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# The Equity Impact of the Value-Added Tax in Bangladesh

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## Abstract

This paper investigates the income distributional implications of different value-added tax (VAT) schemes in Bangladesh. The results indicate that a revenue-neutral uniform VAT is regressive in its impact on the income of different households. This paper explores an alternative policy package, consisting of a basic rate of VAT with exemptions for certain commodity groups, chosen on the basis of their distributional characteristics. The welfare consequences of the alternative package are found to be superior to those of the uniform VAT.

JEL Classification Numbers:
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Contents



Text Tables



Appendix Tables

## Summary

This paper examines the income distributional impact of different VAT schemes on the urban and rural household groups in Bangladesh. It argues that, among the existing approaches to evaluating the nonmarginal tax reform proposals, the Computable General Equilibrium modeling approach is inappropriate for Bangladesh, both on analytical and empirical grounds. An alternative approach, which is based on the "equivalent variation" measure and focuses on the household and welfare side, is adopted to identify the losers and gainers of a policy change in a heterogeneous population.

This approach involves estimating parameters of the Linear Expenditure System for each of the 12 urban and rural household groups (based on their levels of per capita monthly expenditure). The pattern of the results shows that a single, uniform value-added tax (VAT) rate for all commodities, where the rate is chosen such that it has a revenue-neutral effect, is very regressive (relative to the current state) in its impact on the income of different households. In general, richer households gain while the poorer households in both urban and rural areas (the majority of the population) lose.

This paper also explores an alternative package consisting of a basic rate of VAT with exemptions for certain foodstuffs, plus additional excise taxes on tobacco, commercial energy, and sugar. The choice of commodity groups for exemptions and additional excises was facilitated by the estimation of distributional characteristics of the goods discussed in the text. This analysis permitted the identification of commodity groups for VAT exemption and for the imposition of excises.

The welfare consequences of the alternative package is found to be much less regressive relative to the uniform, proportional VAT case. It is therefore likely to be more acceptable to the general public and to policymakers.

## I. Introduction

By 1990, more than 50 countries in the world had adopted VAT of some kind (Tait (1991), pp. 2-3). With the introduction of the VAT by countries of Eastern Europe and the former Soviet Union (FSU) in recent years, the tax is becoming universal. 1/ The uniform taxation associated with VAT rates is likely to reduce the need for detailed information and thus the cost of administration and evasion. This VAT system is distinct from other forms of commodity taxes (e.g., excise and sales tax) that exist in many developing countries, which involve taxation of inputs and a myriad of tax rates.

Even if a VAT has several attractive features, like uniformity, tax neutrality, and simplicity in tax administration, which provide an elastic and buoyant source of revenue to the government, it also has a negative feature: by emphasizing uniformity, a uniform VAT ignores equity or income distributional issues relevant for developing countries. 2/ The theory suggests that if a country does not have a well-developed, effective, and optimally adjusted income tax and transfer system--to tackle equity concerns with the direct tax system--indirect taxes should be differentiated to incorporate the distributional considerations in addition to the usual efficiency concerns (Stern (1987a), pp. 49-52).

In a country like Bangladesh, where income tax plays a relatively small role in the country's tax system (providing only about 20 percent of total tax revenue) and direct transfers are limited, 3/ the distributional impact of the VAT is of concern. Thus, a key question relating to a VAT scheme becomes to what extent can distributional considerations be effectively built into the system without unduly eroding its chief merit of uniformity, simplicity, and efficiency in generating revenue. Accordingly, the objective of this paper is to investigate the distributional consequences of a simple variant of a uniform VAT and then identify a reform package that combines it with carefully chosen exemptions and specific

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1/ The tax is levied on the value added, which is the difference between the value of a firm's sales and the value of purchased inputs used in producing the good. Taxation of value added (usually at a uniform rate) implies that a manufacturer subtracts from the tax due on output, the tax payable on purchases of all raw materials and inputs. The idea is to avoid the taxation of inputs, so that the base of taxation is final goods purchased by the consumers.

2/ VAT, in general, is not an optimal tax. The theory of optimal commodity taxation (more precisely, the Ramsey tax rule) suggests that commodity tax rates should be such that the proportional reduction in compensated demand should be equalized across goods, which generally implies nonuniformity in tax rates. This rule, however, presupposes complete information relating to own and cross-price elasticities for all goods and also unlimited tax powers of governments, neither of which are achievable, in practice.

3/ Food rationing and other forms of direct subsidy in Bangladesh have very patchy coverage, and are confined mostly to urban areas.

excises that will be more acceptable to policymakers (with regard to distributional consequences) than a simple uniform VAT scheme.

Section II of this paper provides a brief description of the salient features of the modified VAT system for Bangladesh, which was introduced in 1991. Section III discusses alternative approaches to evaluating tax policy reform in developing countries and presents a macro framework for assessing a tax reform. The distributional consequences of different VAT schemes in Bangladesh are then assessed within the framework using the household expenditure survey data for Bangladesh. Section IV presents the results of this empirical exercise and policy implications. Section V contains the conclusion.

## II. A Modified VAT System for Bangladesh

The Government of Bangladesh introduced a VAT at the manufacturing-cum-import stage, on July 1, 1991. 1/ Under the new system, the excise duty on domestic production at the production stage and sales tax on imports at the import stage are replaced by uniform VAT intended to be revenue neutral with some exemptions of agricultural and service sectors and zero rating for exports. In particular, the reformed system of indirect taxation of domestic production is characterized by (1) a basic VAT and (2) supplementary excise taxes on some luxury goods and energy products. On imports, there are also customs duties, for protection in certain sectors. The basic rate of VAT is 15 percent.

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1/ The rudimentary VAT adopted for Bangladesh is of the consumption type, based on the destination principle and implemented in its crediting form (World Bank (1989)). Taxation of value added implies that a manufacturer subtracts from the tax due on output, the taxes payable on purchases of all raw materials and capital goods. A consumption type tax ensures that taxes paid on capital goods as well as on raw materials are deductible from taxes due on outputs. The destination principle is designed to tax all value added, at home or abroad, of goods that have as their final destination consumers in Bangladesh; this translates into the taxation of imports, but no taxation of exports. The crediting method requires the firm to subtract the tax already paid on its purchase invoices from tax liability on its output, and to forward the difference to the tax authority.

## III. Evaluating the Equity Impact of Tax Reform: A Macro Framework

One approach to assessing the likely impact of a tax reform on a developing country is to use the CGE modelling framework (Shoven and Whalley (1984)). There have been several attempts to model the Bangladesh economy and assess the incidence of tax reform within the CGE approach. The most recent study is by Mansur and Khondker (1992) which looks at the distributional impact of various tax expenditure policy options, including the VAT, in Bangladesh. 1/ However, CGE models are usually very restrictive in their representation of a developing country, and are inappropriate for assessing the impact of tax policy reforms when the analysis of policy impact is more limited, e.g., to income distribution. 2/

In Stern (1987b, pp. 87-88), an alternative approach utilizing detailed household expenditure survey (HES) data is set out to identify gainers and losers of a policy change in a heterogeneous population. Under this approach, the welfare impact of a proposed policy change is evaluated by specifying an estimated demand/supply response as well as an associated indirect utility function. It uses an exact money measure of welfare change, namely, "equivalent" or "compensated" variation. At the same time, one can trace the revenue impact either by identifying the policy package that is revenue neutral or by looking at the trade-off between revenue gain/loss and welfare loss/gain. Policymakers may find the information provided in HES data-based approach appealing and easy to understand; however, in comparison with the CGE modelling approach, this approach uses many more details on the household and welfare side and pays little attention to the production side of the economy. Ahmad and Stern (1987) have suggested such a method to evaluate intended reforms. The basic elements of the method are discussed below.

It is specified that the tax element in the final consumer prices is defined by "effective" taxes that capture the cascading effect of all input taxes in the economy so that $t^e = t' (I-A)^{-1}$; where $t^e$ and $t'$ are respectively effective and nominal tax vector, **A** is input-output flow matrix and **I** is identity matrix. With fixed producer

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1/ The study is similar to that of the World Bank (1989), which, although not intended to evaluate the impact of VAT, does make an attempt to assess the likely impact of excise tax reform with a view to approaching an uniform tax like a VAT in Bangladesh.

2/ See Hossain (1990) for a critical review of CGE modelling approach in general, and Bangladesh models in particular.

price vector, p, final consumer price vector is given by $q = p + t^e$. 1/

Now the pre- and post-reform tax rates are denoted by $t^{eo}$ and $t^{el}$, with $q^o$ and $q^1$ representing the two associated purchaser prices; the pre- and post-reform social welfare and revenue can similarly be represented by $W^o$, $W^1$ and $R^o$, $R^1$. One way to approach the problem is to identify changes from $t^{eo}$ to $t^{el}$ that yield $W^1 > W^o$ and $R^1 \geq R^o$ (i.e., post-tax revenue should be at least as high as the pre-tax revenue).

To avoid any reference to the controversial social welfare function, we calculate the indirect utility levels using the expenditure function approach corresponding to pre- and post-reform situations, i.e., $V^{ho}$ and $V^{hl}$ for each household (or household group), and thus assess the positive or negative impact on each household. One can express the utility change for household h or $(V^{hl}-V^{ho})$ by the "equivalent variation" measure, which is defined by the following implicit equation:

$$V^{hl} = V^h (q^o, \ M^{ho} + E_{o1}{}^h) \qquad (1)$$

Here, $M^{ho}$ is the pre-reform income of the household h. Thus, $E_{o1}{}^h$ is simply the amount of money we would have to give to household h, if the pre-reform prices were ruling, to allow to reach the post-reform utility level. $E_{o1}{}^h$ can also be defined making use of the explicit expenditure function $e^h (q, U^h)$,

$$E_{o1}{}^h = e^h (q^o, V^{hl}) - M^{ho} \qquad (2)$$

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1/ In this paper, the term **effective** tax has been used to denote a tax that captures the cascading effects of all input taxes in the economy. It should not be confused with the **nominal** tax, which is the actual tax element in the purchaser's price of good i (in some literature, this is often referred to as "effective" tax) or the **statutory** tax, which refers to legally binding tax rates imposed by taxing authorities. If there are no tax exemptions or loopholes and tax administration is perfect, the **statutory** and **nominal** tax rates are likely to be equal, whereas **effective** tax rates are always different from the other two, as long as there are taxes on inputs in the economy.

Thus, $E_{01}^{h}$ is a money measure of the benefit (loss) of the reform to household h. 1/

This measure has been used here to assess the impact of nonmarginal reforms relating to different possible VAT schemes in the Bangladesh context. There are many variants of a VAT, but, for the purpose of this paper, they are reduced to two basic forms. The first form is for a VAT at a uniform rate, and the second is for a VAT at a uniform rate but applying only to a subset of goods and zero rating (and/or exemption) for other goods (and possibly some supplementary excise taxes that can go with the VAT). The latter form closely resembles the Bangladesh case. Here, for the present purpose, a uniform VAT is defined as a tax system that makes the proportion of effective tax in the price of final goods the same for all goods. However, it is also possible to consider the case of differential rates. If the VAT rate is uniform at the level "r," then it implies

$$r = t_i^{el} / q_i^{l} \qquad (3)$$

for all i. The rate "r" will be determined by the Government's revenue requirement. Thus, if $\bar{R}$ is the amount of revenue that must be raised from consumer expenditure, then

$$r \Sigma_i q_i^{l} x_i^{l} - R^{l} = \bar{R} \qquad (4)$$

For unchanged revenue, $R^{l} = R^{o} = \bar{R}$. If one assumes total consumer expenditure is unchanged by the reform, then revenue neutral "r" may be simply calculated by dividing $\bar{R}$ by the total pre-reform consumer expenditure. 2/

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1/ It is positive for a utility gain and negative for utility loss. It is argued that the use of "equivalent variation" measure has one distinct advantage over an alternative measure of exact welfare change, namely, "compensating variation" (defined as the amount of money which the household would need to be given at the post-reform prices in order to attain the pre-reform level of utility). It relates to the use of *reference price vector* to evaluate the reforms. Measures based on "compensating variation" employ post-reform price vector as a reference point implying that it involves use of a different reference price vector for each reform. Hence, the money value of gain/loss from reform A cannot be compared with the money value of gain/loss from reform B. Measures based on "equivalent variation" overcomes the problem because pre-reform price vector is used to evaluate all possible reforms, (King, 1983).

2/ This is a limiting assumption. However, in practice, the revenue-neutral VAT rate was calculated iteratively from the relationship $t^{e'} \cdot X - t^{v'} \cdot X = \bar{R}$, where X is the vector of aggregate consumption expenditure in the pre-reform period, $t^{e'}$ is the vector of pre-reform effective taxes, and $t^{v'}$ is the revenue-neutral VAT rate. It has been found that the resulting rate is indeed quite close to the average rate found by dividing $\bar{R}$ by total consumption expenditure

## IV. Impact of a VAT: An Empirical Exercise

Prior to introducing the VAT, there were three basic categories of indirect taxes in Bangladesh: excise taxes, import duties, and the sales tax. The excise taxes were collected entirely on domestic production, import duties on imports, and a sales tax was imposed on both domestic sales and imports. In practice, though, almost the entire amount of sales tax revenue came from the taxation of imports. As the first step of the empirical exercise, the "nominal" and "effective" tax rates for 47 commodity groups were computed, using the data for fiscal year 1984/85. For the incidence analysis, a commodity classification, consisting of 15 commodity groups (9 food items and 6 nonfood items) was used. The choice of the commodity classification was governed by the convenience of estimating a complete demand system, namely the modified Linear Expenditure Systems (LES) for different household groups, making use of household expenditure survey data for Bangladesh.

The nominal, effective, and shadow consumption tax rates, budget shares, revenue shares for these merged commodity groups were computed as well as their expenditure elasticities, own price elasticities derived from the LES parameters. The results are presented in Appendix Table 1.A and 1.B. 1/ The effective taxes capture the cascading effects of taxes on inputs, of taxes on inputs into those inputs, and so on, and are higher than the nominal taxes. The divergence between nominal and effective tax rates sometimes measures the unintended consequences of government policy. The table shows that there are four commodity groups for which $t_{diff}$ measures (differences between effective and nominal tax rates) are greater than 10 percent: other food (8), clothing (10), manufactured goods (11), and commercial energy (13).

With shadow prices expressed as accounting ratios (v/q or the ratio of border prices to domestic purchase prices), the shadow consumption tax is simply 1 - (v/q). These shadow consumption taxes (normalized) derived from the shadow prices are particularly helpful in assessing how much a good is taxed or subsidized measured at its shadow prices in a distorted economy. For example, as shown in Appendix Table 1, commercial energy (13) faces a high effective tax (42.5 percent) when measured at domestic market prices, but it turns out to be highly subsidized (at 36 percent) when the shadow consumption tax measure is used.

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1/ The nominal tax rate on a good is formally defined as the tax revenue collected divided by the tax inclusive tax base (defined as the gross output plus imports--both valued at purchaser's prices). As mentioned earlier, it is the tax element in the $q_i$ (purchaser's price of good i). Effective tax, as defined earlier is the tax element in the price of a final product and is measured by using the input-output flow matrix. Shadow consumption tax is defined later in this section.

As the second step of the empirical exercise, the net indirect tax element in the total consumer expenditure was estimated. For Bangladesh, it was found that the net indirect tax revenue averaged approximately 5.6 percent of total consumer expenditure for the year 1984-85 for which detailed tax, input-output, and household budget survey data could be gathered. Thus, the first option examined here is the replacement of all taxes with a proportional VAT of approximately 5.6 percent of the tax inclusive prices of all goods. Since it is a sizable reform package, one would expect substantial changes in consumption demand. However, since the impact of a proportional tax on revenue from all expenditures is being examined here, it is reasonable to assume that if total expenditure is unchanged, then the given VAT will raise the required revenue.

To estimate the equity impact of the introduction of the VAT, it is assumed that consumer preferences could be represented by a modified LES. Given the target revenue neutral VAT rate, the task is to estimate the equivalent variation $E_{o1}^h$, defined for each per capita expenditure group (with expenditure pattern generated by LES),

$$E_{o1}^h = (M^h - q^1 \cdot a) \prod_i (q_i^o / q_i^1)^{bi} - (M^h - q^o \cdot a) \qquad (5)$$

Where $M^h$ is the per capita expenditure level of household group h, the $q^o$ and $q^1$ are the pre- and post-tax prices, "$b_i$"s are marginal budget shares and, along with "a" (constant) is determined by the LES estimated for each household group. The parameters "$b_i$" and "a" have been derived from the econometric estimation of the LES demand system for 12 urban and rural household groups, using the household expenditure survey data. What follows is a brief discussion of the development of the database and an estimation of the LES.

1. Estimation of Modified Linear Expenditure Systems (LES)

By grouping urban and rural households into several per capita expenditure groups, the modified LES for each can be estimated with a view to generating the required parameters for the calculation of $E_{o1}^h$ in equation (5). For the purpose of analyzing the distributional impact of VAT, the urban and rural households have been grouped into 12 distinct groups (6 urban and 6 rural), differentiated on the basis of their per capita expenditure. 1/ The grouping was done with two considerations in mind: first, the interval of per capita expenditure that defines a group should not be so wide that it mitigates group homogeneity; and, second, there must be large enough number of households within each group to allow estimation of a demand system consisting of 15 commodity groups. The data

1/ The groups and the average per capita group expenditure, average household size, and the percentage of total households in the country falling within each group are shown in Table 1.

used for the empirical exercise came from the household expenditure survey conducted by the Bangladesh Bureau of Statistics. It contained information for about 1,500 households (500 urban and 1,000 rural) for the year 1985/86. The number of consumption items listed in the tape data was 136, which were then merged into 15 commodity groups appropriate for estimation of LES. 1/

The nonlinear maximum likelihood estimation of the complete demand system, namely, the modified LES for each of the 12 household groups, was carried out by using the software SHAZAM. This estimation was extremely involved and expensive (in terms of computer time). However, good fits were obtained for all but two or three commodity groups (the lowest of the rural expenditure groups). Perhaps the most important result was that "b" (marginal budget shares) estimates were all found to be highly significant (equation 5). The "t" values of the parameter estimate involving "a" (constant term), however, were uneven; on average, the parameter estimates were significant in 8 of the 12 cases.

## 2. Results of the exercise: distributional impact of the VAT

Once the parameters of the modified LES ("a" and "b") were obtained, along with the mean per capita monthly expenditure ($M^h$) for each of the 12 urban and rural household groups, from equation (5) it was straightforward to calculate $E_{o1}{}^h$ for each group. The equivalent variations as proportions of the per capita household group expenditure, i.e., ($E_{o1}{}^h/M^h$) estimates in percentage terms for rural and urban areas (associated with a proportional VAT) are presented in Table 1. The result suggests that the uniform proportional VAT would cause a reduction in the expenditure of the poorest urban households by as much as 3.5 percent, and would increase those of the richest urban households by about 8.1 percent. Similarly for the rural groups, the poorest would be the most affected (though not as much as those in urban areas), and would suffer a loss equivalent to decline of approximately 3.2 percent. The richest rural groups would gain the most--equivalent to an increase in expenditure of approximately 6.1 percent. The results of the exercise, however, must be treated with caution, as many details are omitted. For example, an explicit treatment of cash and in kind consumption, which is relevant in rural Bangladesh, is likely to lead to lower estimates of losses to poorer households, even though they would still lose. Furthermore, if the VAT were to replace import tariffs, benefits to richer urban households would likely be even higher. A uniform VAT, however, would continue to benefit richer groups, and to adversely affect the poorer households.

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1/ In addition to the expenditure data, information on household characteristics and quantity of consumption of mainly food items was also reported in the data set. The cleaning and organization of the HES data turned out to be the most arduous and time-consuming task of the entire empirical exercise.

Table 1. Equivalent Variation ($E_{01}^h$) for Proportional Value-Added Tax

| Group | PCEX taka/month | % of hh | Sample Size | Mean hh Size | Mean PCEX ($M^h$) | EV(%) ($E_{01}^h/M^h$) |
|---|---|---|---|---|---|---|
| Urban | | | | | | |
| 1 | < 249 | 1.15 | 42 | 7.17 | 210.93 | -3.51 |
| 2 | 250 - 349 | 2.38 | 82 | 7.06 | 304.79 | -3.33 |
| 3 | 350 - 449 | 2.36 | 70 | 6.47 | 401.40 | -2.22 |
| 4 | 450 - 599 | 2.94 | 108 | 5.92 | 523.57 | -2.81 |
| 5 | 600 - 699 | 1.18 | 52 | 6.23 | 641.75 | +4.88 |
| 6 | 700 + | 3.99 | 146 | 5.35 | 1092.40 | +8.11 |
| Rural | | | | | | |
| 1 | < 249 | 18.16 | 219 | 6.16 | 201.74 | -3.21 |
| 2 | 250 - 349 | 27.86 | 316 | 6.29 | 298.33 | -2.02 |
| 3 | 350 - 449 | 19.38 | 223 | 5.60 | 399.30 | -1.93 |
| 4 | 450 - 599 | 12.38 | 149 | 5.64 | 504.93 | -3.06 |
| 5 | 600 - 699 | 3.54 | 42 | 4.88 | 644.38 | +4.45 |
| 6 | 700 + | 4.68 | 51 | 5.29 | 944.69 | +6.12 |
| | All | 100.00 | 1500 | 5.94 | 427.56 | |

Note: PCEX: per capita expenditure (monthly) in taka; hh: household; $E_{01}^h$ and $M^h$ are as defined in equation (5); EV: equivalent variation.

Source: Bangladesh household expenditure survey data, 1985/86.

## 3. An alternative reform package

As an alternative to the single proportional VAT applicable to all commodities, another reform package was examined. It contains a proportional VAT with exemptions on certain items to allow for "distributional" considerations; in addition, it is proposed that certain excises on luxury goods and commodities that have low distributional ranking (meaning they feature prominently in the consumption basket of the rich households) be retained at the present level. The choice of particular commodities for zero rating and imposition of additional excises was guided by their distributional characteristics. The methodology and estimation of these distributional characteristics is discussed first.

## 4. Distributional characteristics of commodities

The distributional characteristics ($D_i$) of commodity i is defined as

$$D_i = \Sigma_h \beta^h . q_i x_i^h / q_i X_i \qquad (6)$$

where, $\beta^h$ is the measure of distributional weights for households, $q_i$ is the consumer price of commodity i, $x_i^h$ is the quantity of i-th commodity consumed by household h, and $X_i$ is the quantity of aggregate consumption of commodity i.

Thus, the key data requirement for the calculation of the distributional characteristics of households is the measure of social welfare weights for different households ($\beta^h$). It indicates the change in social welfare due to unit change in household h's income. The weight $\beta^h$ is defined as

$$\beta^h = (\partial W/\partial U^h)/(\partial U^h/\partial y^h) \qquad (7)$$

where, W is level of social welfare, $U^h$ utility of household h, and $y^h$ is the income (or total expenditure) of household h. 1/

The welfare weights $\beta^h$ could be specified in a number of ways. As an example guiding practical application, Ahmad and Stern (1984, pp. 278-79) suggested the following method:

$$\begin{aligned} U^h(I^h) &= k\,[I^{1-e}/(1-e)] \quad e \neq 1,\ e \geq 0 \\ &= k \log (I^h) \qquad\qquad e = 1 \end{aligned} \qquad (8)$$

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1/ Reference to some kind of utility function is unavoidable when we are constructing welfare weights to make interpersonal comparisons. As will be explained later, in the exercise, different values of inequality aversion parameter have been used to assess the sensitivity of $D_i$ estimates to changes in the degree of inequality aversion.

Where, $I^h$ is the total expenditure per capita of the hth household, e is a parameter and $e \geq 0$ ensures concavity. Now one can express $\beta^h = U'(I^h)$, and choose a normalization for $\beta^h$ (by the choice of k), so that the welfare weights for the poorest household is unity. Under these assumptions one can express

$$\beta^h = (I^0 / I^h)^e \qquad (9)$$

where, $I^0$ is the total expenditure per capita of the reference poorest household. 1/ Given this viewpoint, Ahmad and Stern (1984) suggest that $\beta^h$ represents the marginal social value of a unit of expenditure to individual h relative to a unit that accrues to poorest households. One could argue that the judgment as to the value of "e" is that of the researcher or the Government. When $e > 0$, $\beta^h < 1$ for all households, except the poorest, so that the increment to expenditure to the poor are considered socially more valuable than the rich. The ratio $\beta^h/\beta^{h'}$ increases with e for $I^h < I^{h'}$ and thus "e" may be thought of as an inequality aversion parameter. This method has a particular advantage in that it requires only minimal data to compute $\beta^h$ across households. 2/

The present exercise used the household expenditure survey data for Bangladesh to generate distributional weights for rural and urban households. Apart from the base case (e=0), in the exercise, four levels of e, e: 0.1, 1, 2, and 5 were chosen to assess the sensitivity of the estimates to changes in the degree of inequality aversion. A value of $e = 0$ implies that the policymakers value taka 1 of expenditure for the poorest individual as equivalent to taka 1 for the richest. A value of $e = 1$ implies that a marginal unit to h is worth half as much as a marginal unit to the reference household 1 if the expenditure of h is twice that of the 1. Similarly, values of e in excess of 2 give a very much greater weight to the poorest and 5 and above begins to approach the "maxi-min" or Rawlsian utility function, by considering the welfare only of the poorest individuals (a marginal unit to the poorest is worth 32 times a unit to someone with twice the expenditure). With no inequality aversion (e=0), all commodities have distributional characteristics equal to unity. With the introduction of moderate inequality aversion (e=0.1), the situation changes significantly. In general, the commodities that have high budget shares in the consumption basket of poorer households and/or have low expenditure elasticity, acquire relatively high value than the commodities with low budget share or high expenditure elasticity. This is what is being actually observed.

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1/ Strictly speaking, this measure of $\beta^h$ is valid only as a local approximation given current prices and incomes, and it does not hold for all prices and incomes.

2/ However, the iso-elastic function $\beta^h$ given in (9) (which depends only on the per capita expenditure level), represents just one commonly used method for generating the welfare weights.

The results of the calculation of the distributional characteristics of 15 goods presented in Table 2 show a definite pattern. The value of $D_i$ is shown in part A and its ranking is shown in part B. It is interpreted as follows: for example, ranking no. 1 (highest rank) represents the lowest priority and ranking no. 15 (lowest rank) represents the highest priority as a source of extra taxation. With changes in "e," the relative rankings of commodities measured by the value of $D_i$ changes but the commodities that consistently rank high in the measure of distributional characteristics are rice (rank 2), wheat & grain (rank 3), vegetables & fruits (rank 5), edible oil (rank 4) and clothing (rank 6). This implies that incidence of VAT on these commodities will be very regressive. By the same token, the incidence will be less regressive if the VAT is exempted or zero rated for these goods. All these commodities except clothing are agricultural goods, and, from an administrative point of view, VAT exemption is more feasible than zero rating. Clothing, which includes textiles, however, is an important source of tax revenue under the current system; therefore, relinquishing such a large tax base from the VAT does not seem reasonable, given the current narrow revenue base.

It is also found that the commodities that feature low in the distributional characteristics and thus are particularly attractive candidates for additional taxation with different values of "e," are tobacco products (rank 10) and commercial energy (includes electricity, petroleum products, and gas) (rank 9), sugar & gur (rank 11), housing (rank 13), livestock (rank 12) and, to a lesser extent fisheries (7). Of these, taxing housing services, livestock and fisheries, production are either politically unacceptable or administratively difficult. Therefore, we experimented with a package of tax reform where, on the one hand, there will be zero rating of VAT for the agricultural products and, on the other hand, tobacco products, commercial energy, and sugar will now face high excise taxes at the existing rates (excepting commercial energy, which faces a much higher rate to eliminate the subsidy element measured at shadow prices), in addition to a proportional VAT. The excises on some of these products is justified, not only for distributional considerations but also on the grounds of the Government's revenue goals as under the present system they raise substantial revenue.

The reform package identified here maintains the revenue constant, sets a zero rate on foodgrains and vegetables, applies a proportional VAT at an enhanced rate on the remaining commodities, including tobacco, energy goods and sugar, which also face high excise

Table 2. Distributional Characteristics for Commodities, 1984/85

A: Distributional Characteristics

| No. | Commodity Groups | Nie | Inequality Aversion Parameter: e | | | |
|---|---|---|---|---|---|---|
| | | | 0.1 | 1.0 | 2.0 | 5.0 |
| 1 | Rice | 0.46 | 0.8067 | 0.1277 | 0.01953 | 0.00023 |
| 2 | Wheat and grain | 0.65 | 0.8022 | 0.1237 | 0.01910 | 0.00028 |
| 3 | Vegetables and fruits | 1.01 | 0.7927 | 0.1103 | 0.01533 | 0.00016 |
| 4 | Livestock (meat) | 1.42 | 0.7788 | 0.0930 | 0.01095 | 0.00015 |
| 5 | Fisheries | 1.01 | 0.7910 | 0.1070 | 0.01415 | 0.00011 |
| 6 | Edible oil | 0.99 | 0.7932 | 0.1108 | 0.01545 | 0.00019 |
| 7 | Sugar and gur | 1.17 | 0.7837 | 0.0978 | 0.01194 | 0.00006 |
| 8 | Other food | 1.18 | 0.7882 | 0.1046 | 0.01383 | 0.00013 |
| 9 | Tobacco products | 1.36 | 0.7856 | 0.1025 | 0.01343 | 0.00009 |
| 10 | Clothing | 0.94 | 0.7926 | 0.1113 | 0.01613 | 0.00058 |
| 11 | Manufactured goods | 1.42 | 0.7757 | 0.0910 | 0.01113 | 0.00026 |
| 12 | Traditional energy | 0.27 | 0.8076 | 0.1290 | 0.02014 | 0.00041 |
| 13 | Commercial energy | 1.19 | 0.7882 | 0.1062 | 0.01455 | 0.00011 |
| 14 | Housing | 1.80 | 0.7760 | 0.0931 | 0.01168 | 0.00008 |
| 15 | Services | 1.62 | 0.7724 | 0.0874 | 0.01024 | 0.00014 |

B: Ranking of Distributional Characteristics

| No. | Commodity Groups | Nie | Inequality Aversion Parameter: e | | | |
|---|---|---|---|---|---|---|
| | | | 0.1 | 1.0 | 2.0 | 5.0 |
| 1 | Rice | 0.46 | 2 | 2 | 2 | 5 |
| 2 | Wheat and grain | 0.65 | 3 | 3 | 3 | 3 |
| 3 | Vegetables and fruits | 1.01 | 5 | 6 | 6 | 7 |
| 4 | Livestock (meat) | 1.42 | 12 | 13 | 14 | 15 |
| 5 | Fisheries | 1.01 | 7 | 7 | 8 | 11 |
| 6 | Edible oil | 0.99 | 4 | 5 | 5 | 6 |
| 7 | Sugar and gur | 1.17 | 11 | 11 | 11 | 14 |
| 8 | Other food | 1.18 | 8 | 9 | 9 | 9 |
| 9 | Tobacco products | 1.36 | 10 | 10 | 10 | 12 |
| 10 | Clothing | 0.94 | 6 | 4 | 4 | 1 |
| 11 | Manufactured goods | 1.42 | 14 | 14 | 13 | 4 |
| 12 | Traditional energy | 0.27 | 1 | 1 | 1 | 2 |
| 13 | Commercial energy | 1.19 | 9 | 8 | 7 | 10 |
| 14 | Housing | 1.80 | 13 | 12 | 12 | 13 |
| 15 | Services | 1.62 | 15 | 15 | 15 | 8 |

Note: Nie refers to expenditure elasticity of commodity group i. See text for definitions and meanings of symbols.

Source: Author's own estimates, derived from secondary data.

taxes. 1/ The consumption of foodgrains and vegetables was roughly 23 percent of the total private consumption expenditure for 1984/85.

Table 3. Equivalent Variation ($E_{01}^h$) for Proportional VAT with Zero-Rated Commodities and Excise Taxes

| Group | PCEX taka/month | % of hh | Sample Size | Mean hh Size | Mean PCEX ($M^h$) | E.V.(%) $E_{01}^h/M^h$) |
|---|---|---|---|---|---|---|
| Urban | | | | | | |
| 1 | < 249 | 1.15 | 42 | 7.17 | 210.93 | -2.41 |
| 2 | 250 - 349 | 2.38 | 82 | 7.06 | 304.79 | -2.67 |
| 3 | 350 - 449 | 2.36 | 70 | 6.47 | 401.40 | -1.21 |
| 4 | 450 - 599 | 2.94 | 108 | 5.92 | 523.57 | -2.02 |
| 5 | 600 - 699 | 1.18 | 52 | 6.23 | 641.75 | -0.34 |
| 6 | 700 + | 3.99 | 146 | 5.35 | 1092.40 | +6.58 |
| Rural | | | | | | |
| 1 | < 249 | 18.16 | 219 | 6.16 | 201.74 | -1.15 |
| 2 | 250 - 349 | 27.86 | 316 | 6.29 | 298.33 | -1.91 |
| 3 | 350 - 449 | 19.38 | 223 | 5.60 | 399.30 | -1.05 |
| 4 | 450 - 599 | 12.38 | 149 | 5.64 | 504.93 | +0.06 |
| 5 | 600 - 699 | 3.54 | 42 | 4.88 | 644.38 | +0.82 |
| 6 | 700 + | 4.68 | 51 | 5.29 | 944.69 | +4.56 |
| | All | 100.00 | 1500 | 5.94 | 427.56 | |

Note: PCEX: per capita expenditure (monthly) in taka; hh: household; $E_{01}^h$ and $M^h$ are as defined in equation (5); EV: equivalent variation.

Source: Bangladesh household expenditure survey data, 1985/86.

1/ For simplicity, the problems of administration and the payments of rebates, which would be necessary to make such a system operational, have been ignored. In a country like Bangladesh, failure to administer a system of rebates to compensate the agricultural sector for the cost of the VAT on inputs may have significant equity consequences not addressed in this paper.

Setting the tax on the foodgrains group to zero, and with additional excises, the required rate of VAT to keep revenue constant, was approximated to be at 9.9 percent of expenditure on all other commodities. 1/

The $E_{01}^h/M^h$ measures for this reform package calculated for different urban and rural groups are presented in Table 3. Again, the pattern of results clearly show that the poor lose and the rich gain in both urban and rural areas. But in this case, it is clear that the poor lose less and the rich gain less than in the proportional VAT case. The poorest group in urban areas lose about 2.4 percent, while the richest group gain about 6.6 percent. In rural areas, the corresponding figures are -1.15 percent and +4.6 percent. The distribution of losses is also different in rural and urban areas. In the proportional VAT case, four of the urban groups and four of the rural groups suffer losses. In the selective proportional VAT case, three of the rural groups suffer lower losses, but now five urban groups lose. This could be attributable to the higher tax on nonfood items, which form a greater part of the budget of urban households.

## 5. Policy implications

The upshot of the analyses is that the selective VAT with some zero rating (or exemptions) coupled with some additional excises is to be clearly preferred to the proportional VAT if the distributional issues are of dominant concern in the tax reform measures. The results of the study are also broadly consistent with the conclusion of a similar study on India (Ahmad and Stern (1987)), which indicated that a uniform VAT on all final goods is clearly regressive and undesirable. The same study, however, also shows that a proportional VAT with exemptions or zero rates on certain items to allow for "distributional considerations" is much less regressive than the proportional VAT. 2/

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1/ The rate was calculated iteratively from the relationship $t^{e\prime}.X - t^{v\prime}.X = \bar{R}$, where X is the vector of aggregate purchases in the pre-reform period. The revenue neutral VAT rate was then calculated as follows. Some entries like tobacco products and commercial energy were constrained to be the same as in $t^e$. Foodgrains were assumed to be zero rated and all other taxes were replaced by an uniform rate in the manner defined earlier (Ahmad and Stern (1991), p. 225).

2/ It must be noted that exemption of a commodity from VAT (which implies no credit given for purchase of inputs) is not the same as zero rating of the commodity (with credit given for input purchase). Because of modelling difficulties in the reform package, the agricultural goods are set to be zero rated; however, since subsidy from major agricultural inputs were withdrawn and markets liberalized in 1984, it is reasonable to assume that distributive impact of exemption will not be significantly different from zero rating.

## V. Conclusion

A selective VAT scheme with some exemptions and additional excises is likely to be more acceptable to the general public and policymakers. 1/ We have also studied other interesting cases of selective VAT with different combination taxes but the reform package discussed above seems to be the most feasible one that would lose no revenue and looks relatively attractive to policymakers in terms of distributional features. However, it must be remembered that although the nonuniform VAT has clear advantages over a uniform VAT with regard to the distributional considerations, a nonuniform VAT scheme may create administrative difficulties unless there are only a few categories. 2/ In particular, even highly advanced European tax authorities find it very difficult to administer the rebate system that goes with zero rating of agricultural goods. In the context of Bangladesh, if the agricultural goods (foodgrains and vegetables) are exempted from the VAT (instead of being zero rated) because of administrative difficulties, this would introduce an additional degree of distributional inequity, adversely affecting the rural households and causing these goods to be consumed proportionately more.

The analysis presented above is merely suggestive. It is based on published household expenditure survey data and various households were classified only in terms of per capita expenditure. The data in its present form do not distinguish between purchases and expenditure out of production within a household, a phenomenon that is likely to be important in rural Bangladesh particularly among owner occupied farms. Also many transactions in rural and urban areas do not go through formal markets. Thus, the equivalent variation exercise is likely to overstate the losses or gains to such households arising from a major reform. The households with their own farms are likely to be better-off, however, than the households that rely primarily on wage income and form part of a growing number of landless laborers.

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1/ It is interesting to note that the VAT scheme introduced in 1991 imposes a uniform VAT with exemption of agricultural goods and most services coupled with zero rating for exports and retention of excise taxes on tobacco products, petroleum products, and gas. The major distinction of this reform from the reform package identified earlier is that, unlike our package, the VAT scheme that was actually introduced exempted most services (with low distributional characteristics implying high share in the consumption basket of the rich) from the VAT scheme and it did not retain excise taxes on sugar, thus possibly increasing the regressivity of the VAT scheme relative to our reform package.

2/ Tait (1988, 1991) provides detailed and systematic discussions of the administrative problems and issues relating to the introduction of a VAT.

One crucial formulation underlying the model is that commodity taxes are fully passed through to consumer prices. It is likely that the results are affected by the assumptions of the pricing rule. For some commodity groups, as an alternative to full forward shifting, one can assume full backward shifting, in which domestic prices are determined by world prices so that taxes are passed back, which then compresses factor returns in the taxed sectors. Analytically, Dahl and Mitra (1991) have shown that the revenue effect and welfare cost also depend on the particular variant (or mix) of the pricing rule assumed. However, an incidence analysis specifying different pricing rules for different sectors requires much more detailed information than that we presently have. 1/

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1/ Among others, Stern (1987b) has studied the effect of taxes in noncompetitive models. He concludes that 100 percent tax shifting as assumed in the conventional model is a reasonable intermediate case and not an extreme or polar case as is often implied.

## APPENDIX

Table 1A. Revenue Shares, Budget Shares, and Taxes on Commodities

| No. | Commodity Groups | Nominal Tax | Effective Tax | Shadow Consumption Tax | Budget Share (%) | Nominal Revenue Share |
|---|---|---|---|---|---|---|
| 1 | Rice | 0 | 2.4 | -1.1 | 25.4 | 0 |
| 2 | Wheat and grain | 0 | 2.1 | -0.3 | 5.1 | 0 |
| 3 | Vegetables and fruits | 0 | 0.8 | 4.5 | 6.9 | 0 |
| 4 | Livestock (meat) | 0.7 | 2.5 | 6.4 | 5.6 | 0.7 |
| 5 | Fisheries | 0 | 4.1 | 4.5 | 7.0 | 0 |
| 6 | Edible oil | 8.3 | 11.8 | 47.0 | 2.4 | 3.6 |
| 7 | Sugar and gur | 35.9 | 39.0 | 39.0 | 1.2 | 7.4 |
| 8 | Other food | 4.0 | 45.4 | 9.5 | 6.6 | 1.8 |
| 9 | Tobacco products | 77.8 | 84.7 | 26.2 | 2.1 | 14.6 |
| 10 | Clothing | 2.6 | 24.2 | 8.9 | 5.2 | 1.9 |
| 11 | Manufactured goods | 11.1 | 26.5 | 29.5 | 5.9 | 59.4 |
| 12 | Traditional energy | 0 | 0.7 | -0.1 | 6.5 | 0 |
| 13 | Commercial energy | 7.5 | 42.5 | -36.0 | 1.9 | 9.5 |
| 14 | Housing | 0 | 4.0 | 16.3 | 8.0 | 0 |
| 15 | Services | 0.1 | 6.5 | 16.2 | 10.0 | 1.1 |
| | Mean/total | 3.8 | 13.5 | 13.5 | 100.0 | 100.0 |

Table 1B. Expenditure and Price Elasticities of Commodities

| No. | Commodity Groups | Budget Share | Nie | Nii |
|---|---|---|---|---|
| 1 | Rice | 25.4 | 0.46 | -0.49 |
| 2 | Wheat and grain | 5.1 | 0.65 | -0.54 |
| 3 | Vegetables and fruits | 6.9 | 1.01 | -0.78 |
| 4 | Livestock (meat) | 5.6 | 1.42 | -0.96 |
| 5 | Fisheries | 7.0 | 1.01 | -0.78 |
| 6 | Edible oil | 2.4 | 0.99 | -0.77 |
| 7 | Sugar and gur | 1.2 | 1.17 | -0.82 |
| 8 | Other food | 6.6 | 1.18 | -0.89 |
| 9 | Tobacco products | 2.1 | 1.36 | -0.98 |
| 10 | Clothing | 5.2 | 0.94 | -0.70 |
| 11 | Manufactured goods | 5.9 | 1.42 | -0.89 |
| 12 | Traditional energy | 6.5 | 0.27 | -0.26 |
| 13 | Commercial energy | 1.9 | 1.19 | -0.85 |
| 14 | Housing | 8.0 | 1.80 | -1.20 |
| 15 | Services | 10.0 | 1.62 | -1.00 |

Note: (a) Nie: expenditure elasticity of i; (b) Nii: own price elasticity of i; (c) Livestock contains meat and dairy products; Gur: molasses. Traditional energy contains fuelwood and other bio-mass energy items; commercial energy contains kerosene, electricity, and gas.

Source: Author's own estimates, derived from secondary data.

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