Chapter

# 28

# Optimal Taxation and Tax Reform

*There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all who profit by the old order, and only lukewarm defenders in all those who would profit from the new order.*

Machiavelli, *The Prince*

Optimal Taxation: Core Concepts ♦ Optimal Taxation of Income ♦ Optimal Commodity Taxation ♦ Taxes on Producer Goods and International Trade ♦ An Optimal Tax System ♦ Tax Reform

In this chapter we turn to policy questions. What is the best system of tax? And, how can an existing tax system be improved? Answers to these questions require not only an understanding of the effects of alternative taxes but also normative judgements. Traditionally economists evaluated tax systems using various equity and efficiency criteria. More recently economists have sought to determine more formally the tax system that maximises social welfare using a social welfare function. The former approach is more pragmatic; the latter more rigorous. In our discussion below we draw on both approaches.

The first section discusses optimal income taxation concepts. We then discuss optimal taxation of income. Importantly, the term 'optimal income taxation' is used in the economics literature to refer to a set of tax rates **and** income transfers (or negative taxes) across individuals that maximises social welfare. Thus, it is concerned not just with taxation but with optimal income redistribution. The third section discusses an optimal commodity tax system which is a preferred set of tax rates across commodities. We then briefly examine the role of taxes on producer goods (also known as intermediate goods) and international trade. In the fifth section we discuss the optimal overall system of taxes. The last section discusses tax reform—how we can move from a flawed system towards a better one.

## Optimal Taxation: Core Concepts

Traditional public finance asked: what is the best way to raise a revenue target? Three strategies were proposed. One was the principle of **equal absolute sacrifice—**each person should make the same sacrifice in utility (not money) terms. Suppose that government needed to raise \$100 from two individuals where $A$ is rich and $B$ is poor and that the loss of three dollars to $A$ is equivalent in utility to the loss of one dollar to $B$. The principle of equal absolute sacrifice implies that $A$ should pay \$75 in tax and that $B$ should pay \$25.

Although this may appear to be fair, it implies an increase in relative inequality. Suppose that $A$ has 10 units of utility and $B$ has 5 units and that each loses one unit of utility in paying

the tax. After tax, $A$ has 9 units of utility and $B$ has only 4 units. The less well-off person ($B$) has become relatively worse off. This change in relative wellbeing can be avoided by the principle of **equal proportional sacrifice**. In this case, each would be taxed such that they sacrificed an equal proportion of their total utility.

However, so long as a marginal dollar has more value to one individual than to another, neither absolute or equal proportional sacrifice is welfare maximising. Social welfare is maximised by minimising the total loss of welfare (or utility). This is achieved by the principle of **equal marginal sacrifice**. So long as a marginal dollar has less utility to $A$ than to $B$, the marginal tax should be levied on $A$. This continues until the marginal tax dollar has the same utility to $A$ and $B$.

As we saw in Chapter 7, under certain assumptions equal marginal sacrifice implies equality of after-tax incomes. The assumptions are that social welfare is the sum of individual welfares, individuals have similar utility functions with respect to income, these utility functions exhibit diminishing marginal utility of income and total income is constant. For any revenue target, welfare would then be maximised by levying a 100 per cent marginal tax on the highest income individuals until the target is obtained.

A critical assumption underlying this conclusion, and the case for equal absolute sacrifice, is that the tax rate does not change labour supply. If taxation reduces hours worked there is less total income to allocate. If this assumption does not hold, optimal tax system design should allow for the effect of taxation on labour supply and tax revenues.

Optimal tax design becomes more complex if the objective is broadened from achieving a revenue target at least cost to finding the optimal combination of income taxes and grants to individuals or households. The former objective is essentially concerned with how to fund public goods. The latter objective includes redistribution aims. The optimal tax problem is now how to choose both the tax rate and the level of grants, subject to the labour supply constraint, that maximise social welfare. A social welfare function is needed to determine the welfare implications of dollar transfers between individuals.

Figure 28.1 illustrates the problem. This shows how the grant ($G$) per person can vary with tax rates with a fixed (perfectly inelastic) labour supply and with a more typical labour supply that falls as tax increases. A minimum tax rate ($t_o$) is required to finance provision of general government goods. At $t_o$ tax rate, $G$ is zero. As the tax rate increases tax revenue rises and $G$ rises. If the labour supply were perfectly inelastic the grant would rise linearly with the tax

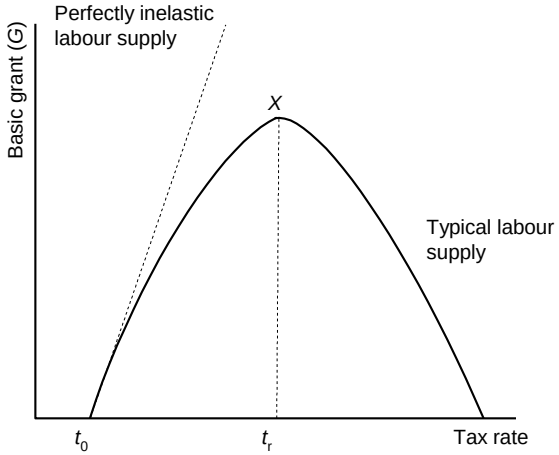
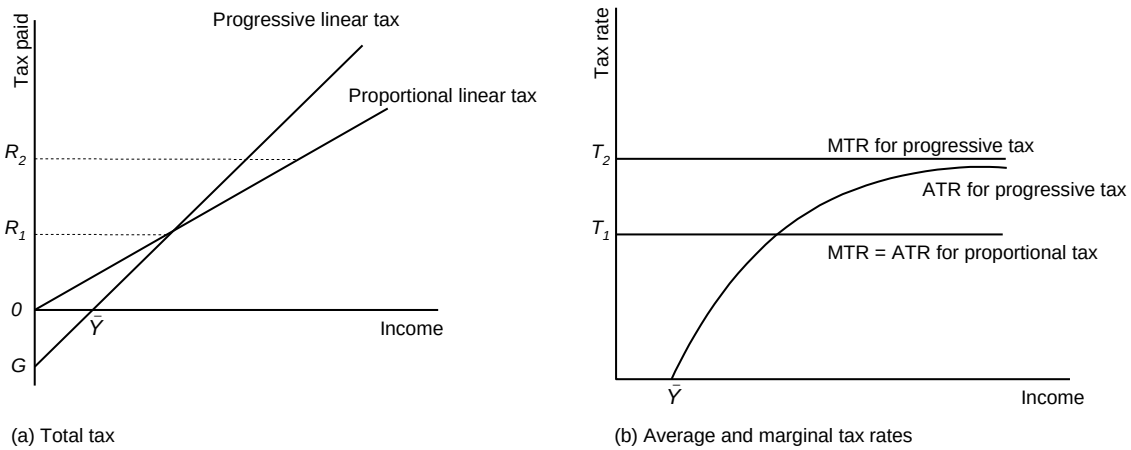



**Figure 28.1 Tax rates and redistribution**

rate. However, if labour supply falls as the tax rate increases, revenue increases less than linearly with the tax rate.

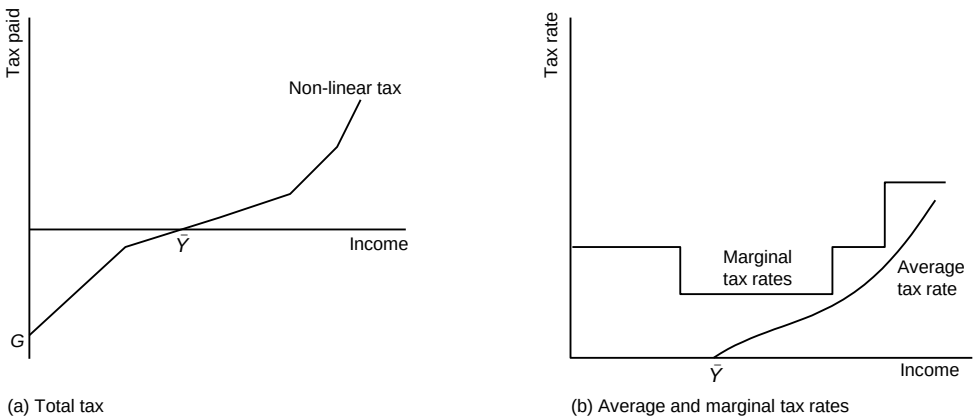
When tax rates are greater than $t_r$, revenue falls. Point $X$ is a Rawlsian solution, where the income of the least well-off person (the basic grant) is maximised. However, at points just to the left of $X$ the tax rate is increasing with little increase in $G$ and the marginal burden to taxpayers may be viewed as exceeding the marginal benefit to grant recipients. The aim of optimal tax studies is to find the optimal tax rate between $t_o$ and $t_r$ (including possibly the end points).

To understand the issues, we need first to understand the concepts of linear and non-linear tax structures. These structures are illustrated in Figures 28.2 and 28.3. In both figures individuals receive a grant until their income reaches $\bar{Y}$. But they also pay effective tax with incomes below $\bar{Y}$ as the grant is withdrawn.




(a) Total tax (b) Average and marginal tax rates

**Figure 28.2 Proportional and progressive linear taxes**




(a) Total tax (b) Average and marginal tax rates

**Figure 28.3 Typical progressive non-linear tax structure**

## Linear and non-linear tax structures

A tax structure is **linear** if it has a constant marginal tax rate (MTR) at all levels of income. As previously notes, this tax structure is also called a **flat tax** system.

As shown in Figure 23.2a, a linear tax structure can be proportional or progressive. In a **proportional linear tax system** tax paid is proportional to income. This means that the MTR equals the average tax rate (ATR) at all levels of income.

**Linear tax**
Has a constant marginal tax rate at all levels of income. It may be proportional or progressive

In a **progressive linear tax system** MTR is again constant but ATR increases with income. This can be achieved by combining a uniform lump sum grant ($G$) to all individuals along with a proportional income tax. The grant that individuals receive in this system is sometimes described as a **negative income tax**.

In Figure 23.2a, the MTR is the slope of the tax schedules. The steeper the slope, the higher is the MTR. Panel (b) shows the MTRs and ATRs for the progressive and proportional tax.

On the other hand, a **non-linear tax structure** is defined by varying MTRs. Figure 23.3a shows a non-linear tax schedule. Figure 23.3b shows the equivalent ATRs and MTRs. The effective MTR for low–medium earners is often high as they lose benefits as well as paying taxes as their income increases.

**Negative income tax system**
A tax system that includes income grants as well as taxes

All tax schedules have two basic features: efficiency and equity. Efficiency is a function of marginal tax rates. Individual decisions, and hence resource allocation, depend on the relevant MTR. On the other hand, equity depends on average tax rates. The tax that a person pays is a function of her income and ATR. Therefore, an optimal income tax system must aim to combine low MTRs that are efficient along with increasing ATRs that are equitable.

**Non-linear tax structure**
Contains varying marginal tax rates

Now consider the implications of proportional and progressive linear tax schedules. As shown in Figure 28.2, for all levels of income MTR is higher with a progressive tax than with a proportional tax. It follows that, for any amount of tax revenue and any linear tax structure, the deadweight loss (DWL) will generally be greater with a progressive tax than with a proportional tax. On the other hand, ATR rises with income with a progressive tax but not with a proportional tax.

In practice, most tax schedules are non-linear with varying MTRs. This is likely to be equitable but may result in significant efficiency costs. In an optimal tax structure, the ATR for high-income earners should be maximised to achieve equity, but the MTR minimised to achieve efficiency. The task of optimal tax studies is to find the best compromise. As we will see this has led some analysts to conclude that a progressive linear system could be preferred.

# Optimal Taxation of Income

In this section we discuss separately the optimal taxation of income from labour and from capital as they raise different issues, albeit that equity may be concerned with total income.

## Optimal taxation of labour income

Most formal economic analysis of optimal income tax focuses on labour income. We follow this approach and discuss optimal linear and non-linear tax systems respectively. With a **linear tax system,** the tax revenue available to pay for public goods ($R$) after paying the basic grant ($G$) to all adults ($N$) equals:

$$R = tY - NG \tag{28.1}$$

where $Y$ is aggregate taxable income. If $G$ is zero, this is a proportional tax system. If $G$ is positive it is a progressive linear tax system. If grants are paid, this is known as a negative income tax system. The optimal tax problem is to determine the values of $t$ and $G$ that maximise social welfare, subject to various constraints.

Formally the aim is to maximise social welfare subject to four constraints shown in Equations 28.3 to 28.6.

| | | |
|---|---|---|
| $W = W(u_1 \ldots u_n)$ | the social welfare function | (28.2) |
| $R + NG = \Sigma_i t w_i h_i$ | government revenue requirement | (28.3) |
| $u_i = u(y_i, l_i)$ | individual utility functions | (28.4) |
| $y_i = w_i h_i (1 - t) + G$ | individual income ($y_i = c_i$) | (28.5) |
| $l_i = T - h_i$ | time constraint | (28.6) |

where $y$ is individual income, $c$ is consumption, $l$ is leisure, $h$ is hours of work, $T$ is time, there are $i = 1 \ldots n$ members of the community and the other variables are as before. The solution depends upon the specifications of the social welfare function (SWF) and individual utility functions. The other three equations are identities. Critically, labour supply is determined by maximising individual utility (Equation 28.4) subject to Equations 28.5 and 28.6. In this model, labour is the only source of income and there are no savings or income from savings.

In a classic study of an optimal linear income tax, Stern (1976) adopted the SWF:

$$W = \frac{1}{(1-\epsilon)} \int_0^x u(c, l)^{1-\epsilon} f(w) \mathrm{d}w \tag{28.7}$$

where $\epsilon$ is an equity parameter and the other variables as above. This SWF is similar to the general SWF in Chapter 7 (Equation 7.6). In Stern's model, individuals have a common constant elasticity of substitution utility function:[1]

$$u(c, l) = \left( \alpha (T - h)^{-\mu} + (1 - \alpha) c^{-\mu} \right)^{-\frac{1}{\mu}} \tag{28.8}$$

where $\mu = (s\text{-}1)/s$ and $s$ is the elasticity of substitution, $\alpha$ is the share parameter, and their budget constraint is $c = wh(1–t) + G$, which is similar to Equation 28.5. Stern calculated the results for various assumptions about government revenue requirements, labour supply elasticities and equity parameters. For example, given a general revenue requirement of 20 per cent of GDP, a compensated labour supply elasticity of 0.4 and $\epsilon = 2.0$, Stern estimated an optimal constant MTR of 54 per cent. But even with this high MTR, the estimated minimum grant income is only one-third of average income. The results are very sensitive to the equity parameter. With the same set of assumptions but with no specific equity allowance in addition to allowances for the falling marginal utility of income (i.e. $\epsilon = 0.0$), the optimal MTR falls to 25 per cent.

Atkinson (1995) also estimated an optimal linear tax. He assumed a SWF where the social value of an additional unit of income to an individual with a wage rate $w$ is proportional to $w^{-\epsilon}$, where $\epsilon$ is a measure of equity.[2] If $\epsilon$ is 1.0 the social value of marginal income is inversely proportional to a person's income. The higher the value of $\epsilon$ the greater the weight attached to a dollar going to a low-income person. Atkinson showed that, with this formulation of the redistribution objective, the optimum tax rate ($t^*$) is given by:

$$\frac{t^*}{1 - t^*} = \underset{\text{efficiency}}{\frac{1}{\eta_{cs}}} \underset{\text{equity}}{\left[ 1 - \left( 1 + v^2 \right)^{-\varepsilon(1+\eta_{cs})} \right]} \tag{28.9}$$

[1] A utility function with a constant elasticity of substitution has the property that the ratio between the proportional changes in relative quantities (of consumption and leisure) and the proportional changes in their relative prices is always the same.

[2] Atkinson used the expression $w^{-y}$, but for consistency of expression we use $\epsilon$ for the equity parameter here.

where $\eta_{cs}$ is again the compensated labour supply elasticity, $v$ is the coefficient of variation in wage rates and $\epsilon$ is the equity parameter.[3] This formula indicates that efficiency is related solely to the elasticity of the compensated labour supply. The larger this elasticity the greater is the DWL due to taxation and the lower the optimum tax rate.

In this formulation, the equity component depends on the values of $v$, $\epsilon$ and $\eta_{cs}$. The greater the inequality of incomes and the higher the value of $\epsilon$, the higher is the optimum tax rate. Assuming a conservative equity value of 0.5 for $\epsilon$, a coefficient of variation of wages of about 0.4 and a labour supply elasticity of 0.3, the optimal MTR would be 21 per cent. However, this makes no allowance for the government's general revenue-raising requirements. This requirement, say 20 per cent of GDP, cannot simply be added to the optimum tax rate that results from Equation 28.9.

All such studies seek to maximise social welfare subject to a government budget constraint. Most studies test the sensitivity of the optimal constant MTR to variations in government's general revenue requirements, the labour supply function and the equity parameter. The range of results is wide. The studies find that the optimal tax rate varies from as low as 17–18 per cent (with no general revenue requirement) to 70–80 per cent when the labour supply elasticity is very low and the equity parameter is high. However, common findings are that the optimal MTR is higher for:

- a high government general revenue requirement;
- greater inequality in pre-tax wages;
- high values of $\epsilon$, the degree of concern for inequality; and
- low values of the compensated elasticity of labour supply.

**Optimal income tax with a non-linear taxation system.** Many studies have examined optimal tax rates with a non-linear tax structure following a similar approach, that is, by maximising social welfare as embodied in a SWF subject to various constraints. However, the studies have produced conflicting results. Some find that the optimal MTR should be an inverted U-shape with low MTRs on both low and high incomes. The logic here is that, for equity reasons, individuals on very low incomes should lose very little of the marginal dollar received and for efficiency reasons individuals with high marginal productivity should not be discouraged from working, while taxes on medium levels of income have less impact on marginal labour supply. Others have found that a U-shaped schedule, with high effective MTRs (allowing for loss of grants) on low and high incomes, is optimal. The logic here is that grants should be highly targeted and withdrawn rapidly as income increases and that equity requires high MTRs on high-income individuals.

In an early study of a non-linear tax structure, Mirrlees (1971) found that the MTR for the person with the highest income should be zero. At the margin, she will be indifferent between work and leisure, so no extra revenue is gained by raising her MTR above zero and there is no reason to distort her labour supply decision. This conclusion that the MTR at the top income should be zero has little practical value because it applies only to the highest income. More usefully, Mirrlees calculated complete optimal income tax schedules for various specific cases. These results indicated a slight decline in the MTR over most of the income distribution. However, the decline is so slight that the optimal income schedule approximated a linear tax schedule (i.e. a constant MTR).

Some other studies support Mirrlees' general findings. For example, Tuomala (1990) found that rapidly declining MTRs are desirable. Slemrod *et al*. (1994) examined a tax system with

[3] For this case study Atkinson assumed a constant elasticity of labour supply and that the variation of wage rates was lognormal. Wages were the only source of income.

two MTRs and concluded that individuals in the higher income bracket should face a lower MTR than those in the lower income bracket. The finding is based on the estimated labour supply elasticity of high-income individuals such that a lower MTR increases both labour supply and tax revenue (and so increases benefits to low-income households). Although MTRs fall in their model, ATRs rise with income so that their tax structure is progressive. In general, if an equal amount of tax can be raised with a lower MTR, the lower MTR is preferred because it minimises the DWL. High-income individuals achieve a higher level of utility with no loss of revenue to the low-income group.

On the other hand, studies by Diamond (1998) and Saez (2001) found that a U-shaped tax schedule could be optimal and preferred to a linear tax schedule because of its greater ability to redistribute income. This ensures a targeted distribution of grants. The results are sensitive to assumptions about the market distribution of income, labour supply elasticities (assumed to be low in the benefit phase out income region) and the government's redistributive tastes.

**Conclusion.** With perfect information and no tax administration costs or avoidance activity, a non-linear (labour) income tax would dominate a linear income tax as a variable MTR would be more efficient and more equitable than a single MTR. However, the benefits of a non-linear system depend on the distribution of labour income, labour supply elasticity and the importance attached to equity relative to deadweight losses.

In a review article, Heady (1996) concluded that a linear tax schedule is generally a reasonable approximation of an optimal tax schedule, with non-linear tax schedules providing only small welfare gains. A linear income tax has a high administrative convenience, especially the ability to withhold taxes from multiple sources. It can also achieve significant redistribution. If combined with personal tax allowances it can also be progressive over most of the income distribution.

Finally, we should note that the analyses above deal only with labour income. Personal income tax is more complicated when it includes taxation of income from capital.

## Optimal taxation of income from capital

Taxation of income from capital (such as rents, term deposits and shares) is controversial. Some economists (see Mankiw *et al*. 2009) contend that income from capital should not be taxed, especially income from new capital. There are three main reasons for this. First, a tax on capital is a tax on capital equipment which is an input to the production of future output. This raises interest costs, reduces investment and distorts production away from capital goods. This is contrary to the Diamond-Mirrlees result discussed later in this chapter that intermediate goods should not be taxed. Second, as we saw in Chapter 27, a tax on income from capital discriminates against deferred consumption and distorts inter-temporal consumption choices. Third, as we will see in Chapter 31, in a small open economy country some of the tax on foreign capital is borne mainly by workers in the local economy.

However, there are strong counter arguments, many of which are made by Auerbach (2006). First, taxation of income from existing (old) capital and taxation of pure economic profits has no deadweight loss. Second, taxation of income from capital, including corporation tax, provides for up to a quarter of all tax revenue in many countries. If this tax revenue were forgone, most of the revenue would have to be obtained by increasing some other distortionary tax, such as taxation of labour income. Third, taxation of income from capital is usually equitable because the income accrues to higher income persons, though not always as it also accrues to elderly non-income earning individuals.

On the whole, the arguments for taxation of income from capital seem to be stronger than the arguments against it. However, there may be a case for exempting from taxation normal returns to new capital and for reducing taxation on international capital. As we will see, recent major tax reviews in the UK and Australia, have recommended reforms along these lines.

# Optimal Commodity Taxation

In this review of commodity taxation, we start by describing an efficient commodity tax system. This is the commodity tax system that would minimise the DWL of commodity taxes for any revenue target. We will then review equity issues.

In Chapter 27 we saw that the DWL of commodity taxation rises with the elasticity of demand or supply. It follows that, to minimise DWL, higher taxes should be imposed on goods in inelastic demand or supply. Further, to minimise the total DWL of commodity taxes the taxes should be set so that the marginal DWL from the last dollar of revenue raised from each commodity is equal. If this is not so, total DWL can be reduced by raising the tax rate on the commodity with the smaller marginal loss and by reducing it on the commodity with the higher marginal loss. To find the tax rates that equate the marginal DWL for each commodity, we need to determine (1) the quantity changes that result in the lowest total DWL and (2) the tax rates that produce these quantity changes.

Consider a simple example of DWL shown in Figure 28.4. The compensated demand curve is linear and there is a constant marginal cost curve. The DWL from a unit tax ($T$) on commodity $X$ (area $ABC$) equals:

$$DWL = 0.5T\ (X_1 - X_2) = 0.5T\ \Delta X \tag{28.10}$$

where $\Delta X$ is the change in $X$ consumed. Given that tax revenue is $TX_2$, the ratio of the DWL to revenue raised is:

$$\frac{Deadweight\ loss}{Revenue\ raised} = \frac{0.5T\Delta X}{TX_2} = \frac{0.5\Delta X}{X_2} \tag{28.11}$$

If there is no tax initially and a small ($1) unit tax is imposed, Equation 23.11 can be interpreted as the ratio of marginal DWL to marginal revenue.

A similar equation would apply to other commodities $Y$ and $Z$. Therefore, to equate the marginal DWLs of the last dollar of revenue raised for each commodity, the following equality must hold.

$$\frac{0.5\Delta X}{X_2} = \frac{0.5\Delta Y}{Y_2} = \frac{0.5\Delta Z}{Z_2} \tag{28.12}$$

where $Y_2$ and $Z_2$ are the amounts of $Y$ and $Z$ consumed after the marginal tax is imposed.

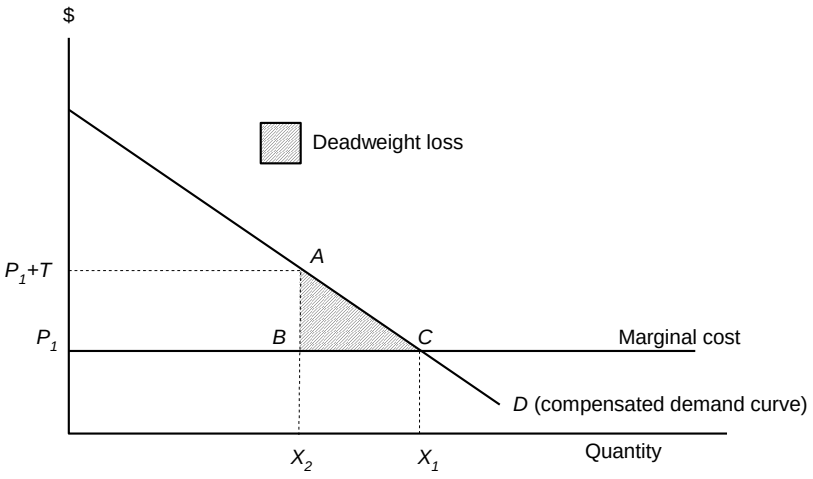



**Figure 28.4 Deadweight loss revisited**

Multiplying Equation 28.12 by two produces:

$$\frac{\Delta X}{X_2} = \frac{\Delta Y}{Y_2} = \frac{\Delta Z}{Z_2} \tag{28.13}$$

**The equi-proportional principle.** Equation 28.13 implies that, to minimise the DWL of a set of commodity taxes, the percentage reduction in the quantity of each commodity consumed must be the same. Strictly speaking, this is true for small changes where $X_2$ is close to $X_1$ etc.

Ramsey (1927) showed that, if there are no income effects and if demand curves are linear, a given amount of revenue is raised from selective commodity taxes with least DWL when taxes produce equal proportional reductions in the consumption of each good. Although these are strong conditions, Atkinson and Stiglitz (1980) show that the principle of equal proportional reductions has quite general application.

**The inverse elasticity rule**. To determine the tax rates that are consistent with this equi-proportional principle, recall the standard demand equation:

$$\frac{\Delta Q}{Q} = \eta_{cd} \frac{\Delta P}{P} \tag{28.14}$$

where $\eta_d$ is here the compensated demand elasticity. Now if $\Delta Q/Q$ is held equal to a constant $k$ for all commodities as required by Equation 23.13, it follows that

$$\frac{\Delta P}{P} = k \frac{1}{\eta_{cd}} \tag{28.15}$$

where k reflects the revenue requirement. Note that $\Delta P/P$ is the tax rate ($t$). Equation 28.15 implies that, to achieve equal proportional changes in consumption, prices must be increased in inverse proportion to the compensated elasticity of demand. This is known as the inverse elasticity rule.[4] It follows that, to minimise DWL, tax rates should also be inversely proportional to the compensated demand elasticities. Tax rates should not be uniform. They should be higher for commodities with a low elasticity of demand.[5,6]

We have assumed so far that the supply of commodities is perfectly elastic. If supply is included in the analysis, the efficient tax rate ($t^*$) is:

$$t^* = T/P = k\ (1/\eta_{cd}\ + 1/\eta_s) \tag{28.16}$$

where $T$ is the per unit tax, $P$ is the producer price after the tax has been levied, $k$ is the proportionality factor that depends on the total revenue that government seeks to raise and $\eta_s$

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[4] These results are similar to the optimal price mark-up rule to achieve a financial result in Chapter 17.

[5] The exposition in the text broadly follows Rosen and Gayer (2014, pp. 349-51, see footnote). Rosen and Gayer show that the result can be obtained more rigorously as follows. Suppose the welfare objective is to minimise total excess burden from two commodities subject to a revenue constraint. The total excess burden for two commodities $X$ and $Y$ is $0.5\,\eta_x P_x X t_x^2 + 0.5\,\eta_y P_y Y t_y^2$, where $t$ is the tax rate. The revenue constraint is $P_x X t_x + P_y Y t_y = R$, where $R$ is the required revenue. The problem is to choose $t_x$ and $t_y$ to minimise the total excess burden subject to $R - P_2 X t_x P_y Y t_y = 0$. Set up the Lagrangian expression:

$$L = \frac{1}{2}\eta_x P_x X t_x^2 + \frac{1}{2}\eta_y P_y X t_y^2 + \lambda[R - P_x X t_x - P_y Y t_y]$$

where $\lambda$ is the Lagrange multiplier. Setting $\delta L/\delta t_x = 0$ yields $\eta_x t_x = \lambda$ and $\partial L/\partial t_y$ yields $\eta_y t_y = \lambda$. Hence $\eta_x t_x = \eta_y t_y$. This implies that tax rates should be inversely related to elasticities.

[6] Strictly this rule applies only if goods are unrelated in consumption, i.e. the compensated demand for each commodity is independent ( the cross-price elasticities are zero). The implications of non-zero cross-price elasticities are usually considered to be minor.

is the supply elasticity. When supply is perfectly elastic ($\infty$), the efficient tax rate is inversely proportional to the elasticity of compensated demand.

## Other efficiency considerations

In practice Ramsey's inverse elasticity of demand theorem has limited application to taxation as distinct from optimal price mark-ups for public utility pricing. The theorem was designed to show how to raise a given revenue target from a limited set of commodity taxes. However, for any given revenue target a limited set of taxed commodities must always have higher tax rates (and therefore higher DWL) than a broader set of taxed commodities with lower tax rates. Given that most developed economies other than the United States have a general consumption tax (although with quite large exemptions), the technical and policy question is whether to adopt differential commodity taxation with a broad-based consumption tax.

There are two main arguments for adopting a uniform commodity tax. Technically, under certain conditions a uniform commodity tax is efficient. The literature here is quite complex (see for example Deaton, 1979) but the underlying idea is that if a uniform commodity tax does not change either individuals' proportionate allocation of income to goods or the amount of leisure they take, then a uniform commodity tax is non-distorting. Secondly, administrative simplicity points against detailed differential commodity taxation. Comprehensive specific commodity taxes would require detailed knowledge of compensated demand elasticities, which are generally not well known. The administration and compliance costs of a differential commodity tax system would be much higher than for a uniform commodity tax. Differential commodity taxes are also open to business and political manipulation.

A uniform, or indeed, any tax on consumption may discourage work relative to leisure. However, it is hard to tax leisure. To deal with the work–leisure distortion, Corlett and Hague (1953) proposed that goods that are consumed jointly with leisure (e.g. sporting goods) should be taxed more highly than other goods such as food and clothing, which could indirectly reduce the demand for leisure. While this would be efficient, it is unlikely that any tax authorities have tried consciously to implement such a strategy. However, in so far as they tax luxury items more heavily than necessities, they may have stumbled towards it.

A different issue arises with externalities and demerit (or merit) goods. As we have seen, there are strong arguments for taxing negative externalities like carbon emissions and traffic congestion and for taxing demerit goods like tobacco and possibly drugs of various kinds. There may also be arguments for subsiding or lower taxes on merit goods like gymnasiums or fitness providers.

These kinds of considerations have led many economists, notably including the influential Mirrlees Review (MR, 2011) of taxation, to advocate basically a uniform commodity system with exceptions only for major externalities and demerit goods.

## Equity issues

The inverse price elasticity rule for efficient commodity taxation states that goods in inelastic demand should be more highly taxed. However, this may not be equitable. Price elasticities may be low for necessities like basic foods and transport and high for luxuries such as fillet beef and sailing boats. This observation is often used as an argument against application of the inverse price elasticity rule.

This argument is sometimes extended. Arguably, for equity reasons, goods that are consumed heavily by the poor should bear lower tax rates. If low-income households spend a greater proportion of their income on food, for example, than do high-income households then a tax on food is regressive. This view has led to adoption of zero taxation of many goods, notably food and health services, in the VAT or GST commodity tax systems in many countries.

However, there are major counter arguments. The most important one is that commodity taxation is only part of an overall tax system. As Kaplow (2008), MR (2011) and many other economists have argued, income taxation can meet any redistributive goals including any inequities that may arise from commodity taxation. Moreover, it is better at meeting these goals. Income taxation can be targeted on income levels adjusted for household differences. Commodities are often purchased by a wide variety of households. In addition, any loss of tax revenue from these exemptions has to be compensated from other tax sources, often raising the MTR and creating efficiency costs. Differential commodity taxation also complicates administration and compliance with all the associated administrative and legal expenses.

# Taxes on Producer Goods and International Trade

Many governments tax producer goods (intermediate goods traded between producers) and internationally traded goods. Taxes on companies are administratively convenient and can raise a large amount of tax revenue from relatively few tax sources. Taxes on imports protect labour and capital in competitive domestic sectors. On the other hand, taxes on exports increase the local supply of goods and thus help to control local prices.

Despite these arguments, taxes on producer and traded goods are poor taxes. Consider first **producer goods**. As Diamond and Mirrlees (1971) demonstrated in an often-cited article, people's level of welfare depends on the income they receive from selling labour and capital and the prices they pay for the goods they consume. Government can control the prices of final goods independently of the prices of intermediate goods and, subject to behavioural responses, can achieve any desired distribution of real income. Government cannot improve welfare further by taxing intermediate goods.

On the contrary, taxing producer goods is likely to distort relative prices of inputs to the production process and reduce productive efficiency and hence welfare. As seen in Chapter 3, productive efficiency requires that the marginal rate of technical substitution between any two inputs is the same for all firms that use those inputs and that the marginal rate of transformation between any two outputs is the same for all firms producing those outputs. To achieve this, the prices of producer goods should reflect their real opportunity cost. Any tax on producer goods will distort relative prices and break the requirements for productive efficiency. It also distorts corporate structure because inter-company transactions are taxed whereas intra-company transactions are not. Turnover taxes increase the tax on small companies that buy and sell each other's goods. Large firms have a government-created competitive advantage because they pay less for inputs than do small firms.

It follows that government should not tax trade between firms or alter the prices that producers face in inter-firm trades. Also, government should not tax company turnover. Taxes on income (including return on capital) or consumption can achieve desired welfare outcomes more efficiently than can taxes on production. Taxes on intermediate goods are inefficient and distort production. There are also better instruments to obtain distributional objectives.

**International trade.** The production efficiency theorem also implies that a small country that has no influence on world trade prices should not tax imports or exports. International trade enables a country to convert exports into imports. This allows a country to consume more goods than it could do otherwise. Import taxes should be replaced by domestic taxes on the same goods. For any given amount of revenue raised, there will be less DWL.

Figure 28.5 overleaf demonstrates the DWL. The $S_L$ and $S_I$ schedules represent local and international supply of goods respectively. With no tariff the price would be $P_1$ and $Q_1$ amount of goods would be consumed, with $Q_4$ goods supplied locally. With the tariff shown, the price would rise to $P_2$ and consumption would fall to $Q_2$, with $Q_3$ goods produced locally. The government would collect $ABED$ in tariff revenue, but this would be a transfer from

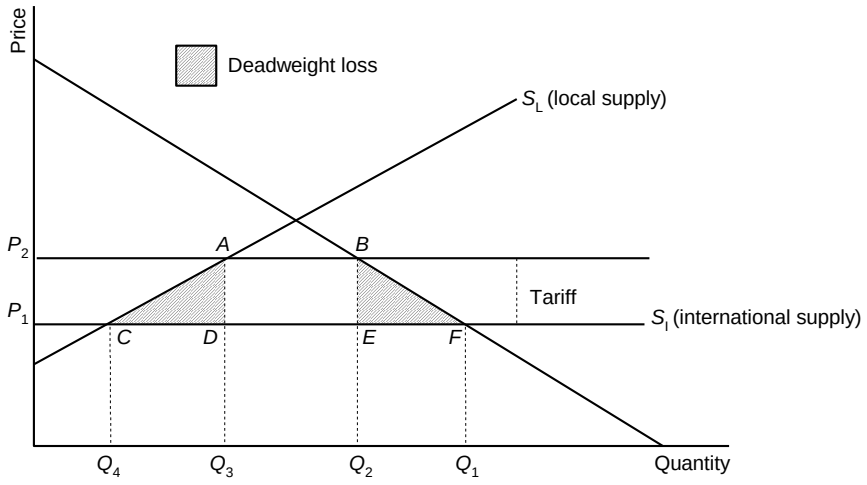


**Figure 28.5 Deadweight loss of tax on international trade**

consumers to government. The DWL would be the sum of triangles *ADC* (inefficient production) and *BFE* (loss of consumer surplus).

These conclusions about non-taxation of intermediate goods and international trade depend on certain assumptions. First, wages are flexible, and removal of trade distortions does not create unemployment. If wages are inflexible, they may not reflect true opportunity costs. Second, firms are competitive and do not make economic profits (these are profits over and above a normal return to capital). Alternatively, government can tax economic profits (as distinct from accounting profits). Third, the country is a price taker. Taxes on trade can improve a country's real income when a country is a price maker rather than price taker. Fourth, government can tax incomes on final goods in such a way as to produce the desired social welfare outcome, including compensation in some cases for workers who would lose from policy changes such as a reduction in import duties.

Arguably, if one or more of these assumptions do not hold, there may be a case for taxation of producer goods or international trade, or both, especially when the administrative costs of such taxes are low. However, given that taxes on producer goods and international trade almost always reduce productive efficiency, proponents of such taxes need to show that the welfare gains more than offset the economic losses.

# An Optimal Tax System

The analysis of optimal taxation above is limited in several ways. First, income and consumption taxes were analysed as separate systems. Fundamentally, what matters is the efficiency and equity of the tax system overall. Individual taxes do not need to be equitable if the system overall is equitable. Second, our analysis of income taxation focused on taxation of labour income. This did not fully resolve the appropriate taxation of income from capital. An optimal tax system needs to consider how to treat savings and, more formally, how to maximise social welfare over time.[7] Third, only light consideration was given to administration and compliance costs. Fourth, we ignored political factors. For example,

[7] Atkinson and Stiglitz (1980, Chapter 14) discuss a formal approach to determining optimal taxation in an inter-temporal model.

differential commodity taxation creates opportunities for rent seeking (by obtaining favourable tax rates) by special interest groups. Some public choice economists argue that, given the tendency of government to act as Leviathan, welfare is maximised by limiting the power of government, including limiting available tax instruments.

In this section we review the major features of the main tax instruments (albeit as separate instruments) and then discuss how these instruments might be combined to create an overall optimal tax system.

## Main tax options

Table 28.1 overleaf shows the main tax bases and options along with some comments on advantages and disadvantages. The comments are only indicative of possible effects. The merits or otherwise of a tax often depend on the circumstances and on how it fits in a package of taxes.

An individualised **head tax** based on ability would be equitable but is not feasible. A uniform head tax would have no DWL but have low revenue-raising capacity because it is constrained by the income of the least well-off taxpayer and inequitable. Thus, the main tax bases are income, consumption and wealth.

A general **income tax** would tax all sources of income at the same rate. The tax structure could be linear or non-linear. In practice, most income tax systems are hybrids. They tax income from different sources at different rates and have non-linear tax structures.

Four forms of **consumption tax** are identified. There are three forms of general consumption tax. These are an expenditure tax (a tax on all income less saving), a general consumption tax (GST or VAT) with investment goods excluded and a general retail sales tax. As we saw in Chapter 26, a general consumption tax is equivalent to a tax on labour. An expenditure tax could have a linear or non-linear tax structure. Despite its potential efficiency and equity advantages, such as tax has never been implemented. A VAT system usually has high compliance costs. On the other hand, with a retail tax it can be difficult to distinguish consumer goods from producer goods. In practice, commodity taxation is usually a hybrid differential tax system, with some commodities not taxed and others taxed at various rates.

**Wealth** taxes are taxes on the capital value of assets. Taxation of land and natural resources is common. It is sometimes easier to tax wealth (such as property values) than income or consumption. However, taxes on income or consumption can achieve most outcomes that wealth taxes can achieve and taxes on wealth may represent double or even triple taxation.

## Features of an optimal tax system

In principle, a complete optimal tax system can be modelled as an exercise in social welfare optimisation, designed to balance efficiency and equity, subject to work–leisure preferences and present–future consumption preferences and so on (see for example Atkinson and Stiglitz, 1980). However, the results are sensitive to assumptions about (1) income differences between households, (2) the structure of household preferences over commodities and leisure, (3) the tax instruments available, including negative tax policies and (4) the nature of the social welfare function, including equity preference.

Nevertheless, some key principles emerge from the many reviews of optimal taxation.

1. All taxes should be viewed as part of an overall taxation system. Moreover, because direct personal income taxes and benefits can be designed to achieve any desired distributional outcomes, other tax instruments should be designed to achieve efficiency.
2. Normal returns to new capital investment should be exempt from income taxation.
3. Taxation should be comprehensive and neutral. A broad tax base reduces tax rates. To avoid distortions, similar activities and goods should be taxed in a similar way.

**Table 28.1 Main tax instruments with some advantages and disadvantages**

| *Tax instrument* | | *Possible advantages* | *Possible disadvantages* |
|---|---|---|---|
| **1** | **Head tax**<br>Individualised on ability or uniform | If tax individualised on ability, equitable and efficient | Individualised head tax not feasible<br>Uniform head tax not equitable and has low revenue raising capacity |
| **2** | **Income tax on labour and capital** | Can be based on personal income and other individual circumstances | Taxes labour supply and other factors of production<br>Distorts inter-temporal consumption decisions<br>Encourages non-market activity |
| 2a | Linear general income tax<br>Taxes equally all sources of income<br>Can include negative income tax and be progressive | May distort less than a partial income tax system<br>Low administrative cost<br>Low compliance costs | May be less equitable than more progressive non-linear tax system |
| 2b | Non-linear general income tax<br>Taxes equally all sources of income<br>Marginal tax rates usually rise with income | May be more equitable than (2a) | High marginal rates may distort use of resources<br>May have high administration and compliance costs |
| 2c | Non-linear differential income tax<br>Taxes different sources of income, e.g. labour and different types of capital, at different rates<br>Marginal tax rates usually rise with income | By treating savings differentially may be more efficient and equitable<br>May be more equitable generally than (2a) and (2b) | Can significantly distort income-gaining activities and investments<br>High marginal rates inefficient<br>Higher administration and compliance costs than (2a) or (2b)<br>May encourage rent seeking |
| **3** | **Consumption taxes**<br>General consumption tax is equivalent to taxation of labour income | Do not distort inter-temporal consumption | Tax labour supply indirectly<br>Can be based only indirectly on individual circumstances<br>Encourage non-market production |
| 3a | General expenditure tax<br>Tax on all forms of income less saving<br>Can be linear or non-linear | Treats savings efficiently and equitably<br>Treats all income in same way<br>Can be implemented equitably | More difficult to administer than general income taxes |
| 3b | General value-added tax<br>Taxes value added at all stages of production for all consumption goods at same rate but usually exempts investment expenditures | May capture income that would otherwise evade tax | Discourages market production (encourages home production)<br>High compliance cost |
| 3c | General retail tax<br>Taxes all goods at the same rate but only at retail stage | May capture income that would otherwise evade tax | Discourages market production<br>Difficult to distinguish between retail and non-retail purchases |
| 3d | Differential commodity taxes<br>Taxes commodities (by VAT or at retail stage) at different rates | Corrective taxes are efficient<br>May be equitable | May be neither efficient nor equitable<br>High compliance costs<br>Encourages rent seeking |
| **4** | **Wealth taxes**<br>Often imposed at differential rates on different assets | Efficient if taxes on fixed assets<br>May be more equitable than other forms of taxes | May discourage investments<br>High taxation of savings |

4. Tax revenue is raised most efficiently by taxing factors of production or goods with inelastic supply or demand respectively. This implies that fixed resources may be taxed efficiently. Labour with a high elasticity of supply should be taxed lightly at the margin.
5. Producer (intermediate) goods should not be taxed.
6. Taxes should be targeted at problems. Thus, major negative externalities or demerit goods may be taxed.
7. To avoid distortions and minimise administration, tax should be as simple as possible. Any advantages of differential taxes should be weighed against complications such as defining and policing boundaries. Thus, there should be few departures from general uniform taxes.

The highly credentialed Mirrlees Review (MR, 2011) of taxation in the UK drew essentially on these principles. Their conclusions form the basis of the following description of an optimal tax system.

MR recommended that the tax system should be progressive and neutral (non-distorting). The idea that the tax system overall should be progressive is of course a normative one but an idea that doubtless has widespread public support (although apparently not from the Tea Party in the United States).

For the income tax, MR recommended that there should be a simple and clear progressive tax rate schedule. This would include a single benefit to support those with low income and/or high needs. There would then be two or at most three rising tax rates (as distinct from one MTR). However, the schedule could reflect evidence of responsiveness to tax rates especially where the rates could not affect behaviour. Thus, there could be lower MTRs for mothers of school age children and for people around retirement age.

Income from all sources of labour and all sources of capital should be taxed according to the same rate schedule. Taxation of capital and labour at a similar rate maintains their relative prices, reduces distortionary substitution of one factor for another and encourages an efficient allocation of both labour and capital. It also discourages high-income individuals from adopting artificial schemes to convert income into capital or vice versa to reduce tax.

However, all costs of generating income, including the normal cost of generating savings, would be deductible. MR would allow savers to deduct the opportunity cost of the capital, defined as the return on a government bond rate, from their return on capital. Thus, there would be no tax on the normal return on capital. This system would allow capital to be taxed at the same rate as labour but avoid the double taxation of savings without all the *ad hoc* tax reductions given to savings in many tax systems, including the Australian tax system.

Turning to commodity taxes, it may be asked why they are needed if income tax can provide sufficient revenue. One reason is that they treat income from savings equitably with income from labour. However, we have just seen that there are other ways of treating savings fairly. Second, commodity taxation captures some income that would otherwise evade tax. In practice, if not in the ideal world of optimal tax, many people arrange their affairs, legally or otherwise, to escape tax. Thus, commodity taxation can contribute to a more equitable tax outcome. Third, consumption taxes affect labour supply less directly than income taxes. Assuming some fiscal illusion, for given revenue a combination of consumption and income tax may distort the labour supply by less than income tax does.

With regards to the structure of commodity taxation, MR takes as a starting point that a uniform commodity tax (via VAT or GST) should be charged on all final consumption by households. A broad taxation base lowers tax rates. There should also be equivalent taxes on hard-to-tax housing and financial services. Zero and reduced rates of tax on sales of commodities would generally be avoided. There may be lower taxes (or some equivalent benefits) for child care and educational investments and higher taxes on tobacco or alcohol. But the list of exceptions should be small. General differential taxation of commodities is too

difficult. Taxes to correct market failures or taxes on damaging goods are also justified. MR picks out carbon and congestion taxes. On the other hand, there should be no taxes on business inputs, business turnover or transaction taxes.

Finally, turning to taxes on wealth, MR argues that there is a strong case for taxing pure economic rents. These taxes are not distorting. Thus, a tax on land is justified if this can be separated from buildings and from improvements to land. Carefully designed taxes on natural resources may also tax pure economic rents. MR also supported on equity grounds taxing transfers of wealth, gifts and bequests, particularly between generations. However, the review noted that there are significant practical difficulties.

As shown in Box 28.1, the Henry Tax Review (2010) in Australia produced similar recommendations to the MR recommendations.

# Tax Reform

Optimal tax principles and recommendations provide critical guides to tax reforms. However, there are some special problems in implementing tax reforms. We discuss these problems immediately below before discussing some strategic responses.

First, we note a technical problem. A key feature of tax reform is that it involves a choice between two or more highly imperfect systems. From the second-best theorem we know that when an economy has two or more distortions, removal of one distortion may not reduce the total DWL. Also, a change to a tax may affect have positive efficiency effects but negative equity effects or the reverse. Thus, it may not always be clear whether a tax change improves overall social welfare. In any case, reform packages may be necessary. Rather than assessing each tax reform separately, changes to the tax system should be assessed as a whole.

**Box 28.1 Key recommendations of the Henry Tax Review**

The Australian tax system has too many taxes and too many complicated ways to deliver policy objectives. The personal tax structure combined with the personal grants system should be the sole way to deliver progressivity in the tax system.

Revenue raising should be concentrated on four efficient and robust tax bases: personal income tax, business income, private consumption and economic rents from land and natural resources. Other taxes should be maintained only if they efficiently address social or economic costs. The Henry Review highlighted taxes on tobacco, alcohol and gambling, and road user charges. Over time all other taxes should be eliminated. This includes insurance taxes, payroll taxes, property transfer taxes, resource royalties, taxes on superannuation contributions in the super funds, income taxes on all government benefits, and fuel and vehicle registration taxes.

The personal income tax system would include all forms of income including employer superannuation contributions, but not government benefits. There would be a higher tax-free threshold of about $25 000 and a simple, transparent two-step tax scale beyond that. To allow for inflation there would be an arbitrary 40 per cent discount for interest income, net residential rents and capital gains.

There would be three levels of primary support payments. These would be pensions for the aged, disabled and carers, lower-rate participation allowances for those of working age, and assistance payments for young persons and students. Means-tested withdrawal rates would reflect different work expectations. Family assistance would be paid through a simplified single program.

The company income tax rate should be maintained to the lower end of small to medium OECD economies with a reduction to 25 per cent in the medium term.

The Henry Tax Review argued strongly for a broad-based land tax but rather confusingly said that there could be a threshold and different rates based on the value per square metre of land. It also recommended resource rent taxes to replace mineral royalties and road user charges to replace other vehicle and fuel taxes.

The Review also recommended that one-off consumption taxes, such as taxes on insurance, should be eliminated and that a more efficient tax on financial services be developed. Restricted by its terms of reference, the Review did not recommend any changes to the GST that currently covers less than 60 per cent of all final goods and services.

Second, related to the first point but perhaps more important in practice, tax reforms will nearly always produce winners and losers. Many of the losers may oppose the tax change. If a tax reform generates an aggregate net welfare gain, it should be possible to compensate losers where this is deemed appropriate. When the fringe benefits tax was introduced, income tax rates were reduced. When the GST was introduced, pensions were increased and various state taxes were eliminated. Thus, both efficiency and equity can be achieved.

However, compensation can be difficult in practice. For example, a carbon tax (even with some exceptions) will affect millions of individuals in some way. It would be hard to achieve full compensation. For a start, the winners and losers may not always be clear. This occurs especially when gains or losses are capitalised. Capitalisation occurs when changes in asset values reflect the impacts of any actual or expected taxes on the after-tax income stream. Asset prices adjust so that investors obtain a similar after-tax return on assets of similar expected risk. Note that asset prices reflect expected tax changes. Introducing an unexpected tax on an asset may be viewed as unfair to investors who have paid a high price for an asset. It is also important that compensation does not set up distorting incentives. Finally, introducing taxes without compensation is especially difficult with short three-year political cycles as applies to the Australian government.

Third, multi-government systems or fiscal federalism are a major obstacle to tax reform. The Australian government collects 80 per cent of all taxes and consequently dominates policy making at sub-national as well as at national level. The recommendations of the Henry Tax Review could increase this already excessive vertical fiscal imbalance. The Review recommended abolishing a raft of state and territory taxes including payroll, royalty, insurance, property transfers and motor vehicle taxes and it is not clear how these will be replaced by an extended land tax (assuming this remains a state tax) and road user charges. The Review was remarkably light on how vertical fiscal imbalance would be addressed.

**Strategies for tax reform.** What strategies for tax reform emerge? First, tax reform needs to be based on clear principles and a good road map. The Mirrlees and Henry tax reviews provided both principles and a road map. Related to this, tax reform should be viewed and assessed as part of a tax system.

Moreover, both the Mirrlees and Henry reviews recommended that distributional objectives be achieved wholly through the income tax and transfer system and that all other taxes should be assessed against efficiency criteria. Acceptance of these principles is a major constructive first step towards tax reform.

Second, once these principles are agreed, the next step is to design a workable and simple income tax/transfer system that meets at least most of the distributional objectives. This is likely to be a progressive system but one with relatively few tax rates. To be efficient, income would be defined to include most, or all, components of income. Some deduction for the costs of earning income, including child care and costs of savings, as per MR, may be allowed.

Third, the tax reform program would identify and progressively eliminate the taxes with the highest deadweight losses. The consumption tax base would also be broadened to minimise tax rates, since deadweight losses rises by the square of the tax rate. For administrative and compliance simplicity, the tax rate structure would be fairly uniform other than for some important exceptions.

Fourth, the transition to the new tax system may have to include income compensation for clear cases of hardship or inequity. One way in which this can be done is by slow transition. This reduces inequity associated with unexpected tax changes. But it also risks policy stagnation or in some cases policy reversals.

## Summary

- The optimal tax system is sometimes viewed narrowly as the system that raises the required revenue at least deadweight loss. More broadly, it is the system that maximises social welfare with the optimal combination of taxes and income transfers.
- Tax systems are efficient and deadweight loss is minimised when marginal tax rates are low.
- On the other hand, equity rises with average tax rates. Thus, redistribution objectives usually involve rising marginal tax rates.
- Optimal tax rates rise with government's general revenue requirement, wage inequality and concern for equity. They fall with higher (compensated) labour supply elasticities.
- Income taxes and transfers can achieve all distributional objectives. Thus, other taxes should be designed to minimise deadweight losses.
- Some studies find that linear tax systems (those with a constant marginal tax rate) are close to the optimal form of income tax. But others find that a variety of non-linear tax schedules are optimal.
- For a selective set of commodity taxes, the deadweight loss is minimised when tax rates are inversely proportional to demand elasticities.
- However, deadweight loss is also minimised by a broader set of taxes with lower tax rates. Also, differential taxes increase compliance and rent-seeking costs. Therefore, a broadly uniform commodity tax rate is generally preferred along with corrective taxes and taxes on demerit goods.
- Taxes on producer goods and international trade are generally inefficient. Government should not alter the prices that producers face in trades between themselves or that local citizens face in trades with foreigners.
- Major tax reviews (chaired by Mirrlees in UK and Henry in Australia) found that tax should be based on four major tax bases: income (personal and business), consumption and wealth (or land and natural resources) along with some special taxes on major demerit goods and externalities. Other taxes should be eliminated.
- Most proposals for tax reform are based on base broadening, more uniform tax rates, reducing the discrimination against savings, tax simplification and rewriting tax statutes to reduce tax evasion.
- Tax reform is complicated because there are many winners and losers. Losers may receive income compensation so long as this does not produce adverse incentives. Also, the transition process may be slow, providing that this does not result in a stalled or reversed reform process.

## Questions

1. 'Distributional objectives can be achieved simply by raising marginal income tax rates.' Discuss.
2. Marginal tax rates are constant with proportional and progressive linear income tax schedules. What then is the main difference between these two schedules?
3. Income from capital should not be taxed. Discuss.
4. Why should only final goods be taxed and not intermediate goods?
5. Consider a small country which levies a tax on imports equal to \$2 per unit of import. Suppose that the supply of the domestic producer is given by $Q^s = 50 + 2P$ while domestic demand is given by $Q^d = 90 - 3P$.

   If the world price for the imported good is \$3, determine the following:

   i. The quantities supplied by domestic producers and by imports if there is no import tax.

   ii. The revenue that government raises from the tax on imports.

   iii. The deadweight loss due to the import tax.
6. The compensated demand curve for good $A$ is given by $Q^d_A = 50 - 2P$. Supply is perfectly elastic and the marginal cost of producing a unit of $A$ is equal to \$10. A unit tax of \$2 per unit is imposed on good $A$. Suppose the observed demand for a second good $B$ is $Q^d_B = 100 - 7P$, supply is perfectly elastic and marginal cost is equal to \$10. Determine the following:

   i. The change in quantity of good $A$ consumed as a result of the tax.

   ii. The ratio of the deadweight loss to revenue raised for good $A$.

   iii. The quantity of good $B$ consumed.

   iv. The tax rate to be imposed on good $B$ that will minimise the deadweight loss.

7. Some optimal tax studies find that, given a choice between income and commodity taxation, the optimal solution is complete reliance on income taxation. Should consumption be taxed as well as income in an optimal tax system? Give reasons.
8. A uniform commodity tax is simply an increase in linear income taxation. True or false? Why?
9. Draw on public choice theory to explain why most governments fail to index income taxes. Does this have any implications for optimal tax design?
10. Individuals with low incentives to work should be taxed at lower marginal tax rates. Discuss
11. What key principles do the Mirrlees and Henry tax reviews share?
12. What are some differences of substance or emphasis between the Mirrless and Henry tax reviews? What reasons might there be for these differences?
13. What are the key issues arising in tax reforms?
14. What impacts, if any, do international factors have on optimal taxation?

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