

## Chapter 15. Efficient taxation

Because a tax distorts economic decisions, it creates an **excess burden** (also referred to as welfare cost or deadweight loss): a loss of welfare above and beyond the tax revenues collected.

The Pareto efficiency condition stated:

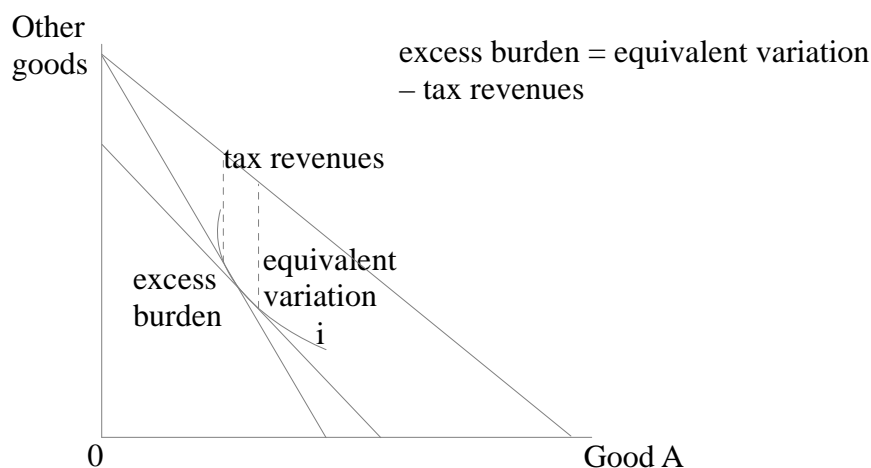
$$\text{MRS} = \text{MRT}$$

With a tax, the marginal rate of substitution becomes:

$$\text{MRS} = (1+t)P$$

Profit-maximizing firms set the MRT at:

$$\text{MRT} = P$$



As long as  $t$  is not 0, the efficient allocation of resources is violated. Taxes drive a *wedge* between the consumer price and the price received by producers.

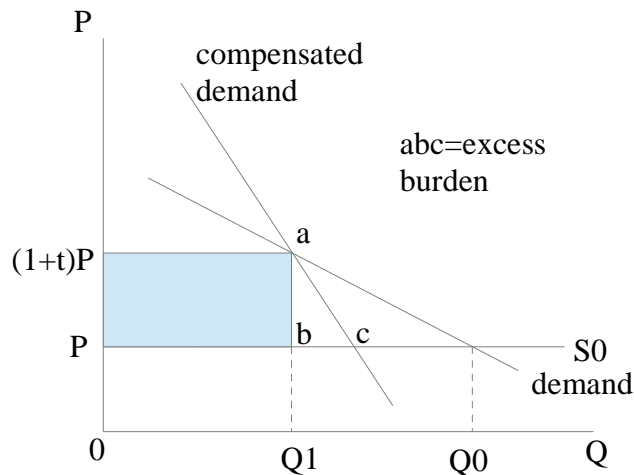
Obviously, a tax puts you on a lower indifference curve. The important question is whether the tax inflicts a greater utility loss than is necessary to raise revenues. If so, the tax has an excess burden. We can measure this with the **equivalent variation** – the change in income that is needed to cause a shift from an indifference curve to a lower indifference curve. It is a reduction in income that shifts the budget line downwards until it touches the lower indifference curve. If the equivalent variation exceeds the taxes collected, there is an excess burden.

Not every tax entails an excess burden. A **lump sum tax** – a certain amount that must be paid regardless of the taxpayer's behavior – does not change the price ratios. A lump sum tax is just a parallel shift of the budget line. Because the revenue yield of a lump sum tax equals its equivalent variation, a lump sum tax has no excess burden. Lump sum taxes are unattractive as policy tools. Because the amount of income individuals earn is at least in part under their control and people's choices affect their incomes, the income-based tax is not a lump sum tax. It reduces the price of leisure.

A tax creates two kinds of responses:

- **Uncompensated response:** It shows that consumption changes because of the tax and incorporates effects due to both losing income (*income effect*) and the tax-induced change in relative prices.
- 1. **Compensated response (substitution effect):** The tendency of an individual to consume more of one good and less of another because of a change in the two goods' relative prices.

An ordinary demand curve depicts the uncompensated change in the quantity of a commodity demanded when price changes. A **compensated demand curve** removes the income effect and the consumer remains on same indifference curve. Only the substitution effect is reflected. The compensated demand curve is important because only the compensated response affects the MRS. This means excess burden depends on movement along the compensated demand curve.



The excess burden can then be measured ( $h$  = absolute value of the compensated price elasticity of demand):

$$\text{Excess burden} = \frac{1}{2} (Q_0 - Q_1) \cdot Dp$$

$$Dp = (1+t)p - p = t \cdot p$$

$$h = (DQ/Q) / (Dp/p) \Rightarrow DQ = (h \times Q) \times (Dp/p) = h \times Q \times t$$

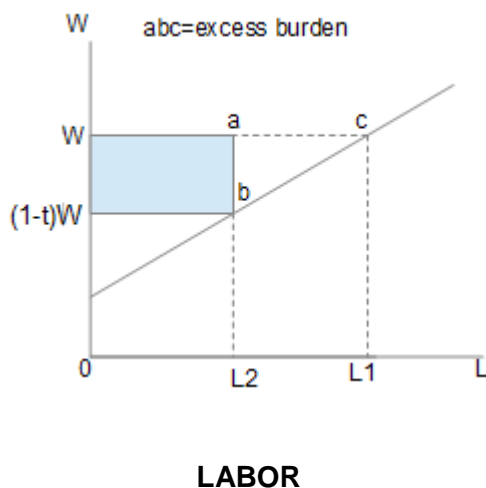
$$\text{Excess burden} = \frac{1}{2} \cdot h \cdot Q \cdot p \cdot t^2$$

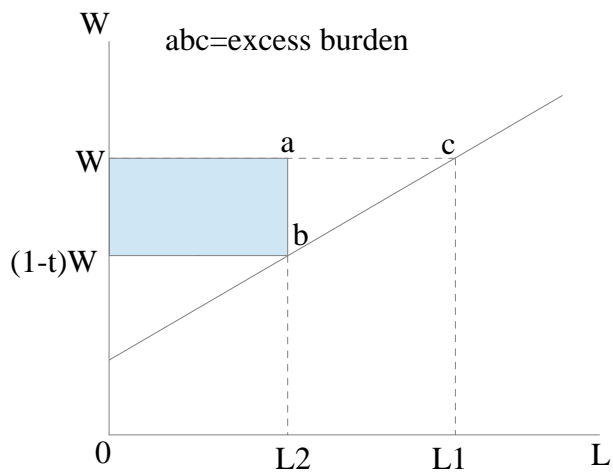
When the supply curve is upward sloping, the excess burden also depends on the compensated price elasticity of supply ( $\epsilon$ ):

$$\text{Excess burden} = \frac{1}{2} \cdot \frac{1}{(1/\eta + 1/\epsilon)} \cdot Q \cdot p \cdot t^2$$

This analysis assumed no distortions in the economy other than the tax. In reality, when a tax is introduced, there are already other distortions. For instance with negative externalities, a Pigouvian tax can even improve welfare.

A subsidy is just a negative tax, and is also associated with an excess burden, because people are encouraged to consume goods valued less than the marginal social cost of production. The theory of excess burden applies just as well to factors of production.





### SUBSIDY

The differential taxation of inputs creates an excess burden. Such inputs are used 'too little' in taxed activities, and 'too much' in untaxed activities. Whenever a factor is taxed differently in different uses, it leads to misallocation of factors between sectors and hence to an excess burden.