

The Equity Impact of the Value-Added Tax in Bangladesh

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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 (relative to the pre-reform situation) in its impact on the income of different households. This paper explores the income distributional impact of an alternative policy package, consisting of a basic rate of VAT with exemptions and excise taxes 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 H22, H23]

AS OF 1990, more than 50 countries in the world had adopted a 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 in recent years, the tax is becoming universal.¹ The uniform taxation associated with VAT rates is likely to reduce the need for detailed

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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 the tax payable on purchases of all raw materials and inputs, from the tax due on output. The idea is to avoid the taxation of inputs, so that taxation is on final goods purchased by the consumers.

information and thus the cost of tax administration and the degree of tax evasion. The VAT system is distinct in its simplicity compared with other forms of commodity taxes, such as the excise and sales taxes that exist in many developing countries, which involve taxation of inputs and a myriad of tax rates. The uniform VAT is also neutral as it avoids distortion in production associated with taxation of inputs to production.

Even though a VAT has these attractive features and provides an elastic and buoyant source of revenue to the government, it does have a drawback: by emphasizing uniformity, a uniform VAT ignores equity, or more specifically, income distributional issues, which are particularly relevant for developing countries.² 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, the distributional impact of the VAT is of concern.³ Thus, a key question for any VAT scheme is to what extent distributional considerations can be effectively built into the VAT system without unduly eroding its chief merit of uniformity, simplicity, and efficiency in generating revenue. This paper investigates the distributional consequences of a simple variant of a uniform VAT and then identifies a reform package that combines the simple VAT with carefully chosen exemptions and specific excises whose distributional consequences would be more acceptable to policymakers.

Section I of this paper provides a brief description of the modified VAT system for Bangladesh, which was introduced in 1991. Section II discusses alternative approaches to evaluating tax policy reform in developing countries and presents a macro framework for doing so. Then, in Section III, the distributional consequences of different VAT schemes in Bangladesh are explored within that framework, using household

²VAT, 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.

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

expenditure survey data for Bangladesh. The empirical exercise, among other things, involved computation of effective taxes for different commodities and estimation of a modified linear expenditure system (LES) for different household groups in Bangladesh. The results of this empirical exercise and policy implications are also presented in Section III. Section IV concludes.

I. A Modified VAT System for Bangladesh

The Government of Bangladesh introduced a VAT at the manufacturing/import stage on July 1, 1991.⁴ Under this new system, the excise duty on domestic production at the production stage and sales tax on imports at the import stage were replaced by a uniform VAT. The change was intended to be revenue neutral, with some exemptions of agricultural and service sectors and zero rating for exports. On domestic production, the new system of indirect taxation is characterized by a basic VAT and supplementary excise taxes on some luxury goods and energy products. On imports, in addition to a basic VAT, there are also customs duties to protect certain economic activities. The basic rate of the VAT was set at 15 percent.

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

One approach to assessing the impact of a tax reform (e.g., introduction of a VAT) on a developing country is to use the computable general equilibrium (CGE) modeling framework (Shoven and Whalley (1984)). There have been several attempts to model the Bangladesh economy and assess the impact of tax reform using the CGE framework. The most recent study, by Mansur and Khondker (1991), looks at the distributional impact of various tax expenditure policy options, including the VAT, in

⁴ The simple VAT scheme 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 producer 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 and 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 producer 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.

Bangladesh.⁵ 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, for example, to income distribution.⁶

An alternative approach is suggested by Ahmad and Stern (1987). It uses detailed household expenditure survey (HES) data to identify winners and losers under a policy reform in a population characterized by income inequality. In this approach, the welfare impact of a tax reform 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 "compensating" variation. It also enables one to look at 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 by this approach very useful and easy to follow; however, in comparison with the CGE modeling approach, it uses more detailed data on the household and welfare side, while the production side of the economy is relegated to the background (Stern (1987b)). The basic elements of the Ahmad and Stern (1987) method are discussed below.

The Ahmad and Stern method specifies 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 $\mathbf{t}^e = \mathbf{t}' (\mathbf{I} - \mathbf{A})^{-1}$, where \mathbf{t}^e and \mathbf{t}' are the effective and nominal tax vector, respectively; \mathbf{A} is the input-output flow matrix; and \mathbf{I} is the identity matrix. With the fixed producer price vector, \mathbf{p} , the final consumer price vector is given by $\mathbf{q} = \mathbf{p} + \mathbf{t}^e$.⁷

Now the pre- and post-reform tax rates are denoted by \mathbf{t}^{e0} and \mathbf{t}^{e1} , with \mathbf{q}^0 and \mathbf{q}^1 representing the two associated purchaser prices; the pre- and post-reform social welfare and revenue can similarly be represented by W^0 , W^1 and R^0 , R^1 . One way to approach the problem is to identify

⁵ The study is similar to that of the World Bank (1989), which, although not intended to evaluate the impact of introducing a VAT, does make an attempt to assess the likely impact of excise tax reform in Bangladesh that would aim at an uniform tax like a VAT.

⁶ Hossain (1990) provides a critical review of the CGE modeling approach in general, and Bangladesh models in particular.

⁷ 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.

changes from t^0 to t^1 that yield $W^1 > W^0$ and $R^1 \geq R^0$ (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^{h0} and V^{h1} 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 $(V^{h1} - V^{h0})$ by the "equivalent variation" measure, which is defined by the following implicit equation:

$$V^{h1} = V^h(q^0, M^{h0} + E_{01}^h). \quad (1)$$

Here, M^{h0} is the pre-reform income of the household h . Thus, E_{01}^h is simply the amount of money that would need to be given to household h , if the pre-reform prices were ruling, to allow it to reach the post-reform utility level. E_{01}^h can also be defined making use of the explicit expenditure function $e^h(q, U^h)$:

$$E_{01}^h = e^h(q^0, V^{h1}) - M^{h0}. \quad (2)$$

Thus, E_{01}^h is a money measure of the benefit (loss) of the reform to household h .⁸

This measure has been used in the Bangladesh context to assess the impact of nonmarginal tax reforms like introducing a specific VAT scheme. One could conceive of many different VAT schemes, but, for the purpose of this paper, they can be broadly classified into two basic schemes. The first is a completely uniform VAT applied to all goods (defined to include services); the second scheme consists of a VAT at a uniform rate but applying only to a subset of goods with a zero rating (and/or exemption) for other goods (and possibly some supplementary excise taxes that could go along with the VAT). The latter form closely resembles the Bangladesh case. Here, for the present purpose, a uniform VAT is simply defined as a tax system that makes the proportion of

⁸ E_{01}^h 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 that the household would need to be given at the post-reform prices in order to attain the pre-reform level of utility. This advantage relates to the use of *reference price vector* to evaluate the reforms. Measures based on compensating variation use post-reform price vector as a reference point, implying that a different reference price vector is used for each reform. Thus, the money value of gain/loss from reform A cannot be compared to the money value of gain/loss from reform B. Measures based on equivalent variation are free from this analytical problem because the pre-reform price vector is used to evaluate all possible reforms (King (1983)).

effective tax in the price of final goods the same for all goods. However, as a variation, it is also possible to consider the case of differential VAT rates applied to different goods. If the VAT rate is uniform at the level “ r ,” this implies that

$$r = t_i^e / q_i^1 \quad (3)$$

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 needs to be raised from total consumer expenditure, then

$$r \sum_i q_i^1 X_i^1 = R^1 = \bar{R} \quad (4)$$

For fixed revenue, $R^1 = R^0 = \bar{R}$. 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.⁹

III. Distributional Impact of a VAT: An Empirical Exercise

Before the introduction of the VAT, there were three basic categories of indirect taxes in Bangladesh: excise taxes, import duties, and the sales tax. The excise taxes were imposed entirely on domestic production, import duties, on imports, and the sales tax, on both domestic sales and imports. In practice, though, almost the entire 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 47-sector input-output and tax data for fiscal year 1984/85. To use the resulting estimates 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—the modified LES—for different household groups, making use of household expenditure survey data for Bangladesh. In the second step, the weighted average nominal, effective, and shadow consumption tax rates as well as revenue shares and budget (expenditure) shares for these 15 commodity groups

⁹ This may be a limiting assumption. However, in practice, the revenue-neutral VAT rate was calculated iteratively from the relationship $t^e \cdot X = r^v \cdot X = \bar{R}$, 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 r^v is the vector of revenue-neutral VAT rates chosen such that it satisfies the above equality. It has been found that the resulting rate/rates derived iteratively is indeed quite close to the average rate found by dividing \bar{R} by total consumption expenditure.

were computed. The third step was to estimate the modified LES for 15 commodity groups (for all the population as well as each of 6 urban and 6 rural household groups) and derive expenditure elasticities and own price elasticities for the commodity groups from the LES parameters. The results are presented in the Appendix in Tables A1 and A2.¹⁰

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. Table A1 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).

Another critical fiscal indicator in a distorted economy is shadow consumption tax. 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 $1 - v/q$. Derived from the shadow prices, these shadow consumption taxes (when normalized) are particularly helpful in assessing how much a good is taxed or subsidized when measured at its shadow price in a distorted economy. For example, as shown in Table A1, 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.

As the final 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 fiscal year 1984/85, for which detailed tax, input-output, and other data could be gathered.¹¹

The first tax reform option examined here is to replace all taxes with a uniform (proportional) VAT of approximately 5.6 percent of the tax inclusive prices of all goods.¹² Since this is a sizable reform package, one

¹⁰ 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 measures the extent of tax or subsidy to which a good is subject (with reference to its shadow price) in a distorted economy. A formal definition is given later in this section.

¹¹ However, it must be noted that the household expenditure survey data were collected in 1985/86 and not in 1984/85.

¹² Later in this section we also consider an alternative tax reform package consisting of a basic rate of VAT with zero rating and additional excises for some goods chosen on the basis of their distributional characteristics.

would expect substantial changes in consumption demand. However, since the impact of a uniform (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 impact of the introduction of the VAT on household income, 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_{01}^h , defined for each per capita expenditure group (with expenditure pattern generated by LES),

$$E_{01}^h = (M^h - \mathbf{q}^1 \cdot \mathbf{a}) \prod_i (q_i^0/q_i^1)^{b_i} - (M^h - \mathbf{q}^0 \cdot \mathbf{a}), \quad (5)$$

where M^h is the per capita expenditure level of household group h ; \mathbf{q}^0 and \mathbf{q}^1 are the pre- and post-tax prices; b_i is the marginal budget share of commodity group i and, along with \mathbf{a} (which is a constant), is determined by the modified LES estimated for each household group. The parameters b_i and \mathbf{a} have been derived from the econometric estimation of the LES demand system for 12 urban and rural household groups, using the detailed household expenditure survey data. What follows is a brief discussion of the development of the database and an estimation of the LES.

Estimation of Modified Linear Expenditure Systems

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_{01}^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.¹³ 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 a large enough number of households within each group to allow estimation of a demand system consisting of 15 commodity groups. The data 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

¹³ The groups and the average per capita group expenditure, average household size, and the percentage of total households falling within each group are shown in Table 1.

rural) for the fiscal year 1985/86. The number of consumption items listed in the tape data was 136; these were then merged into 15 commodity groups appropriate for estimation of LES.¹⁴

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.¹⁵ 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 the marginal budget share estimates (**b**) were all found to be highly significant (equation 5). The *t* values of the parameter estimate involving **a**, however, were uneven; on average, the parameter estimates were significant in 8 of the 12 cases. 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, it was straightforward to calculate E_{0i}^h from equation (5) for each group.

Results of the Exercise: Distributional Impact of the VAT

The equivalent variations as proportions of the per capita household group expenditure, i.e., (E_{0i}^h/M^h) estimates in percentage terms for rural and urban areas (associated with a uniform VAT), are presented in Table 1. The impact of introducing a VAT on household income examined here is measured relative to the pre-reform tax regime.¹⁶ The results indicate that a uniform (proportional) VAT would harm four urban and four rural groups that are relatively poor and form a large majority of the population. On the other hand, it would benefit two urban and two rural groups that are relatively rich and form a small minority of population. The poorest urban households incur a loss equivalent to a 3.5 percent decrease in their total expenditure while the richest urban households benefit significantly—equivalent to an 8.1 percent increase in their total expenditure. In rural areas, the magnitudes of gain or loss are smaller but the pattern is similar: the poorest households lose the most—about 3.2

¹⁴ 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 household expenditure survey data turned out to be the most arduous and time-consuming task of the entire empirical exercise.

¹⁵ This estimation was extremely involved and expensive (in terms of computer time).

¹⁶ Thus, in this paper we are comparing one second-best (post-reform) situation with another second-best (pre-reform) situation.

Table 1. *Equivalent Variation (E_{01}^h) for Uniform VAT*

Group	Per capita expenditure (taka/month)	Percent of household	Sample size	Mean household size	Mean per capita expenditure (M^h)	Equivalent variation (percent) (E_{01}^h/M^h)
Urban						
1	<249	1.1	42	7.2	210.9	-3.5
2	250-349	2.4	82	7.1	304.8	-3.3
3	350-449	2.4	70	6.5	401.4	-2.2
4	450-599	2.9	108	5.9	523.6	-2.8
5	600-699	1.2	52	6.2	641.8	+4.9
6	700+	4.0	146	5.4	1092.4	+8.1
Rural						
1	<249	18.2	219	6.2	201.7	-3.2
2	250-349	27.9	316	6.3	298.3	-2.0
3	350-449	19.4	223	5.6	399.3	-1.9
4	450-599	12.4	149	5.6	504.9	-3.1
5	600-699	3.5	42	4.9	644.4	+4.5
6	700+	4.7	51	5.3	944.7	+6.1
All		100.0	1500	5.9	427.6	

Sources: Bangladesh household expenditure survey data, 1985/86; and author's estimates.

Note: E_{01}^h and M^h are defined in equation (5).

percent of their total expenditure, while the richest rural households benefit the most—about 6.1 percent.

The results of the exercise must, however, be treated with caution, as many details are omitted. For example, if the VAT were to replace import tariffs, benefits to richer urban households, which consume a relatively higher proportion of imported goods, would likely to be even higher. On the other hand, incorporating cash and in kind consumption (which is relevant in rural Bangladesh) in the analysis is likely to indicate lower level of losses to poorer households, even though they would still lose. The basic result appears to be very robust: relative to the pre-reform tax regime, a uniform VAT would always benefit richer groups and adversely affect the poorer households.

An Alternative Reform Package

Another reform package was examined as an alternative to the single uniform VAT applicable to all commodities. It contains a uniform 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.

Distributional Characteristics of Commodities

The distributional characteristics (D_i) of commodity i are defined as

$$D_i = \sum_h \beta^h \cdot q_i x_i^h / q_i X_i, \quad (6)$$

where β^h is the measure of distributional weights for household h ; 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 (β^h). This measure indicates the change in social welfare owing to a unit change in household h 's income. The weight β^h is defined as

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

where W is the level of social welfare; U^h is the utility of household h ; and y^h is the income (or total expenditure) of household h .¹⁷

The welfare weights β^h could be specified in a number of ways. As an example guiding practical application, Ahmad and Stern (1984) suggest the following method:

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

where I^h is the total expenditure per capita of the h th household; e is a parameter; and $e \geq 0$ ensures concavity. Now one can express β^h as equal to $U'(I^h)$, and choose a normalization for β^h (by the choice of k), so that

¹⁷ Reference to some kind of utility function is unavoidable when we are constructing welfare weights to make interpersonal comparisons. As will be explained later, different values of inequality aversion parameter have been used in the exercise to assess the sensitivity of D_i estimates to changes in the degree of inequality aversion.

the welfare weight for the poorest household is unity. Under these assumptions one can express

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

where I^0 is the total expenditure per capita of the reference poorest household.¹⁸ Given this viewpoint, Ahmad and Stern (1984) suggest that β^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 by the poor is socially more valuable than that by 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 β^h across households.¹⁹

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 1 taka of expenditure for the poorest individual as equivalent to 1 taka 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 household 1. Similarly, values of e in excess of 2 give much greater weight to the poorest, and values of 5 and above begin 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 the value of 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 higher value than the commodities with low budget share or high expenditure elasticity. This is what is being observed.

¹⁸ Strictly speaking, this measure of β^h is valid only as a local approximation given current prices and incomes, and it does not hold for all prices and incomes.

¹⁹ However, the iso-elastic function β^h given in equation (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 panel A and its ranking is shown in panel B. These can be interpreted as follows: for example, ranking no. 1 (highest rank) repre-

Table 2. *Distributional Characteristics for Commodities, 1984/85*

A: Distributional Characteristics (D_i)

No.	Commodity group	N_{ie}	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 group	N_{ie}	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

Source: Author's estimates, derived from household expenditure survey data.

Note: N_{ie} refers to expenditure elasticity of commodity group i .

sents the lowest priority and ranking no. 15 (lowest rank) represents the highest priority as a source of extra taxation. With changes in ϵ , the relative rankings of commodities measured by the value of D_i change, but the commodities that consistently rank high in the measure of distributional characteristics are rice (rank 2), wheat and grain (rank 3), vegetables and fruits (rank 5), edible oil (rank 4), and clothing (rank 6). This implies that applying a VAT on these commodities will be very regressive. By the same token, the VAT will be less regressive if it is exempted or zero rated for these goods. All of these commodities except clothing are agricultural goods, and, from an administrative point of view, VAT exemption would be more feasible than assigning zero rating. However, clothing, which includes textiles, is an important source of tax revenue under the pre-reform 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 following commodities feature low in the distributional characteristics, and thus are particularly attractive candidates for additional taxation with different values of ϵ : tobacco products (rank 10); commercial energy (including electricity, petroleum products, and gas) (rank 9); sugar and gur (rank 11); housing (rank 13); livestock (rank 12); and, to a lesser extent, fisheries (rank 7). Of these, taxing housing, livestock, and fisheries is either politically unacceptable or administratively difficult. Therefore, we experimented with a package of tax reform whereby, on the one hand, there would be zero rating of the VAT for the agricultural products and, on the other hand, tobacco products, commercial energy, and sugar would face high excise taxes at the existing rates (except 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 are justified, not only for distributional considerations but also because under the present system they raise substantial revenue.

This reform package maintains the previous revenue level, sets a zero rate on foodgrains and vegetables, and applies a proportional VAT at an enhanced rate on the remaining commodities, including tobacco, energy goods, and sugar, which also face high excise taxes.²⁰ The consumption of foodgrains and vegetables was roughly 23 percent of the total private

²⁰For 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 distributional consequences not addressed in this paper.

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

Group	Per capita expenditure (taka/month)	Percent of household	Sample size	Mean household size	Mean per capita expenditure (M^h)	Equivalent variation (percent) (E_{01}^h/M^h)
Urban						
1	<249	1.1	42	7.2	210.9	-2.4
2	250-349	2.4	82	7.1	304.8	-2.7
3	350-449	2.4	70	6.5	401.4	-1.2
4	450-599	2.9	108	5.9	523.6	-2.0
5	600-699	1.2	52	6.2	641.8	-0.3
6	700+	4.0	146	5.3	1092.4	+6.6
Rural						
1	<249	18.2	219	6.2	201.7	-1.2
2	250-349	27.9	316	6.3	298.3	-1.9
3	350-449	19.4	223	5.6	399.3	-1.1
4	450-599	12.4	149	5.6	504.9	+0.1
5	600-699	3.5	42	4.9	644.4	+0.8
6	700+	4.7	51	5.3	944.7	+4.6
All		100.0	1500	5.9	427.6	

Sources: Bangladesh household expenditure survey data, 1985/86; and author's estimates.

Note: E_{01}^h and M^h are as defined in equation (5).

consumption expenditure for 1984/85. If the tax on the foodgrains group is set at zero, and additional excises are applied, a VAT of 9.9 percent of expenditure on all other commodities would be required to keep revenue constant.²¹

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 shows that the impact of a selective VAT is beneficial to the rich and harms the poor. But in this case, the magnitudes of loss or gain are less than in the uniform VAT case. The poorest group in urban areas loses the most—equivalent to about a 2.4 percent decrease in its total expenditure. The richest group, on the other hand, benefits—equivalent to about a 6.6 percent increase in its total expenditure. In rural areas, the

²¹ The rate was calculated iteratively from the relationship $r^*X = r^*X = \bar{R}$, where X is the vector of aggregate purchases in the pre-reform period. The revenue neutral VAT rate (r) was then calculated as follows. Some entries like tobacco products and commercial energy were constrained to be the same as in r^* . Foodgrains were assumed to be zero rated and all other taxes were replaced by a uniform rate in the manner defined earlier (Ahmad and Stern (1991), p. 225).

loss to the poorest group is 1.2 percent while the benefit to the richest group amounts to 4.6 percent. In this case, the distribution of losses also differs between rural and urban areas. In the uniform VAT case, four of the urban groups and four of the rural groups suffer losses. In the selective VAT case, three of the rural groups suffered lower losses, but now five urban groups lose. This could be attributable to the higher tax on nonfood items, which feature prominently (with a higher budget share) in the budget of urban households.

Policy Implications

The upshot of this paper's analysis is that a selective VAT with some zero ratings (or exemptions) and additional excises is clearly preferable to a completely uniform VAT if distributional issues are of dominant concern in tax reform. The results of the paper are also broadly consistent with the conclusion of a similar study on India (Ahmad and Stern (1987)), which indicates that a uniform VAT on all final goods is clearly regressive and undesirable. That same study, however, also shows that a uniform VAT with exemptions or zero rates on certain items to allow for "distributional considerations" is much less regressive than a proportional VAT.²²

IV. Conclusion

The findings of our study suggest that among the different possible VAT schemes, a selective VAT scheme with some exemptions (or zero rating) and additional excises is likely to be more acceptable to the general public and policymakers than a uniform VAT.²³ We have studied other interesting cases of selective VATs with a different combination of

²² Exemption of a commodity from a 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 modeling difficulties in the reform package, the agricultural goods are set to be zero rated; however, since subsidies from major agricultural inputs were withdrawn and markets liberalized during the mid-1980s, it is reasonable to assume that the distributive impact of exemption would not be significantly different from zero rating.

²³ The VAT scheme introduced in 1991 imposed 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.

taxes, but the reform package discussed above seems to be the most feasible one because it is revenue neutral in its impact and its distributional features are relatively attractive to policymakers. However, a nonuniform VAT scheme may create administrative difficulties unless it has only a few categories.²⁴ In particular, even highly advanced European tax authorities find it very difficult to administer the rebate system that accompanies zero rating of agricultural goods. In Bangladesh, if agricultural goods (foodgrains and vegetables) were 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.

Our analysis is merely suggestive. It is based on detailed 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 incidence analysis based on equivalent variation measure is likely to overstate the magnitude of losses or gains to such households. 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.

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. Dahl and Mitra (1991) have shown analytically 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 now have.²⁵

²⁴ Tait (1988) and (1991) provides detailed and systematic discussions of the administrative problems and issues relating to the introduction of a VAT. Among others, Cnossen (1992) has also discussed the administrative, economic, and social issues pertinent to the introduction and operation of the VAT in countries of Eastern Europe and the former Soviet Union.

²⁵ 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 A1. *Revenue Shares, Budget Shares, and Taxes on Commodities*

No.	Commodity group	Nominal tax	Effective tax	Difference between effective and nominal tax (t_{diff})	Shadow consumption tax	Budget share (%)	Nominal revenue share
1	Rice	0.0	2.4	2.4	-1.1	25.4	0.0
2	Wheat and grain	0.0	2.1	2.1	-0.3	5.1	0.0
3	Vegetables and fruits	0.0	0.8	0.8	4.5	6.9	0.0
4	Livestock (meat)	0.7	2.5	1.8	6.4	5.6	0.7
5	Fisheries	0.0	4.1	4.1	4.5	7.0	0.0
6	Edible oil	8.3	11.8	3.5	47.0	2.4	3.6
7	Sugar and gur	35.9	39.0	3.1	39.0	1.2	7.4
8	Other food	4.0	45.4	41.4	9.5	6.6	1.8
9	Tobacco products	77.8	84.7	6.9	26.2	2.1	14.6
10	Clothing	2.6	24.2	21.6	8.9	5.2	1.9
11	Manufactured goods	11.1	26.5	15.4	29.5	5.9	59.4
12	Traditional energy	0.0	0.7	0.7	-0.1	6.5	0.0
13	Commercial energy	7.5	42.5	35.0	-36.0	1.9	9.5
14	Housing	0.0	4.0	4.0	16.3	8.0	0.0
15	Services	0.1	6.5	6.4	16.2	10.0	1.1
	Mean/total	3.8	13.5	9.7	13.5	100.0	100.0

Table A2. *Expenditure and Price Elasticities of Commodities*

No.	Commodity group	Budget share	N_{ie}	N_{ii}
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

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

Notes: N_{ie} refers to expenditure elasticity of i , and N_{ii} to own price elasticity of i . Livestock includes meat and dairy products; gur includes molasses; traditional energy includes fuelwood and other bio-mass energy items; and commercial energy includes kerosene, electricity, and gas.

REFERENCES

- Ahmad, Ehtisham, and Nicholas Stern, "The Theory of Reform and Indian Indirect Taxes," *Journal of Public Economics*, Vol. 25 (December 1984), pp. 259–98.
- , "Alternative Sources of Government Revenue: Illustrations from India, 1979–80," in *The Theory of Taxation for Developing Countries*, ed. by David Newbery and Nicholas Stern (Oxford: Oxford University Press for the World Bank, 1987), pp. 281–332.
- , *The Theory and Practice of Tax Reform in Developing Countries* (Cambridge: Cambridge University Press, 1991).
- Bangladesh Bureau of Statistics, *Data: Household Expenditure Surveys 1985/86, 1983/84 and 1981/82* (computer tape; Dhaka: Bangladesh Bureau of Statistics, 1989).
- Bangladesh Planning Commission, *Fiscal Statistics: 1972–73 to 1985–86* (Dhaka: Bangladesh Planning Commission, June 1986).
- , *The Structure of the Bangladesh Economy: Input-Output Flow Table, 1981–82* (Dhaka: Bangladesh Planning Commission, August 1988).
- Cnossen, Sijbren, "Key Questions in Considering a Value-Added Tax for Central and Eastern European Countries," *Staff Papers*, International Monetary Fund, Vol. 39 (June 1992), pp. 211–55.
- Dahl, Henrik, and Pradeep Mitra, "Applying Tax Models in Country Economic Work: Bangladesh, China and India," *World Bank Economic Review*, Vol. 5 (September 1991), pp. 553–72.
- Deaton, Angus, "Household Survey Data and Pricing Policies in Developing Countries," *World Bank Economic Review*, Vol. 3 (May 1989), pp. 183–210.
- Hossain, Shahabuddin, "A Critical Review of the CGE Models for Bangladesh," (unpublished; Cambridge: University of Cambridge, 1990).
- , *Tax Reform, Public Pricing, and Trade Protection in Bangladesh* (Ph.D. dissertation; Cambridge: University of Cambridge, 1991).
- King, Mervyn A., "Welfare Analysis of Tax Reforms Using Household Data," *Journal of Public Economics*, Vol. 21 (July 1983), pp. 183–214.
- Mansur, Ahsan H., and Bazlul Haque Khondker, "Revenue Effects of the VAT System in Bangladesh," *Bangladesh Development Studies*, Bangladesh Institute of Development Studies, Vol. 19 (September 1991), pp. 1–34.
- , "Equity Aspects of the VAT System in Bangladesh" (unpublished; Dhaka: 1992).
- Newbery, David M., "On the Desirability of Input Taxes," *Economics Letters*, Vol. 20, No. 3 (1986), pp. 267–70.
- , and Nicholas Stern, eds., *The Theory of Taxation for Developing Countries* (Oxford: Oxford University Press, 1987).
- Shoven, John B., and John Whalley, "Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey," *Journal of Economic Literature*, Vol. 22 (September 1984), pp. 1007–51.

- Stern, Nicholas (1987a), "The Theory of Optimal Commodity and Income Taxation: An Introduction," in *The Theory of Taxation for Developing Countries*, ed. by David Newbery and Nicholas Stern (Oxford: Oxford University Press, 1987), pp. 22–59.
- (1987b), "Aspects of General Theory of Tax Reform," in *The Theory of Taxation for Developing Countries*, ed. by David Newbery and Nicholas Stern (Oxford: Oxford University Press, 1987), pp. 60–91.
- Tait, Alan A., *Value-Added Tax: International Practice and Problems* (Washington: International Monetary Fund, 1988).
- , *Value-Added Tax: Administrative and Policy Issues*, IMF Occasional Paper No. 88 (Washington: International Monetary Fund, 1991).
- World Bank, "Bangladesh: An Agenda for Tax Reform," World Bank Report No. 7196-BD (Washington: World Bank, 1989).