

CHAPTER VII– MARGINAL COST OF PUBLIC FUNDS

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I – INTRODUCTION

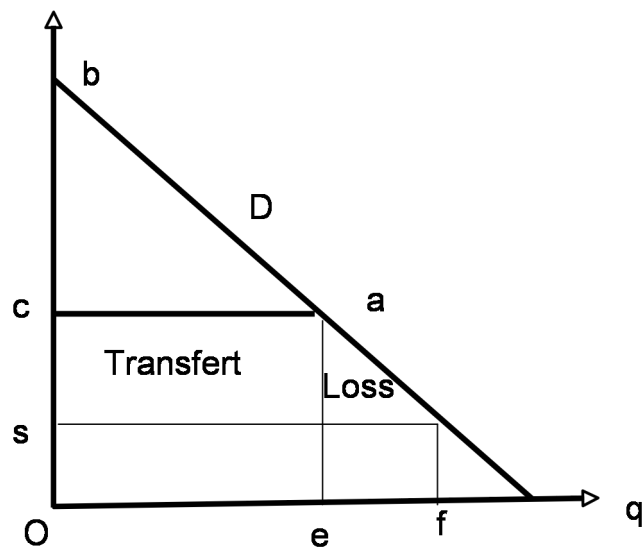
In practical terms there is **no way** of raising taxes that **does not affect** the choices that individuals make on their resources.

There is therefore an **additional** (excess) burden of taxes over and above the (direct) financial burden entailed in paying the taxes.

In the case of cigarettes, imagine a situation where a tax on cigarette leads people to quit smoking.

There is no tax revenue, but an excess burden caused by losing the satisfaction from consuming.

Graph 1. Excess burden



The **excess burden** from financing the project needs to be **included as a part of the CBA** criterion.

"The marginal cost of public funds (MCF) is the sum of indirect and direct cost per unit of finance required by the project".

$$NSB = B - C - MCF \quad (2)$$

(Net Social Benefit from a government policy)

II – ALTERNATIVE APPROACHES TO ESTIMATION OF THE MCF

The assumption behind the *traditional approach* to estimate the MCF (and how these differ from the *modern approach*) can be understood by working on a typical analysis of the MCF of wage tax (Ballard and Fullerton, 1992)¹.

2.1 – Traditional approach

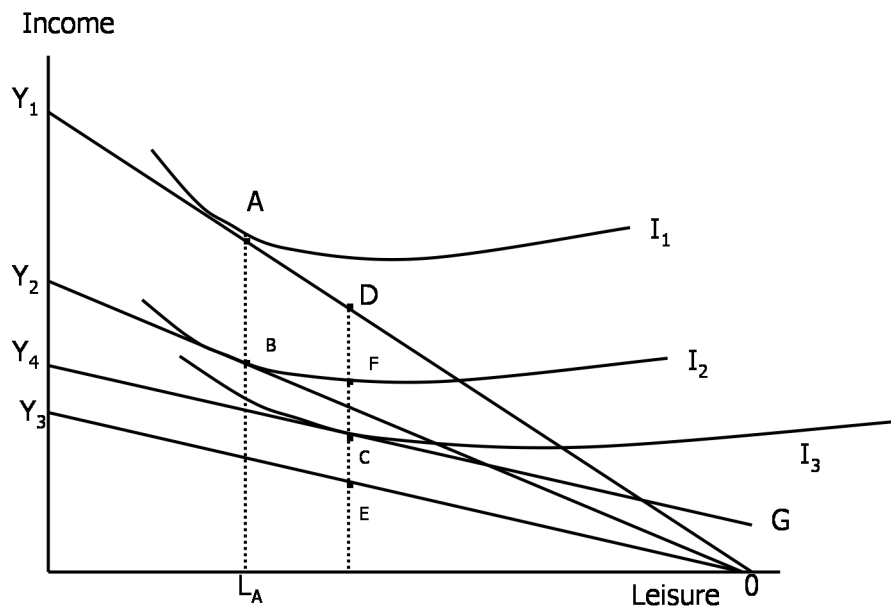
Consider the choice between leisure (L) on the horizontal axis and earned income Y (on the vertical axis). The price (opportunity cost) of leisure is the wage w that is forgone by not working.

The budget line at the wage w is OY₁. The individual chooses a point such as A (where the budget line is tangential to the indifference curve I₁). At A, leisure is L_A.

¹ Ballard and Fullerton, 1992 "Distortionary Taxes on the Provision of Public Goods" *Journal of Economic Perspectives*, n°6, 117-131.

Now impose a wage at tax rate t . The price of the leisure falls to $(1-t)w$ and the budget line becomes OY_2 . The individual choose a point B (where the new budget line is tangential to the lower indifference curve I_2).

For simplicity of reading the diagram, B corresponds to the same number of hours of leisure as at A. Earned income is at B, after tax is $L_A B$. Tax collected is the vertical distance AB .



Graph 2. Traditional approach

The **concept of the MCF** involves a consideration of **marginal increase in tax** to finance increments in government expenditure for the public project. Let the higher wage tax be t' . This means that the price of leisure would fall even further to $(1-t')w$ and this produces the new (flattest) budget line OY_3 .

This is because the analysis assumes an equal yield framework. Effectively this means that the public project is an **income transfer programme**. Any additional tax revenue will be returned to the private sector in a lump sum way.

The budget line where the new equilibrium will take place will have two properties.

- (i) It will have the **same slope** as OY_3 . This is because the incremental tax t' has been incurred and lump sum income changes are to take place at these prices.
- (ii) It will be at a **distance AB** from the original budget line OY_1 , in line with the equal yield assumption.

Given the preferences of the individual, GY_4 is the relevant budget line. Equilibrium is at C (where an indifference curve I_3 is tangential to GY_4 .) with the tax collected CD equal to AB. C is always to the right of B because there is a substitution effect, an income effect.

We can now **make the MCF calculation**.

The tax **revenue collected** (and returned to the individual) is distance **CE**. E is the budget line OY , vertically below C.

DE is what the total tax revenue would have been if there were no rebate, and CD is the tax with the rebate, making the difference CE the tax rebated).

The **excess burden is the distance CF**. (F is on the indifference curve I_2 being the vertically above C.

If utility were held constant at the level prior to the incremental tax (i.e at I_2) and the price of leisure would have been lowered by the tax rate t' , then F would have been the equilibrium point).

The **MCF is therefore $(CE+CF)/CE$** .

A value always **greater than unity**.

2.2 – Modern approach

The modern approach follows the traditional analysis up to the point the new budget line OY_3 is introduced.

This time the revenue **from the incremental tax t' is used to finance a public project** that involves a transfer of resources to the government. There **is no lump sum rebate** to accompany the tax.

So equilibrium will take place somewhere on the budget line OY_3 . Depending in the relative size of the income and substantial effects, the new equilibrium would be to the left or to the right of point B.

We will consider the **situation where the income effect outweighs the substitution** effect as people work more due to the tax. This is the so called '*back-ward-bending supply curve*' case. With leisure reduced, equilibrium point C is drawn to the left of point B (where indifference curve I_3 is tangential to OY_3).

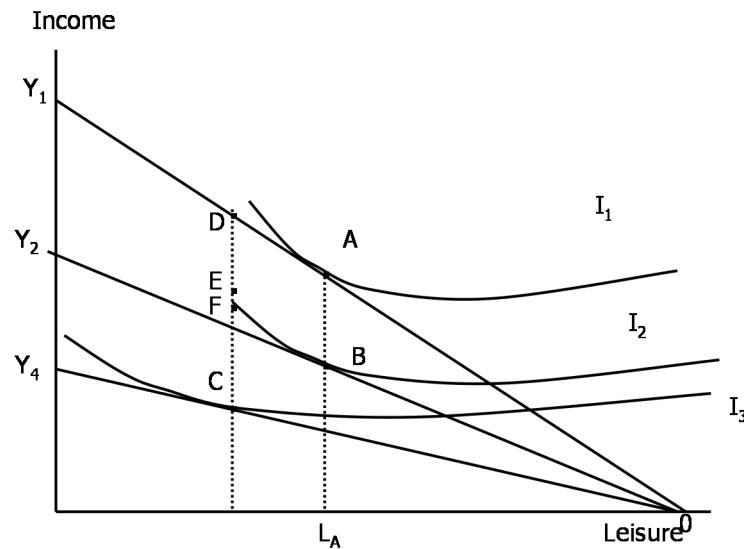
The equivalent amount of **tax to AB** that was collected before is given by ED. (D is the point on the original budget line OY_1 vertically above the new equilibrium c. E is also vertically above C, and positioned so that the distance DE equal AB).

DE is therefore the equivalent amount of revenue that would have been raised from tax rate t.

The **total tax collected at C** from t and t' , is **DC**, which **makes CE (the difference between DC and DE) the tax from the incremental tax increase t' .**

It is **CE that is on the denominator** of the MCF. On the numerator **is the total change in welfare of CF (the difference between indifference curves I_2 and I_3).**

The resulting **MCF is therefore CF/CE .** As can be seen from diagram this is ratio **less than 1.**



The initial equilibrium is in A. After a tax is imposed the individual moves to B. The tax paid is AB. Then the tax is raised further still. C is the new equilibrium after the tax. DC is the total tax now paid. DE is the amount equal to the Previous tax AB. Hence CE is the additional tax raised. The welfare change is the difference between indifference curves I_2 and I_3 equal to CF (F gives the same level of utility as prior to the additional tax increases). The MCF is the welfare change divided by the revenue change i.e. $MCF=CF/CE$. As drawn (i.e. for the backward-bending supply of Labour case), the MCF has a value less than 1. This is the modern approach.

Graph 3. Modern approach

III - RECONCILING THE APPROACH

It is clear from the previous two sections that the traditional and modern approach to estimating the MCF have very different kinds of public project in mind. The **modern approach** is more appropriate for the typical type of CBA analysis that relate to the **building of bridges**, highways, dam and so in while the **traditional approach** has a particular relevance **for transfer payment** were resources are not moving from the private to the public sector.

The domain of the traditional approach is wider if one interprets programmes such as providing of public housing and food stamps as one to one substitutes for private expenditures.

They are two main ways of explaining the difference between the modern and traditional approach, the tax revenue collected

is returned to the individual. **This means that there is no income effect from the tax.**

The substitution effect is always negative which leads to more leisure when its price has fallen (due to the tax increase). The MCF always exceeds unity. However, in the modern approach (where there is no lump sum transfer back to the individuals) there is an income as well as the substitution effects. Leisure may increase or decrease. When leisure decreases the MCF can be less than 1.

The difference between the two approaches can therefore be understood in these terms: *the modern approach use the uncompensated labour supply curve, while the traditional approach use the compensated supply curve.*

IV – CONCLUSION

V – QUESTIONS

1. Consider a single aggregate individual facing a constant gross wage and a flat 50% tax, and a single consumption good such that the uncompensated labour supply elasticity is zero and the compensated labour supply is positive. Is this wage distortionary ?

Hints. Is the compensated or the uncompensated supply elasticity that cause the excess burden?

2. In the same model, with the same assumption, suppose a public project with production costs (MRT) of \$1, and benefits ($\sum MRs$) of slightly more than \$1, could be funded by a 1% increase in the wage tax. Would this be desirable?

Hints. Draw a diagram like the diagram of the modern approach, but this time let the income and substitution effect cancel out (which is what a zero uncompensated supply elasticity involves). What is the MCF in such a diagram?

