



Issues in Optimal Taxation

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The intent of the discussion paper series is to stimulate discussion and exchange ideas on issues pertinent to the economic and social development of Mozambique. A multiplicity of views exists on how to best foment economic and social development. The discussion paper series aims to reflect this diversity.

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Glossary

This glossary is compiled from [Oxford Reference Online](#) dictionaries and from the literature used in this paper. The purpose is to define and clarify concepts used here and within the taxation literature, more generally.

[Taxes](#) are payments compulsorily collected from formal firms or individuals by central or local government and can target factors or products. A [direct tax](#) is often, misleadingly, referred to in the literature as a tax levied on factors. The word ‘direct’ is misleading since it implies the view that the real burden of such a tax falls on the person or firm paying it and cannot be passed on to anybody else. For example a [lump-sum tax](#) is a tax where the amount paid is not affected by the tax-payer’s actions and thus a truly direct tax. The same misinterpretation goes for an [indirect tax](#) as a tax levied on products, with ‘indirect’ implying the view that the real burden of such a tax does not fall on the person or firm paying it, but can be passed on to others. Yet this will ultimately depend on price elasticities of demand and supply. Thus, the above implicit views on the real [incidence of taxes](#) are not necessarily correct.¹ Tax incidence therefore assesses which individual will in reality bear the real burden of paying taxes.

Factors (labour or capital) can be taxed with an [income tax](#) levied on labour income. [Capital gains](#) may be included as income, excluded, or taxed separately from income. A capital gains tax is levied on the increase in the value of assets. A [corporate income tax](#) is a tax on the profits of firms, distinct from taxation of the income of their owners.

Products (goods and services) can be taxed by means of a [sales tax](#) based on the selling price. Such taxes are generally not favored, since they have a cascading effect, i.e. tax on tax. If goods are sold on from one trader to another, the effective tax borne by the ultimate buyer becomes considerable. A tax that is designed not to have the cascading effect is the [Value-added tax](#) (VAT) levied on the value-added of a business. An [expenditure tax](#) is levied on income less net savings, so it is not the creation of income and wealth that is taxed, but the spending of it. A [duty](#) is a tax on certain goods or services. This could be an [excise duty](#) levied on the consumption of for example alcoholic drinks,

¹ If income is a pure rent, or if levying of taxes comes as a surprise after decisions concerning the tax are made, the burden of a tax cannot be passed on; but taxes on earned incomes affect the incentives to work. Taxes on property incomes affect the incentives to save, and taxes on profits affect the incentives to take risks. It is therefore possible that some of the real burden of taxes can be passed on, to employers, borrowers, or customers.

tobacco, or petrol, which are all widely used. Duties also include taxes on international trade like an [import duty](#); a tax or [tariff](#) or duty on imported goods. A [specific tax](#) is levied on goods at a rate fixed in nominal terms per unit of quantity, regardless of their price. An [ad valorem tax](#) on goods is levied as a set proportion of their value.

The [tax base](#) is the specified domain on which a tax is levied, e.g. an individual's income for an income tax or the profits of a company for a corporation tax. The tax base is lowered through: [tax allowances](#), i.e. deductions of particular activities, such as pension contributions, which individuals or firms are allowed to deduct when calculating their taxable incomes. Tax exemptions, i.e. omission of goods, such as food or children's clothing, will also lower the tax base. The more exemptions, the higher the tax rates required on the remaining tax base to raise any given amount of tax revenue will be. [Tax evasion](#) is failing to pay taxes, which are lawfully due; [tax avoidance](#) is conducting one's affairs so as to avoid becoming legally liable for taxes. [Tax expenditure](#) is the loss of government revenue due to granting tax allowances to encourage particular activities.

[Horizontal equity](#) concerns fairness among equals. Equals should be treated equally by the tax system. Tax liability should not depend on any of a set of irrelevant characteristics. [Vertical equity](#) considers the distributional impact of taxation. Questions such as how much a skewed distribution of income or consumption should be moderated by redistributive taxation. A [proportional tax](#) increases in proportion to the taxpayer's income, whereas a [progressive tax](#) collects a higher proportion of income when income rises. A [regressive tax](#) collects a lower proportion of income when income increases.

1. Introduction

Developing countries (especially in sub-saharan Africa) face many difficulties in raising tax revenue for public purposes. Low per capita incomes, an economic base in subsistence agriculture, poorly structured tax systems, and weak tax and customs administrations all contribute to this situation. At the same time, the absence of institutions to mobilize and channel savings, to productive investment, makes the potential role of the state in harnessing the resources for development even more crucial. Combating inequality and low living standards are rightly key government concerns, and in this perspective tax policy is an important instrument.

The established theory of taxation remains today essentially much the same as it was in 1980 when Atkinson and Stiglitz wrote their *Lectures on Public Economics*. For developing country tax analysis, Burgess and Stern (1993) list many of the special features of particular relevance for low-income countries. In Newbery and Stern (1987) particular attention is paid to taxation of agriculture, and in Bell (2003) taxation and international trade are in focus.

Comparing the composition of government revenue in developing countries with tax revenue in the industrialized countries, the most striking differences are the low usage of social security taxes, the high revenue from trade taxes and the high levels of non-tax revenues. There is also a generally lower share of income tax in total revenue. Tanzi and Zee (2000) show that developing countries tend to collect a substantially higher share of their income tax revenue from companies than from individuals. A relatively low personal income tax is in many cases responsible for this low share.

These general differences in revenue shares in comparison with industrialized countries should not mask the substantial differences among low-income countries. Table 1 and 2 list some summary statistics with revenue categories in percent of GDP. When comparing data concerning the central government revenue in relation to GDP for the latest available year, it is clear that the share of revenue in GDP varies widely. The standard deviation (std.) is 9.5 around a mean of 25.2 with three countries below 10% and six above 40%. This can be compared to the industrialized countries where the std. is 8.3 around a mean of 35.1%. At the level of general government the mean for developing countries increases to 32.3% with a std. of 10 compared to an industrialized country mean and std. of 46.1% and 7.6, respectively. Within developing countries there is a particularly wide range in non-tax revenue, due to large differences in the value of mineral deposits among countries (compare for instance Rep. of Congo to Madagascar in Table 2).

The differences in revenue patterns between low-income countries and the industrialized world are easy to understand when administrative characteristics are considered. The high proportion of the workforce employed by well-established companies facilitates the heavy reliance placed on social security taxes and personal income taxes in industrialized countries. In contrast, the reliance of low-income countries on international trade taxes reflects the relative ease of observing and valuing goods as they cross international frontiers. In addition, the greater reliance on company income tax reflects the greater ease of collecting taxes from established companies rather than individuals. However, there are as well other, non-administrative forces at work. A high non-tax revenue in some countries results from mineral deposits, while trade taxes were often introduced as part of a strategy of import substitution. Also, the use of export taxes in addition to import duties by some developing countries reflects in part their export of agricultural products over which they hold some monopoly power, although this has fallen recently for most countries, Heady (2001).

Instead of directly comparing tax levels, another approach is to estimate a potential tax level given the structure of the economy. Stotsky and WoldeMariam (1997) use panel data on 43 sub-Saharan African countries during 1990-95 to measure the determinants of the tax share in GDP and to construct a measure of tax effort.² The measure of tax effort is constructed as the ratio of the actual tax share to the predicted (or potential) tax share so in essence the index measures the extent to which the observation is an 'outlier', either above or below the regression line.

Results suggest that countries with a relatively high tax share (above the regression line) tend to have a relatively high tax index. This means that these countries make more intensive use of their tax base to increase revenue. In other words countries with low indices of tax effort could increase the tax base and may thus wish to place greater emphasis on increasing revenues rather than on reducing expenditures compared to countries with higher indices of tax effort.

Though more sophisticated than a simple descriptive analysis such comparative studies do not answer whether higher or lower taxes, in a given country, would increase efficiency and equity.

² GDP includes income earned locally that accrues to non-residents and excludes income received from abroad by residents, whereas GNP excludes the former and includes the latter. Since local income accruing to non-residents is typically taxed while remittances from abroad are not, GDP produces a more accurate measure of taxable capacity. Mozambique is dropped from the analysis because of missing data.

This paper provide a brief account of the theory of taxation on addition to what can be learnt from the data in the IMF *Government Finance Statistics* and World Bank *World Development Indicators*, the main data source on taxation in developing countries. After this introduction issues related to tax incidence, tax efficiency and the tax base follow in section 2, 3 and 4. Optimal taxes (respectively product and factor taxes) are considered in section 5. Section 6 concludes and relates briefly but more specifically to Mozambique.

2. Tax Incidence

The study of incidence of taxation is the study of the distribution of the real burden or the equity of taxation in a heterogeneous society. Consider for example the question of how progressive a tax system should be. While there is fairly general agreement that it is necessary to exempt the very poor from taxes, so some degree of progression is inevitable, the proper degree of progression is controversial. Some economists maintain that taxes should be as progressive as is consistent with preserving incentives for effort and saving, and the need of keeping the rich within the formal economy. Others prefer keeping taxes as near to proportional as is consistent with exemptions for the very poor.

Many of the macroeconomic reforms undertaken with support from the IMF and the World Bank in African countries are aimed at reducing fiscal deficits, improving macroeconomic stability, and enhancing economic efficiency. The different measures in achieving these goals affect different income and social groups in varying ways; and the way in which the poor, vulnerable, and low-income groups are affected is a special concern. Given the poverty reduction goal on which there is now consensus, policymakers need to know the impact on vertical equity in order to assess the desirability of alternative policy or price changes. A case of tax equity in Mozambique is international companies paying incomes from offshore branches, for example in Mauritius, to avoid income taxes in Mozambique. This suggests that international companies can easier avoid tax burdens than domestic companies and it highlights the importance of paying attention to whom actually pay the taxes.

One approach that has been in use for quite some time is called incidence analysis. Incidence analysis has been carried out for many countries and in most cases focuses on impact of changes in tax and public spending policy on household income or welfare, often using econometric techniques. It makes intensive use of household survey data to evaluate policies in terms of their effect on particular household groups by income/expenditure, region, education, gender, etc. The

starting point of such an analysis is the household data, which provide information on how much of different commodities each household group consumes and on sources of income. The incidence analysis measures the deadweight loss/gain of changes in taxation for each household group, given its consumption patterns, as demonstrated by for example Deaton (1997). Typically, data show that for the low-income household group food and other necessities make up a larger share of expenditure than for the high-income household group. Conversely, luxury goods make up a larger share of the expenditure of high-income households relative to expenditure by low-income households. A change in commodity taxes affects a given household group positively if the tax rate declines, and negatively if the tax rate raises, Hossain (2003).

Effective incidence of a tax is determined by market circumstances, including the elasticity of demand for consumption and the nature of competition among suppliers. In a partial equilibrium model with perfect competition, incidence can be illustrated as follows - here as the distribution of the burden between a consumer and a firm. Consider the market for some good, X, subject to an ad valorem excise tax, t , on the consumption of X. In equilibrium consumer demand equals firm supply:

$$X^d(p) = X^s(q), \quad p = (1+t)q$$

where p is gross price and q is the net price. In this setup it can be shown that a small tax increase from an initial tax of zero is equivalent to:

$$\frac{dq/q}{dt} = -\frac{\varepsilon^d}{\varepsilon^d + \varepsilon^s} \in [-1; 0]$$

where ε^d and ε^s are numerical demand and supply elasticities. Thus the incidence depends on relative elasticities. If demand is relatively elastic producers will bear most of the burden. If supply is relatively elastic, then consumers will bear most of the burden.

Two general conclusions, which also hold for the labour market and other forms of competition, are: (i) the more elastic side of the market will be able to avoid relative more of the tax burden,³ and (ii) in the long run the incidence of a tax levy does not depend on which side of the market bears the legal responsibility for remitting the tax to the government.⁴ The earlier example from Mozambique suggests that international companies have higher taxable-income elasticity with respect to changes

³ See any textbook of public finance, for example Salanié (2002) or Rosen (2002), for more on the incidence of taxes.

⁴ Introducing compliance costs calls the second conclusion into question. With compliance costs a complete analysis of the incidence of a particular tax requires specifying the remittance process and estimating “compliance elasticities” for both the suppliers and demanders of the taxed good, Slemrod and Yitzhaki (2000).

in the tax rates than domestic companies. Thus, their taxable-income is more sensitive to changes in tax rates.

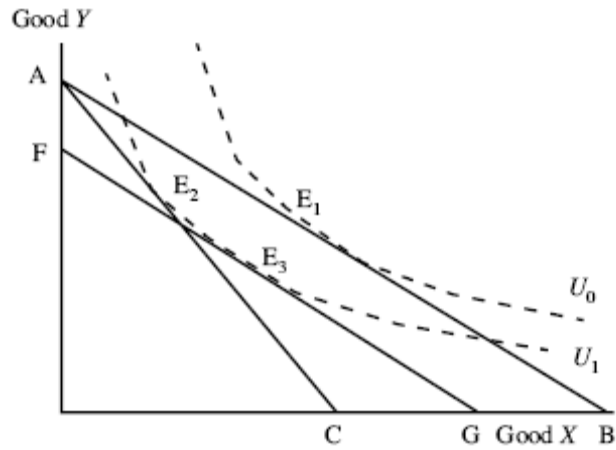
An alternative approach (using Walrasian general equilibrium theory) that can be used to assess the impact of a policy reform is a framework based on a computable general equilibrium (CGE) model. A CGE model incorporates the fundamental general equilibrium links among production structures, incomes of various groups, and the pattern of demand and supply. It is capable of tracing changes in a particular policy throughout the entire economy. To avoid generating misleading results, the CGE model should incorporate as many true market imperfections and distortions present in the economy as possible.

3. Tax Efficiency

The aim of this section is to explain the concept of welfare change and excess burden used in the tax theory literature. The first discussion relying on figures from Creedy (2004) is intended to ease comprehension of the more technical details in the following discussions.

Consider a single individual who is maximizing utility subject to a fixed budget. There are two goods, X and Y. Good Y may be considered as a composite of all other goods, with the price set equal to unity. Hence units of Y are equivalent to money units. In the initial situation, the budget line, with a slope equal to the relative price of X to that of Y, is shown as AB in Figure 1. The optimal position is E_1 , a tangency position on indifference curve U_0 . Suppose a selective tax is imposed on good X. This causes the price of X to increase so that the budget line pivots to AC. The new optimal position is E_2 on indifference curve U_1 . There is a reduction in the individual's welfare as a result of the tax, as indicated by the move from U_0 to the lower indifference curve U_1 . However, the difference U_0-U_1 does not provide a useful measure of welfare change because utility is an ordinal concept. The utility levels themselves are arbitrary and the utility function provides simply a preference ordering of alternative bundles.

Figure 1: A Tax on Good X

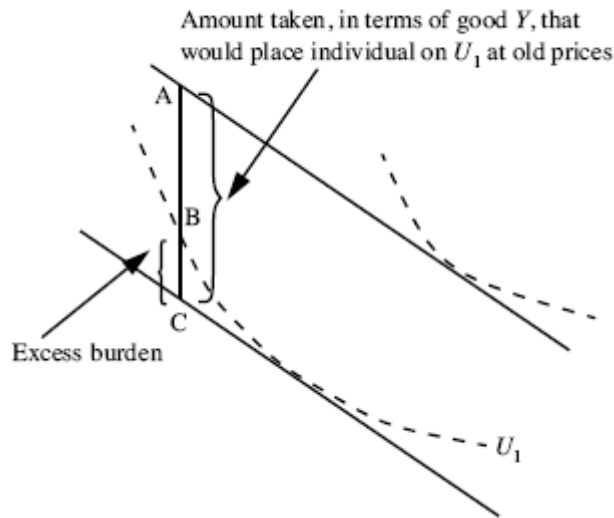


Source: Creedy (2004)

Welfare changes are instead based on the change in the cost of reaching a particular indifference curve as relative prices change. This cost is not affected by the arbitrary utility number assigned to the indifference curves. Figure 1 shows that utility level U_1 can be attained at the pre-tax prices if the individual faces budget line FG which is parallel to AB . The optimal position along this hypothetical constraint is E_3 . Hence, a variation in the individual's budget is equivalent to the tax imposed on X , in the sense that the individual would be indifferent between that budget variation (at the old prices) and the tax. This 'equivalent variation', denoted EV , is measured in terms of a quantity of good Y by AF , the vertical distance between the two budget lines AB and FG .

It is useful to concentrate on the area in Figure 1 around the two points E_2 and E_3 , which lie on indifference curve U_1 . This expanded area is shown in Figure 2. Since point B represents the position actually reached by the individual after the imposition of the tax on X , the vertical distance AB shows the tax paid, expressed in terms of good Y . This is less than the equivalent variation in income that also places the individual on U_1 at pre-tax prices. The difference between the equivalent variation and the tax paid, T , represents the excess burden, EB_{EV} , of the tax. This is the distance BC in Figure 2.

Figure 2: Welfare Change and Excess Burden

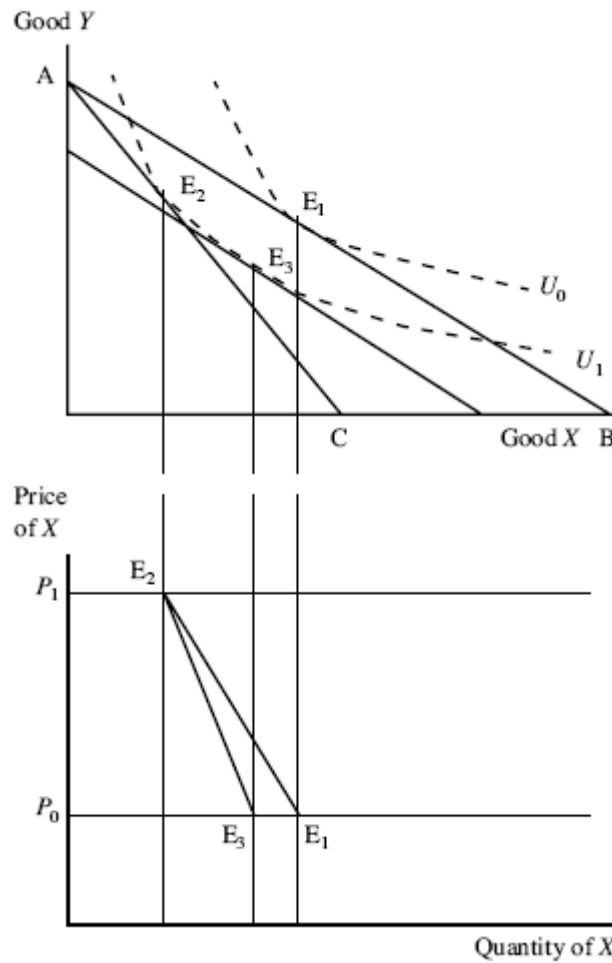


Source: Creedy (2004)

The tax revenue can be used to finance government projects or for redistribution to other individuals. However, the excess burden $EV-T$ is not available for anyone to spend. It represents a pure efficiency loss arising from the tax. The size of this excess burden depends partly on the degree of convexity of the indifference curve, which reflects the degree of substitutability between the two goods.

As shown the excess burden is a vertical distance traced out by moving along the post-tax indifference curve from E_2 to E_3 as the relative price changes from the post-tax to the pre-tax ratio. This movement actually traces out part of a demand curve, in this case a Hicksian (compensated) demand curve for good X: demand changes as the price varies, while utility is constant. This contrasts with the Marshallian (ordinary) demand curve for X, which relates to the movement between E_1 and E_2 . These two demand curves are shown in the lower part of Figure 3, for variations between P_0 and P_1 .

Figure 3: Demand Curves for Good X

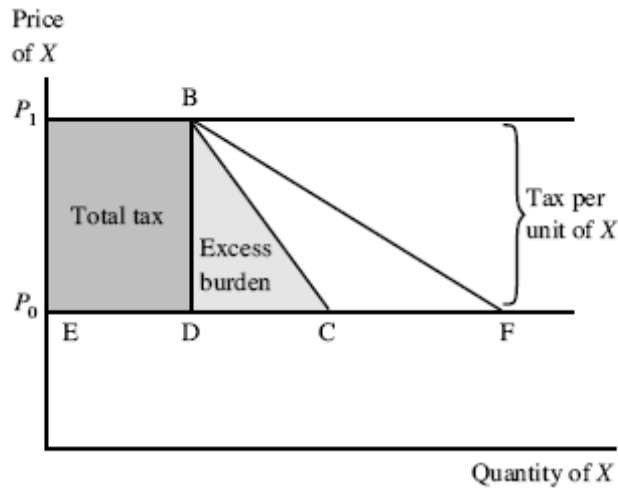


Source: Creedy (2004)

For a small change in the price, the area to the left of the Hicksian demand curve between the prices represents an expenditure level (since it is a money price per unit multiplied by a quantity). In just the same way that the Hicksian demand is produced by gradually moving along U_1 as the relative price varies, it is necessary to add up all the areas for each small price change. The total area - obtained by adding all horizontal strips - gives the expenditure required to obtain the equivalent variation. Hence EV is the area $P_1E_2E_3P_0$ and ordinary consumer surplus CS is the area $P_1E_2E_1P_0$ in Figure 3.

The distance between the two price lines, $P_1 - P_0$, represents the tax per unit imposed on the good, so that multiplying this by the quantity of the good purchased after the imposition of the tax gives the tax revenue. Hence total tax revenue is represented by the area indicated in Figure 4. The difference between EV and this area is the excess burden, EB_{EV} , BDC in Figure 4 and the difference between CS and this area is the excess burden, EB_{CS} , BFC in Figure 4

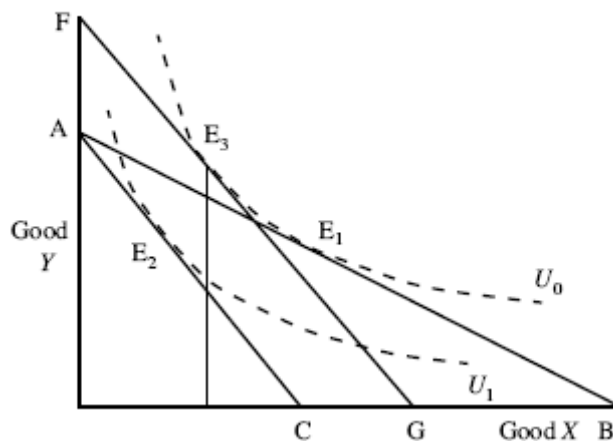
Figure 4: The Excess Burden as an Area



Source: Creedy (2004)

It is also possible to consider the amount of money that, if given to the individual, would allow the initial indifference curve, U_0 , to be reached at the new prices. This is the compensating variation. The comparisons are illustrated in Figure 5. The hypothetical budget line FG is parallel to the post-tax budget line AC but places the individual at E_3 on indifference curve U_0 . The compensating variation is AF , the vertical distance between the two budget lines at the new prices. Dropping a vertical line from E_3 , the tax paid is the distance between the budget lines AB and AC , so the excess burden, based on the compensating variation, is the vertical distance between lines AB and FG at E_3 .

Figure 5: The Compensating Variation



Source: Creedy (2004)

Welfare Effect of Taxes

The figures demonstrated three measures that attempt to measure, in monetary units, the change in consumer welfare following changes in public policy: consumer surplus (CS), compensating variation (CV) and equivalent variation (EV) and related these measures to a central concepts in public finance; the excess burden (or deadweight loss). This subsection will go through the general technical details and introduce one more related concept: the marginal cost of public funds (MCF).

Consumer surplus (CS) is the amount consumers would be willing to pay in excess of what they are actually paying. Graphically this would be the area between the ordinary demand curve, $x(p,y)$, (p is the price and y , income) and the price. Formally the change in consumer surplus via change in the price then becomes:

$$-\Delta CS = \int_{p_0}^{p_1} x(p, y) dp$$

The problem with this measure occurs when more than one price change. Total change in CS is the sum of individual changes, and if there are cross-price effects on demand, i.e. a price change in market j affects demand in market i , the order in which one calculates the individual price changes, effects the size of ΔCS .

Only if cross-price effects are symmetric is the total change in CS independent of the order in which individual changes are calculated. Such symmetry is generally not satisfied for ordinary demands. However, compensated demands are symmetric; suggesting that measures based on compensated demand might improve analysis.

Compensating variation (CV) is the amount of income the consumer has to receive as compensation in order to retain the initial utility level after a policy change. Formally from the expenditure function, $e(\mathbf{p}, \bar{U}) = \mathbf{p}\tilde{\mathbf{x}}(\mathbf{p}, \bar{U})$, where $e(\mathbf{p}, \bar{U})$ is the minimum total expenditure needed to reach \bar{U} at prices \mathbf{p} and $\tilde{\mathbf{x}}(\mathbf{p}, \bar{U})$ is compensated (Hicksian) demand, CV is:

$$CV = e(\mathbf{p}, \bar{U}_0) - e(\mathbf{q}, \bar{U}_0), \quad \mathbf{p} = \mathbf{q} + \mathbf{t}$$

Where \mathbf{q} is for example a pre-tax (producer) price vector, \mathbf{t} is the vector of commodity taxes introduced and, \mathbf{p} is the post-tax price vector (equal to $\mathbf{q} + \mathbf{t}$).

Equivalent variation (EV) is the amount of income the consumer would be willing to forgo in order to avoid the price change. Formally this corresponds to:

$$EV = e(\mathbf{p}, \bar{U}_1) - e(\mathbf{q}, \bar{U}_1)$$

Writing this in the same form as the change in consumer surplus results in the following equations where change is now related to compensated demand.

$$\begin{aligned} e(\mathbf{p}, \bar{U}) - e(\mathbf{q}, \bar{U}) &= \int_{\mathbf{q}}^{\mathbf{p}} \frac{\partial e(\mathbf{q}, \bar{U})}{\partial \mathbf{p}} d\mathbf{p} \\ &= \int_{\mathbf{q}}^{\mathbf{p}} \tilde{\mathbf{x}}(\rho, \bar{U}) d\rho \end{aligned}$$

where $\bar{U} = \bar{U}_0$ for CV and $\bar{U} = \bar{U}_1$ for EV.

Differences in the three measures arise through the income effect. With no income effect (quasi-linear utility) the three measures coincide, see Auerbach (1985) for elaborations on the welfare loss of taxation, also in relation to the following topic – the excess burden.

Excess Burden

The deadweight loss or excess burden (EB) is the welfare loss in excess of what the government collects in revenue. Since (most) taxes are distortionary, and therefore produce some excess burden, a well-designed tax levy should minimize the burden of collecting a given tax revenue. Considering a tax that raises the price of a taxed good, the quantity sold falls. Consumers only buy units of the good for which they have a consumer surplus at the new tax-inclusive price. There are thus some units where the benefit to the consumer would be higher than the cost of production, but lower than the tax-inclusive price. The consumer surplus which could have been made on these units is lost. This is the so called “triangle of loss”. Similarly, taxes on income are likely to reduce effort,⁵ since workers will only exert effort if net-of-tax wage exceeds the disutility of working. They will not work when the cost to them is less than the net-wage but more than the gross-wage. Thus, the producer surplus which could have been made on these units is lost.

Consensus in the literature seems to be that the most appropriate way of measuring excess burden is to subtract the actual revenue raised by the tax system from the equivalent variation (EV) associated

⁵ This assumes an increase in the tax rate causes a decrease in labour supply, i.e. the tax system is on the efficient part of the Laffer-curve. See Triest (1990) and Ballard and Fullerton (1992) on Laffer-curve effects.

with the imposition of the tax system (Triest, 1990). The superiority of this measure is that it may be used more generally to compare any two tax systems, neither of which are necessarily optimal. Formally it may be written as:

$$EB = e(\mathbf{p}, \bar{U}_1) - e(\mathbf{q}, \bar{U}_1) - \mathbf{t} \cdot \mathbf{x}(\mathbf{p}, y)$$

where $\mathbf{x}(\mathbf{p}, y)$ is uncompensated (Marshallian) demand. The general result, which holds for CS and CV as well, is: The Excess burden, in monetary terms, is equal to the revenue effects of change in behavior. The further away tax payers need to move from their preferred consumption, due to a price increase, the larger the burden to society. This is why, in this simple setup, taxes on necessities, from a theoretical point of view, are often used.

Marginal Cost of Public Funds

The previous measure of excess burden relates the burden of a tax to the no-tax situation. Yet, in cost-benefit analysis or tax-reform analysis it is essential to measure the burden related to a tax change, basing the argument on the derivatives, and hence on an implicit linearization around the tax system already in existence. The marginal cost of public funds (MCF) is such a measure.

It is useful, first, to view the marginal cost of funds (MCF) in a general fiscal policy framework like the Samuelson rule for public goods provision. In the Samuelson rule the sum of the marginal rates of substitution between the public good and a reference private good ($\sum MRS$),⁶ should equal the marginal cost of the public good. This marginal cost is given by the marginal rate of transformation (MRT) between the public good and the reference private good. Allowing for the efficiency cost of taxation means the marginal rate of transformation (MRT) must be multiplied with the marginal cost of public funds (MCF). The MCF is defined, in terms of the reference private good, as the cost to consumers per unit of public good. Thus, in the theoretical case where government can impose a lump-sum tax, the MCF would be exactly one.

The tax-modified Samuelson establishes that government spending should proceed until

$$\sum MRS = MRT \times MCF$$

where the right hand side is the cost to consumers per unit of public good. MCF can be either larger or smaller than one depending on whether consumers use less or more, respectively, of the taxed good (leisure) after taxation, on this see Ballard and Fullerton (1992).

⁶ The amount of the reference private good that people would be willing to give up in exchange for the public good.

With a distortionary tax, the burden imposed on tax payers will exceed the revenue collected by tax authorities. It is therefore important to design tax systems to keep the MCF or excess burden to a minimum. Deaton (1997, ch. 5) estimated the MCF for foodstuffs from Pakistanian and Indian household surveys to be roughly between 0.5 and 2.5. This means that the cost to consumers of raising revenue is between 0.5 and 2.5 units per unit of government revenue depending on the targeted good. Necessities receive a high value due to efficiency arguments (they have a low elasticity) but a low value due to equity considerations (they are consumed predominantly by the poor). If the government cares about redistribution the principal food should be taxed at a lower rate than other goods, a topic which will be pursued further in section 5 under optimal taxation of products.

Before governments start implementing different tax brackets for all goods there is another important constraint that needs to be considered. Administrative costs at the minimum excess burden could be exorbitant, especially in developing countries. Overall, it may be sensible to increase the excess burden since it may lower the administrative burden. Slemrod and Yitzhaki (2001) present one of the theories incorporating administrative cost in the tax decision - in their paper through the MCF.

Formally the MCF is defined as:

$$\text{MCF} = - \frac{\text{Change in consumer welfare}}{\text{Change in government revenue}}.$$

For marginal changes in the excess burden (MEB), the MCF is given by:

$$\text{MCF} = \frac{\text{MEB}}{\Delta R} + 1$$

where ΔR is change in government revenue (Creedy, 2004). It thus measures the welfare cost to consumers per additional unit of revenue and is closely related to the excess burden.

4. Tax Base Concerns

In the previous sections taxes caused people to change their consumption bundle due to change in relative prices. This substitution distorted market decisions away from the competitive equilibrium resulting in an excess burden to society. Besides the excess burden caused by the tax wedge the social costs of a tax system include the *enforcement cost* incurred by the public tax authorities of enacting and administering the tax law. Such costs include collecting information on tax liabilities, reviewing tax returns and pursuing evaders. In addition there are *compliance costs* incurred by tax payers such as expenditure activities undertaken to reduce the tax burden, such as evasion and

avoidance. Firms also spend time collecting taxes for the government, e.g. VAT and payroll taxes. This section, based on Slemrod and Yitzhaki (2000) and Sandmo (2004), will first review compliance costs from the perspective of the theory of tax evasion. Second, the administrative costs of enforcing the tax system are discussed.

The Allingham-Sandmo Model of Tax Evasion

In the standard tax model the efficiency cost of taxation is entirely due to the fact that change in relative prices induces individuals to select socially suboptimal consumption baskets. They move away from relatively highly-taxed goods to relatively lightly-taxed goods. Suppose that the true tax base is known to the taxpayer, but is not costlessly observable by the tax collection agency. Then, under certain circumstances, the taxpayer may be tempted to report a taxable income below the true value.

In the standard Allingham-Sandmo (A-S) model on tax evasion a taxpayer maximizes expected utility given by a fixed subjective probability of being detected by tax authorities and paying a penalty, and not being detected, whereby, the taxpayer succeeds in his endeavor and saves on taxes by evasion. A higher penalty rate or a higher probability of detection will then discourage tax evasion. This conclusion also holds when the utility function is augmented to include (i) an endogenous detection probability where the probability of detection depends positively on the amount evaded, (ii) a social cost of evasion, or (iii) endogenous income through a labour supply and allocation decision in and between the formal and informal sector.

Turning to the tax rate, and making the reasonable assumption that the Arrow-Pratt measure of absolute risk aversion is decreasing in income the taxpayer would be inclined to evade more in absolute dollar terms as he becomes wealthier.⁷ When the subjectively expected penalty rate is smaller than the tax rate optimum is an interior solution (we are only concerned with those who actually evade taxes). We can in this case then interpret the effect of increased taxes in the standard Slutsky equation with a negative income effect and positive substitution effect. What is useful to understand here is that a tax is the same as increasing the relative price in the formal market compared to the informal market, making trade in the informal market relatively more attractive (the substitution effect). There is however also an income effect. When taxes are increased the real income decreases and the taxpayer is less willing to gamble since he has become poorer.

⁷ Whether higher-income individuals will evade more, as a fraction of income, depends on relative risk aversion.

What limits the amount of evasion attempted in the Allingham-Sandmo (A-S) model is the risk aversion of the taxpayer. At some point further evasion just becomes too big a gamble. At the chosen amount of evasion the marginal gain in expected tax savings is exactly offset by the marginal disutility of the extra risk taken on. The simple version of the A-S model has been criticized on the grounds that it fails a simple reality check. Given the fraction of people audited by the tax authorities, which is very low, and the penalty for evasion, then based on the degree of risk aversion exhibited in other situations people should be evading a lot more than they apparently do. The intriguing question becomes why people pay taxes rather than why people evade.

Empirical attempts to more systematically establish how compliance responds to aspects of the tax environment have met with limited success, primarily due to the data problems. Slemrod and Yitzhaki (2000) review the three main approaches to estimate tax evasion: cross-sectional analysis, time-series analysis and controlled experiments based on difference-in-difference analysis.

Tax Incidence Analysis with Compliance Cost

In tax incidence analysis the long run incidence of a tax levy does not depend on which side of the market bears the legal responsibility for remitting the tax to the government. In the section on tax incidence it was explained how the burden of a tax does not fall on the person or firm paying it, but can be passed on to others depending on price elasticities of demand and supply. When compliance costs are introduced the analysis of tax incidence is modified for two separate reasons. First, the presence of compliance costs affects the behavioral response to a change in the tax system. This alters what otherwise would be the change in equilibrium prices. Second, compliance costs alter the link between tax-inclusive prices and welfare. This suggests that the incidence (not to mention the efficiency) of a tax may depend on which side of the market the responsibility for remittance falls, Slemrod and Yitzhaki (2000).

Enforcement Cost

Enforcement costs pose new challenges for the analysis of optimal taxation including the extent of audit coverage, the penalty imposed on detected evasion and the administrative cost of collecting information.

Consider again the simple A-S model: A government concerned with maximizing the utility of a homogeneous citizen will want to set the penalty of evasion as high as possible, to help ensure the

resources devoted to enforcement are as low as possible. This discourages evasion while minimizing the resource cost of administration. Yet, this simple model ignores the possibility of a corrupt tax administrator, who abuses the system or, alternatively, harshly punishes someone, who commits an honest mistake. The harsher the penalty, the more damage can be inflicted by a corrupt administrator or, in the case of an honest mistake, the more risky the system is. Hence, the harsher the penalty, the more detailed and cautious the prosecution process should be, although this may increase administrative costs.

In the absence of modelling the interaction between the penalty rate and administrative costs, analytical models usually assume a ceiling on the penalty rate. For a given penalty structure how much resources should be devoted to enforcing the tax laws? Or, in other words, what is the optimal probability of detection? The cost of increasing the probability of detection by hiring more auditors, buying better computers, etc. is a true resource cost, but the revenue brought in through assessed fines as well as higher compliance does not represent a net gain to the economy. Instead it is a distorting transfer from private citizens to the government. Thus, the answer is to increase the probability of detection until the marginal *social* benefit of reduced evasion equates to the marginal resource cost. This result implies that privatization of revenue collection, where marginal *private* benefit characterize the optimal allocation of resources, will inevitably lead to a socially excessive amount of resources devoted to enforcing the tax laws unless restrictions are put on the resources and behavior of the agency.

Several game theoretical models of optimal enforcement strategy have been put forward. In these models the audit strategy of the tax collection agency depend on a signal of the taxpayer (usually reported income) in a way that maximizes an explicit objective function. The taxpayer, in turn, forms some expectation of what the auditing rule of the tax authorities is, and acts accordingly. A crucial assumption in these models is whether it is assumed that the tax authorities can commit to an announced audit rule, or whether it cannot commit, and therefore will opportunistically audit whatever returns it wishes once returns are filed. Most papers conclude that the optimal strategy in this context is to randomly audit individuals whose signal is below some threshold level of income. In equilibrium only low-income individuals report honestly, while high-income taxpayers report exactly at the threshold level of income and are never audited.

Tax authorities also deal with information gathering. The cost of gathering information depends on how accessible the information is. Therefore taxing a market transaction is easier than taxing an

activity of the individual such as self-consumption. First, in any market transaction there are two parties with (potentially) conflicting interests, and any unsatisfied party may in turn report the transaction to the authorities. Second, the more documented the transaction, the lower is the cost of gathering information on it. So it is easier to tax transactions involving large companies. They need the documentation for their own purposes. A small business, which may not require the same level of documentation, is harder to tax. Finally, prices in market transactions established through demand and supply greatly facilitate valuing the transaction.

Administrative costs may also be a function of (i) the physical size and the mobility of the tax base (it is harder to tax diamonds than windows), (ii) whether there is a registration of the tax base (e.g., owners of cars, holders of drivers' licenses), (iii) the number of taxpayer units, and (iv) information sharing with other agencies.

5. Optimal Taxes

The approach adopted in the following sections is that of trying to establish the optimal level of taxation. This implies identifying tax systems that minimize the excess burden of taxation, subject to various restrictions on tax instruments and information available to the government. Similarly different assumptions about population heterogeneity and the functioning of private and public institutions are made.

The structure of tax rates reflects the political, social, and administrative history of society, as well as the constellation of influences and interests that presently compete with one another. Marginal tax reform theory establishes whether improvements within the existing tax structure can be found and implemented. It therefore requires less information than optimal tax theory where an important implicit assumption in much of the literature is that there is sufficient information to evaluate/estimate, the complete demand system around the optimum. What is attempted here is not the identification of optimum as such but rather to help structure the analysis of tax issues.

At the center of optimal taxation is the minimization of the excess burden when policymakers have different tax instruments available to them. In addition this section will describe cross country tax structures. The main data in focus will be *central government* data rather than *general government* data, due to many countries lack of data on local government revenue sources included in general government. From the summary statistics in Table 1 it is clear that there is a trade-off in the choice

between central – and general government. The higher number of observations in central government data is gained at a cost of missing local government data.

The section will proceed with product (indirect) taxes and then move on to factor (direct) taxes.

Product Taxes

The Ramsey Rule

This section starts with a simple model with homogeneous individuals and a government objective of raising exogenous revenue with proportional commodity taxes on a set of fixed producer prices (perhaps world prices). This first model should be thought of as a building block towards a more realistic model, rather than one that models reality. More on the Ramsey-rule can be found in Auerbach and Hines (2001) and Bell (2003). Following Slemrod and Yitzhaki (2000) this section also reformulates the standard optimal setting of commodity tax rates in the light of administrative costs.

Consider a representative consumer facing consumer prices $\mathbf{p}=(p_0,\dots,p_n)$. Producer (before tax) prices are denoted by $\mathbf{q}=(q_0,\dots,q_n)$, and taxes are given by $\mathbf{t}=\mathbf{p}-\mathbf{q}$. With given producer prices, the government in setting taxes is effectively choosing consumer prices and the optimal tax problem becomes

$$\max_{\mathbf{p}} V(\mathbf{p}, y) \quad st. \quad (\mathbf{p} - \mathbf{q})' \mathbf{x} \geq R$$

where $V(\mathbf{p},y)$ is the representative consumer's indirect utility function, y is exogenous income, and R is the exogenous revenue requirement. This problem is equivalent to:

$$\min_{\mathbf{p}} y - e(\mathbf{q}, V(\mathbf{p}, y)) - R \quad st. \quad (\mathbf{p} - \mathbf{q})' \mathbf{x} \geq R$$

because y and R are constant and the expenditure function, $e(\cdot)$, is monotonically increasing in $V(\cdot)$. Since $y \equiv e(\mathbf{p}, V(\mathbf{p}, y))$, there is a clear relationship between the optimal tax problem and minimization of the excess burden.

A uniform tax on all goods in this setup is equivalent to a lump sum tax on income and thus first best, to see this note that $\mathbf{p} = \mathbf{q} + \mathbf{t} = \mathbf{q} + \theta \mathbf{p} \Leftrightarrow \mathbf{p} = \mathbf{q}/(1-\theta)$ and the household budget constraint is

$$\mathbf{p}\mathbf{x} = y \quad \Leftrightarrow \quad \mathbf{q}\mathbf{x} = (1-\theta)y$$

thus the uniform tax is really a tax on the exogenous income y and hence a lump sum tax and first best.

In the theoretical models second best considerations result from one of two restrictions. (i) exogenous income is absent, $y=0$. In such a tax system a uniform tax yields no revenue. Whether $y=0$ or $y>0$ depends on the definition of taxable commodities, \mathbf{x} . If labour supply is included in \mathbf{x} , y in the household budget constraint is by definition equal to zero.⁸ The general restriction is that it is not possible to tax the consumption of any endowed good separately from its endowment only market purchases are taxable. For example it is not possible to tax leisure separately from its own endowment. (ii) exogenous restrictions in tax instruments typically restrictions on lump-sum tax instruments. In both situations governments are constrained to use distortionary taxes. Here the second best case arises from (i) where the \mathbf{x} vector is interpreted as market purchases.⁹

Maximizing the tax problem over the Lagrangean yields n first order condition for p_i given by

$$\frac{\partial V}{\partial p_i} + \mu \left(\sum_{j=1}^n t_j \frac{\partial x_j}{\partial p_i} + x_i \right) = 0 \quad i = 1, \dots, n$$

where the Lagrange multiplier μ may be interpreted as the utility loss of increasing revenue by one additional unit of income. Using Roy's identity, $\frac{\partial V}{\partial p_i} = -\frac{\partial V}{\partial y} x_i = -\lambda x_i$, symmetry of the Slutsky equation, and rearranging the equation, results in the homogeneous (single person) Ramsey-rule:

$$\sum_{j=1}^n t_j \frac{\partial \tilde{x}_i}{\partial p_j} = -\left(\frac{\mu - \alpha}{\mu} \right) x_i \quad i = 1, \dots, n$$

where tilde denotes compensated demand and net social marginal utility of income is given by

$$\alpha = \lambda + \mu \sum_{j=1}^n t_j \frac{\partial x_j}{\partial y}$$

α is thus social evaluation of marginal utility of income (in the homogenous case also the marginal utility of income) plus the value of the additional tax revenue raised when the household receives another unit of income. In the general form the Ramsey-rule is not very operational for policy; it is a statement about compensated quantity changes rather than about tax policy.

⁸ Especially in this static model where labour income is the only source of income.

⁹ With $\mathbf{p}\mathbf{x}=0$ two tax systems are equivalent if they differ only by a proportional tax on all commodities and it is, therefore, possible to normalize one tax, convention is to let good 0 be the untaxed good ($t_0=0$), and for convenience choose the same good as numeraire ($q_0=p_0=1$). Typically, labour is chosen as the untaxed good. Letting labor be the untaxed good is just normalization, while the assumption that leisure is untaxable is a restriction.

To gain some policy implications of the homogeneous Ramsey-rule consider the following three situations: First; the case where $(\partial \tilde{x}_i / \partial p_j)$ is constant, i.e. demand functions are linear in prices. This changes the left hand side of the Ramsey-rule such that the proportional reduction in compensated demand resulting from the burden of taxes should be the same for all goods. Thus, goods whose compensated demand schedules are inelastic should be relatively heavily taxed:

$$\frac{\Delta \tilde{x}_i}{x_i} = - \left(\frac{\mu - \alpha}{\mu} \right) \leq 0, \quad \Delta \tilde{x}_i = \sum_{j=1}^n t_j \frac{\partial \tilde{x}_i}{\partial p_j}, \quad i = 1, \dots, n$$

Second; if compensated cross price effects are zero, except with respect to the untaxed good, then the tax rate on any good should be inversely related to its own price elasticity (the inverse elasticity rule). Again inelastic goods are taxed relatively harder:

$$\frac{t_i}{p_i} = - \left(\frac{\mu - \alpha}{\mu} \right) \frac{1}{\varepsilon_{ii}} > 0, \quad \varepsilon_{ii} = \frac{\partial \tilde{x}_i}{\partial p_j} \frac{p_i}{x_i}, \quad i = 1, \dots, n$$

Third; in the second case the own price elasticity is (due to Euler's Theorem¹⁰) equal to the negative of the cross price effect with respect to the untaxed good ($\varepsilon_{i0} + \varepsilon_{ii} = 0$). Thus, the tax rate should be higher on goods which are better complements to the untaxed good. More detail on this will follow later.

As mentioned earlier this simple model was meant as a first building block towards a more realistic model. To increase realism, relax the constraint of identical individuals and look at H heterogeneous individuals, and replace the indirect utility function of the representative individual with a social welfare function.

Defining α^h as individual h 's net social evaluation of marginal utility of income, Diamond (1975), the many-person Ramsey rule can be expressed as

$$\sum_{j=1}^n t_j \sum_{h=1}^H \frac{\partial \tilde{x}_i^h}{\partial p_j} = - \left(\frac{\mu - \tilde{\alpha}_i}{\mu} \right) x_i \quad i = 1, \dots, n$$

where $\tilde{\alpha}_i$ is a weighted average of α^h , where the weights are the individual consumption shares of good i . The value of $\tilde{\alpha}_i$ is large for goods which are purchased predominantly by those with a high α^h ("the poor").

¹⁰ Since compensated demands are homogenous of degree zero in prices, Euler's theorem implies that $\sum (\partial \tilde{x}_i / \partial p_j) p_j = 0$

This rule calls for a smaller proportional reduction in compensated demand for goods with a high $\tilde{\alpha}_i$, i.e. for goods which are purchased predominantly by individuals assigned a high social weight “poor-people” (necessities, like food, should then be more lightly taxed).

To further illustrate this tax rule, consider the three-good case with one untaxed and two taxed goods. The tax rule can be described by

$$\frac{t_1 / p_1}{t_2 / p_2} = \frac{\pi_1 \varepsilon_{20} + \pi_1 \varepsilon_{21} + \pi_1 \varepsilon_{12}}{\pi_2 \varepsilon_{10} + \pi_1 \varepsilon_{21} + \pi_2 \varepsilon_{12}}$$

where $\pi_i = (\mu - \tilde{\alpha}_i) / \mu$ and ε_{ij} is the compensated cross-price elasticity of demand for good i with respect to the price of good j .

The tax ratio (t_i/p_i) of good one is larger than that of good two if and only if $\varepsilon_{10} / \varepsilon_{20} < \pi_1 / \pi_2$. If the good most complementary with leisure, the untaxed good, is also the good with the greater social valuation, $\tilde{\alpha}_i$, it is not clear which good will be taxed more heavily – the answer depends in part on the strength of government preferences for equity. Without distributional considerations this is the standard Corlett-Hague rule (Auerbach and Hines, 2001) stating that the good which is a better complement for the untaxed good should carry a higher tax rate. Intuitively this is clear, since it is not possible to tax leisure. Leisure is relatively cheaper than taxed goods and, is over consumed. Government should therefore set higher tax rates on goods consumed together with leisure. With distributional concerns this still holds, unless the good consumed together with leisure is bought predominantly by those favored by government (typically the poor).

Until now producer prices did not change due to tax changes¹¹. Since the excess burden of a tax is a function of the extent to which the tax changes producer prices, a realistic model of optimal taxes should also incorporate the effect of elastic producer prices. In this respect, increasing realism through the introduction of a production function with constant returns to scale; the optimal tax schedule can be written as

$$\frac{dEB}{dp_i} = \left(\frac{\mu - \tilde{\alpha}_i}{\mu} \right) \left(\frac{dR}{dp_i} + \frac{dEB}{dp_i} \right) \quad i = 1, \dots, n$$

¹¹ The producer prices are inelastic. Thus the burden of taxes is shifted completely onto the consumers. This is a general assumption in the commodity tax model and probably why taxes on commodities are often referred to as indirect taxes.

where EB is the excess burden measure from earlier. That is, the excess burden of a marginal increase in any tax must be proportional to the sum of marginal revenue plus marginal excess burden, or by rearranging, the marginal excess burden per unit of revenue raised should be constant:

$$\frac{dEB}{dp_i} = \left(\frac{\mu - \tilde{\alpha}_i}{\tilde{\alpha}_i} \right) \frac{dR}{dp_i} \quad i = 1, \dots, n$$

The marginal excess burden should be reduced for those commodities for which the associated loss in real income is costly to society ($\tilde{\alpha}_i$ is high).

The characterization of optimal commodity taxes is a cornerstone of the standard theory of optimal taxation. The standard theory, though, assumes that taxes on all commodities can be verified and collected costlessly and, as just shown above, all goods should be taxed at different rates. However, it is likely that administrative cost depends on the number of different tax rates as well as on the number of commodities taxed. In that case there is a tradeoff between enforcement and compliance costs on the one hand and the standard excess burden on the other, see Slemrod and Yitzhaki (2000).

In the developing country sample of Table 1 taxes on goods and services average 8% of GDP compared to industrialized countries where the same tax accounts for 10%. In addition to comparing the tax revenue with GDP, another very used measure is to compare different taxes to total tax revenue so as to assess how important the different taxes are in revenue creation. Table 4 lists summary statistics for GFS revenue panel data for 10 years (1993-2002) of different taxes in percent of revenue. Domestic product taxes are in the GFS-database listed as “114 Taxes on goods and services”. For developing countries these taxes have had an overall (over countries and time) mean of 31%, whereas the corresponding figure for industrialized countries is 27%. The difference in importance in this tax, among developing countries is almost the same (std. of 12) as the difference among industrialized countries (std. of 9). Within developing countries, over time, the changes in domestic product taxes have been larger (std. of 3.4) compared to the slightly more stable revenue flow from taxes on goods and services in industrialized countries (std. of 1.5).

From Table 4 it can also be seen that VAT and excises are the most important domestic product taxes in both developing and industrialized countries. With respect to “1142 Excises” industrialized countries are more homogenous (between std. of 2.9) than developing countries (with a between std. of 6.2). Over time developing countries have changed more (within std. of 2.1) than industrialized countries with a (within std. of 0.6).

Further down in Table 4 under “115 Taxes on international trade and transactions” the differences between developing and industrialized countries become more pronounced. Here developing countries rely on an overall mean of 11.1% of revenue with customs and other import duties as the most important (9.5% of revenue) compared to a much smaller 0.46% for industrialized countries. Among developing countries there are, however, huge differences (illustrated in a std. of 11.6) whereas industrialized countries are again more homogenous (between std. of 0.8).

Value-Added Tax

Since the late 1960s, the value added tax (VAT) has been adopted in over 120 countries, including 10 of the 13 member states in SADC.¹² Under the VAT, output is taxed at each stage of production, irrespective of the use to which it is put. To ensure that final consumption is taxed, the tax on all goods and services subsequently used as inputs to production must in effect be refunded to purchasers of those inputs. A VAT with unrestricted crediting of this kind, including a tax on investment good purchases, is a *consumption-type* VAT¹³. Restrictions can be imposed in relation to investment goods. Under a *production-type* VAT, taxes on investment goods are not refunded while under an *income-type* VAT, taxes are effectively refunded only on the depreciated part of capital. The production-type implies that part of the tax levied on inputs is unrecovered, the income-type, that it is recovered but with a lag.¹⁴

VAT is often recommended to replace existing commodity taxes for three reasons. First, it broadens the tax base by including services, which have usually not been taxed before. Second, it eliminates the cascading involved in turnover taxes and some manufacturers’ sales tax systems. Third, its self-enforcing mechanism means that compliance is higher. However, VAT does have problems. It is a difficult tax to administer, both for the taxpayer and the tax authorities. This has ruled it out as a possibility in some countries, and a wish to reduce its administrative complexity has usually led to advice that only a single rate of VAT should be used, the only exception being zero-rating for exports. Such a single rate VAT does not distort consumer choice between alternative goods, and is thus, not consistent with the simple Ramsey-rule without enforcement cost. It opted for distortions in taxes in favor of goods consumed predominantly by the poor, and substitutes for the untaxed good.

¹² Including Tanzania, Zambia, and Malawi (where it is called “surtax”), Bolnick (2004).

¹³ Imports are taxed and exports are sold free of tax (zero rated).

¹⁴ Ebrill et al. (2001).

The non-cascading property of the VAT might not hold for developing countries. Bell (2003, ch. 5.2) demonstrates that if the VAT system is not fully comprehensive then departures from the non-cascading property could be quite large. This would occur for example due to a large informal sector or that not all sectors are inside the VAT scheme, and when there is inter-industry transactions.

Introduction of VAT imposes a compliance burden on taxpayers, who must file regular invoices and keep accurate records of the taxes paid on purchases as well as those collected on sales. In poor countries problems with VAT administration invariably arise, and the efficiency benefits are, as described, attenuated where VAT has limited coverage. One way of combining administrative ease, of the single rate, with equity concerns from the Ramsey-rule is an exemption for small scale agriculture and to give favorable tax treatment to food consumed mainly by the poor. This has been done in Uganda and Zambia, DFID (2001). Doing so eliminates the administrative costs by exempting a large number of small farmers from the VAT. In introducing such a scheme, it is important to investigate the tradeoff between enforcement and compliance costs, on the one hand, and the standard excess burden, on the other. This is so when it is assumed that taxing agriculture will only have limited success.

The self-enforcing mechanism of the VAT means that compliance is higher although taxpayers can evade the VAT. Agha and Haughton (1996) list some of the common methods of evasion of VAT:

- Understate sales. This is especially a problem at the retail level and with services such as construction and consulting, where the self-enforcing properties of the VAT break down. In such cases, invoices are often neither issued nor requested.
- Inflate claims for VAT paid on inputs. For instance, there are dealers in tax invoices who sell false tax invoices to traders.
- Claim credit for taxes paid on inputs used in producing goods, which are exempt from VAT. This is possible if a firm sells both exempt and non-exempt goods and services. It can be difficult to detect, since it is not always possible to link specific inputs with specific outputs.
- VAT is collected by a firm, which does not remit it to the VAT administration, and then disappears. This is especially a problem in the construction industry.
- Claim VAT credit for non-creditable purchases, such as a car used for non-business purposes.

- Non-registration for VAT. In the United Kingdom this is especially true of small traders, bookmakers and operators of massage parlors.
- Divert zero-rated exports to the domestic market. Here the producer obtains export papers, claims a refund, and then sells the goods locally.
- Claim the transaction is not a taxable event, and that it is a gift rather than a sale.

All the foregoing types of evasion are possible even with a single-rate VAT. However many VAT systems currently in operation have more than one tax rate. Most obviously, this makes it possible for the taxpayer to apply the wrong rate to output. The recognition of these additional difficulties may explain the tendency for value-added taxes to get simpler with time, Agha and Haughton (1996).

In a study of Bangladesh, Hossain (2003) finds that among 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 policy makers. He finds that such a reform package seemed to be the most feasible because it is revenue neutral in its impact and looks relatively attractive to policymakers in terms of distributional features. However, as Hossain notes, although the non-uniform VAT has clear advantages over a uniform VAT with regard to distributional considerations, a non-uniform VAT scheme with more than a few categories may create administrative difficulties

The advice of the IMF has been a single positive rate with zero-rating for exports and exemptions on health, education, and non-fee financial services. The recommended rate has of course varied due to differences in needed revenue and levels of economic activity but has been clustering between 11 and 19 percent. Ebrill (2001).

In the view of Bell (2003, p. 145) it could be that: “Not too much should be expected of a VAT as a tax reform in the early phase. Rather, one should think of its introduction as an initial investment, whose pay-off will be realized as the system’s coverage is progressively increased with the accumulation of experiences and the growth of administrative capacity”.

Excises

The excises on alcohol, tobacco and petrol are often used to raise government revenue, and they are often levied at higher rates on goods which consumption is believed to have adverse effects on

public health, public order, or the environment. Goods as alcoholic drinks, tobacco, and petrol are widely believed to have low demand elasticities. However, governments should be concerned with more than the low price elasticity, which enables large amounts of revenue to be collected with little distortionary cost. As predicted by theory, it is essential to account for the distributional impact of these taxes, especially on petrol as high taxation can increase the cost of rural transport and this way harm the poor.

International Trade Taxes

International trade taxes is a major type of barrier used to protect domestic production against foreign competition and as mentioned earlier they are also an important source of government revenue in developing countries. Since taxes on international trade are seen as having unfavorable distortion effects between domestic and foreign goods, countries are frequently advised to reduce the rates of import duties. There is also advice to reduce or eliminate export taxes because they discourage exports. These policy recommendations often encounter considerable opposition. It can be argued that export taxes exploit monopoly power in primary export markets, but this should be viewed with some care because of the threat of new entrants into the market if world prices rise too high. The reduction of import duties often runs into serious political opposition, with the domestic producers of protected goods using the threat of large-scale unemployment as a consequence of trade liberalization. However, trade liberalization may increase export potential and open up new job opportunities, so a well-phased reduction in protection together with complementary policies to boost supply can improve social welfare considerably. Reductions in trade taxes can also lead to improvements in tax compliance, and so not reduce revenue by as much as might be expected, Heady (2001) and Arndt and Tarp (2004).

Any lost revenue from reducing trade taxes must be balanced by increases in tax revenue elsewhere. A common recommendation is to increase the revenue from domestic commodity taxes, which are perceived to be less distortionary than trade taxes. Indeed, the replacement of an import duty on a consumer good by a domestic sales tax at the same rate will yield at least as much revenue as before without raising prices. This is because the base of the tax is broadened to include domestic production as well as imports without increasing marginal cost. On the other hand Emran and Stiglitz (2002) cast doubt on the current consensus of replacing the international trade taxes with a VAT. Though removing an import duty will remove distortions between foreign and domestic produced goods, a revenue equivalent increase in VAT, will increase distortions between the formal sector, subject to the VAT, and the informal sector evading the VAT.

Factor Taxes

Labour Income Taxes

Glancing over Table 2 reveals that income tax is not a massive tax in developing countries. Three countries (Rep. of Congo, Vanuatu and United Arab Emirates) collect zero income tax and South Africa at the maximum is collecting 14.1% of GDP. Comparing means in Table 1, developing countries collect on average 4.4% of GDP and industrialized countries 10.7%.

From the overall mean of “111 Taxes on income, profits, and capital gains” in Table 4, the same pattern emerges. Income taxes are with 18% of revenue for developing countries compared to 32% for industrialized countries not a major revenue source. For income taxes “1111 Payable by individuals” the difference is even more significant. Developing countries only collect 8% of revenue from this source, as compared to 24% for industrialized countries.

In developing countries, individual income taxes are typically narrow in scope, generally due to a small formal sector, lack of administrative resources aimed at observing individual income, and various exemptions (many of which have been designed to protect the interests of powerful groups). Also, the fact that wage income is often a small share of national income has contributed to the difficulties in rendering the individual income tax a significant revenue source.

The rate structure of the individual income tax is often the most visible policy instrument for showing commitment towards equity. However, the effectiveness of real rate progressivity is often undercut by very high personal exemptions, which amount to several times the countries per capita income. This leaves little income subjected to these high rates, see Table 3 and Tanzi & Zee (2000). There are large differences within countries as well (Table 3). In Senegal in 2004 the taxpayer's income had to be 45 times the per capita income before he entered the highest tax bracket. In Mauritius it was the other way around. Here the same figure was 0.22. For Mozambique it was for the years 1999, 2000 and 2002, respectively, 3.44, 3.07 and 29.48. Levin (2001) shows that the effective tax rate in Tanzania is high among the poorer households it then falls and rises among the middle-income earners. For the richest two deciles, income tax rates are smaller than for the poorest group.

The general experience in the late twentieth century was that at the same time as progressive tax rates were introduced, tax allowances and tax expenditures were also introduced. The result was to

reduce the redistributive impact of these taxes. As a consequence tax policy makers have come to believe that progressive income taxes do not redistribute income effectively because they are inherently easy to avoid.

This ends the description of the level and structure of income taxes. The next sections, based on Kleven and Kreiner (2004) will go through the theory of optimal income taxation. The linear income tax comes first, followed by the more advanced non-linear tax and some comments on discrete labour supply at the end.

Optimal Linear Income Tax. This section will address the question: “What is the optimal constant marginal tax rate when the tax system is a linear Negative Income Tax (NIT)?” The NIT is a tax-transfer system with a universal transfer and (in this case linear) taxation of income from the first unit of wage, (a flat tax). Consider a continuum of individuals with identical preferences but with different productivities/wages (ω), who are optimizing over consumption and hours of work (L). A government restricted by an exogenous revenue requirement, choosing marginal taxes (t) and transfers to maximize an additive Bergson-Samuelson social welfare function. Under these circumstances the optimal tax formula becomes, see Auerbach and Hines (2001) or Kleven and Kreiner (2004):

$$\frac{t}{1-t} = -\frac{1}{\lambda} \frac{\text{cov}(b, \omega L)}{E[\omega L \varepsilon^c]}$$

where λ is the marginal value of government revenue, b is the net social marginal utility of income,¹⁵ and ε^c is the compensated labour supply elasticity. Since the denominator is always positive, a negative numerator would make the right-hand side positive such that the optimal marginal tax rate is between zero and one. The covariance in the numerator is negative if individuals with low income tend to be those with high net social marginal utilities of income. In other words, a negative covariance reflects that the government has preferences for low-income individuals and therefore prefers redistribution from the rich to the poor, i.e. desire a higher optimal tax rate.

The optimal tax policy is mirrored by the deadweight loss indicated in the denominator. As one would expect, if compensated labor supply elasticities are generally high, i.e. huge behavioral effects by the use of the income tax policy, the optimal marginal tax rate is low. Moreover, it is

¹⁵ Net, refers to change in labour behavior as government expenditure increases; labour is endogenous.

important to note that the denominator include the expected labor supply elasticity, $E[\omega L \varepsilon^c] = E[\omega L] E[\varepsilon^c]$. Therefore, the profile of labor supply elasticities across the wage distribution comes into play. If the highest elasticities are concentrated at the top of the distribution, the expected labor supply elasticity $E[\varepsilon^c]$ will be higher. This implies the denominator will be higher, and so optimal marginal tax rate is lower. The intuition is that negative labor supply responses of high-wage individuals have a large impact on revenue. They are therefore more damaging to the deadweight loss than the behavioral responses of low-wage individuals since they don't move as much revenue.

To gain more intuition, consider a case where a fraction γ of the population has very low productivity, implying that it is not optimal for them to work. Moreover, assume that government preferences are such that it wishes to redistribute in favor of the unemployed. Also, assume that the compensated labor supply elasticity, ε^c , is constant across individuals. Under this assumption, the optimal tax formula becomes, see Salanié (2003, p. 174):

$$\frac{t}{1-t} = \frac{1}{\varepsilon^c} \frac{\gamma(a-1)}{\gamma(a-1)+1}$$

First, the formula shows that the optimal tax rate depends on the share γ of unemployed people in the population, i.e. the greater the share of unemployed, the larger the tax rate, and thus the redistribution to the unemployed. Second, as one would expect, the optimal tax rate is decreasing in the compensated labor supply elasticity ε^c , while it is increasing in government preferences for equality as measured by the parameter a . Hence, we have the classical dichotomy of efficiency (reflected by ε^c) and equity (reflected by a) in taxes.

In the special case of $a = 1$, implying that the net social marginal utility of income is the same for everybody (utilitarian social welfare), the optimal marginal tax rate equals zero. Since the government has no desire for redistribution in this case, there is no reason to impose distortionary taxes. At the other extreme, as a goes to infinity, government social preferences become Rawlsian and the optimal marginal tax rate is simply the inverse elasticity rule for an optimal tax rate. In this case, where the government cares only about the unemployed (or the poor) it is optimal to maximize the transfer. The optimal tax formula thus reflects the maximum of the Laffer-curve, which plots tax revenue as a function of t . The above formula, based on extreme preferences for equality, indicates the limits to optimal tax rates within the framework of a linear Negative Income

Tax. If for example the compensated labor supply elasticity is in the interval $0.2 - 1.0$ ¹⁶, the optimum of the Laffer-curve is at a marginal tax rate in the range of 0.83 to 0.50. As the elasticity increases, the optimal marginal tax rate is reduced. Thus, the responsiveness of labor supply (or taxable income) is crucial for the optimal tax rate.

Optimal Non-Linear Income Tax. Modifying assumptions from the linear model, by quasi-linear utility,¹⁷ Diamond in 1998 derived the optimal non-linear tax schedule at each income level, Y . See Salanié (2003, p. 94), Auerbach and Hines (2001) or Kleven and Kreiner (2004).

$$\frac{T'(Y)}{1-T'(Y)} = \left(1 + \frac{1}{\varepsilon(\omega_Y)}\right) \frac{1-F(\omega_Y)}{(\omega_Y)f(\omega_Y)} \left(1 - \frac{D(\omega_Y)}{D(0)}\right)$$

Here, it is made explicit that the elasticity of labour supply ε is measured at income level Y . Taking a closer look at the role of the different components in the above formula, the optimal marginal tax rate at income level Y is determined by five components:

- (i) The labour supply elasticity, $\varepsilon(\omega_Y)$: as one would expect, a large elasticity implies, ceteris paribus, a relatively low optimal marginal tax rate. With a large elasticity, high marginal tax rates leads to big reductions in hours of work and taxable income, thereby creating large negative feedback effects on government revenue.
- (ii) The wage distribution, $F(\cdot)$, specifically, the wage distribution of the number of individuals above the income level Y , $1-F(\omega_Y)$: A high value of $1-F(\omega_Y)$ implies, ceteris paribus, a high marginal tax rate. To understand this result, notice that for all individuals above the income level Y , a high marginal tax rate at point Y is a tax on an inframarginal unit of income, thereby collecting revenue with no behavioral consequences.¹⁸ Hence, the closer to the bottom of the distribution, the higher the marginal tax rate, other things being equal. By contrast, at the very top of the distribution, we have $1-F(\omega_Y)=0$ such that the optimal marginal tax rate equals zero at this point. In other words, the richest individual in the country should face a zero marginal tax rate. This result seems perhaps striking. It is quite intuitive though. A positive marginal tax rate at the very top collects no revenue, it only creates a negative substitution effect.
- (iii) The wage rate of individuals at income level Y , ω_Y : A high ω_Y implies, ceteris paribus, a low marginal tax rate. Intuitively, the labour supply responses of high-wage individuals create relatively

¹⁶ These are not unrealistic compensated labour supply elasticity's (Salanié (2003, p. 44). Feldstein (1995) has even measured elasticity's of taxable income w.r.t. the marginal net-of-tax rate that is at least one.

¹⁷ There are no income effects on labour supply.

¹⁸ There is no income effect so only marginal taxes affect behavior through the substitution effect in the quasi-linear utility function.

large drops in taxable income and therefore in government revenue. A similar result was derived for the optimal linear tax system.

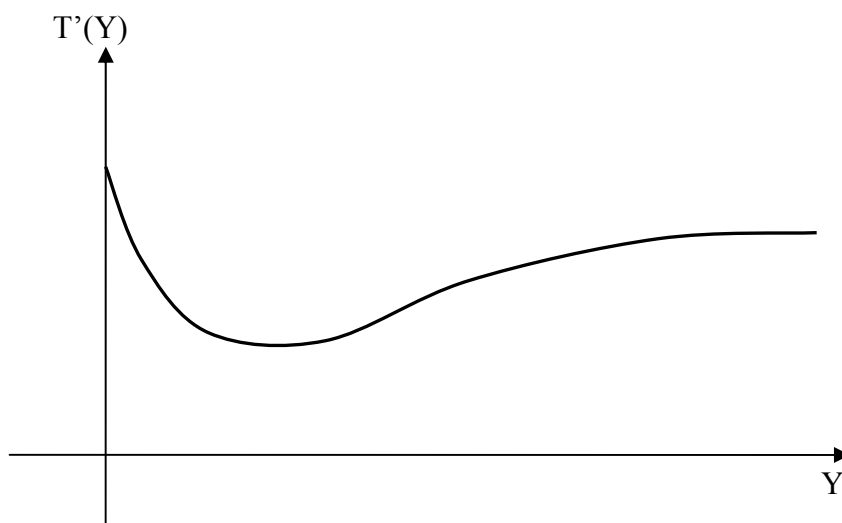
(iv) The number (density) of individuals at income level Y , $f(\omega_Y)$. A large density $f(\omega_Y)$ implies, other things being equal, a low marginal tax rate at that income point. If many individuals are located in some income interval, imposing a high marginal tax rate in that interval will induce many people to reduce their labour supply, thereby creating large negative feedback effects on government revenue. The shape of the distribution of skills/wages is thus captured by the ratio $[1-F(\omega_Y)]/[\omega_Y f(\omega_Y)]$.

(v) Political preferences or preferences for equality given by the average of the social marginal utility of income, $D(\omega_Y)$ in the interval $[\omega_Y; +\infty]$:¹⁹ Consider the special case, where the government has Rawlsian preferences. In this case, the government cares only about the least favored individual, $\omega = 0$, such that $D(\omega_Y)$ is equal to zero for all $\omega_Y > \omega$. In this case the last parenthesis of the optimal tax formula disappears and the right-hand side in the expression is greater than or equal to zero, implying that the optimal marginal tax rate is always between zero and one. With less extreme social preferences, where the social marginal utility of income is positive and declining (the government cares about redistributing to the poor), $D(\omega_Y)$ will be gradually decreasing and the last parenthesis on the right-hand side would be increasing in earnings which, *ceteris paribus*, implies increasing marginal tax rates.

What can be concluded about the profile for the marginal tax rate under a non-linear tax? Should the marginal tax rate be increasing or decreasing? Diamond (1998) and Saez (2001) used US data to, simulate the non-linear tax model, see Salanié (2003, p. 103), with a constant elasticity of labour supply, skills/wages approximated by a Pareto distribution, and a government that cares about redistributing to the poor. Their results suggest optimal marginal tax rates decreasing for the low to middle incomes and increasing to zero for the middle to high incomes, as illustrated by Figure 6.

¹⁹ If the government has preferences for redistribution $D(\omega_Y)$ will be decreasing in ω_Y , due to decreasing social marginal utility.

Figure 6: The optimal non-linear marginal tax rate



Discrete Labour Supply: So far, the models have considered labor supply responses only along the intensive margin (hours of work for those who are working). Not explicitly including labor supply responses along the extensive margin (labor force participation). However, within the standard convex models analyzed here, the optimal tax analysis can easily be extended to account for participation responses. In the models studied here, labor force participation will be a continuous choice, i.e., individuals will exit or enter the labor market at infinitesimal hours following marginal changes in taxes and transfers. Infinitesimal participation responses of this sort will not affect government revenue and hence will not affect the optimal tax formulae. However, labor force participation is, in practice, not continuous. It is discrete. Because of non-convexities in budget constraints and preferences, due to for example fixed costs of working, people do not enter the labor market at infinitesimal hours but at some minimum number of hours, see Cogan (1981). Such discrete labor supply responses have been shown empirically (for the US) to be very important for variations in aggregate labor supply, see Eissa and Liebman (1996).

A paper by Saez (2002) investigates the implications for optimal tax policy of incorporating discrete extensive labor supply responses. In this model the tax payment (net of transfers) for the employed low-wage earners becomes smaller than the tax payment (net of transfers) of non-employed people. To achieve this, marginal tax rates would have to be negative at the bottom of the wage distribution, encouraging the unemployed to take a job at a wage above the fixed cost of working. This stands in sharp contrast to the optimal linear and the non-linear tax models, where the optimal marginal tax rate is positive at all income levels as shown above.

Models on optimal taxation take as granted that labor income ω_Y is the only observable individual characteristic which can be used by the government to differentiate taxes and transfers across individuals. Yet, there may be observable and exogenous characteristics by which we can base redistributive policies. For example, some people may deserve transfers because they are old or disabled. If people can be separated by such exogenous characteristics, it is possible to tag transfers to those, who are needy according to these exogenous characteristics.

In developing countries, the issues of interest are typically not as comprehensive as in the non-linear and discrete models, but generally require that more attention be paid to the administrative repercussions of the tax reform, given that administrative capabilities are much more binding than in industrial countries. Administrative ease, point in the direction of a “flat tax” with a single rate above a personal exemption possibly scaled according to some observable exogenous characteristics. In any case, in countries operating a tax on wages, a reform could have the triple advantages of raising revenue, reducing the excess burden and achieve greater equality.

Another important issue concerning the level of the highest marginal individual tax rate is that it should never exceed the marginal corporation and enterprise tax rates. This would give incentives for tax payers to choose the corporate form of doing business purely for tax reasons. The next section will look more into the taxation of firms.

Corporation and Enterprise Taxes

From a legal point of view corporations are independent legal entities and as such are often referred to as artificial legal persons. Accordingly, where the former sections considered taxes on real persons this section considers taxes on artificial persons (firms). The artificial person setup is a juridical specification, but from an economic perspective only individuals can pay taxes. Why then tax corporations? One answer is that unless corporate income is taxed, tax liability can be reduced by accumulating income within the corporation, for later tax payment. Returning to Table 4 it can be seen that developing countries have on average (in the ten year period) collected 9% of revenue “1112 Payable by corporations and enterprises” compared to 7.8% in the industrialized countries. There are again large differences among countries in the developing country group (between std. of 6.5) compared to the industrialized group (std. of 3.5). Also, over time taxes on firms have been more constant in the industrialized group. This section will mainly focus on two issues: depreciation allowances and capital tax competition.

Many developing countries have different rates of corporate income tax for different sectors. This distorts the market as relative prices among sectors are distorted, and administrative costs increase, as discussed under international trade taxes. Countries also apply different rates of corporate income tax to companies of different size. These are generally easier to justify as they are often designed to compensate for disadvantages that small businesses suffer in terms of tax compliance costs. However, they can distort competition between large and small firms and provide incentives for firms to split into smaller units in order to benefit from the lower taxes.

Depreciation Allowances: An important element in determining the cost of capital and thus the profitability of investments is the design of deductions. Designing appropriate depreciation allowances is crucial for fostering an investment friendly climate. The amount by which to 'write down' an asset can be estimated in several ways. *Straight line depreciation* assumes that the asset loses an equal amount of its value each year over its expected lifetime, say n years. This is the number of years allowed for write-down depending on the category of the asset, permitting the firm deductions of $1/n$ of the asset purchase value from taxable income each year until it is fully written down. *Decreasing balance depreciation* assumes that the asset loses a constant percentage of the value remaining each year after deducting previous write-downs until it is finally scrapped and the remaining value is written off. This design results in a steadily decreasing stream of depreciation allowances with a rate of depreciation equal to $1 - (S/C)^{1/n}$, where n is estimated life in years; S is estimated scrap value at time n , and C the original cost.

To encourage investment governments could allow *accelerated depreciation*, i.e. the right to write off assets faster than the rate at which they would normally be depreciated. This would enable a company to postpone its taxes when it invests. Under accelerated depreciation firm profits net of depreciation (and thus its tax liabilities) are lower than they would have been under normal depreciation. Once the capital goods are written off, profits net of depreciation become higher than they would have been under normal depreciation, and tax bills rise again.

Tanzi and Zee (2000) highlight four guidelines for a good allowance scheme: i) classifying assets into three or maximum four categories, i.e. grouping assets from long-lived at one end to fast-depreciating at the other end; ii) using only one depreciation rate in each group; iii) setting the depreciation rate higher than the expected physical life of the asset to compensate for inflation; and iv) using the depreciation method of decreasing balance since it allows pooling of assets in the same

category and automatically accounts for capital gains and losses from asset disposals, substantially simplifying bookkeeping and administrative requirements.

Profit and Capital Gains Tax. Most countries have a form of income tax under which they tax the surplus from sales of assets either by traders for whom the assets are not trading stock (e.g. a traders factory) or by individuals, who do not trade (e.g. sales of shares by an investor). The first is a tax on profits while the latter is a capital gains tax (a tax on increases in the value of assets). A capital gains tax is typically collected on the realization of gains by sale or bequest as taxing unrealized capital gains would require regular valuations of all assets. Only gains over some minimum sum each year should be liable to tax for administrative reasons, and it should only be levied on proportional gains greater than the rise in the retail price index since an asset was acquired.

Taxation of Capital in fact involves two sorts of taxes: i) taxes on the stock of capital like the wealth tax, the tax on bequests or property taxes; and ii) taxes on the flow of capital like income from savings, such as the corporate income tax, taxation of interest and dividends, and the taxation of capital gains. Economic analyses of these two cases are very similar, since capital stocks stem from accumulated savings.

It has been argued that company taxation should be designed to provide incentives for inward foreign direct investment (FDI). Such FDI could contribute to the increase in productivity by introducing modern machinery and providing skills to a currently poorly trained workforce. The argument against is that taxes are only one of a large number of factors which multinational firms take into account in deciding where to invest, and taxes only become an issue if the other factors are sufficiently positive for the firm to expect the project to be profitable. As a result of this constellation of considerations, it has often been argued that tax incentives for FDI are relatively ineffective. However, recent evidence suggests that tax incentives can have a noticeable effect on the location of investment, especially between locations that are similar in other respects, OECD (2001).

There is, therefore, growing support for the idea that tax incentives can be effective in attracting FDI. However, there is also recognition of the fact that neighboring countries, which may often offer similar non-tax attractions, could compete against each other in offering tax incentives in a way which provide a benefit to the investor without increasing the total amount of FDI allocated to

the region. Despite this risk, many countries do offer tax incentives to FDI in such forms as tax holidays, accelerated depreciation, or investment tax credits, see Tanzi and Zee (2000) for more on advantages and disadvantages concerning these. The question that governments have to answer is whether the additional investment created by such incentives is really worth the revenue forgone from investments that would have been made without the incentives. The following will summarize the theoretical conclusions concerning capital taxation.

Due to the relative mobility of capital, compared to labour, it becomes important to review cross country taxation when considering capital taxation in the presence of international capital mobility. The general result for nationally set capital taxes within the standard literature of tax competition, see Krogstrup (2004) is that taxes on mobile capital will be competed downward and the public good will be under provided. Alternatively, taxation of labour and other less mobile tax bases will have to finance more of the public spending when capital mobility increases. These results are, however, based on a set of rather restrictive assumptions about the economies in which tax competition takes place.

The point of departure in the standard models assumes that capital is the only variable input in the production of firms. With mobile capital there is “tax competition”. Countries compete for the fixed international amount of capital by undercutting each others’ tax rates, effectively engaging in a “race to the bottom”. Each country sets its tax rate assuming that tax rates in all other countries remain unchanged. Yet, each time a tax rate is lowered in one country, the other countries will lose capital to that country and will have an incentive to decrease their tax rate as well. The “bottom” describes the equilibrium level of tax rates on capital. At this “bottom” the cost of decreasing the tax rate in terms of lost tax revenue is balanced against the benefit of the capital inflow such a decrease would entail, given all other tax rates on capital in the world. In this setting, the “bottom” is not a zero tax on capital, but a positive although sub-optimally low level of capital taxation. If all countries could credibly commit to increasing the tax rate marginally from the tax competition equilibrium level, such that the international allocation of capital would remain unchanged, overall utility in all countries would increase.

The downward pressure on capital tax rates due to tax competition can, as mentioned, be counterbalanced by the many other factors relevant for the location decision of a firm. Among such factors are levels of education of the work force, infrastructure and market access for final products as well as for intermediates. A different theoretical setup, namely that of new economic geography

models, has been employed to analyze capital tax competition issues. New economic geography models generally show that a race to the bottom in capital tax rates does not have to take place even though capital is becoming increasingly mobile. One reason is the presence of agglomeration economies and the possibility of differential economic rents across countries. This cross-country difference in gross returns to capital allows for positive taxation of capital in the country hosting the agglomeration/cluster without giving an incentive for capital to flow out. Krogstrup (2004) includes a historic overview of developments within capital tax competition models.

6. Conclusion

This paper presented a brief account of the basic tools of measurement related to the theory of taxation and the main data source on taxation in developing countries. The tradeoff of incidence, efficiency, enforcement- and compliance cost, four core concepts in the literature, have been pursued through the paper.

Looking at who pays the taxes two main conclusion emerge from the incidence analysis: (i) the more elastic side of the market will be able to avoid relative more of the tax burden, and (ii) the long run incidence of a tax levy will only depend on which side of the market bears the legal responsibility for remitting the tax if some agents are more likely to comply with the tax or if their administrative costs are lower. The poor consume mainly food and other non-elastic necessities thus taxing these items will mainly hurt the poor.

Related to tax efficiency consensus in the literature seems to be that the most appropriate way of measuring excess burden is to subtract the actual revenue raised by the tax system from the equivalent variation (EV) associated with the imposition of the tax system. The superiority of this measure is that it may be used more generally to compare any two tax systems, neither of which are necessarily optimal. The general result, which holds for CS and CV as well, is: The Excess burden, in monetary terms, is equal to the revenue effects of change in behavior. The further away tax payers need to move from their preferred consumption, due to a price increase, the larger the burden to society. This is why, in this simple setup, taxes on non-elastic necessities, from a theoretical point of view, are more efficient.

Linked to the range of the tax base are compliance costs in the form of evasion and the administrative costs of enforcing the tax system such as collecting information on tax liability and the optimal penalty rate on evasion. The Allingham-Sandmo model demonstrated the intuitive result

that a higher penalty rate or higher probability of detection will result in lower evasion. Yet, this simple model ignores the possibility of a corrupt tax administrator, who abuses the system or, alternatively, harshly punishes someone, who commits an honest mistake. The harsher the penalty, the more damage can be inflicted by a corrupt administrator or, in the case of an honest mistake, the more risky the system is. Hence, the harsher the penalty, the more detailed and cautious the prosecution process should be, although this may increase administrative costs.

The cost of increasing the probability of detection by hiring more auditors, buying better computers, etc. is a true resource cost, but the revenue brought in through assessed fines as well as higher compliance does not represent a net gain to the economy. Instead it is a distorting transfer from private citizens to the government. Thus, in optimum the probability of detection should be increased until the marginal *social* benefit of reduced evasion equates to the marginal resource cost.

In the Allingham-Sandmo model it was possible to theoretically determine the optimal tax rate by considering the same good in the formal and informal market as two different goods. In this setup a tax is the same as increasing the relative price in the formal market compared to the informal market, making trade in the informal market relatively more attractive. Pulling in the other direction is the tax payers risk aversion. When taxes are increased the real income decreases and the taxpayer is less willing to gamble since he has become poorer. Using the Allingham-Sandmo model as empirical foundation tax payers should be evading a lot more than they apparently do. The simple theoretical model, thus, confirms our intuition concerning causes of evasion but it fails a simple reality check.

In the second best setup with heterogeneous individuals, theoretical guidelines on product taxes are to distort prices in favor of goods consumed by groups with a high social weight and against goods that are compliments to endowed goods. In practice this would mean distort prices in favor of goods consumed predominantly by the poor, and against goods consumed together with leisure. This result does not set any constraints on the number of goods taxed or the number of tax brackets. It is clear, though, that it is more costly for the tax administration to enforce a complex tax system and more costly for the tax payers to comply with such a tax scheme. As a result there is a tradeoff between complicated tax systems that catch all details in the consumption pattern and a simple tax rule that is cheap to enforce and comply with. The more fine-meshed the net is, the more holes the treasurer has to observe.

The recommended ‘best practice’ in VAT schemes has been a single positive rate with zero-rating for exports and exemptions on health, education, and non-fee financial services, but more than one rate or additional exemptions seem to have been more attractive to policymakers probably due to distributional concerns.

Much of the literature on factor taxes focus on labour (income) and capital taxes in develop countries but this does not mean that it is impossible to draw conclusions for developing countries. In developing countries it is generally require that more attention be paid to the administrative cost of the tax reform and administrative ease, point in the direction of a “flat tax” with a single rate above a personal exemption maybe scaled according to some observable exogenous characteristics. Also, if more than one tax rate is adopted the level of the highest marginal tax rate should never exceed the marginal corporation and enterprise tax rate since this could give tax payers incentives to choose the corporate form of doing business purely for tax reasons.

In comparison the latest Mozambiquean tax system established between 1999 and 2004 introduced: (i) a VAT system of the consumption-type, with refunding of VAT paid on inputs and zero rating of exports. VAT exemptions cover small enterprises trading only on the domestic market and an array of goods and services related to agriculture, forestry, fishing, health, education, insurance and social security, and banking and financial operations. (ii) a progressive personal income tax with deductions according to exogenous characteristics such as marital status and number of dependents. (iii) a company income tax at a rate above the personal income tax applied to profits from commercial, cooperative and public enterprises. Byiers (2005)

In general evidence in Byiers (2005) would suggest that tax structures, in Mozambique, try to follow the theoretical models, without administrative constraints, and therefore put less emphasis on the lack of administrative sophistication required to implement such a tax system. The lack of administrative coordination between tax authorities implies that it is not reasonable to assume Mozambique, at present, is able to administer a highly sophisticated tax system. Incidence and excess burden analysis would be highly recommended, since there seems to be a potential gain by increasing the excess burden if that will lower the administrative burden.

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Tables

Table 1: Revenue Categories: Summary Statistics of General and Central Government (in % of GDP)

		Taxes											
		Income, Profits, & Capital Gains	Taxes on Payroll and Work Force	Taxes on Property	Taxes on Goods and Services	Taxes on Inter-national Trade	Other Taxes	Total	Social		Other		
									Contributions	Grants	Revenue	Revenue	
Central Government	Developing	Number of obs.	65	65	66	65	66	65	65	66	66	65	66
		Mean	4.43	0.13	0.30	7.66	2.16	0.28	14.90	4.08	0.76	5.31	25.20
		Std.	3.21	0.32	0.44	4.12	2.72	0.54	6.52	4.57	1.17	6.17	9.45
	<i>Africa</i>	Number of obs.	12	12	12	12	12	12	12	12	12	12	12
		Mean	5.68	0.11	0.33	6.80	5.09	0.21	18.22	1.72	1.10	4.44	25.48
		Std.	4.53	0.15	0.30	3.12	4.47	0.28	8.88	2.17	1.38	6.22	10.85
	<i>Asia</i>	Number of obs.	15	15	15	15	15	15	15	15	15	15	15
		Mean	4.08	0.02	0.33	6.56	2.18	0.33	13.49	0.76	0.60	5.58	20.44
		Std.	3.20	0.06	0.44	4.75	2.41	0.53	5.47	1.85	0.77	4.36	8.93
	<i>Europe</i>	Number of obs.	19	19	19	19	19	19	19	19	19	19	19
		Mean	4.46	0.16	0.12	10.61	0.98	0.34	16.68	9.27	0.60	3.18	29.72
		Std.	2.27	0.36	0.23	2.85	0.85	0.82	4.21	4.51	0.75	1.83	7.99
	<i>Middel East</i>	Number of obs.	6	6	6	6	6	6	6	6	6	6	6
		Mean	4.54	0.47	0.23	3.56	1.36	0.12	10.27	2.56	0.91	16.90	30.64
		Std.	5.56	0.62	0.18	5.22	1.16	0.22	11.26	2.86	1.66	10.92	12.48
	<i>Western Hemisphere</i>	Number of obs.	13	13	14	13	14	13	13	14	14	13	14
		Mean	3.58	0.09	0.53	7.32	1.55	0.26	12.98	3.29	0.79	3.58	21.58
		Std.	1.07	0.30	0.71	2.63	1.33	0.26	2.59	2.52	1.60	3.49	5.40
Industrial	Number of obs.	21	21	21	21	21	21	21	21	21	21	21	
	Mean	10.73	0.29	0.57	9.96	0.15	0.16	21.86	9.81	0.54	2.93	35.13	
	Std.	4.37	0.68	0.58	3.90	0.28	0.40	6.51	5.77	1.12	2.29	8.28	
General Government	Developing	Number of obs.	25	25	26	25	26	25	26	27	27	26	27
		Mean	6.56	0.29	0.92	10.11	2.22	0.28	20.32	5.51	0.76	5.55	32.32
		Std.	3.40	0.78	0.78	4.03	3.93	0.49	6.28	5.39	1.24	3.87	9.98
	<i>Africa</i>	Number of obs.	3	3	3	3	3	3	3	3	3	3	3
		Mean	8.85	0.15	1.00	8.54	7.07	0.22	25.82	0.47	0.77	5.05	32.12
		Std.	5.85	0.17	1.00	1.36	8.36	0.27	8.40	0.42	1.12	1.53	10.39
	<i>Asia</i>	Number of obs.	4	4	4	4	4	4	5	5	5	5	5
		Mean	4.94	0.00	0.89	11.15	1.09	0.15	18.31	1.52	0.14	6.16	26.13
		Std.	2.57	0.00	0.47	7.38	1.24	0.14	6.11	2.90	0.28	3.18	10.84
	<i>Europe</i>	Number of obs.	11	11	11	11	11	11	11	11	11	11	11
		Mean	7.30	0.47	0.79	11.40	0.80	0.30	21.05	10.09	0.60	4.57	36.31
		Std.	2.05	1.08	0.37	2.27	0.89	0.66	3.24	5.13	0.92	2.55	8.37
	<i>Middel East</i>	Number of obs.	2	2	2	2	2	2	2	2	2	2	2
		Mean	8.29	0.78	1.71	7.42	1.61	0.65	20.45	5.63	1.67	14.25	41.99
		Std.	7.63	1.10	1.97	9.10	1.87	0.67	17.26	2.98	2.35	8.63	13.97
	<i>Western Hemisphere</i>	Number of obs.	5	5	6	5	6	5	5	6	6	5	6
		Mean	4.20	0.00	0.88	8.48	3.37	0.26	17.36	2.94	1.26	3.90	27.05
		Std.	2.36	0.00	1.07	2.73	4.98	0.37	5.77	2.18	1.89	1.67	7.62
Industrial	Number of obs.	19	19	19	19	19	19	19	19	19	19	19	
	Mean	14.81	0.46	1.99	11.50	0.11	0.20	29.07	10.96	0.19	5.88	46.10	
	Std.	4.65	0.86	1.14	2.85	0.19	0.46	6.35	5.52	0.25	2.60	7.59	

Note: Numbers are for the latest year available but no later than 1997

Source: International Monetary Fund: Government Finance Statistics Yearbook, Table W4 (2004)

Table 2: Revenue Categories: General and Central Government (in % of GDP)

	Year	Taxes										Total	Social Contributions	Grants	Other Revenue	Revenue
		Income, Profits, & Capital Gains	Taxes on Payroll and Work Force	Taxes on Property	Taxes on Goods and Services	Taxes on Inter-national Trade	Other Taxes	Social Contributions		Other Revenue						
								Contributions	Grants							
General Government																
Industrial Countries																
United States	2003	11.03	—	3.08	4.43	0.19	—	18.74	7.03	—	5.99	31.76				
Canada	2003	15.47	0.71	3.51	8.54	0.24	0.12	28.59	5.74	—	6.43	40.76				
Australia	2003	16.86	1.66	2.74	8.52	0.72	—	30.49	—	—	6.31	36.81				
Euro Area																
Austria	2002	13.41	2.17	0.55	12.58	—	0.02	28.72	16.57	0.26	5.2	50.75				
Belgium	2002	16.93	0.01	2.87	11.14	—	0.13	31.08	16.74	0.11	2.61	50.54				
Finland	2003	17.37	—	1.05	13.93	—	0.03	32.38	12.12	0.22	8.14	52.86				
France	2003	10.27	1.08	4.34	11.11	0.01	0.01	26.83	18.45	0.19	4.89	50.36				
Germany	2003	11.49	—	0.79	10.53	—	—	22.81	18.57	0.21	3.46	45.05				
Italy	2000	14.2	—	0.91	12.79	—	1.92	29.82	12.72	0.08	3.47	46.09				
Luxembourg	2003	15.05p	—p	1.59p	12.97p	—p	0.05p	29.67p	12.90p	0.02p	4.05p	46.65p				
Netherlands	2003	9.83	0.09	1.79	12.31	0.24	—	24.27	15.52	0.09	5.79	45.66				
Portugal	2001	9.54	—	0.51	13.26	—	0.76	24.07	11.92	0.49	5.27	41.74				
Spain	2002	10.33p	—p	2.49p	9.69p	—p	—p	22.51p	13.35p	1.03p	3.01p	39.90p				
Denmark	2003	29.17p	0.21p	1.82p	15.86p	—p	0.01p	47.07p	2.73p	0.15p	9.33p	59.27p				
Iceland	2002	16.57	—	3.31	14.56	0.32	0.23	34.99	3.07	—	6.77	44.82				
Norway	2003	20.09	—	0.51	13.18	0.12	0.05	33.95	9.93	—	13.41	57.29				
Sweden	2002	17.77	2.86	1.42	12.98	—	0.14	35.17	15.42	0.05	7.37	58.02				
Switzerland	2001	12.67	—	2.71	6.71	0.24	—	22.33	7.66	0.41	7.14	37.54				
United Kingdom	2003	13.25	—	1.79	13.33	—	0.42	28.79	7.79	0.35	3.17	40.1				
Developing Countries																
Africa																
Lesotho	2003	9.89p	—p	—p	7.00p	16.50p	0.12p	33.50p	—p	2.06p	6.40p	41.97p				
Mauritius	2003	2.55	0.11	1.02	9.04	4.14	0.01	16.85	0.8	0.23	3.39	21.27				
South Africa	2003	14.11p	0.33p	1.99p	9.58p	0.58p	0.52p	27.11p	0.62p	0.02p	5.37p	33.11p				
Asia																
China, P.R.: Hong Kong	2002	5.76	—	1.48	1.93	0.06	0.09	9.31	—	—	5.96	15.27				
China, P.R.: Macao	2003	1.23	—	0.82	18.52	—	0.36	20.93	0.15	—	3.05	24.13				
Malaysia	2003	.	.	.	.	.	.	18.67p	—p	—p	7.59p	26.27p
Mongolia	2003	†7.16p	†—p	†0.93p	†15.41p	†2.40p	†0.06p	†25.97p	†6.67p	†0.64p	†10.77p	†44.04p				
Thailand	2003	†5.60p	†—p	†0.33p	†8.74p	†1.90p	†0.09p	†16.66p	†0.77p	†0.04p	†3.44p	†20.92p				
Europe																
Armenia	2003	2.12p	—p	0.37p	9.05p	0.66p	2.23p	14.43p	2.75p	3.16p	1.34p	21.68p				
Bulgaria	2003	6.40p	—p	1.11p	13.99p	0.67p	0.02p	22.19p	10.62p	0.90p	6.45p	40.15p				
Czech Republic	2003	9.91	—	0.56	11.28	0.43	0.01	22.2	16.07	0.51	2.84	41.62				
Hungary	2003	9.33p	0.13p	0.83p	15.06p	0.71p	0.49p	26.55p	12.43p	0.14p	4.55p	43.67p				
Kazakhstan	2003	8.15	3.51	0.74	7.59	0.95	0.17	21.1	—	—	1	22.1				
Latvia	2003	7.29	—	0.82	10.74	0.3	0.16	19.31	8.89	0.79	4.35	33.33				
Lithuania	2003	8.1	0.04	0.44	11.28	0.26	—	20.12	8.7	0.78	2.24	31.84				
Poland	2002	6.37	0.18	1.35	11.65	0.49	0.15	20.18	13	0.07	5.26	38.52				
Russia Federation	2003	7.79	—	1.43	9.8	3.41	0.04	22.47	8.34	—	9.19	40				
Slovak Republic	2003	†6.75p	†—p	†0.44p	†10.75p	†0.34p	†—p	†18.28p	†14.10p	†0.02p	†6.11p	†38.51p				
Slovenia	2003	8.04p	1.29p	0.60p	14.22p	0.61p	—p	24.77p	16.04p	0.20p	6.95p	47.96p				
Middle East																
Iran, I.R. of	2003	2.89p	—p	0.32p	0.98p	2.93p	1.12p	8.24p	3.52p	—p	20.35p	32.11p				
Israel	2002	13.68	1.56	3.1	13.85	0.28	0.17	32.65	7.74	3.33	8.15	51.87				
Western Hemisphere																
Bolivia	2003	1.81	—	3.03	10.77	0.94	0.41	16.96	2.37	4.03	5.79	29.16				
Chile	2003	†4.41	†—	†0.73	†11.27	†0.64	†0.84	†17.88	†1.46	†—	†4.07	†23.42				
Costa Rica	2003	3.36	—	0.62	8.87	1.03	0.03	13.91	7.35	—	2.19	23.45				
El Salvador	2003	3.33	—	0.28	6.6	1.21	—	11.42	2.31	0.12	2.22	16.06				
Jamaica	2003	.	.	0.3	.	2.99	.	.	2.18	0.05	.	33.05				
St. Vincent and the Grenadines	2003	8.07	—	0.29	4.87	13.39	—	26.61	1.99	3.33	5.25	37.18				

Source: See bottom of table

Table 2 continued

	Year	Taxes										Revenue
		Income, Profits, & Capital Gains	Taxes on Payroll and Work Force	Taxes on Property	Taxes on Goods and Services	Taxes on International Trade	Other Taxes	Total	Social Contributions	Grants	Other Revenue	
Central Government												
Industrial Countries												
United States	2003	8.86	—	0.2	0.62	0.19	—	9.87	6.89	—	0.52	17.29
Canada	2003	10.22	—	—	3.43	0.24	—	13.89	4.77	0.05	1.13	19.84
Australia	2003	16.86	0.4	—	6.98	0.72	—	24.95	—	0.03	2.42	27.4
New Zealand	2003	19.22	—	—	10.51	1.08	—	30.81	0.1	—	5.91	36.82
Euro Area												
Austria	2002	9.88	1.32	0.11	9.64	—	0.02	20.97	15.5	0.17	2.59	39.23
Belgium	2002	16.24	0.01	0.33	10.08	—	0.06	26.72	15.38	0.16	0.97	43.23
Finland	2003	8.41	—	0.59	13.92	—	0.03	22.96	12.11	0.49	3.94	39.49
France	2003	10.27	0.8	0.86	10.63	—	0.01	22.55	18.43	0.35	2.87	44.19
Germany	2003	4.88	—	—	6.67	—	—	11.55	17.77	0.5	0.88	30.69
Ireland	1997	13.34	0.36	0.89	11.93	—	—	26.52	4.12	1.75	1.28	33.67
Italy	2000	13.17	—	0.09	8.88	—	1.73	23.87	12.64	0.04	1.55	38.1
Luxembourg	2003	12.97p	—p	1.46p	12.94p	—p	0.05p	27.42p	12.88p	0.32p	2.72p	43.34p
Netherlands	2003	9.83	0.09	1.1	11.47	0.24	—	22.72	14.97	0.09	2.84	40.62
Portugal	2001	9.06	—	0.07	12.12	—	0.74	22	11.86	0.5	3.75	38.11
Spain	2002	7.92p	—p	0.02p	4.97p	—p	—p	12.91p	13.29p	5.13p	1.73p	33.06p
Denmark	2003	13.34p	0.21p	0.64p	15.85p	—p	0.01p	30.05p	2.11p	0.55p	5.38p	38.09p
Iceland	2002	8.92	—	1.41	14.56	0.32	0.1	25.31	3.07	—	4.89	33.27
Norway	2003	13.94	—	0.31	13.05	0.12	0.05	27.47	9.93	0.13	10.23	47.76
Sweden	2002	1.64	2.86	1.42	12.98	—	0.14	19.05	15.03	0.23	3.63	37.94
Switzerland	2001	3.09	—	0.69	6.2	0.24	—	10.22	7.66	0.55	0.91	19.33
United Kingdom	2003	13.25	—	1.78	11.72	—	0.42	27.17	7.54	0.32	1.3	36.33
Developing Countries												
Africa												
Burundi	1999	3.32	0.14	—	6.95	3.19	0.01	13.6	1.18	2.49	1.02	18.29
Congo, Dem. Rep. Of	2001	0.66	—	—	0.93	1.37	0.99	3.95	—	4.61	0.34	8.89
Congo, Rep of	2002	—	—	—	6.43	1.92	0.01	8.37	1.1	0.18	22.47	32.12
Côte d'Ivoire	2001	3.44	0.32	0.39	3.6	7.09	0.07	14.9	1.45	0.51	0.61	17.48
Lesotho	2003	9.89p	—p	—p	7.00p	16.50p	0.12p	33.50p	—p	2.06p	6.40p	41.97p
Madagascar	2002	1.76	—	0.09	2.3	3.47	0.05	7.67	—	1.64	0.33	9.64
Mauritius	2003	2.55	0.11	0.87	8.9	4.14	0.01	16.56	0.8	0.23	3.28	20.88
Morocco	1999	7.13	—	0.57	10.76	4.71	0.31	23.47	2.59	—	3.58	29.64
Seychelles	2002	6.61	—	0.51	8.39	10.18	0.4	26.09	6.62	0.66	8.59	41.96
South Africa	2003	14.11p	0.33p	0.55p	9.35p	0.58p	0.23p	25.14p	0.62p	0.16p	1.21p	27.13p
Tunisia	2003	6.75	0.37	0.42	10.41	2.25	0.35	20.55	5.52	0.24	3.3	29.61
Zimbabwe	1997	11.98	—	0.6	6.58	5.68	—	24.85	0.77	0.42	2.15	28.19
Asia												
Bangladesh	2003	1.27	0.02	—	3.63	2.82	0.35	8.07	—	1.1	2.03	11.2
China, P.R.: Hong Kong	2002	5.76	—	1.48	1.93	0.06	0.09	9.31	—	—	5.96	15.27
China, P.R.: Macao	2003	1.23	—	0.82	18.52	—	0.36	20.93	0.15	—	3.05	24.13
India	2003	3.45	—	0.01	3.84	1.78	—	9.07	0.04	0.05	2.46	11.62
Indonesia	2001	6.52p	—p	0.57p	5.40p	0.66p	0.01p	13.15p	0.42p	—p	7.67p	21.24p
Korea, Republic of	2001	5.73	—	0.47	7.04	0.95	1.2	15.4	3.39	—	4.01	22.8
Malaysia	2003	11.32p	—p	0.05p	5.12p	1.33p	-0.11p	17.72p	—p	—p	6.16p	23.88p
Maldives	2003	0.58f	—f	—f	3.87f	7.68f	0.22f	12.35f	—f	1.24f	18.52f	32.11f
Mongolia	2003	†6.83p	†—p	†—p	†14.99p	†2.40p	†—p	†24.22p	†6.67p	†1.73p	†9.71p	†42.34p
Myanmar	1999	0.97	—	—	1.54	0.25	—	2.75	—	0.01	2.85	5.61
Nepal	2003	1.48p	0.25p	0.35p	4.13p	3.16p	—p	9.37p	—p	1.84p	2.26p	13.46p
Pakistan	2003	3.59p	—p	0.01p	6.08p	1.73p	1.66p	13.09p	—p	1.43p	4.38p	18.89p
Singapore	2002	6.88	—	0.83	4.11	0.44	1.04	13.3	—	—	8.9	22.21
Thailand	2003	†5.60	†—	†0.01	†7.81	†1.90	†0.09	†15.40	†0.77	†0.04	†3.30	†19.52
Vanuatu	1999	—	—	0.37	10.4	7.52	—	18.28	—	1.62	2.46	22.36
Europe												
Armenia	2003	2.12p	—p	0.01p	9.05p	0.66p	2.18p	14.01p	2.75p	3.11p	0.97p	20.85p
Belarus	2002	1.75	0.84	—	9.61	2	—	14.2	10.89	0.06	1.48	26.63
Bulgaria	2003	4.29p	—p	—p	13.99p	0.67p	0.02p	18.97p	10.62p	0.89p	5.80p	36.28p
Croatia	2001	3.25	—	0.17	18.18	2.55	0.29	24.45	13.15	—	1.94	39.53
Cyprus	1998	6.38	0.57	0.55	8.59	1.18	3.04	20.32	4.74	0.02	6.23	31.31
Czech Republic	2003	7.17	—	0.36	9.29	0.43	0.01	17.26	16.07	0.51	1.51	35.35
Estonia	2001	3.74	—	—	11.68	0.04	—	15.46	10.04	0.6	2.56	28.65
Georgia	2002	0.37p	—p	—p	6.56p	0.68p	—p	7.62p	2.08p	0.30p	0.77p	10.76p
Hungary	2003	7.15p	0.12p	0.28p	13.41p	0.71p	0.49p	22.17p	12.43p	0.20p	2.68p	37.48p
Kazakhstan	2003	6.07	—	—	6.37	0.95	0.05	13.44	—	1.28	0.88	15.6
Latvia	2003	3.13	—	—	10.71	0.3	0.12	14.26	8.89	0.81	3.18	27.13
Lithuania	2003	5.91	0.04	—	11.22	0.26	—	17.43	8.7	0.78	1.95	28.87
Malta	2000	8.71	—	0.8	11.33	1.24	0.01	22.07	5.64	0.57	3.35	31.63
Poland	2002	5.05	0.18	—	11.57	0.49	0.12	17.41	9.62	0.08	2.5	29.6
Romania	2001	2.75	—	—	8.03	0.82	0.15	11.75	11.04	0.12	3.86	26.77
Russia Federation	2003	1.25	—	0.01	8.56	3.41	—	13.24	8.34	0.01	5.85	27.43
Slovak Republic	2003	†5.97p	†—p	†0.12p	†10.36p	†0.34p	†—p	†16.79p	†14.10p	†0.02p	†4.43p	†35.34p
Slovenia	2003	5.88p	1.33p	0.01p	13.86p	0.61p	—p	21.69p	16.04p	0.63p	5.81p	44.18p
Ukraine	2002	3.74	—	—	9.29	1.29	—	14.32	10.9	1.48	4.64	31.35
Middle East												
Bahrain, Kingdom of	2002	1.41	0.52	0.23	0.68	1.63	—	4.47	1.83	1.32	27.89	35.51
Iran, I.R. of	2003	2.89p	—p	0.32p	0.64p	2.93p	—p	6.78p	3.52p	—p	19.81p	30.11p
Israel	2002	13.68	1.56	0.5	13.68	0.28	0.17	29.87	7.74	4.12	6.78	48.52
Kuwait	1999	0.28	—	0.06	0.01	0.96	—	1.31	2.13	—	31.04	34.48
Syrian Arab Rep.	1999	8.98	0.74	0.25	4.57	2.36	0.54	17.43	0.06	—	6.45	23.94
United Arab Emirates	1998	—	—	—	1.75	—	—	1.75	0.07	—	9.43	11.26
Western Hemisphere												
Argentina	2002	†1.84	†0.05	†1.45	†3.90	†1.92	†0.27	†9.43	†2.77	†0.04	†1.46	†13.70
Bolivia	2003	1.48	—	1.65	9.04	0.76	0.41	13.33	2.37	4.13	3.61	23.44
Brazil	1998	5.04	1.08	0.02	5.28	0.72	—	12.15	8.48	0.01	4.22	24.24
Chile	2003	†4.41	†—	†—	†10.42	†0.84	†0.84	†16.30	†1.46	†0.01	†3.51	†21.29
Costa Rica	2003	3.36	—	0.49	8.59	1.03	—	13.46	7.35	0.05	1.86	22.73
Dominican Republic	2002	3.71	—	0.17	6.08	5.52	0.23	15.7	0.74	0.13	0.88	17.46
El Salvador	2003	3.33	—	0.1	6.6	1.21	—	11.24	2.31	0.12	1.82	15.48
Jamaica	2003	—	—	—	—	2.99	—	—	2.18	0.05	—	32.56
Mexico	2000	5.04	—	—	9.17	0.6	0.11	11.67	1.55	—	1.55	14.76
Nicaragua	2003	3.92p	—p	—p	10.14p	1.01p	0.02p	15.09p	3.95p	4.81p	1.60p	25.45p
Panama	2001	3.85	—	0.36	2.29	2.21	0.56	9.26	5.04	0.2	11.26	25.75
Peru	2003	3.98	—	—	8.84	1.19	0.42	12.93	1.19	0.26	2.11	16.49
Uruguay	2001	3.86	0.1	1.59	9.83	0.73	0.38	17.46	6.13	1.3	1.63	26.53
Venezuela, Rep. Bol.	2002	2.68	—	1.65	4.99	1.22	0.12	10.66	0.59	—	10.99	22.24

Source: International Monetary Fund: Government Finance Statistics Yearbook Table W3 and W4

Note: A dash (—) indicates that a figure is zero or less than half of a significant digit. An ellipsis (...) indicates the nonavailability of data. The letter f denotes forecasted or projected data. The letter p denotes data that are preliminary or provisional. The symbol † marks a break in the comparability of data.

Table 3: Comparative Tax Rates in Sub-Saharan African Countries

Highest marginal tax rate, corporate rate (%)										
Highest marginal tax rate, individual (on income exceeding, US\$)										
GDP per. Capita (in current US\$)										
Highest marginal tax rate, individual rate (%)										
Country		1998	1999	2000	2002	Country	1998	1999	2000	2002
Botswana	%	15	15	15	15	Mozambique	..	35	35	35
	US\$	21008	17960	14920	14085		..	792	640	5754
	US\$	3056	3078	3201	3080		228	230	208	195
	%	30	30	25	25		..	20	20	20
Cameroon	%	39	39	39	39	Namibia	35	40	35	35
	US\$	12345	13321	10726	10726		16461	16129	25641	17241
	US\$	602	636	587	575		1908	1845	1826	1463
	%	60	60	60	60		35	40	36	36
Congo, Dem. Rep.	%	..	..	40	40	Nigeria	28	..	30	30
	US\$	13167	..	1500	1500		1600	1395	1553	1553
	US\$	129	98	100	111		266	295	332	328
	%	50	..	60	60		25	25	25	25
Congo, Rep.	%	..	45	..	..	Senegal	35	35	35	35
	US\$	..	14210	..	..		20821	22469	22469	22469
	US\$	603	705	934	825		515	512	459	503
	%	..	50	..	..		50	50	50	50
Cote d'Ivoire	%	35	35	35	35	South Africa	35	30	30	30
	US\$	3950	4263	3432	3432		20576	20391	15000	18534
	US\$	847	812	668	707		3190	3053	2908	2299
	%	10	10	10	10		45	45	45	42
Gabon	%	40	..	35	35	Swaziland	..	..	30	30
	US\$	2290	..	31462	..		..	..	5089	5089
	US\$	3849	3538	3920	3780		1370	1350	1334	1091
	%	55	..	50	50		..	..	39	39
Ghana	%	35	35	33	33	Tanzania	30	30	30	30
	US\$	7269	7102	7059	7059		13405	12335	8000	7074
	US\$	396	400	254	304		261	262	269	267
	%	35	35	30	30		35	35	30	30
Kenya	%	35	33	30	30	Uganda	30	30	30	30
	US\$	384	382	5612	5612		4316	3578	2795	2860
	US\$	391	359	347	393		298	264	253	236
	%	33	33	30	30		30	30	30	30
Malawi	%	38	38	38	..	Zambia	35	35	35	35
	US\$	1969	948	948	..		1212	742	524	557
	US\$	176	179	166	177		341	323	328	361
	%	38	38	38	..		30	30	30	30
Mauritius	%	15	..	..	25	Zimbabwe	38	35	30	30
	US\$	2471	2220	894	828		3578	20455	14756	15273
	US\$	3574	3557	3727	3740		471	443	570	639
	%	30	30	25	25		40	50	53	46

Source: World Development Indicators: World Bank 2004

Table 4: Summary Statistics of Central Government panel data (1993-2002) of different taxes in percent of revenue

Developing						Industrial				
	Mean	Std. Dev.	Min	Max	Observations	Mean	Std. Dev.	Min	Max	Observations
1 Revenue										
Overall	100	0	100	100	N = 524	100	0	100	100	N = 185
Between		0	100	100	n = 94		0	100	100	n = 38
Within		0	100	100			0	100	100	
11 Taxes										
Overall	62.60	17.31	2.58	99.75	N = 520	62.03	14.23	34.40	93.58	N = 185
Between		15.80	3.12	91.49	n = 94		14.08	36.18	93.05	n = 38
Within		4.67	38.44	86.51			1.86	53.31	75.98	
111 Taxes on income, profits, and capital gains										
Overall	17.77	10.96	0.00	61.83	N = 520	31.62	14.13	4.33	68.13	N = 185
Between		10.76	0.00	52.16	n = 94		13.73	11.90	66.83	n = 38
Within		3.47	-2.45	34.48			1.39	24.05	35.39	
1111 Payable by individuals										
Overall	7.52	7.73	0.00	38.92	N = 483	23.47	11.99	-1.48	50.57	N = 179
Between		7.92	0.00	35.57	n = 88		11.63	4.55	49.25	n = 37
Within		2.00	-8.31	19.14			1.34	17.45	28.54	
1112 Payable by corporations and other enterprises										
Overall	9.09	7.12	0.00	50.17	N = 484	7.81	3.65	1.00	22.11	N = 179
Between		6.50	0.00	31.82	n = 88		3.54	1.70	18.02	n = 37
Within		3.09	-4.38	31.23			0.97	5.12	11.90	
1113 Unallocable										
Overall	1.06	3.96	-0.01	36.51	N = 488	0.59	1.34	0.00	8.38	N = 178
Between		3.88	0.00	31.92	n = 89		1.42	0.00	7.99	n = 37
Within		0.68	-4.27	7.31			0.17	-0.19	1.54	
112 Taxes on payroll and workforce										
Overall	0.45	1.08	0.00	8.87	N = 522	0.81	1.77	0.00	10.76	N = 185
Between		0.95	0.00	4.85	n = 94		1.70	0.00	7.66	n = 38
Within		0.54	-1.87	4.47			0.52	-1.63	5.41	
113 Taxes on property										
Overall	1.16	1.85	-0.12	10.55	N = 521	1.98	1.86	0.00	7.16	N = 185
Between		2.19	-0.02	10.55	n = 94		1.90	0.00	6.98	n = 38
Within		0.62	-2.09	7.21			0.33	0.70	3.91	
1131 Recurrent taxes on immovable property										
Overall	0.23	0.70	-0.04	5.71	N = 514	0.47	1.29	0.00	5.34	N = 177
Between		0.78	0.00	5.03	n = 94		1.24	0.00	5.05	n = 37
Within		0.18	-0.85	1.94			0.10	-0.23	0.88	
1132 Recurrent taxes on net wealth										
Overall	0.11	0.58	0.00	5.38	N = 513	0.45	0.93	0.00	5.24	N = 177
Between		0.50	0.00	4.48	n = 94		1.00	0.00	5.12	n = 37
Within		0.15	-0.90	1.50			0.33	-1.20	2.83	
1133 Estate, inheritance, and gift taxes										
Overall	0.06	0.18	0.00	1.45	N = 515	0.36	0.39	0.00	1.46	N = 177
Between		0.22	0.00	1.28	n = 94		0.38	0.00	1.29	n = 37
Within		0.06	-0.27	0.53			0.07	0.07	0.68	
1134 Taxes on financial and capital transactions										
Overall	0.69	1.49	0.00	10.00	N = 514	0.72	0.79	0.00	3.07	N = 177
Between		1.75	0.00	10.00	n = 94		0.77	0.00	2.36	n = 37
Within		0.53	-1.71	7.11			0.27	-1.16	1.91	
1135 Other nonrecurrent taxes on property										
Overall	0.03	0.12	0.00	1.11	N = 514	0.04	0.28	0.00	3.51	N = 175
Between		0.12	0.00	0.66	n = 94		0.11	0.00	0.50	n = 37
Within		0.07	-0.50	1.01			0.25	-0.46	3.05	
1136 Other recurrent taxes on property										
Overall	0.02	0.14	-0.12	1.41	N = 514	0.01	0.02	0.00	0.25	N = 175
Between		0.09	-0.02	0.66	n = 94		0.02	0.00	0.07	n = 37
Within		0.11	-0.64	1.08			0.02	-0.06	0.19	

Continued next page.

Table 4 continued

Developing					Industrial					
	Mean	Std. Dev.	Min	Max	Observations	Mean	Std. Dev.	Min	Max	Observations
114 Taxes on goods and services										
Overall	31.16	13.36	0.00	76.74	N = 514	26.86	9.87	3.09	50.00	N = 184
Between		12.38	0.02	66.50	n = 94		9.36	3.42	48.66	n = 38
Within		3.38	17.02	43.41			1.51	19.77	36.39	
1141 General taxes on goods and services										
Overall	18.41	11.48	0.00	60.98	N = 512	16.27	6.65	0.00	32.47	N = 178
Between		11.17	0.00	52.84	n = 93		6.39	0.00	31.28	n = 37
Within		3.38	-7.64	36.60			1.15	12.67	22.86	
11411 Value-added taxes										
Overall	13.89	12.35	0.00	39.98	N = 131	14.70	7.26	0.00	32.47	N = 104
Between		12.72	0.00	39.48	n = 49		7.00	0.00	31.52	n = 21
Within		1.05	11.02	18.75			1.98	6.47	21.12	
11412 Sales taxes										
Overall	1.20	4.61	0.00	29.81	N = 130	0.38	1.37	-0.02	9.74	N = 103
Between		5.58	0.00	27.60	n = 49		0.95	0.00	4.14	n = 21
Within		0.36	-1.01	3.40			1.00	-3.36	5.98	
11413 Turnover and other general taxes on goods and services										
Overall	0.50	2.66	0.00	18.93	N = 130	0.00	0.00	0.00	0.00	N = 102
Between		2.61	0.00	17.11	n = 49		0.00	0.00	0.00	n = 21
Within		0.36	-2.75	2.32			0.00	0.00	0.00	
1142 Excises										
Overall	8.56	6.53	0.00	31.63	N = 513	8.19	2.94	2.28	14.58	N = 176
Between		6.20	0.00	27.88	n = 93		2.92	2.45	14.18	n = 37
Within		2.12	1.10	22.75			0.59	6.28	10.10	
1143 Profits of fiscal monopolies										
Overall	0.35	2.26	0.00	32.31	N = 518	0.18	0.47	0.00	3.83	N = 171
Between		2.29	0.00	20.59	n = 93		0.47	0.00	2.21	n = 37
Within		0.89	-7.08	12.07			0.17	-0.46	1.79	
1144 Taxes on specific services										
Overall	1.80	7.97	0.00	72.40	N = 519	0.73	0.62	0.00	2.31	N = 171
Between		6.73	0.00	62.10	n = 93		0.63	0.00	2.17	n = 37
Within		1.15	-12.34	12.10			0.12	0.27	1.19	
1145 Taxes on use of goods and on permission to use goods or perform activities										
Overall	1.10	1.87	0.00	20.01	N = 518	1.33	1.49	0.00	6.08	N = 169
Between		1.48	0.00	7.85	n = 93		1.49	0.00	6.05	n = 37
Within		0.96	-2.42	13.94			0.34	0.00	2.97	
11451 Motor vehicle taxes										
Overall	0.33	0.85	0.00	6.87	N = 152	0.72	1.06	0.00	4.00	N = 90
Between		0.96	0.00	6.68	n = 56		1.03	0.00	3.20	n = 20
Within		0.13	-0.29	0.99			0.30	-0.31	2.26	
11452 Other taxes on use of goods and on permission to use goods or perform activities										
Overall	0.23	0.44	0.00	3.07	N = 151	0.59	1.03	0.00	4.42	N = 90
Between		0.56	0.00	3.07	n = 56		1.09	0.00	4.39	n = 20
Within		0.13	-0.47	0.94			0.31	-0.65	1.79	
1146 Other taxes on goods and services										
Overall	1.03	3.10	0.00	29.36	N = 517	0.40	0.90	-1.55	5.82	N = 171
Between		2.81	0.00	23.81	n = 93		0.86	-0.39	4.91	n = 37
Within		1.05	-7.39	8.90			0.21	-0.77	1.30	
115 Taxes on international trade and transactions										
Overall	11.11	11.94	0.00	58.33	N = 515	0.46	0.76	-0.16	3.29	N = 184
Between		11.62	0.00	47.28	n = 94		0.80	-0.03	3.06	n = 38
Within		2.89	-4.12	28.56			0.11	0.11	0.93	
1151 Customs and other import duties										
Overall	9.54	10.16	0.00	46.18	N = 498	0.43	0.70	-0.07	3.06	N = 178
Between		10.24	0.00	44.86	n = 91		0.70	-0.01	2.66	n = 37
Within		2.51	-5.69	22.85			0.10	0.08	0.90	
1152 Taxes on exports										
Overall	0.57	2.18	0.00	16.33	N = 504	0.00	0.00	-0.02	0.03	N = 178
Between		2.14	0.00	13.68	n = 91		0.00	0.00	0.00	n = 37
Within		1.03	-4.93	12.92			0.00	-0.03	0.03	
1153 Profits of export or import monopolies										
Overall	0.08	0.78	0.00	11.94	N = 502	0.00	0.00	0.00	0.01	N = 178
Between		0.51	0.00	4.84	n = 91		0.00	0.00	0.00	n = 37
Within		0.53	-4.69	7.18			0.00	0.00	0.00	
1154 Exchange profits										
Overall	0.10	1.02	0.00	15.32	N = 503	0.00	0.00	0.00	0.04	N = 178
Between		0.46	0.00	4.01	n = 91		0.00	0.00	0.01	n = 37
Within		0.83	-3.91	11.41			0.00	-0.01	0.03	
1155 Exchange taxes										
Overall	0.03	0.28	0.00	5.64	N = 502	0.00	0.00	0.00	0.00	N = 178
Between		0.59	0.00	5.64	n = 91		0.00	0.00	0.00	n = 37
Within		0.09	-0.30	1.26			0.00	0.00	0.00	
1156 Other taxes on international trade and transactions										
Overall	0.24	0.92	-0.24	10.47	N = 502	0.05	0.23	0.00	1.78	N = 178
Between		0.70	0.00	3.68	n = 91		0.28	0.00	1.57	n = 37
Within		0.63	-3.44	7.22			0.03	-0.07	0.33	
116 Other taxes										
Overall	1.52	2.90	-4.73	25.73	N = 520	0.41	0.82	0.00	4.77	N = 185
Between		2.89	0.00	15.19	n = 94		0.96	0.00	4.61	n = 38
Within		1.37	-7.11	18.58			0.15	-0.15	1.15	

Source: International Monetary Fund: Government Finance Statistics

Note: Overall is over countries and over time. Between is between countries. Within is within the country over time. N is number of country-time observations. n is number of countries.