# Appendix B: What are the potential tax bases?


### Summary

This appendix relates the three tax bases of labour, capital and land, to the traditional income and consumption tax bases often discussed in the literature on tax policy. It also presents an intertemporal analysis of the traditional income and consumption tax bases.


## Factors of production

While there are at least a hundred taxes, they all ultimately fall on returns to owners of three possible factors of production; land or other naturally endowed resources (R), labour (L) or produced capital (K). The ***earnings*** of each of these factors make up the income of individuals, and when added up over the whole resident population for a given time period (t), the income of the nation (Y):

(1) $Y_t = rR_t + iK_t + wL_t$

where r is the return to resources, i is the return to capital and w is the return to labour.

This framework allows for an analysis of the relationship between the two main broad bases of income and consumption.

## Income taxation base

### Result

Comprehensive income taxation falls on the earnings of the providers of capital, natural resources and labour.

Moving closer to a comprehensive tax base treatment of income taxation has been the goal of many tax reform proposals (for example, the 1985 tax reforms), since the work of George van Schanz in the late 1890s which was further developed by Haig (1921) and Simons (1938).

According to the Schanz-Haig-Simons income definition, the income tax base is the total amount that an individual can devote to consumption in a given period (C) plus the increase in the economic wealth between that period and the next ($\Delta W$). Based on this benchmark, income is:

(2) $C_t + \Delta W$

where $\Delta W = W_{t+1} - W_t = S_t$

$W_t$ is the stock of wealth in period t and $S_t$ is the amount saved in period t for future consumption which is equivalent to the increase in wealth by definition.

Taxing income comprehensively means taxing income from all sources — land, labour and capital. This includes cash flows to individuals, such as wages, interest and dividends, as well as accruing capital gains and imputed rent from owner occupied dwellings.

The comprehensive income base can therefore be equivalently defined by (1) or (2) and the relationship is clear between the Schanz-Haig-Simons income tax base and the three tax bases of labour, capital and land:

$$(3)\ rR_t + iK_t + wL_t = C_t + \Delta W$$
$$= Y_t$$

Thus, comprehensive income taxation in the Schanz-Haig-Simons sense falls on the earnings of the providers of capital, natural resources and labour and is equivalent to a consumption tax plus a wealth tax.

## Expenditure tax base

The other potentially broad taxation base is consumption or expenditure, which can be traced back to Mill (1848) and Fisher (1937). Consumption is a component of income and can be derived by excluding changes in wealth (referred to by Fisher as 'accruals') from the comprehensive income tax base. This can be seen by rearranging (3):

$$(4)\ Y_t - S_t = C_t$$

The ideal consumption base involves domestic rents and wage labour. If there are no domestic rents, then the consumption base is effectively labour income.

### Result

A tax on consumption is equivalent to a tax on labour under strict conditions.

To illustrate this result, consider a two-period model of a closed economy (see Box B.1 for a discussion of model assumptions). In period t, assuming no existing capital or accumulated savings, income is equal to:

$$(5)\ Y_t = wL_t$$

Of this income a proportion α is saved for future consumption. Assume it is saved through the acquisition of land (R) and capital (K), such that:

$$(6)\quad S_t = \alpha Y_t = \alpha w L_t = R_t + K_t$$

### Box B.1: Generalising assumptions of the two-period model

The story as told by the two-period model in this appendix assumes (i) a starting point with no capital or accumulated saving, (ii) the rate of return equals the discount rate, and (iii) a closed economy. The equivalence of a consumption tax and a labour tax for the two-period model holds only under strict assumptions of no pre-existing savings, common tax rates across periods and no windfall gains or losses on future savings (Freebairn and Valenzuela 1998).

For the reality of prior savings, the relaxation of (i) strengthens the results of this model from an efficiency perspective. A consumption tax versus the wage tax has an efficiency dividend by taxing previous period decisions to save which cannot be reversed. That is, this form of double taxation[1] of prior savings does not alter decisions and therefore there are no efficiency losses.

For the reality of rents above the discount rate, and the relaxation of (ii), note that in the long run, rents and interest on capital or naturally endowed resources will equal return on savings, but there may be timing differences so that for sustained periods of time rents are above normal returns to capital. In such circumstances, the consumption tax base is greater than simple wage income as it captures rents.

An important qualification in relaxing (iii) and moving to an open economy is that a consumption tax is a destination base whereas a labour tax has an origin base. Thus offsetting exchange rate adjustments are required for equilibrium and similarity.[2]

Consumption in period t equals:

$$(7)\quad C_t = (1-\alpha) w L_t$$

Let savings invested in land (R) generate a return r and capital (K) generate a return i. Thus income in period t+1 is given by:

$$(8)\quad Y_{t+1} = w L_{t+1} + r R_t + i K_t$$

In period t+1, all income and savings from prior years is consumed.

1 The double taxation of the existing wealth stock in the consumption tax context is different to the concept of the 'double taxation of savings' in the income tax context (which does have an efficiency cost).

2 After offsetting exchange rate adjustments, border adjustments (as under a pure consumption tax) on balance have real but small impacts on capital flows and revenues cf Auerbach (1997) and Auerbach (2005).

$$(9)\quad C_{t+1} = wL_{t+1} + (1+r)R_t + (1+i)K_t$$

Discounted to period t dollars using rate d, this is equivalent to:

$$(10)\quad \frac{C_{t+1}}{(1+d)} = \frac{wL_{t+1} + (1+r)R_t + (1+i)K_t}{(1+d)}$$

Where there are no domestic rents (r = i = d), consumption over the two periods (in period t dollars) is equal to:

$$(11)\quad \sum C = C_t + \frac{C_{t+1}}{(1+r)}$$
$$= (1-a)wL_t + \frac{wL_{t+1}}{(1+r)} + \frac{(1+r)(R_t+K_t)}{(1+r)}$$

Substituting (6) into (11):

$$(12)\quad \sum C = (1-a)wL_t + \frac{wL_{t+1}}{(1+r)} + a\,wL_t$$
$$= wL_t + \frac{wL_{t+1}}{(1+r)}$$

From (12), we observe that the consumption base can be expressed as the present value of labour income. Therefore, in the absence of rents, a tax on consumption is equivalent to a labour tax.

## Income or consumption taxation — intertemporal analysis


### Summary

The two-period model can be extended to show that the choice of the income or the consumption tax base can affect the intertemporal pattern of revenue collections in spite of revenue neutrality.


To see this more clearly, consider the two-period model of a closed economy presented earlier. In period t, assuming no existing capital or accumulated savings, the government introduces a uniform and proportional income tax rate ($0<\tau_y<1$). The revenue collected from the income tax base ($T^y$) in period t is equal to:

$$(13)\quad T_t^y = t_y Y_t = t_y wL_t$$

A proportion α is saved out of disposable income for future consumption:

$$(14)\quad S_t = \alpha(1-t_y)Y_t = a\,(1-t_y)wL_t$$

where S is savings.

Assuming S generates a return r (no domestic rents), income in period t+1 before income tax is imposed for that year is given by:

(15) $Y_{t+1} = wL_{t+1} + rS_t = wL_{t+1} + ra(1-t_y)wL_t$

The revenue collected from the income tax base ($T^y$) in period t+1 is:

(16) $T_{t+1}^{\ y} = t_y Y_{t+1} = t_y[wL_{t+1} + ra(1-t_y)wL_t]$

Thus the present value of government revenues collected from an income tax base ($G_y$) is:

(17) $G_y = T_t^{\ y} + (1+r)^{-1}T_{t+1}^{\ y}$

$$= t_y w[(1+r)^{-1}L_{t+1} + (1+\frac{a\,r(1-t_y)}{(1+r)})L_t]$$

Compare this to the case where a uniform and proportional uniform tax rate ($0<\tau_c<1$) is imposed on consumption. The revenue collected from the consumption tax base ($T^c$) in period one is equal to:

(18) $T_t^{\ c} = t_c C_t = t_c(1-\alpha)wL_t$

Savings in period t is denoted by:

(19) $S_t = \alpha Y_t = \alpha wL_t$

S generates a return r (no domestic rents). So income in period t+1 before tax is:

(20) $Y_{t+1} = wL_{t+1} + rS_t$

In period t+1, all income and savings from prior years is consumed.

(21) $C_{t+1} = wL_{t+1} + (1+r)S_t = wL_{t+1} + (1+r)a\,wL_t$

The revenue collected from the consumption tax base ($T^c$) in period t+1 is equal to:

(22) $T_{t+1}^{\ c} = t_c C_{t+1} = t_c[wL_{t+1} + (1+r)a\,wL_t]$

Thus the present value of government revenues collected from a consumption tax base ($G_c$) is:

(23) $G_c = T_t^{\ c} + (1+r)^{-1}T_{t+1}^{\ c}$

$$= t_c w[(1+r)^{-1}L_{t+1} + L_t]$$

To summarise, the table below sets out the revenue collections each year under the two tax regimes in period t dollars:

| Period | Income tax collected | Consumption tax collected |
|---|---|---|
| t | $t_y wL_t$ | $t_c(1-\alpha)wL_t$ |
| t+1 | $t_y w[(1+r)^{-1}L_{t+1}+\frac{r(1-t_y)}{(1+r)}\alpha L_t]$ | $t_c w[(1+r)^{-1}L_{t+1}+\alpha L_t]$ |

We observe that in period t, whether income taxes collected ($t_y wL_t$) is greater than the consumption tax collected ($t_c(1-\alpha)wL_t$) depends on the savings ratio, the consumption tax rate and the income tax rate levied. In period t+1 when savings are drawn down, the consumption tax revenue is greater than income tax revenue if:

$$(24)\ t_c > t_y\left[\frac{r(1-t_y)}{(1+r)}\right]$$

where $t_y$ and $t_c$ are between zero and one and r is positive.

For better comparability, set the consumption tax rate such that the present value of revenue collected through an income tax is the same as the present value of revenue collected through a consumption tax. That is, assuming that $G_c = G_y$:

$$(25)\ t_y w[(1+r)^{-1}L_{t+1}+(1+\frac{\alpha r(1-t_y)}{(1+r)})L_t] = t_c w[(1+r)^{-1}L_{t+1}+L_t]$$

Equation (25) can be rearranged to give the consumption tax rate which satisfies revenue neutrality between the income tax and the consumption tax:

$$(26)\ t_c = t_y\left\{\frac{L_{t+1}+[(1+r)+a\,r(1-t_y)]L_t}{L_{t+1}+(1+r)L_t}\right\}$$

Where $\alpha$,r>0 and the income tax rate is between zero and 1, the term $t_y a\, r(1-t_y)$ in equation (26) representing the double taxation of savings will always be positive. Thus under the revenue neutral constraint the income tax rate is less than the consumption tax rate.

This is an important result. It illustrates that under a comprehensive income tax and given revenue neutrality, a lower tax rate is possible because of the broader base driven largely by the double taxation of savings, and thus a reliance on capital income taxation, which distorts the relative price of future consumption.

The analysis above is also pertinent in illustrating the pattern of revenue collections in the context of an economy facing demographic challenges such as demographic shifts and population ageing.

To see this more clearly and for simplicity of presentation, as an extreme example, suppose that in period t+1 all labour factors in the economy are retired (that is, let $L_{t+1} = 0$). The revenue collected in period t+1 under the two regimes in period t dollars is given by:

| Period | Income tax collected | Consumption tax collected |
|---|---|---|
| t+1 | $\left[\frac{r(1-t_y)}{(1+r)}\right] t_y a\, wL_t$ | $\left[1+\frac{a\, r(1-t_y)}{(1+r)}\right] t_y a\, wL_t$ |

It is implied that the revenue raised from the income tax in period t+1 would be a fraction ($r(1-t_y)/(1+r)$ compared to $1+a\,r(1-t_y)/(1+r)$) of the revenue collected under a consumption tax. Note that if r was 50 per cent[3], α was 50 per cent, $\tau$ was 30 per cent, this model suggests that an income tax would only collect around 20 per cent of the revenue that would be collected under a consumption tax in period t+1 where all labour is retired and the stock of savings is being fully consumed.

3 A period in the two-period model can represent many years.