FUNDING THE STATE BUDGET WITH TAXES AND PUBLIC DEBT FROM THE PERSPECTIVE OF ECONOMIC GROWTH MODELING –THE DIAMOND MODEL CASE[165]

Predescu Antoniu

Universitatea „Spiru Haret", Facultatea de Contabilitate şi Finanțe Râmnicu Vâlcea, Râmnicu Vâlcea, str. Ostroveni nr. 35, gen3pavo@yahoo.com***, 0721143258***

Abstract: The fiscal lever is of such complexity and range, that is, even in theory, linked to the phenomenon of economic growth – at least, to the phenomenon of the production of goods and services; one link is that taxation is a very effective tool for filling up the coffers of the public budget, but one point is questionable, that is whether, being as effective as it can be, it should be used exclusively, or not. Through this, the object of this paper is, consequently, built: solving the question whether, for the purpose of funding the state budget, public debt is also to be used – or, even, must be used, in conjunction with taxation.

Key words: Cobb-Douglas, effective labor, debt.

Using the demographical perspective of the Diamond model, we will analyze, in this paper, the influence of the public expenses, financed through taxes and public debt, to the balanced growth – and we will accomplish this analysis using the tools the logarithmic utility and the Cobb-Douglas shape of the Solow production function provide us with.

This analysis is very useful, in the case of the production function of Cobb-Douglas type, for practical grounds: the production function, in this shape, is very easily usable – and this especially in an dynamic analysis –, being, furthermore, a very precise (first) approximation of what shapes the production functions applicable to the actual economies should have.

The Solow production function, in its Cobb-Douglas shape, has the following structure:

$$F(K, A \cdot L) = K^{\alpha} \cdot (A \cdot L)^{1-\alpha}, \alpha \in (0,1).$$

The Solow production function, in its *intensive* Cobb-Douglas shape, has the following structure:

$$F(K, A \cdot L) = F(K / A \cdot L, 1) = f(k) = \left(K / A \cdot L\right)^{\alpha} \Leftrightarrow f(k) = k^{\alpha}.$$

We must also add this production function satisfies, with no exception, all the assumptions the intensive form Solow production function bounds to.

The amount of capital stock per unit of effective labor, from the demographical perspective of the Diamond model – and, because the Solow economic growth model *is* the mathematical base of Diamond model's economical simulations, of the Solow model too –, is calculable is the following manner:

$$k_{t+1} = [1/(1+n) \cdot (1+g)] \cdot (1/2 + \rho) \cdot w_t.$$

The real wage per unit of effective labor, w_t, is calculable, using the Cobb-Douglas shape of the Solow production function, through the use of the following algorithm:

$$w_t = f(k_t) - k_t \cdot f'(k_t) = k_t^{\alpha} - k_t \cdot (k_t^{\alpha})' \Leftrightarrow w_t = k_t^{\alpha} - k_t \cdot \alpha \cdot k_t^{\alpha-1} \Rightarrow w_t = k_t^{\alpha} - \alpha \cdot k_t^{\alpha} \Leftrightarrow$$

$$\Leftrightarrow w_t = k_t^{\alpha} \cdot (1-\alpha).$$

$$\Rightarrow k_{t+1} = [1/(1+n) \cdot (1+g)] \cdot (1/2 + \rho) \cdot k_t^{\alpha} \cdot (1-\alpha).$$

[165] This paper is not a tool built for summing up the principal outlines of the Diamond and Solow models, but, instead, is (chiefly) addressed to those who are acquainted with economic growth modeling, in general, and with the bases of the Diamond and Solow models, in particular.

The above stated k_{t+1} equation – with which the effect on the economic growth of the public expenses can be circumscribable, and in dynamics too – is being built according to the above expressed premises, that is taking into account the fact in order to finance the public expenses both incomes generated by taxes and the public debt[166] are used.

But to begin with, we must analyze the basic idea we are, here and in the following lines, minutely analyzing: why do we mention, ant this only, the public expenses? The answer, even if it were not be the final answer, can be thus expressed: the public expenses are, before any others, linked to the *mechanism* of the economic growth – and vice versa.

The public expenses are expenses of a *public nature*, financed by the use of the resources contained by the public (state) budget; in these circumstances, the public expenses *growth* takes place, in principle, and in any economy, given the fact the government acts on the following three levers:

- Goods and services purchases;
- Income transfers (e.g. welfare funds);
- Paying off the interests on the public debt.

In this point of our demonstration, some explaining is required; firstly, and maybe the first, from the point of view of importance, it must be underlined that, because part of the money savings of the young individuals will transform, consequently, not into capital (stock), but into government securities, to the left side of the equation another term will be added – in fact, this term is $b_{t+1} - b$ being the amount of government securities per unit of effective labor.

We say – and use $-b_{t+1}$, and not b_t, because, using a similar expression for – in this realm, where economic growth is interwoven with population dynamics – that of the capital per unit of effective labor, b_{t+1} is a function of the government securities bought in period t.

For the object of our study, it suffices only to sketch the structure of this variable (b_{t+1}) – using a sufficient degree of accuracy, though, in order for the utility of its use, in the domain of taxing and economic growth, not to be meddled with; from this we, therefore, start – from the government securities stock.

Be B_{t+1} the size of the government securities stock, in the period t+1 – these securities are bought in the period t, and, similarly to the mechanism of generating the capital stock, K_{t+1}, the amplitude of this acquisition depends on the interest rate attached to those securities; be $r_{t+1}^{'}$ this interest rate.

This amplitude, also, is determined by the proportion of personal incomes every individual – and, in the end, all individuals – save, in the form of government securities; this proportion is determined, primarily, by the interest rate $r_{t+1}^{'}$ – be it $s(r_{t+1}^{'})$.

In the end, this dynamics can be mathematically modeled like this:

$$B_{t+1} = L_t \cdot [(w_t \cdot A_t) \cdot s(r_{t+1}^{'})] \Leftrightarrow B_{t+1} / (L_{t+1} \cdot A_{t+1}) = w_t \cdot s(r_{t+1}^{'}) \cdot (L_t \cdot A_t) / (L_{t+1} \cdot A_{t+1}) \Leftrightarrow$$

$$\Leftrightarrow b_{t+1} = (L_t / L_{t+1}) \cdot (A_t / A_{t+1}) \cdot w_t \cdot s(r_{t+1}^{'}) \Leftrightarrow b_{t+1} = (L_t / L_t + n \cdot L_t) \cdot (A_t / A_t + g \cdot A_t) \cdot w_t \cdot s(r_{t+1}^{'}) \Leftrightarrow$$

$$\Leftrightarrow b_{t+1} = [L_t / L_t \cdot (1+n)] \cdot [A_t / A_t \cdot (1+g)] \cdot w_t \cdot s(r_{t+1}^{'}) \Leftrightarrow b_{t+1} = (1/1+n) \cdot (1/1+g) \cdot w_t \cdot s(r_{t+1}^{'}) \Leftrightarrow$$

$$\Leftrightarrow b_{t+1} = [1/(1+n) \cdot (1+g)] \cdot w_t \cdot s(r_{t+1}^{'}).$$

It must also be added that, because taxes and public debt globally contribute to the financing of the state budget, the total amount of the public expenses will be equal not to the total value of the sum the taxpayers acquitted for their tax taxes they were levied to; so, in the right side of our equation, the term I_t appears – I_t is the amount of tax revenue the state received per unit of effective labor.

[166] This debt is materialized, for instance, by the government securities issue – if it were to use only this classic example.

Therefore:

$$k_{t+1} + b_{t+1} = [1/(1+n)\cdot(1+g)]\cdot[1/(2+\rho)]\cdot[k_t^{\alpha}\cdot(1-\alpha) - I_t] \Leftrightarrow$$

$$\Leftrightarrow k_{t+1} = [1/(1+n)\cdot(1+g)]\cdot[1/(2+\rho)]\cdot[k_t^{\alpha}\cdot(1-\alpha) - I_t] - b_{t+1}$$

As one can notice, starting the analysis from a (given) value of k_t, and, respectively, of b_t, it may seem as if it can be stated for a large(r) value of I_t, the value of k_{t+1} will diminish. It would be like this, but, in this frame, of the existence of the public debt, the most common *status quo* is, in the economy, not that of "a large(r) value of I_t".

In fact, and at least for political reasons, if not, and in the first instance, for economic grounds, the issue of, especially, a large amount of government securities – that is to resort to a deep public debt – is, really, to cut, simultaneously, and not necessarily by the same proportion, the taxes levied on the taxpayers.

Though, the only reachable effect anyone can obtain, by the use of such methods, is anything but a cut – even less a large cut – of public expenses; these will have, and anyway must have, the dimensions needed in order to, among others, pay the interest of the public debt. The k_{t+1} may, therefore, drastically reduce[167].

Through this dynamics, the bottom line has this appearance: the needs of the present are financed, so to speak, with the toil of the next generations, but the story doesn't end here; with a lowering fiscal pressure, the taxpayers tend to consume more (rather than to save more, in one form or another), in every part of their lives. This fact, especially – in these conditions – will make the capital stock to decrease.

Bibliografie

1. **Dornbusch, R., Fisher, S.**, „Macroeconomics (6th edition)", The McGraw-Hill Companies, Inc., U.S.A., 1992
2. **Romer, D.**, „Advanced Macroeconomics", The McGraw-Hill Companies, Inc., U.S.A., 1996
3. **Schiller, B.R.**, „The Economy Today (9th edition)", The McGraw-Hill Companies, Inc., New York, 2003

[167] In our study we use the simplification through which public debt is nothing but **internal** public debt. In the real world, however, there are, also, external loans, loans not without interests – which interests must be, naturally, paid.