

**Estimating Revenues  
from Tax Reform  
in Transition Economies**

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Quantitative analysis is a key aspect of the design and evaluation of tax policy. To make informed decisions, policymakers should know how much revenue is collected and from whom. The tax reform planned for transition economies should include the introduction not only of new tax structures but also of new models to estimate revenues. Preliminary methodologies can be developed in time to influence the current discussions on the design of tax legislation. These efforts will also lay the groundwork for the further development of data bases and models that will be used to evaluate tax policy in the years ahead.

This paper provides an introduction to quantitative techniques for analyzing tax reforms. Section I discusses three interrelated functions of tax analysis departments. These functions are (1) forecasting tax receipts, (2) estimating revenues resulting from changes in tax laws, and (3) analyzing the economic effects of tax laws. Section II lays out a general conceptual framework for preparing these analyses. Section III presents examples of relatively simple techniques for forecasting, estimation, and analysis for a value-added tax. Section IV offers conclusions.

## I. Quantitative Analysis of Tax Policy

Ministries of Finance are responsible for three separate but somewhat interrelated types of quantitative analysis of tax policy. First, the tax analysis division prepares forecasts of tax receipts. Forecasts are made for each major tax--such as the personal income tax, the corporate profits tax, the value-added tax, excise taxes, and social security taxes. Such forecasts are part of the official budget prepared by the Government. They are usually

updated once or twice a year. Countries in Central and Eastern Europe and the former Soviet Union now face the added challenge of forecasting revenues from tax structures that are totally new.

Second, Ministries of Finance are responsible for estimates of revenues resulting from changes in tax laws. Usually these are revisions within a given tax structure--for example, a redefinition of the tax base or a raising or lowering of tax rates. The tax analysis division would calculate the difference in revenues between the proposed and existing laws.<sup>1</sup> The current reforms in transition economies call for a more complex form of revenue estimation. For example, most countries are implementing a value-added tax (VAT) as a replacement for the turnover tax as a method of taxing consumption. This reform affects both the rate and base for taxation. It also changes the method of collecting the tax, since firms receive a credit for VAT paid by their suppliers.

Finally, the Ministries of Finance perform analyses of the economic effects of tax laws. This involves comparing tax liabilities for different types of individuals and businesses. Of key interest in evaluating the fairness of tax laws is the computation of tax payments for households with different levels of income. For purposes of evaluating the neutrality of a tax, Ministries compare tax obligations for businesses in different industries or with different ownership structures. These kinds of analyses require disaggregated information about the structure of the economy. Access to such information is always a challenge, but it is especially so in countries where the economic system is changing rapidly. In the case of Central and Eastern

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<sup>1</sup>In the United States, the term "revenue estimation" is used to describe this function. Projection of revenues under existing law is termed "receipts forecasting." The terminology differs somewhat from country to country.

Europe and the former Soviet Union, statistical reports often are not able to reflect the most recent changes in the distribution of income and the structure of industry.

## II. Conceptual Framework

The task of preparing these three types of estimates fits into a single conceptual framework. The starting point for computations is a given set of macroeconomic assumptions. From these assumptions and with reference to a given tax law, the next step is to compute the tax base. Knowledge of tax rates then gives tax liability. Finally, assumptions about the timing of tax payments enable estimation of tax receipts.

### Macroeconomic Assumptions

The preparation of a macroeconomic forecast is an inherent part of preparing the Government budget. In many countries, macroeconomic forecasting is the responsibility of a government agency other than the Ministry of Finance. In the United States, the President's Council of Economic Advisers issues the government's official economic projections. In the countries of Central and Eastern Europe and the former Soviet Union, this task may fall to an economic planning ministry. But whatever institutional setup exists, the tax analysis staff of the Ministry of Finance (or its equivalent) is consulted during the preparation of the macroeconomic projection.

Tax and spending policy affect the economy. In turn, the economy affects the budget. Therefore some simultaneity is inherent in preparing macroeconomic and budgetary forecasts. The solution to this simultaneity problem is to institute an iterative procedure involving those who prepare the macroeconomic projections and those who prepare budget projections.

At the outset of the process, the Ministry of Finance should prepare an initial forecast of receipts and expenditures based on a pre-existing evaluation of macroeconomic conditions. This forecast should take note of assumptions being made about tax policy, including new initiatives such as a major tax reform. The macroeconomic forecasters (whether they be located at the Ministry of Finance or another government agency) should then use these results to prepare a revised economic projection. This revised economic projection is passed to the receipts forecasters, who in turn revise their estimates if needed. In the United States, we have found that two or three iterations of this kind are sufficient to produce a consistent macroeconomic and budget projection.

The resulting macroeconomic projection should be used as an input into further revenue estimates. For example, if the Parliamentary debate over tax reform results in a change in tax rates, the estimated effects of these changes would be calculated assuming that they have no further effect on macroeconomic conditions. Although this assumption is not strictly valid, in most cases the effect of these further changes in tax policy would be relatively small--at least in comparison with the range of uncertainty associated with macroeconomic projections. The macroeconomic effects of these further changes in tax policy can be considered the next time the government submits a budget. At that time, the macroeconomic projection would consider not only these policy changes but also other developments that were unanticipated at the time the previous budget was prepared.

At a minimum, the government's macroeconomic projection should include a measure of national production (e.g., gross domestic product--GDP), a measure

of inflation (e.g., the consumer price index), and an indicator of labor market conditions (e.g., the employment level or the unemployment rate).

Inevitably, macroeconomic forecasts are not detailed enough to fill the needs of the tax analysis division. In the case of economies in transition, even basic macroeconomic indicators may not be available. Therefore the tax analysis division might have to develop its own assumptions for key variables. For example, it may be necessary to convert data on net material product to GDP. Calculations by international organizations such as the International Monetary Fund and the World Bank can be helpful in this regard. More generally, macroeconomic forecasts may lack detail on the composition of gross product and income. For example, suppose that the Ministry of Finance wants to estimate value-added tax (VAT) receipts. The base for a comprehensive VAT is total consumer spending. If the macroeconomic forecast does not break down national product into its components, then the tax department might estimate consumer spending according to historical ratios. If consumption equalled, say, 60 percent of GDP in the last year for which data were available, then this ratio could be applied to the forecast for GDP. Similarly, the macroeconomic forecast may not indicate sources of national income--such as wages, corporate profits, interest, dividends, rental income, pensions, and so forth. Therefore, for purposes of projecting income and profits tax bases, the Ministry of Finance would have to make its own assumptions. The most recent historical data are the appropriate starting point. But the tax analysis division would also have to apply a fair amount of judgment to determine the effects of economic restructuring and recent legislation on income shares.



## Tax Base

Tax bases never correspond exactly to macroeconomic aggregates. Some types of production are excluded from the value-added tax base, either because they are viewed as merit goods, or because levying a tax would be difficult from an administrative viewpoint. Similarly, various exclusions and deductions cause the base of the personal income tax to be narrower than personal income in the national accounts. On the other hand, the tax base may include some income that is not the result of current economic production. One example is capital gains on the sale of financial or physical assets.

The next step in preparing a receipts forecast is to estimate the magnitude of the differences between the actual tax base and numbers found in the national income and product accounts. In revenue estimation, the tax department will compare different tax bases against each other. Usually the Ministry of Finance must rely on historical data from the Central Statistical Office or other government agencies. The widespread practice of granting businesses tax exemptions and tax holidays further complicates the task of estimating tax bases in transition economies. As part of introducing tax reform, the Ministry should consider expanding its own data collection. Tax forms should be designed with statistical needs in mind.

The magnitude of the tax base depends also on the degree of taxpayer compliance. For new tax structures, there will be a high degree of uncertainty about this factor. Initially, compliance rates for new types of taxes will probably be no higher than for the taxes they replace. However, the efficiency of collection can be improved by explicit actions on the part of the tax authorities. The existence of an extensive public information campaign prior to introducing new tax structures should boost compliance. The

introduction of more modern techniques of tax administration--such as computerization of tax collection records--would also tend to improve tax yields. Over time, the structure of these new taxes will also have an effect. For example, in a value-added tax, each enterprise receives a tax credit for VAT paid at previous stages of production and distribution. This introduces some degree of self enforcement. Similarly, withholding of income taxes at the source will tend to raise collections.

### Tax Liability

In a simple proportional tax with only one rate, tax liability equals the tax rate times the tax base. Such is the case for excise taxes. But it may not be true for the major sources of revenue. For example, the VAT may have two or more positive rates. Personal income tax rates may increase with income. In the case of these taxes, the estimation of tax receipts must inevitably be based on data disaggregated, respectively, by type of production and level of income. Thus, estimation of aggregate tax receipts will be based on the same data that are used to examine the effects of the tax system on the distribution of income and incentives for production in different industries. The best sources for such information are surveys on household expenditures and industrial production, as well as input-output tables.

### Tax Receipts

For budgetary purposes, it is important to know not only the amount of tax liability but also when payments are made. This is especially so in countries without well-developed credit markets, since government expenditures will be constrained by the timing of tax receipts.

In the case of the value-added tax, payments may be due during the month following the one to which they apply. However, some taxpayers will pay late,

especially in difficult economic times. Rules regarding refunding of excess tax credits will also affect the government's cash flow from the VAT. Nevertheless, the lag between liability and payment generally should be fairly small.

For the income and profits tax, timing issues may be significant. The schedule for payments depends on how closely monthly or quarterly withholding matches final tax liability, and on how much time is allowed for taxpayers to make their final payments. Rules concerning the carryforward of losses have a further effect on the timing of tax receipts.

At first, the Ministry of Finance in a transition economy will be able to make only rough guesses as to the time lag between liability and payment. As time goes on, it would be advisable for the Ministry to collect data on tax collections that would permit more educated estimation. For example, income tax receipts in 1994 should be labeled according to whether they are estimated payments for 1994, estimated payments for 1993, final payments for 1993, or refunds for 1993. The Ministry should also study the seasonal pattern of tax receipts.

### III. Modeling Revenues from the Value-Added Tax

Ministries of Finance in transition economies will face serious constraints in developing models to be used during the first phases of tax reform. Existing databases are inadequate, and human resources are scarce relative to the great amount of work that is required. Still, it is imperative that models start to be developed. The task of building economic models will improve the skills and usefulness of the tax analysis staff of the

Ministry of Finance. It will also point out, concretely, what data will be needed to evaluate the tax system in the future.

For models to be influential in the near term, they must be relatively simple. Right now, there is no other choice, given the lack of data and time. But even the basic structure of more complicated models must continue to be understandable if their results are to be used to influence decisionmakers who are not tax experts.

This section discusses methods for determining revenues from the value-added tax. The structure of these models is relatively simple, but implementation will require gathering data from several sources as well as making some additional approximations.

#### Forecasting Receipts

Table 1a outlines a model for forecasting receipts from a value-added tax. It is assumed that the basic tax rate is 20 percent. A reduced rate of 5 percent applies to certain items, exports are zero-rated, and exemptions apply to still other goods and services. This model also permits a comparison of VAT revenues with those under existing turnover taxes.

The exercise has three main parts, indicated by the numbers on the table. First is the calculation of the adjusted VAT base using the most recent historical data available. The adjusted VAT base refers to that amount which, when taxed at a rate of 20 percent, would produce VAT liability. Under this approach, both exemptions and reduced rates are treated as effective diminutions of the VAT base. The second step is to project the adjusted VAT base for the year in which the VAT takes effect. Third, this tax base is multiplied by the basic tax rate and a further judgment is made about the efficiency of tax collection.

Table 1a  
Forecasting VAT Receipts

	Actual 1993		Forecast 1994	Forecast 1995
	Levels (billions of currency units)	Shares (percent)		
Gross Domestic Product				
Adjustments to Produce Consumption Base				
Adjustments for Exemptions				
Adjustments for Reduced Rate				
Adjustments for Taxes Eliminated by VAT Legislation				
-----				
Adjusted VAT Base	#1			#2
Adjusted Base x 20% = Tax Liability				
-----				
Tax Liability x Efficiency Rate = Tax Receipts				#3

Adjusted VAT base. The starting point for the calculations is the most recent annual measure of nominal gross domestic product. Then four adjustments are made. The first set of adjustments, indicated in table 1b, is definitional. Because the VAT is levied on the destination principle, imports must be added to and exports subtracted from GDP. Also, the VAT does not cover investment.

Second are several adjustments for exemptions. The VAT may exclude consumer purchases from exempt industries, such as postal services, education, and health care. Household expenditure surveys can be used to estimate these items. If detailed spending patterns are available only for a previous year, it is possible to construct 1993-based estimates by applying the earlier shares of the household budget to the estimated consumption level for 1993. If the consumer expenditure survey predates recent deregulation of prices, the analysts preparing the estimate may wish to make a judgmental adjustment for the effects of changes in relative prices on expenditure shares.

The VAT may also exclude consumer purchases from businesses below the VAT threshold, such as small farms and self-employed providers of services. However, usually these businesses may choose voluntarily to register for the VAT in order to claim input tax credits. With increased privatization, smaller businesses are likely to increase as a fraction of total production and sales relative to historical estimates. Because such businesses often operate informally, good statistics will not exist on their activity. Also, the issue of avoiding double counting must be dealt with. The receipts estimate for this category should exclude consumer purchases from small businesses in exempt industries. Although the results of the estimation will be heavily judgmental, two sources of evidence may serve as a guide. First,

Table 1b  
Adjustments to the VAT Base

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Adjustments to Produce Consumption  
Base:

- plus: Imports
- minus: Exports
- minus: Gross fixed investment
- minus: Change in inventories

Adjustments for Exemptions:

- minus: Consumer purchases  
from exempt industries
- minus: Consumer purchases from  
businesses below VAT  
threshold
- plus: Intermediate sales of  
taxable inputs to exempt  
industries
- plus: Intermediate sales of  
taxable inputs to  
businesses below VAT  
threshold

EXAMPLES:

POSTAL SERVICES, EDUCATION, HEALTH

SMALL FARMER, SELF-EMPLOYED  
PROVIDERS OF SERVICES

SUPPLIES PURCHASED BY SCHOOLS

FERTILIZER PURCHASED BY SMALL FARMER

Adjustments for Reduced Rate:

- minus: Adjustment for consumer  
purchases of goods  
taxed at reduced rate  
of 5%

FOODSTUFFS

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data on other countries can indicate what percentage of VAT revenues is collected from companies of different size. Some countries where the threshold level has changed have estimated the resulting effects on revenues. Also, statistical agencies in transition economies may have conducted surveys of industries that indicate how much production is accounted for by larger businesses.

Because firms that are not registered for the VAT do not take an input tax credit, the revenue forecast must include their purchases of taxable inputs. Although input-output tables are unlikely to be up to date, they can provide a guide to the purchases of inputs by exempt industries relative to the importance of final sales of these items to consumers. Computing the size of purchases of taxable inputs to unregistered businesses below the VAT threshold involves considerably more guesswork. The estimate should be made consistent with the assumption about the overall importance of these firms in the economy.

The third major adjustment is accounting for a reduced rate of tax on some goods and services consumed domestically. The purchases of these items may be estimated from household expenditure surveys. Under the hypothetical proposal for a 5 percent rate of tax, these expenditures would be multiplied by a factor of one-fourth to convert the effect of the lower rate into an adjustment to the tax base.

Finally, past data on consumption are based on prices that reflect the existing turnover taxes. These revenues should be subtracted from the VAT base, since the turnover tax will be eliminated as part of tax reform.

Projecting the tax base. The result of the above calculations is an adjusted VAT base for 1993 (or whatever year is used for historical data).



Having filled in the first two columns of table 1a, the next step is to make assumptions about the macroeconomy for 1995, the target year for implementing the VAT. The simplest approach is to project nominal GDP for 1995, and then assume that the adjusted VAT base is the same fraction of nominal GDP in 1995 as it was in 1993.<sup>2</sup> Nominal GDP in 1995 will equal nominal GDP in 1993 augmented by the growth of real production plus inflation. Partial information on real growth and inflation is already available for 1994. Further forecasts should come from official government projections if they are available. In the absence of government prognoses, international agencies and private forecasters may be called upon to provide assumptions. The result of this part of the exercise is point #2 on table 1a, a forecast of the adjusted VAT base in 1995.

Finally, tax receipts in 1995 are obtained by multiplying the adjusted base first by the basic tax rate (here assumed to be 20 percent), and then by an efficiency factor. Unfortunately, the assumption about the efficiency factor is likely to swamp many of the finer adjustments needed to produce the estimate of the historical base. Evidence collected by the International Monetary Fund suggests a first-year efficiency rate not much in excess of 50 percent. The Ministry of Finance should also take into account the general history of tax compliance and tax collection in the country, as well as any related steps connected with the introduction of the VAT that may cause efficiency to increase or decrease.

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<sup>2</sup>A more thorough approach would call for separate forecasts of each row of table 1a. For example, one could prepare separate estimates of how quickly the consumption and non-consumption components of GDP will grow. But unless this is already part of the standard macroeconomic analysis by the government, the complication is unlikely to produce a more correct or acceptable forecast.

### Further Revenue Estimates

As the VAT legislation is being debated, members of Parliament are likely to offer suggestions of their own. If the Ministry of Finance has already prepared a systematic forecast of VAT receipts, it will be in a strong position to evaluate the revenue consequences of alternative proposals.

Proposals will be of two types: changes in exemptions and changes in the structure of rates (see table 2). For example, members of Parliament might propose to expand the list of exempt industries or to reduce the lower rate (perhaps even to zero).

Usually the effects of such proposals will require the Ministry of Finance only to recompute the historical adjusted VAT base. The same macroeconomic assumptions should be used in getting from point #1 to point #2 on table 1a. If the basic VAT rate is to be increased or decreased from 20 percent, then only a very simple recalculation is needed to go from point #2 to point #3. The efficiency estimate should be left unchanged, even though the Ministry of Finance may legitimately argue that some proposals would change the effectiveness of tax collection.<sup>3</sup>

In the process of preparing basic receipts forecasts, the Ministry of Finance should try to ensure that it can prepare revenue estimates for proposals that are likely to emerge during the political debate. This

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<sup>3</sup>For example, if two similar goods are taxed at different rates, consumption of the lower-taxed item will increase in importance, for two reasons. Consumers will substitute the lower-taxed for the higher-taxed good. Sellers will attempt to recharacterize the mix of their sales in favor of the lower-taxed product. Both factors tend to reduce tax collection relative to the case where both goods are taxed at the same rate. The Ministry should raise this argument to defend a uniform rate structure. However, it is difficult to quantify the magnitude of this effect on revenues. The Ministry of Finance should keep its revenue estimates as objective as possible so that they do not themselves become a point of controversy.

Table 2  
Further Revenue Estimates - VAT

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Change in Status for Industries

- Taxable to exempt
- Exempt to taxable

Change in Threshold Level

Change in Goods Taxed at Reduced Rate

Change in Regular or Reduced Rate

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requires collecting the requisite data. It also means using a systematic and well-documented format to prepare receipts forecasts. Computerized spreadsheet programs can be very helpful in this regard.

Proposals from Parliament are more likely to lose than to gain revenue. Beyond showing revenue estimates, the Ministry of Finance may wish to indicate the adjustment in the basic VAT rate needed to restore the original revenue yield of the VAT. For example, a proposal that results in the reduction of the adjusted VAT base by half would require a doubling of the basic VAT rate. By being prepared with this kind of information, the Ministry of Finance can add balance to public discussions of tax reform.

#### Further Analysis of VAT Proposals

One issue that arises in consideration of a value-added tax is its effect on the cost of living for households of different means. That is, with the removal of turnover taxes and the imposition of a VAT and revised excises, one would want to know how much of an increase in outlays will be required to permit a household to purchase the same bundle of goods as before. To avoid the problems of forecasting future consumption, such calculations may be done on a percentage basis.

Some countries have information on household expenditures by type of good or service. Thus, by assuming that turnover taxes, the VAT, and excise taxes are fully reflected in the price a consumer pays, it is straightforward to compute the effects of the tax reform on the cost of living.<sup>4</sup>

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<sup>4</sup>The assumption that the tax is fully reflected in the price means that the imposition of a 10 percent tax on an item costing 100 raises the price to 110. The analysis requires first dividing the observed expenditures by the quantity one plus the turnover tax rate in order to obtain the net price. This is then increased by applicable excise rate changes and the VAT.

An interesting extension of the analysis is to divide up households according to the level of income. By doing this, one can measure the progressivity or regressivity of the VAT relative to the taxes it replaces.

#### IV. Conclusions

Quantitative analysis potentially is very useful in analyzing the tax system and developing tax reforms. It is also very challenging in the context of an immediate lack of experience, data, and time.

During the debate over tax reform in transition economies, the Ministry of Finance can contribute some forecasts, revenue estimates, and other analyses that will guide and improve the final outcome. The Ministry of Finance must first pick some key calculations to perform. For example, Ministry personnel could project the revenue and price effects of substituting a value-added tax for the existing system of turnover taxes. To influence the debate, these calculations should include some alternatives that are likely to emerge from Parliament. The Ministry may also wish to recast Parliamentary proposals in the form of balanced budget amendments. That is, it could calculate how much of an increase in tax rates would be necessary to offset erosions in the base.

As indicated in this paper, such exercises involve splicing together information from a variety of sources and making additional assumptions. No one knows what next year's economy will be like or what level of taxpayer compliance will be achieved. The Ministry should take pains to use as reasonable procedures as possible, given the limitations of the underlying data. Even though some of the particular calculations will be subject to considerable uncertainty, it is likely that some conclusions of the analysis

will be fairly robust. For example, the Ministry should be able to determine the relative importance of different types of consumption on the base of the VAT. This is extremely useful for discussions of alternative rate structures. In general, revenue estimates and other analyses of revisions to a given type of tax will be more straightforward than receipts forecasts because they will not necessitate making new assumptions about macroeconomic conditions and compliance.

Over time, the Ministry of Finance will be able to improve its forecasting, estimation, and analysis techniques. To do so requires improving underlying data sources. Even in the process of developing relatively simple models, the Ministry will increase its understanding of data released by statistical agencies and international organizations. The Ministry will also learn about gaps in these sources that it may be able to fill by designing its own collection of statistics on taxation or by persuading other issuers of statistics to modify their data collection efforts.

The process of implementing quantitative analysis of tax reform also imposes some organizational requirements on the Ministry of Finance. Those who develop tax legislation and those who analyze tax policy must cooperate closely, even if they are in separate divisions. Together, they must work up a schedule for estimates that must be performed on a regular basis, such as projections connected with the release of a government budget. They should agree on the procedures for releasing estimates to officials outside the Ministry of Finance and other members of the public. They should also cooperate on long-range plans. If the developers of tax legislation discuss potential initiatives with revenue estimators in advance, it is more likely

that analytical tools will be developed that can enhance the chances of passing desired reforms.

