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THE QUANTIFICATION OF THE EFFICIENCY LOSS OF THE TAX

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Abstract: *Since the fiscal policy is able to change the 'content' of the real economy including the increase in fiscal pressure – in order, in the short term anyway, to rise the fiscal incomes 'fuelling' the state budget –, we found it really important investigating the price this financial strategy comes with. For this, we computed the efficiency (or deadweight) loss of the tax using geometry as a helping tool of our algebraic computations. It resulted the size of this loss is a matter, firstly, not of fiscal theory, but of the frequency of pressure' application, and, secondly, of prices' fluctuation: it will determine, through the demand and supply elasticity, the size of both the fiscal revenues and the fiscal losses.*
Key words: *efficiency, loss, tax, price, elasticity*

1. INTRODUCTION

The stimulus given to a real economy by the fiscal policy (Mishkin, 2004), when the latter amplifies the 'area' and the 'depth' of the total fiscal debt acts as a deterrent not only for economic growth (generally speaking), but even for the effectiveness of fiscal policy itself.

This effect, known as efficiency/deadweight loss of the tax, can be measured: as such, the formulae used for this must take into account the influence of demand, respective supply elasticity over the real economy, since those elasticities practically materialize the (increased) fiscal pressure, modifying, consequently, the real economy (Lipsey&Chrystal, 1999).

In this paper, we employed the method of treating the efficiency loss of the tax, and, in a certain degree, the elasticities themselves as 'functions' of price, e.g. of the price paid by the consumers and received by the producers whenever a certain product is sold – and bought –, using a geometric framework for the economic dynamics we are quantifying.

What remains to be researched, in the future, is the size, on one side, of a given elasticity for which this loss is at a minimum, and, on the other side, of the period of time during which a given dimension of the efficiency/deadweight loss of the tax is not bearable.

2. AGGREGATE DEMAND AND AGGREGATE SUPPLY

The elasticity of both demand and supply relative to the price, when a tax having a significant impact on the real economy is introduced, represent nothing less than a lever 'linking' that tax with the *future* dynamics of the real economy (McConnell et al., 2003), assuring its functionality in the short and long terms.

From the perspective of the aggregate demand, the starting point of the analysis is the following: we can consider *aggregate* demand is, in essence, inelastic, on both the short term and the long one. In fact, as regards certain products, demand, even aggregate demand, is, at least on short term, inelastic when the price is on the rise (Schiller, 2003).

But, also in practice, the aggregate demand of certain goods (e.g. bread – in Romania), in the long term, is surely elastic.

As such, the assumed constant rise of the financial effort of taxpayers for paying the fiscal debt is under no circumstance coupled with, as complement of, the continual rise, and at least in the same proportion, of the size of the taxpayers' incomes (e.g. wages), as a response to the (general) surge of the prices. Therefore, the conclusion is even if a certain product is, practically, indispensable to the consumer (that is, the buyer), if its price is on the rise in the long term the demand will become elastic; for all the products (of the real economy), the aggregate demand is *a fortiori* elastic, in the long term (Maddala&Miller, 1989).

The elasticity of the aggregate supply is likewise important here. First of all, this latter elasticity cannot be conceived, the (general) level of prices being raised by the fiscal policy or not, but in an environment of increasing prices. And yet, the rise of the aggregate demand, and of the production capacity cannot be realised over night, so that aggregate supply is, in such conditions, in the short term, inelastic: larger profits are surely wanted, but – without expanding production – unreachable.

In the long term, the aggregate supply is inextricably linked with the aggregate demand. And, even if it can be *assumed* the aggregate demand is, in the long term, even inelastic (with far more probability, that it is at least 'a little' elastic), the consumers will buy (practically) as much as before the rise of the price level, or, more likely, almost as much, respective substantially less after the prices soared, while the firms will produce an equal, or, more likely, slightly smaller quantity than the quantity obtained, and sold, before the introduction/rise of the tax, respective substantially less after the prices soared.

The arguments which prove correct that, in the long term, the aggregate demand is elastic were exposed theretofore. But, even if, *in extremis*, this statement would be false, it is clear the aggregate supply is itself, in the long term, elastic.

In our analysis, quantifying the size of the incomes of the taxpayers after the tax is needed: and also to emphasize a new fiscal pressure determines a drop in the aggregate output, and of the equilibrium (quantitative) level of the real economy (Goolsbee, 1997), both the aggregate demand and supply leaving their mark in the process.

3. THE PRICE – LINK BETWEEN THE REAL ECONOMY AND THE FISCAL POLICY

The sum paid that accounts for the tax is quantifiable starting from the observation the efficiency loss of the tax presumes a drop in the aggregate output, on one side – the size of its initial level is larger than after the introduction/increase of a tax –, and the rise of the (general) level of prices, on the other side.

Both producers *and* consumers will bear, price-based, their share of the total fiscal debt, forcefully imposed (on the latter, e.g. with V.A.T.) or not, income taxation being direct (when the prices will surely rise) or indirect – if, like today, in addition, the consumer bear the brunt of the fiscal debt. In other words,

charging/paying those prices acquits, in the *market* economy, the fiscal debt, by the means of the real economy itself (Romer, 1996), which yields to the Treasury what can be named the **net price** paid by consumers.

The price paid by the consumers can be named *demand enforced price* (P_D): from the unit price they pay, as tax, a share of that price – labelled ΔP_D –, with which the firms raise the price, to the respective government authorities (McConnell et al., 2003). The price paid by the producers can be labelled *supply enforced price* (P_S): less than the (nominal) value of the unit price can be used by them, giving the deduction from it of the sum charged by the fiscal authorities – labelled ΔP_S. Thus, the unit value of the newly imposed tax is equal with:

$$T_{ax} = P_D - P_S = (P + \Delta P_D) - (P - \Delta P_S) = \Delta P_D + \Delta P_S \quad (1)$$

For the aim of the quantification of the paid tax, the size of this index (T_{axT}) can be computed using the following simple formula (Ξ stands for output, and Ξ_1 is the value of the output produced *after* the introduction, or the rise, of the tax/taxes):

$$T_{axT} = \Xi_1 \times \Delta P_D + \Xi_1 \times \Delta P_S = \Xi_1 \times (\Delta P_D + \Delta P_S) \quad (2)$$

Since a share of the tax is paid by the consumers and *the other part* of the tax is paid by the producers, the sum computed as financing the budget this way is the sum of those two payments: geometrically, the area composed by adding the two rectangles (from the graph below).

4. EFFICIENCY LOSS OF THE TAX – QUANTIFICATION

In order to quantify, further on, the efficiency loss of a tax we need to compute the value of the above mentioned deadweight loss (of the real economy too), for which we use the following graph:

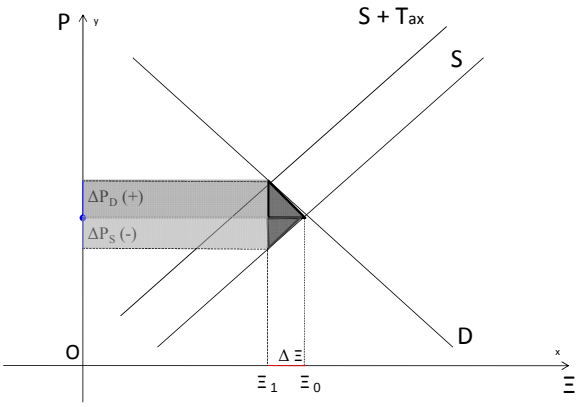

Fig. 1. The deadweight loss of the real economy due to the tax

To quantify the area of these two triangles we use, as basis of our calculations, the formula used for quantifying the area of a triangle: (base × height) ÷2. The base of the two triangles is equal with $\Delta\Xi$; the height is equal with ΔP_D, respective ΔP_S. From this, the value of the deadweight loss of the tax (denoted here as L_{otax}) is obtained using the following formula:

$$L_{otax} = \frac{\Delta\Xi \cdot \Delta P_S}{2} + \frac{\Delta\Xi \cdot \Delta P_D}{2} = \frac{\Delta\Xi \cdot (\Delta P_S + \Delta P_D)}{2} \quad (3)$$

$$\Rightarrow L_{otax} = \frac{\Delta\Xi \cdot T_{ax}}{2} \quad (4)$$

The elasticities of demand, respective supply are required for computing the size of the variation in the demand/supply enforced prices (ΔP_D and ΔP_S); once inserted in the equation L_{otax} can be quantified, these, of course, being not identical. As a result, firstly, we quantified the size of elasticity of demand, using the well known variables:

$$\eta_D = \frac{\frac{\Delta\Xi}{\Xi}}{\frac{\Delta P}{P}} \Rightarrow \eta_D = \frac{\frac{\Delta\Xi}{\Xi}}{\frac{\Delta P_D}{P_D}} = \frac{\frac{\Delta\Xi}{\Xi}}{\frac{\Delta P_D}{P}} = \frac{\Delta\Xi}{\Delta P_D} \cdot \frac{P}{\Xi} \quad (5)$$

Similarly, the elasticity of supply is computed like this:

$$\eta_S = \frac{\Delta\Xi}{\Delta P_S} \cdot \frac{P}{\Xi} \Rightarrow \begin{cases} \Delta P_D = \frac{\Delta\Xi}{\eta_D} \cdot \frac{P}{\Xi} \\ \Delta P_S = \frac{\Delta\Xi}{\eta_S} \cdot \frac{P}{\Xi} \end{cases} \quad (6)$$

It is known that $T_{ax} = \Delta P_D + \Delta P_S$. It can be, thus, quantified the value of the efficiency/deadweight loss of the tax depending on the elasticities of demand and supply (relative to the price):

$$T_{ax} = \Delta P_D + \Delta P_S = \frac{\Delta\Xi}{\eta_D} \cdot \frac{P}{\Xi} + \frac{\Delta\Xi}{\eta_S} \cdot \frac{P}{\Xi} = \frac{P \cdot \Delta\Xi \cdot (\eta_D + \eta_S)}{\eta_D \cdot \eta_S \cdot \Xi} \quad (7)$$

$$\Rightarrow \Delta\Xi = \frac{T_{ax} \cdot \Xi \cdot \eta_D \cdot \eta_S}{P \cdot (\eta_D + \eta_S)} \quad (8)$$

5. CONCLUSIONS

The main *mathematical* conclusion is that the efficiency/deadweight loss of the tax can be quantified in the following manner:

$$L_{otax} = \frac{1}{2} \cdot \frac{T_{ax} \cdot \Xi}{P} \cdot \frac{\eta_D \cdot \eta_S}{\eta_D + \eta_S} \cdot T_{ax} \quad (9)$$

$$\Leftrightarrow L_{otax} = \frac{1}{2} \cdot \frac{T_{ax}^{\ 2} \cdot \Xi}{P} \cdot \frac{\eta_D \cdot \eta_S}{\eta_D + \eta_S} \quad (10)$$

The second conclusion is an economic principle that can be labelled "focus on the number": the loss quantified here grows one more time whenever the fiscal authorities decide to increase the fiscal pressure again.

From this point of view, it must be noticed the direct taxation is far more 'harmless' to the real economy than the indirect taxation is, given the current fiscal behaviour of raising more often the level of VAT or excises than that of direct taxes.

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