taxes and announced to introduce a broad based Goods and Services Tax (GST). It was emphasised that these tax reforms combined with other economic policy reforms are being introduced to improve the economic efficiency, growth and productivity.

Recent tax changes opened the area of discussion in connection with the possible effects of these changes on the overall economy. This is a very complex issue to discuss the overall effects of these tax reforms on an economy because such reforms affect the economy in a number

of ways. But, one of the important aspect of changes in taxation policies, is the impact on the distribution of income. The introduction of GST also have its distributive effects related with the distribution of its burden on the various income group households. This study analyses these distributive properties of GST for the economy of Newzealand. The effects of GST are of special interest because this tax is a consumption tax which is broad based, uniformly rated and introduced for the first time in the economy of Newzealand.

It is worthwhile to note that distributional aspects of a tax is the only one element to evaluate its desirability and suitability. There are other properties of a tax like effect on economic growth, productivity, efficiency and its role as a source of revenue have also to be considered. But, in this paper only the distributional aspect i. e. the effect of tax on income distribution which is examined. As a first step, the effect of GST is measured in terms of tax elasticities by estimating a functional relationship between GST paid by a household and its disposal income or total expenditure. We introduce the additional variables for the size and composition of households in the above functional forms, as a second step. Finally, we ad-

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just the household consumption, expenditure and tax paid to adult equivalent scale in the revised functional forms. The results obtained from various regression equations are compared to analyze the incidence of GST.

The plan of this paper is as follows : the discussion of major studies were conducted in Newzealand associated with the effects of GST and some overseas studies related with the effects of consumption tax along with the scope of present study are given in section II. Section III to VII describes the conceptual and methodological issues, while section VIII presents an analytical view of available data set. Section IX explains the empirical results and their policy implications. Some conclusive remarks are given in the last section of the paper.

## II

The tax reforms in Newzealand have been debated and discussed at various levels in the government and public circles. In a detailed study Scott et al (1985) analyzed the impact of GST on different income groups and household types. But the major limitation of this study is that it measures the ex-ante incidence of GST, as it measures the impact on the basis of income and expenditure distribution that existed before the tax reforms were implemented. This does not include the possible behavioral changes in the consumption patterns of the households due to introduction of tax changes. This limitation is overcome in a recent report published by the Department of Statistics, Newzealand on the fiscal impact on income distribution (1990). This report found that indirect taxation is directly

proportional to the household equivalent market income but inversely proportional when indirect tax is considered in proportion to total household's income. As this study examines the overall impact of government expenditure and revenue collection on the income of households, the impact of indirect taxes (GST in particular) on various income groups, discussed very briefly and in an aggregated manner, only as a part of study. The proportion of income paid as indirect tax for decline income groups are also measured in a report, published by Newzealand Planning Council on 'income and wealth' (1988). This report supports the earlier finding that incidence of indirect taxes as a percentages of disposal income is higher for lower income group deciles, than for higher income groups. The revised version of this report published on the distribution of income and wealth in Newzealand (1990) by the planning council concludes that incidence of indirect taxation has further increased for lower income deciles in a time period from 1985-86 to 1987-88. Like previous studies these measurement are also, in a very aggregated form in terms of income groups and do not discuss the distribution of indirect tax burden on the group of commodities level.

The discussion of some of the overseas studies on the effects of indirect tax on income distribution are outlined below. Levitt (1976) measures the redistributive effects of Value-Added Tax (VAT) in United Kingdom. He emphasised the need to examine the redistributive effects of an indirect tax on real purchasing power of the households rather than nominal income. Adams (1980) examined the effects of VAT in United Kingdom, Ireland, Belgium and Germany. Using regression analysis to

measure the tax elasticities with respect to household's income and expenditure. He found VAT progressive for both income and expenditure base. The impact of consumption taxes at different income levels (1981) studied by the committee on fiscal affairs by OECD for the member countries. This report concludes on the basis of experiences of Belgium, Finland, France, Germany, Netherlands, Norway and United Kingdom with the value-added taxation, that this tax is not regressive, but tending towards a proportional tax in most of the countries. Using Australian data Kakwani (1983) studied the effects of sales tax on individual goods and services on the overall income distribution. He derives an index of progressivity of sales tax on specific items of consumptions applying generalized Lorenz curve approach. His results are of special interest for the purpose of policy implication as they identify the particular goods and services whose tax exemption would reduce the tax burden of target income groups.

Reviewing the previous studies we found it of interest to study in depth the effects of GST on distribution of income. The present study is also relevant in the context of major tax reforms in Newzealand and its effect on standard of living of households Newzealanders in general. The present study is a forward step in this direction. The main contribution of this study is to measure the incidence of GST on the households belong to various income groups and across the several group of commodities. Furthermore, this also takes into account the composition of household's size and adjusts household's income, expenditure and tax paid accordingly.

We believe this study of interest because it deals with the issues like what is

the tax burden on households, if tax burden is regressive, then what is the degree of regressivity, how this regressivity get affected with the composition of household's size and for various commodities. These estimates may also be helpful to assess the various social security schemes for the households belong to lower income groups while compensating to offset increased tax burden. It is the purpose of this study to explore further some of these issues which are of considerable importance in suggesting and thus, helping in the formulating the more practical and feasible taxation and social welfare policies.

### III

#### Consumption Type Value-Added Broad-Based Tax

Value-added is the difference between the value of the sectoral output and value of intermediate inputs used in producing the sectoral output. Value-added can also be defined as the sum of wages and salaries, interest payments and profits before tax earned by a firm. The proportional tax levied on a sum equal to value-added minus purchases of investment goods known as a value-added tax (VAT). When VAT was introduced in Newzealand, it was decided to call it as Goods and Services Tax (GST). GST is a consumption type tax as it tax consumption expenditure (not the income) and it is a broad-based, because of its comprehensive nature, that is covering almost all goods and services rather than a selected few. This tax system operates in following way: the amount of GST, a producer charges and collects on his output subtracts the GST on purchases made for its inputs. This mechanism referred as a 'credit off-

set' in which the additional GST charged at the each stage of production and distribution will ultimately be borne by the final consumer. This tax is very similar to the value-added tax system operates in United Kingdom, with a difference that some consumption items are exempted in U. K., whereas, almost all the items are uniformly taxed (at a flat rate) in Newzealand. GST is imposed at a zero percent on exported goods whereas, imported goods are taxable at a standard GST rate under current tax system.

Precisely, GST is an indirect tax imposed on the value-added at every stage of production and distribution in such a manner that the final consumer ultimately pays the full amount of GST levied.

#### IV

##### **Incidence of GST**

The real income of a household reduces whenever, any tax is imposed. Tax burden is known as the amount by which real income is reduced by the imposition of a tax. The way in which this tax burden is shared among the individuals households is referred as the tax incidence. Thus, the incidence of tax deals with the distributional aspects of a tax. One of the convenient ways to study the incidence of a tax is to analyse the distribution of tax burden among households grouped by income classes.

The fundamental approach is to examine the proportion of tax paid as some notion of household's command over economic resources like household's income or expenditure. The proportionate tax burden is derived as the amount of tax

paid corresponding to a particular income class divided by the total tax paid. Thus, obtained tax distribution function regressed upon the existing income/expenditure distribution function. If proportion of tax paid rises with the rise in income/expenditure than such a tax is referred as a progressive tax structure and a decreasing proportion of tax indicates a regressive tax system. In case the tax burden among households is distributed in proportion to their income, then, that tax system is known as proportional. Thus, the concept of tax progressivity/regressivity is related with its deviation from proportionality.

#### V

##### **Income vs Expenditure Base**

The purpose measuring tax progressivity/regressivity is to examine the effect of tax on the distribution of economic welfare. This measurement needs a quantifiable and acceptable base which may be considered to be a close representative of household's economic welfare. The household's income and expenditure are considered for this purpose in the literature. The argument in favour of selecting income, as a base is that income is total command over economic resources on the basis of which a household makes choices. Household's savings are included as a part of income because in long run savings are also to be spent. A good number of studies used total household's income a base to measure the incidence of indirect taxation like Musgrave (1964), Bentley et al (1974), Nicholson (1974,77), Pechman and Okner (1974), Dodge (1975); and Kakwani (1983). The argument put forward in favour of the use of expenditure base is that for a household expenditure pattern

is adjust relatively slowly with respect to change in income. Analysing the cross-sectional data, the income at a given point of time may not necessarily represent 'normal income' which is called sometime as a permanent income. Further, it is argued that expenditure pattern includes all long term life time expected income and taxes, so expenditure base would be more appropriate. The most obvious weakness of expenditure base is that at a given time it also includes the expenditure on consumer durables which is a deviation from normal consumption pattern.

After a lucid discussion in favour and against of these two bases, an OECD report on the impact of consumption taxes at different income levels (1981) concluded that 'the choice between income or consumption (expenditure) as the basis for measuring progressivity is essentially one of methodology and the solution adopted is, where ever possible, to show the results on the both bases'. Therefore, present study uses both the bases for the purpose of estimation with a difference that we use disposable income representing the income base. We take the view that disposable income is more realistic choice, which represnets the real command of a household on economic resources than the total household income.

## VI

### Model

For a given type of household we start with assumed functional relationship between GST paid and disposable income/expenditure. If  $GST_1$  be the total GST

payment,  $HDI_1$  be the disposal income and  $HEXP_1$  be the total expenditure (including GST) belonging to the household representing ith income class, then

$$GST_1 = f(HDI_1) \quad (1)$$

$$GST_1 = f(HEXP_1) \quad (2)$$

It is proposed to explain these functional forms in to the simple linear double  $\log^1$  relationship as

$$\log(GST) = a_1 + a_2 \log(HDI) \quad (3)$$

$$\log(GST) = b_1 + b_2 \log(HEXP) \quad (4)$$

The advantage of these regression equations are that regression coefficients  $a_2$  and  $b_2$  represents the tax elasticities with respect to disposal income/expenditure.  $a_1$  and  $b_1$  are interception of equations. These equations are also, accounted for randomly distributed error terms which satisfy all the assumptions required for Ordinary Least Square methods. A progressive tax implies that the 1 percent rise in disposal income/expenditure leads to rise in tax paid more than 1 percent and value of elasticity will be more than one. That is to say :

Tax elasticity  $< 1$  Regressive Tax

Tax elasticity  $= 1$  Neutral Tax (proportional Tax)

Tax elasticity  $> 1$  Progressive Tax

## VII

### Household Size

The functional relationships discussed above are subject to ceteris paribus assumptions. The estimation of equation (3) and

<sup>1</sup>natural logs are applied for the purpose of estimation in this paper.

(4) on the basis of single dependent variable means that the number of households, their age, sex, occupation and similar other demographic and personal factors are same for all the households. In a cross sectional data analysis, such as this, these factors are likely to differ among various households belong to various income groups and may affect the expenditure patterns. In turn, these factors may also affect the amounts of GST paid by the households. One of the important demographic factors is the size of the household. This would be worthwhile to test the significance of this factor on the distribution of tax burden of GST. Including household size as an independent variable, the functional relationships may be expressed as

$$GST_1 = f(HDI_1, N_1) \quad (5)$$

$$GST_1 = f(HEXP_1, N_1) \quad (6)$$

$N_1$ , is the size of household representing income class. It should be noted that demographic characteristics other than household size are ignored here.

The double log linear equations based on functional relationships (5) and (6) can be expressed as

$$\log GST = c_1 + c_2 \log HDI + c_3 \log NAM + c_4 \log NAF + c_5 \log NC \quad (7)$$

$$\log GST = d_1 + d_2 \log HEXP + d_3 \log NAM + d_4 \log NAF + d_5 \log NC \quad (8)$$

$NAM$ ,  $NAF$  and  $NC$  are the number of adult males, females and number of children in the household representing  $i$ 'th income class.

It is possible to attach proper weight to each and every adult male, female and child (aged less than fifteen years) in the household as per their 'Adult Equivalent units' provided an appropriate 'Adult Equivalence Scale' exists. In such cases the number of adult males, females and children are adjusted accordingly to derive an 'Adult Equivalence Sum' corresponding to the size of each representative household belong to various income classes. Let  $AES$  describes the adult equivalence sum representing the household's size belongs to  $i$ 'th income class, then equation (7) and (8) can be transformed as

$$\log GST = f_1 + f_2 \log HDI + f_3 \log AES \quad (9)$$

$$\log GST = g_1 + g_2 \log HEXP + g_3 \log AES \quad (10)$$

Now, it is possible to derive burden of GST in terms of household's disposal income/expenditure per adult equivalent units, as

$$\log GST = k_1 + k_2 \log(HDI/AES) \quad (11)$$

$$\log GST = l_1 + l_2 \log(HEXP/AES) \quad (12)$$

$K_2$  and  $l_2$  are tax elasticities with respect to household's disposal income and expenditure adjusted to household size.

## VIII

### Data Set : Availability and limitations

The statistical information on which the GST system is evaluated in this paper are mainly from Newzealand Household Expenditure and Income Survey : 1988-89, (HEIS : 1988-89) published by the Department of Statistics. The survey contains the information on expenditure and income for various composition, size, age and types of households. This survey is es-

pecially useful for present study, as it provides information for the expenditure pattern for more than sixty goods and services classified in seven groups of consumption items. This report is based on the information obtained from representative samples of approximately 3,400 New-zealand-resident private households.

In this report, most of the statistical tables classified the statistical information for either deciles or octiles household's income groups. This limited range of data is a serious limitations for any study related to household's consumption behaviour, which may require more disaggregated data for estimations. As a special request to the department of statistics, we were supplied some of the required statistical information on a more detailed income group basis considering our needs for present piece of work. These tables contained expenditure patterns on various goods and services classified for twenty five, fairly large, disaggregated income groups. This type of disaggregated information was also, made available for some of the household characteristics wise like average number of persons, average ages, tenure of dwellings wise corresponding to Table - 17 of HEIS : 1988-89. Due to the limited sample size of HEIS survey, we have been informed that the disaggregated data will not be reasonably reliable for the household types and occupational classifications, which would have been more suitable for the present type of work.

In the HEIS survey, income is regarded as receipts which are received regularly or are of reoccurring nature. The household income is defined as the aggregation of total income received by all individual household members of age 15 years or over from the following sources :

(i) Wages and salaries, which includes salary and wages and earnings related accident compensation.

(ii) Business income—which includes income from self-employment, i. e. assessable profits plus withholding profits plus payments less expenses, minus current and previous losses.

(iii) Investment income includes interest, dividends, rent, net of expenses and royalties.

(iv) Social Security Benefits—includes Unemployment Benefit, National Superannuation and War pensions.

(v) Other regular incomes which include occupational pensions.

These income components are clearly quite a wide cross-section of income sources, thus found fairly comprehensive from the view point of reasonably good measure of households' welfare.

Given the way the report presents the data, some assumptions have had to be made to make them amenable to statistical manipulation for estimating the intended tax elasticities, for example, out of twenty five disaggregated income groups, the first income group was containing negative to zero income group range. This income group was not included for further estimation processes. So, for the purpose of analysis only twenty four income groups were used. Similarly mean income for a class interval has been assumed to be the actual income of each household in that group, as given in Tables of HEIS : 1988-89 supplied to us by the Department of Statistics.

As the focus of this study is to highlight the distributional effects of GST,

rather than all direct and indirect taxes and, also, a household made its expenditures out of disposable income only, this was found appropriate to use disposable income to represent the income base instead of total income. Due to unavailability of this statistic from HEIS, we have calculated income tax for representative household of each income class on average total income, on the basis of tax calculation information supplied in the Income Tax Return IR5 Guide (1989) published by the Inland Revenue Department, New Zealand, for the financial year 1988-89. The amount of income tax, thus calculated is subtracted from total income to get the disposable income for income for the household representing each income class.

We consider in this paper the current expenditure only and used the household's total expenditure including expenditure on all durable and non-durable goods and services. In order to avoid negative statistics in the capital transaction item of some income groups, the expenditure under this head is excluded from total household expenditure for all income groups. Any adjustment have not been made for consumption of income in kind or imputed rent.

For tax incidence purposes, we calculate the GST paid by multiplying the current rate of GST (as 12.5 percent ad-valorem) to current expenditure item wise for a household. Special attention has been paid to the housing group where house rent and mortgage payments are exempted from GST, rest of the items in the housing group are taxed like any other goods and services consumed by the household. This computation assumes that tax burden of GST shifted 100 percent

on the final consumers, that is on households, through prices.

It would have been more appropriate to use a standard adult equivalence scale to adjust the household's expenditure and income for household's size. One such scale for New Zealand is Jensen's Revised Scale discussed in the report on Income Equivalence and Estimation of Family Expenditures on Children (1988) of the Department of Social Welfare. Application of this scale requires the household classification analyzed by household type and income, as this information is given in Table 18 of HEIS : 1988-89 for only five major income groups. Due to small size of household's survey, it would not be statistically reliable to disaggregate this information for twenty four income class intervals. This limitation prevents us to use the standard adult equivalence scale in this study. Nevertheless, we have the information on the various household characteristics, analyzed by disaggregated income groups corresponding to Table 17 of HEIS : 1988-89. This table contains the information on average number of adult males, females and children for the representative household belonging to respective, twenty four income class intervals. As an alternative, we have converted each representative household in to a certain number of equivalent adult by using the following scale

first adult in the household	1.0
second and subsequent adult	0.7
each child (age less than fifteen years)	0.4

Thus obtained average size of representative household is the sum of the adult

equivalents and defined as Adult Equivalence Sum (AES) per household for each income group.

The above mentioned scale is applied by Kakwani (1989) for analysing the progressivity of sales-tax using the Australian data and defined as the scale '..... formulated on the basis of intuitive reasoning and can be considered arbitrary'. We believe that this scale serves the purpose as a best alternative in present circumstances from methodology and analyzing point of view and helps us in understanding the process of change when some adjustment for household size considered in the present type of study.

The available data set from HEIS : 1988-89 is in a grouped form, where each income class interval represented by different number of households. When this type of data set used for the estimation of elasticities through regression, here is a possibility of error in estimation, called heteroscedasticity, because of grouped data. Kakwani (1977) suggested to use weighted least square technique in such cases, where each equation is multiplied by the square root of the number of households in each income class interval, in order to minimize the error due to heteroscedasticity. Following (Kakwani, 1977, Bewley, 1982, and Giles and Hampton 1985) the above treatment to deal with heteroscedasticity, was also, applied to the regression equations estimated for this study.

### **Limitations of data**

As stated earlier the, distributional impact of GST burden is mainly based on the statistics collected from HEIS : 1988-89. The survey is based on relatively

small sample size, like 3400 households. As a result of which this survey is prone to sample and non sampling errors. Sampling error increases as we disaggregate the data by increasing the number of classes. This error increases because by increasing the number of classes by way of disaggregation, the number households belonging to per income class interval decreases drastically. Non sampling errors are classified as non response errors, measurement errors and processing errors. It is worth consider to highlight the measurement error at this stage. It is experienced in general that expenditure on certain type of goods like alcohol drinks and tobacco are under stated. Similarly, expenditure on durable goods may increase the household expenditure in some cases and caused the measurement error.

To measure the income, survey used most comprehensive definition of household income includes almost all the possible components of income, but few in the form of irregular income and imputed rents are excluded. It has long been recognised that there is a tendency to understate the income in most of the households. This understatement is not equi-proportional across the income groups, this differs with the levels of income. This tendency becomes the sources of bias which may over/understate the tax elasticities (see, Adams, 1980). Keeping all these limitations in mind, the findings of this study should be taken with a caution.

## **IX**

### **Empirical Results**

The main results of statistical analysis are presented in this section. The regression analysis of GST paid on total household

expenditure and disposal income gave the following results

$$\log \text{GST} = -2.392 + 1.028 \log \text{HEXP} \quad (13)$$

$$t = 48.176 \quad R^2 = 0.991$$

$$s = 0.021 \quad \text{ADJ-R}^2 = 0.990$$

$$\log \text{GST} = -0.187 + 4.696 \log \text{HDI} \quad (14)$$

$$t = 12.896 \quad R^2 = 0.882$$

$$s = 0.054 \quad \text{ADJ-R}^2 = 0.877$$

whereas,  $t$  and  $s$  are the value of  $t$ -ratio and estimated standard error, and  $R^2$  is coefficient of determination and  $\text{ADJ-R}^2$  is adjusted  $R^2$ . It is quite clear from equation 13 and 14, that the estimated elasticities are significant at 95 percent confidence interval. Tax elasticity with respect to total household expenditure (1.028) shows that tax system is almost proportional. This is so because goods and services are taxed at a uniform rate under GST system, so amount of GST paid becomes almost proportional to total expenditure. Uniform tax rate and comprehensive broad-base coverage of GST also evidenced from very high  $R^2$  and  $\text{ADJ-R}^2$ . The tax system revealed as regressive tax system (the value of tax elasticity is less than one), when we select disposable income as a base. This result was not surprising because household expenditure is higher for lower and middle income groups than their respective disposable incomes. As it is explained earlier, as a one of the possible reason for this mismatch, is that a household's expenditure is based on their long term expected income, rather than their income at a specific time period as revealed in cross section data.

It is worth mentioning at this stage that GST is exempted on house rent pay-

ments and mortgage payments on residential houses (provided the house is not being sold first time). These two items are the major expenditure components for most of the households. While calculating total GST paid these two expenditure items are excluded, while these two items are included in the total house hold expenditure as the household's expenditure items.

In order to test the significance of household's size on the distributive effects of GST, as a first step, the Table-1 presents the Karl pearsons correlation coefficients ( $r$ ) of number of adult males (NAM), adult females (NAF) and children (NC) with GST paid by the households.

**Table 1.**  
**Household Size and GST**

GST paid and NAM	0.947
GST paid and NAF	0.886
GST paid and NC	0.203

The high correlation coefficients of GST paid with various parameters of the size of households in Table-1 evident that GST paid is significantly and positively related with household's size. GST paid is generally high when the size of the household enlarges.

Double log linear estimates further explain the relationships of the NAM, NAF and NC with GST paid.

$$\log \text{GST} = -2.268 + 1.00 \log \text{HEXP} + 0.027 \log \text{NAM}$$

$$t = 17.745 \quad t = 0.287$$

$$s = 0.053 \quad s = 0.095$$

$$+ 0.139 \log \text{NAF} - 0.082 \log \text{NC}$$

$$t = 0.932 \quad t = 2.042 \quad R^2 = 0.993$$

$$s = 0.146 \quad s = 0.039 \quad \text{ADJ-R}^2 = 0.991$$

$$\log \text{GST} = 1.545 + 0.400 \log \text{HDI} + 0.578 \log \text{NAM}$$

$$t = 4.550 \quad t = 2.460$$

$$s = 0.087 \quad s = 0.252$$

$$+ 0.614 \log \text{NAE} - 0.155 \log \text{NC}$$

$$t = 1.440 \quad t = 1.430 \quad R^2 = 0.938$$

$$S = 0.420 \quad S = 0.116 \quad \text{ADJ-R}^2 = 0.925$$

The higher  $R^2$  and  $\text{ADJ-R}^2$  compared with the equations 13 and 14 show that, when the household size parameters are included as independent variables, it increases, the amount of variance explained by the dependent variable (GST paid) in equations 15 and 16. It is also interesting to note that tax-elasticities with respect to NAM and NAF are positive in both the equations, but only in case of NAM in equation 16, it is found statistically significant.

Applying arbitrary adult equivalence scale, the households adjusted and converted in to the number of adult equivalents per household, which is defined as adult equivalence sum (AES). The AES is found strongly positively correlated ( $r = .742$ ), with GST paid. This relationship can further be present in the following form

$$\log \text{GST} = -2.565 + 1.068 \log \text{HEXP} - 0.108 \log \text{AES} \quad (17)$$

$$t = 24.173 \quad t = -1.033 \quad R^2 = 0.991$$

$$s = 0.044 \quad s = 0.105 \quad \text{ADJ-R}^2 = 0.990$$

$$\log \text{GST} = 0.382 + 0.515 \log \text{HDI} + 0.744 \log \text{AES} \quad (18)$$

$$t = 6.566 \quad t = 2.877 \quad R^2 = 0.916$$

$$s = 0.078 \quad s = 0.259 \quad \text{ADJ-R}^2 = 0.908$$

The tax elasticities with respect to household size adjusted by the adult equivalence scale are not found statistically significant in equation 17, because of equi-proportional tax on household expen-

ditures the large amount of variances in GST, has already been explained by the variances in households' expenditures. Whereas, it is significant according to result obtained from equation 18 and positively affects the GST paid.

After realising the importance of household size and its possible impact on GST paid, the above analysis encourage us to look for the responses of tax elasticities of GST when household's expenditure and disposable incomes are adjusted by household size. This can be done by estimating tax elasticities with respect to household's expenditure per adult equivalent and disposable income per adult equivalent. We get finally the following results

$$\log \text{GST} = -4.052 + 1.462 \log (\text{HEXP}/\text{AES})$$

$$t = 16.853 \quad R^2 = 0.928$$

$$s = 0.087 \quad \text{ADJ-R}^2 = 0.925$$

$$\log \text{GST} = -0.495 + 0.850 \log (\text{HDI}/\text{AES}) \quad (20)$$

$$t = 9.189 \quad R^2 = 0.7932$$

$$s = 0.093 \quad \text{ADJ-R}^2 = 0.7838$$

The tax elasticities estimated and as revealed in equations 19 and 20, are found statistically significant at 99 percent confidence interval. It is clear that tax system is progressive with respect to household's expenditure adjusted to household's size, whereas it is regressive with respect to household's disposable income adjusted to household's size.

Comparing results from Table-2, it is interesting to note that GST tax system becomes progressive when expenditure base is chosen, and it is adjusted to household's size. Similarly, this tax system becomes less regressive when disposable income is selected as base and it is adjusted to household's size. These results show the im-

portance of household's size before reaching any conclusion about the distribution of tax burden on the households.

**Table 2**

**Tax—elasticities with respect to household's**

Size	Expenditure	Disposable Income
without adjusting	1.028	0.696
after adjusting	1.462	0.850

**Estimates of Tax -Elasticities for the Groups of Goods and Services**

We have measured and discussed so far, the incidence of GST in terms total GST paid with respect to total household expenditure and disposable income and thus, obtained results are compared with the tax incidence parameters where household expenditure and income are adjusted to household size. These measurement of aggregate tax incidence do not give us the insight of GST tax burden with respect to certain groups of goods and services. This section discusses the tax elasticities

of GST by the groups of goods and services wise in a disaggregated form. This analyses can give an idea that what are the group of goods and services on which GST is most regressive/progressive ? To what extent the distribution of this tax burden affected by the size of the household ?

The functional forms to deal with these issues are, defined as the GST paid on specific set of goods and services as the function of households expenditure and disposable income. This follows as

$$GST_{ij} = f(HEXP) \quad (19)$$

$$= f(HDI) \quad (20)$$

where  $GST_{ij}$  represents the amount of GST paid by the household representing the  $i$ th income class on  $j$ th group of goods and services. In order to adjust the above functions for household size the functional forms 19 and 20, be transformed as

$$GST_{ij} = f(HEXP/AES) \quad (21)$$

$$= f(HEXP/AES) \quad (22)$$

**Table 3. Results of Regression Analyses for the Groups of Goods / Services**

Household expenditure basis	Household Expenditure basis;				Adjusted for household size			
	$\log GST = a + b \log(HEXP) + u$				$\log GST = a + b \log(HEXP/AES) + u$			
	a	b	s.e.of b	R <sup>2</sup>	a	b	s.e.of b	R <sup>2</sup>
elasticities	elasticities							
Food	-1.386	0.575	0.036	0.922	-1.992	0.760	0.083	0.798
Meals, Take-aways	-8.072	1.395	0.060	0.961	-9.742	1.880	0.173	0.842
Household operation group	-1.786	0.643	0.039	0.924	-2.820	0.914	0.079	0.857
Domestic fuel and power	-1.467	0.336	0.026	0.883	-2.021	0.480	0.047	0.825
Clothing	-5.046	0.991	0.087	0.856	-6.135	1.318	0.168	0.737
Transport	-4.203	1.093	0.056	0.945	-5.778	1.520	0.130	0.862
Other Goods	-3.684	0.916	0.049	0.934	-4.903	1.256	0.120	0.834
Alcohol	-6.219	1.074	0.096	0.850	-7.771	1.494	0.167	0.784
Other services	-5.006	1.598	0.047	0.964	-6.560	1.592	0.137	0.859
Over-all GST	-2.392	1.028	0.021	0.991	-4.052	1.467	0.087	0.928

Table-3 presents the estimated parameters of regression analysis, when household expenditure is selected as base. The value of tax elasticities is least in case of Domestic fuel and power, reveals that GST is most regressive on this group of consumption items. When expenditure on Meals away from home and take-aways subtracted from food group, then incidence of GST is quite regressive and GST paid on Meals away from home and take aways becomes progressive tax. This result supports the assumption that as we move to higher income group households, expenditure on meals away from home and take aways increases.

It is discussed earlier that there is a general tendency of under reporting of expenditure on Alcohol, as an experiment efforts have been made to estimate the tax

elasticity for this group of consumption items and it was found a proportional GST burden along with expenditure distribution. Tax elasticities, in general, were found higher when, household's expenditure adjusted with its size, this supports already established, a positive correlation between household expenditure and size of the household. In this case, the GST on Meals away from home and tax aways becomes most progressive followed by other services group and Alcohol. Rest of the groups of goods and services are revealing tax elasticities lower than overall tax elasticity (1.476). It is important to note, that the regressivity of GST on the expenditure on Domestic fuel and power and Food, has not get affected much even after adjusting the household expenditure by its size, just it has become slightly less regressive in later case.

**Table 4. Results of Regression Analyses for the Groups of goods & Services**

Disposable income basis					Disposable income basis; Adjusted for household size				
logGST		a+b log HDI+u			R <sup>2</sup>	logGST		a+b log (HDI/AES)+u	
a	b	s.e. of b		a		b	s.e. of b		
elasticities					elasticities s				
Food	-0.234	0.403	0.032	0.878	-0.311	0.473	0.054	0.777	
Meals, Take aways	-5.134	0.954	0.078	0.872	-5.370	1.131	0.132	0.770	
Household operation group	-0.431	0.440	0.041	0.838	-0.657	0.280	0.064	0.765	
Domestic fuel and power	-0.743	0.227	0.025	0.783	-0.856	0.280	0.038	0.708	
Clothing	-2.783	0.648	0.088	0.711	-2.850	0.752	0.129	0.606	
Transport	-2.054	0.772	0.049	0.957	-2.393	0.942	0.087	0.837	
Other Goods	-1.737	0.623	0.057	0.845	-1.927	0.745	0.094	0.742	
Alcohol	-4.127	0.762	0.073	0.832	-4.483	0.933	0.108	0.773	
Other services	-2.590	0.797	0.061	0.885	-2.864	0.959	0.106	0.788	
Over-all GST	-0.187	0.696	0.054	0.882	-0.495	0.850	0.092	0.793	

Table-4 reveals major results of regression analyses for the same groups of goods and services, as it was presented in Table-3, with a difference, that here the disposable income is opted as a base. GST is regressive in general for almost all the groups of goods and services in Table-4 except in the case of meals away from home and take aways. Impact of GST on this group of consumption items is proportional. The extent of tax regressivity marginally reduces almost in all cases when disposable income is adjusted to household size. Similarly, comparing the results, revealed from Table-3 and Table-4, it is clear that, GST is more regressive in general when disposable income is selected as a base.

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### Concluding Remarks

The present paper is an effort in the direction of estimating the incidence of GST in order to analysing its impact on the households of Newzealand. It reveals that Overall impact of GST on the basis of estimating tax elasticities with respect

to household expenditure is almost proportional and turns out to be mildly progressive when household's expenditure is adjusted with its size. The impact of GST appears regressive when it is estimated with respect to disposable income.

Disaggregating the distribution of tax burden by the selected groups of goods and services, it is possible to find out the certain type of goods and services which are having most regressive/progressive impacts over the households.

The interesting findings of this study may encourage the further in-depth research in this and related fields. Infact, there is a need to study in detail, that how GST possibly affects the lower income group households and to identify the 'types' of households which are most adversely affected by the imposition of a uniform rate, broad based tax, such as GST. As a policy implication this type of analysis would be helpful to formulate a more reasonable social security policies, which compensates the regressive impact of GST on most adversely affected household to the maximum possible extent.

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