Abstract

The paper deals with the problems of fiscal sustainability and the stabilization of the public debt. It criticizes the mainstream approach to these issues and argues that an approach based on Domar’s contribution (Domar 1944, 1946) is preferable.

While mainstream analyses of debt stabilization are based on the hypothesis that the economy’s growth rate is independent of public spending and its composition, the paper removes this hypothesis. In this analytical context, with the interest rate on the debt higher than the growth rate, ensuring the stabilization of the ratio of the public debt to the GDP does not necessarily requires running a primary surplus, which instead is the fundamental mainstream conclusion.
The sustainability of fiscal policy: an old answer to an old question?

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1. Introduction

The sustainability of fiscal policy, and the related problem of the stabilization of the ratio of the public debt to the GDP, are old questions. In the 1940s, Domar (1944) provided a pioneering contribution to the analysis of these issues. More recently, in the 1990s, Blanchard and others (1990) have offered what they call “new answers” to the problem of fiscal sustainability. The approach followed by Blanchard and his co-authors represents the current standard approach in the mainstream literature on the topic of fiscal sustainability.

This paper argues, however, that the old questions of fiscal sustainability and debt stabilization should be given an “old” answer, i.e. inspired by the original contributions of Domar. In fact, it is argued that mainstream analyses are flawed, as they are based on the hypothesis that all the variables considered are independent of one another; in particular, the economy’s growth rate is taken as independent of public spending and its composition.

Thus, the main object of the paper is re-considering the condition for debt stabilization by removing the hypothesis that the economy’s growth rate is independent of public spending and, hence, of the fiscal budget. The analysis of the relationship between the economy’s growth rate and public spending is inspired by Domar as well, as it is carried out by using a generalization of Domar’s growth model (1946), based on previous works by Palazzi and Sardoni (1987; 2000). The model shows that the economy’s growth rate depends on the composition of public spending; more precisely it is decreasing in the share of public revenue devoted to current spending. It is then shown that, in this analytical context, ensuring the stabilization of the ratio of the public debt to the GDP does not necessarily requires running a primary surplus, which instead is the fundamental mainstream conclusion when the interest rate on the debt is higher than the economy’s growth rate.

Section 2 is devoted to a brief exposition of the generalized Domar model of growth. Section 3 outlines Domar’s contribution to the analysis of the problem of the public debt. Section 4 analyzes the condition for debt stabilization by using the generalized growth model of section 2. Section 5 concludes with some policy implications of the approach to public debt and growth suggested in the paper.

2. The growth rate in a generalized Domar model

In Domar’s model, the equilibrium rate of growth of an economy with no public sector is

\[ g = s \alpha \]
(s is the private propensity to save and σ is the potential social average investment productivity.)

\[
\sigma = \frac{dP}{dh} = \frac{P'}{I}
\]

so that

\[
P' = \sigma I
\]

\(dP/dh = P'\) is the increase in aggregate potential capacity associated with investment \(I\); \(h\) is time.)

Let us now introduce the public sector. Its total revenue is \(tY\), with \(t\) being the average tax rate. Public current spending, \(C_g\), is a share \(a < 1\) of total revenue; capital spending is denoted by \(I_g\). If \((C_g + I_g) > tY\), the government borrows from the economy to finance its deficit.

Public investment \(I_g\) contributes to the growth of the economy's potential capacity.\(^1\) For now, it is assumed that the ratio of the increase in \(P\) to investment is the same in both sectors.\(^2\)

In order for the economy to be in equilibrium, it must be

\[
Y' = \frac{dY}{dh} = \frac{dP}{dh} = P'
\]

The increase in aggregate demand is

\[
Y' = (1 - s)(1 - t)Y' + I'_g + atY' + I'_g
\]

from which we obtain the equilibrium rate of growth, \(g\).

\[
g = [s(1 - t) + t(1 - a)]\sigma
\]

(1)

The rate \(g\) is decreasing in \(a\left(\frac{\delta g}{\delta a} < 0\right)\). The higher is the share of the public revenue devoted to current spending the lower is the rate of growth of the economy. Moreover, the rate of growth is increasing in \(t\), provided that the following condition is fulfilled:

\[
a < (1 - s)
\]

(2)

\(a\) can be interpreted as the "public propensity to consume", so that (2) tells us that an increase in the tax rate is associated to a higher rate of growth if the public propensity to consume is lower than the private propensity to consume.

The economic meaning of this results is quite simple. In an equilibrium model, in which all savings must be invested, the existence of a public sector that levies taxes implies a reduction in private saving and, hence, a reduction in the equilibrium rate of investment and

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\(^1\) In the present model and in the following analysis of debt stabilization, it is assumed that all public capital expenditures contribute to the increase in the aggregate potential capacity, while current expenditures do not. This is a strong simplification, as there could be some investment expenditures that are "unproductive" and, conversely, current expenditures that contribute to the increase in capacity. Domar himself (see below, section 3) points out this aspect. Here, however, the assumption is maintained throughout.

\(^2\) Therefore, \(P' = \sigma (I_g + I_p)\), where \(I_p\) denotes private investment.
in the growth rate. However, if the public propensity to save and to invest is higher than the private, the negative effect of taxes is more than compensated for. The overall propensity to save of the economy is larger than \( s \), the rate of investment is higher and, hence, the growth rate is higher.

So far it has been assumed that public and private investment give the same contribution to the growth of potential capacity. More in general, it can be assumed that the productivity of public and private investment is different, so that the average investment productivity \( \sigma \) is a weighted average of the two different productivities:

\[
\sigma = \frac{\sigma_p I_p + \sigma_g I_g}{I_p + I_g}
\]

(\( \sigma_p \) is the private investment productivity and \( \sigma_g \) is the public investment productivity.)

It is clear that, if \( \sigma_g > \sigma_p \), \( \sigma \) is increasing in \( I_p \). Moreover, if public investments positively affect the productivity of private investment, also \( \sigma_g \) is increasing in \( I_g \). In such a case, it is

\[
\sigma = f(I_g)
\]

with \( \frac{\partial \sigma}{\partial I_g} > 0 \)

From this, it derives that the economy’s rate of growth can increase as a consequence of an increase in public investment, even though \( a \) remains unchanged.

3. Domar’s contribution to the problem of debt sustainability

The determination of the growth rate in the way followed above is derived from Domar’s growth model. Also the idea that the problem of debt can be approached by concentrating on the growth of GDP rather than on the public budget derives from Domar’s analysis of the “burden” of public debt. Domar’s objective was to contrast the opinion that deficit spending leads to an ever-growing public debt, the servicing of which inevitably leads to an increasing tax burden on the economy. For Domar, while all underline the obvious fact that continuous borrowing results in an ever-increasing debt, many tend to overlook that deficit spending affects income.³

In order to study the analytical relations between deficit spending, debt and income, Domar considers four different cases.⁴ In the first case, it is assumed that income remains constant while, in each period, the government borrows a percentage \( a \) of income. It is clear that in this case the ratio of debt to income will grow indefinitely. But “there is something inherently odd about an economy with a continuous stream of investment expenditures and a stationary national income” (1944, p. 804). Such a case could occur because investment does not have any positive effect on productivity and the number of working hours remains unchanged.⁵ The second case is analogous to the first. Now income increases over time but at a constant absolute rate \( Y = a + bt \). Since the government keeps on borrowing \( a\% \) of the

³ “... that deficit financing may have some effect on income (...) has received a different treatment. Opponents of deficit financing often disregard it completely, or imply, without any proof, that income will not rise as fast as the debt.” (1944, p. 801).

⁴ In all four cases, the interest rate on the debt and the price level are taken as given and constant.

⁵ Alternatively, productivity grows but the number of working hours diminishes.
income, also in this case the ratio of debt to income will grow with no limit (1944, p. 806). The reasons why such a case could occur are the same as in the first case.

The third case is the most important. Domar now assumes that income grows at a "constant percentage rate" \( Y = ae^{\alpha t} \). In this case the public deficit grows at the same rate as income. Also the growth rate of debt will approach the growth rate of income and, therefore, the ratio of debt to income will tend to a constant value (1944, p. 809). More precisely, it will approach the value \( \frac{\alpha}{g} \).

It follows that the larger is the rate of growth of income, the lower is the ratio of debt to income. Thus, the problem of the debt ratio lies in the ability to make income grow rather than in attempting to reduce it without taking account of the effects of such reduction on income.

A certain growth rate of income can be achieved if aggregate demand grows at that rate and, at the same time, a sufficient amount of the expenditures is directed toward “increasing the efficiency of production, so as to allow the required volume of monetary expenditures to take place without a rise in prices.” (1944, p. 820). The government can contribute to increasing the economy’s growth rate by converting into productive expenditures that part of the private income that it absorbs through taxation.

For simplicity, such expenditures can be thought of as public investment, opposed to current expenditures seen as unproductive. But Domar is careful to point out that the distinction between investment and current expenditure may be misleading: “As a matter of fact, the term ‘investment expenditures’ may be misleading, because it is too closely associated with steel and concrete. If healthier people are more productive, expenditures on public health satisfy these requirements. The same holds true for expenditures on education, research, flood control, resource development and so on.” (1944, p. 820).

4. The stabilization of the public debt in the generalized Domar model

Fiscal policy is sustainable in so far as it does not lead to increasing ratios of the public debt to the GDP or, conversely, to an increasing tax burden. Central to the discussion of sustainability is the dynamic government budget constraint, which is

\[
\frac{dB}{dh} = G - T + iB \tag{3}
\]

See the mathematical appendix to Domar’s article (1944, pp. 823-25). The fourth case is a “war model”, in which the percentage of income borrowed differs between peace times and war times. For brevity, this case is not considered here.

“Now, some economic and political circles are burning with a desire to reduce the debt burden (...). They recognize no other method of achieving their goal but by reducing the absolute size of the debt; that the government must stop borrowing is of course taken for granted. They should beware, however, lest the policies they advocate exert such a depressing effect on the national income as to result in an actually heavier debt burden, even though they succeed in paying off a part of the debt.” (Domar 1944, pp. 815-6).
where $B$ denotes the public nominal debt, $G$ is public expenditure, $T$ taxes (net of transfers) and $i$ is the nominal interest rate. By writing the constraint in terms of ratios to GDP and considering the real interest rate, we obtain

$$\dot{b} = \frac{db}{dh} = (\gamma - \tau) + (r - g)b$$

(4)

where $b = \frac{B}{Y}$, $\gamma = \frac{G}{Y}$, $\tau = \frac{T}{Y}$, $r$ is the real interest rate on the debt and $g$ is the economy’s growth rate.

If it is assumed that the interest rate $r$ is larger than the growth rate $g$, the ratio of public debt to GDP does not vary from one period to the next ($\dot{b} = 0$) only if $(\tau - \gamma) > 0$, i.e. if the government runs a primary surplus. In other terms, from (4), it must be

$$(r - g)b = \tau - \gamma$$

(5)

If one starts from a situation in which it is $\dot{b} > 0$, the ratio of public debt to GDP can be stabilized through fiscal policies that give rise to a primary surplus, i.e. either by increasing taxes and/or by reducing expenditure. If an increase of the ratio of fiscal revenue to GDP is excluded, the primary surplus can be realized only through a reduction in the ratio of public spending to GDP, $\gamma$.

Once the hypothesis that the economy’s growth rate depends on $a$ (the share of public revenue devoted to current public expenditure) is introduced, the conclusion above that the debt ratio can be stabilized only by running a primary surplus does not necessarily follow any longer.

Since, from the model of section 2, it is

$$\gamma = \frac{l_g + l_p}{s(1-t) + t(1-a)} \text{ and } g = \left[ s(1-t) + t(1-a) \right] \sigma$$

(5) can be written as

$$t - \left\{ at + \frac{l_g \left[ s(1-t) + t(1-a) \right]}{l_g + l_p} \right\} = \left\{ r - \left[ s(1-t) + t(1-a) \right] \sigma \right\} \frac{B \left[ s(1-t) + t(1-a) \right] \sigma}{l_g + l_p}$$

(6)

The fact that the growth rate depends on the value taken by $a$ suggests that it is possible to stabilize the ratio of the public debt to the GDP through measures that do not necessarily require changes in the left-hand side of (6). $\dot{b}$ can be reduced, or brought to zero, through a reduction in the right-hand side of (6). Let us start by considering this case.

Suppose that it is $\dot{b} = D > 0$, i.e. the debt ratio is increasing. It is possible to determine variations of $l_g$ and $a$ such as to produce a change in $(r - g)$ that is equal to $-D$ while $(\tau - \gamma)$ remains unchanged, so that $\dot{b}$ is brought to zero. In other words, it must be

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8 The budget constraint in its general form is $\frac{dB}{dt} = G - T + iB + \frac{dH}{dt}$ (H is the supply of hard money). In other words, the government debt can be also financed by issuing money. Throughout this paper the possibility to “monetize” the debt is not considered.

9 Or fiscal policies that generate a larger primary surplus if it initially $0 < (\tau - \gamma) < (r - g)b$. The increase in public debt could, of course, also be stopped by reducing the interest rate $r$ to bring it below $g$. This possibility is not considered here.
\[
\frac{d}{da} (\tau - \gamma) da + \frac{d}{dl_g} (\tau - \gamma) dl_g = 0
\]

(7)

\[
\frac{d}{da} b(r - g) da + \frac{d}{dl_g} (r - g) dl_g = -D
\]

which is fulfilled for

\[
dl_g = \frac{D(l_g + l_p)^2}{B[s(t-1) + t(a-1)]^2} > 0, \quad da = \frac{s[t(t-1) + t(a-1)] dl_g}{t(l_g + l_p)} < 0
\]

(8)

Notice that the variation in capital expenditure is positive \((dl_g > 0)\) and is increasing in \(D\), i.e. the size of the required reduction in the ratio of the debt to GDP. The larger is the required reduction in \(b\), the larger is increase in capital spending, the larger is the decrease in \(a\) \((da)\) to ensure that the primary budget does not vary, the larger is the positive effect on the growth rate \(g\) and, hence, the negative effect on \((r - g)b\).

The general case is that in which the reduction in the debt ratio is realized through both an increase in \((\tau - \gamma)\) and in \((r - g)\). In this case the problem to solve is

\[
\frac{d}{da} (\tau - \gamma) da + \frac{d}{dl_g} (\tau - \gamma) dl_g = mD
\]

\[
\frac{d}{da} b(r - g) da + \frac{d}{dl_g} (r - g) dl_g = -nD
\]

(9)

with \(0 \leq m \leq 1\) and \(n = 1 - m\).

The general solutions for (9) are:

\[
dl_g = \frac{D(l_g + l_p)^2}{Bl_p[s(t-1) + t(a-1)]^2} \left[ nl_p + Bm(r - 2g) \right]
\]

\[
da = \frac{l_gBm(l_g + l_p) + l_p[t(1-a) + s(1-t) + Dmdl_g]}{tl_p(l_g + l_p)}
\]

(10)

Whereas \(da\) certainly is negative, \(dl_g\) is not necessarily positive. In other words, a reduction in \(b\) through an increase in the growth rate \(g\) and a positive variation of \((\tau - \gamma)\) may require that also the public capital spending be reduced. However, the conditions for the positivity of \(l_g\) can be easily found. The positivity of \(l_g\) depends on the values that are taken by \(m\) and \(n\), \(l_p\) and \(r\).

First of all, if \(m = 0\), we are in the particular case considered above and the solutions in (10) reduce to those in (8). When \(m = 1\), the reduction in debt is obtained only through the realization of a primary surplus. In this case, it is possible to run a primary surplus associated to an increase in capital expenditure \((dl_g > 0)\) if it is

\[
r > 2g
\]

(11)

as it can be easily seen from (10).

The rationale of this result is quite evident. If the stabilization of the debt ratio has to be realized through a primary surplus while capital expenditures increase \((dl_g > 0)\), \(a\) must decrease more than when \((\tau - \gamma)\) is left unchanged. The larger decrease in \(a\), in turn, affects \((r - g)\) more significantly. In order that the larger decrease in \(a\) does not cause an increase in \(g\) such that \((r - g)b\) reduces instead of remaining constant, the interest rate must be
significantly higher than the growth rate. Precisely, the interest rate must be more than double the growth rate.

This result differs from the standard one, even though it is assumed that the debt ratio is stabilized only through running a primary surplus. In order that the debt ratio is stabilized, the constraint above on the real interest rate must be fulfilled, while there is no such constraint in mainstream analyses. The reason of this difference is that, in the present model, changes in the primary balance also affect \((r - g)b\).

If, instead, it is \(0 < m < 1\), the positivity of \(dl_g\) depends both on \(I_p\) and \(r\). More precisely, if it is

\[
0 < I_p < \frac{-2B(n-1)g}{n}
\]

then \(dl_g\) is positive when

\[
r > 2g + \frac{nl_p}{B(n-1)}
\]

Notice that the constraint on \(r\) is now less stringent, since it certainly is \(\frac{nl_p}{B(n-1)} < 0\). It is so because, in this case, the stabilization of the debt ratio must be only partly realized through an increase in \((\tau - \gamma)\).

Finally, if it is

\[
l_p \geq \frac{-2B(n-1)g}{n}
\]

then no constraint on \(r\) is required to ensure the positivity of \(dl_g\). When private investment is relatively high, also the GDP is higher and, hence, the debt ratio is lower, so that the decrease in \(\alpha\) has a smaller impact regardless of the value taken by \(r\).

So far, the analysis has been carried out under the hypothesis that the public and private investment productivities are equal. Now this hypothesis is lifted and it is assumed that \(\sigma\) is an increasing function of \(I_g\). For brevity, we consider only the case in which \(m = 0\) (the reduction in the debt ratio is realized only through an increase in the rate of growth \(g\)) and assume that \(\sigma\) is linearly increasing in \(I_p\), i.e. that it is

\[
\sigma = kI_p
\]

Under the new hypothesis, the conditions for debt stabilization change and become less restrictive. The change in the hypothesis on investment productivity does not affect the left-hand side of (6), but only its right-hand side. More precisely, what changes is the effect of a change in \(I_p\). The solutions to (7) become

\[
dl_g = \frac{D(I_g + I_p)^2}{Bk[s(t-1)+t(a-1)](2I_g + I_p)} > 0, \quad da = \frac{[s(t-1)+t(a-1)]dl_g}{t(I_g + I_p)} < 0
\]

Comparing (16) to (8) shows that \(I_g\) must increase less and, consequently, \(da\) must decrease less. In other words, when \(\sigma\) is increasing in \(I_p\), the effect of the change in the composition of public spending favorable to capital expenditures is more powerful.
The model above, based on a generalization of Domar’s growth model, is also in the spirit of Domar’s approach to the problem of the public debt. Like in Domar, attention is focused on the effects of different types of public expenditure on the economy’s growth rate. However, whereas Domar deals with the relation between the growth rate and public spending only at an intuitive level, the present model is based on an explicit functional relationship between the growth rate and the composition of public spending. The model is built in such a way to emphasize that changes in the composition of the public expenditure, namely reductions in the share of current spending, have a positive effect on the growth rate and, hence, on the debt ratio. Other functional relations—like, e.g., private investment or the tax rate—are dealt with in a very simple way, but the model can be developed by introducing more specific equations for such variables.

5. Conclusion

The main object of this paper is to present an approach to the problem of the sustainability of fiscal policy and debt stabilization that is different from the mainstream approach. The paper argues that it is unsatisfactory to deal with the ratio of the public debt to GDP by considering the growth rate of the economy as independent of the composition of public spending. A larger share of public spending devoted to “productive expenditures” can positively affect the growth rate and, hence, the ratio of public debt to GDP.

The present work draws its inspiration from two fundamental contributions by Domar in the 1940s. The analytical relationship between the composition of public spending and the economy’s growth rate is derived from a generalization of Domar’s growth model. The idea that the problem of the public debt must be dealt with by considering the effects on the GDP of different types of public expenditure comes from Domar’s contribution on the burden of the public debt. In this sense, the paper offers an “old answer” to the old question of fiscal sustainability.

In the approach suggested here, public spending and borrowing have an impact on the economy as a whole. The government can run deficits and borrow from the private sector in order to bring the economy to a higher growth rate. Mainstream analyses of fiscal sustainability do not concern themselves with the problem of the effects of government spending and borrowing on the economy’s output. In fact, in these models, the level and composition of the public expenditure as well as the public debt are totally independent of the growth rate. And even the obvious multiplier effects of public spending on the GDP are often ignored, for example by assuming that any reduction in the level of public expenditure implies a proportional reduction in its ratio to the GDP.

The mainstream approach to fiscal sustainability amounts to not offering any real explanation of why the government borrows resources from private agents, unless it is (at least implicitly) accepted the idea that governments draw resources from the private sector only to the benefit of their bureaucratic apparatuses and without any concern for the general welfare. The exclusive concern for the stabilization of the debt ratio through the realization of primary surpluses follows from this sort of approach.

Differently, this paper suggests that the problem of debt stabilization should not focus exclusively on the realization of primary surpluses but rather on the effects that different types of public expenditure have on the economy’s overall productivity and growth rate. If, in a situation in which the debt ratio is growing, more public resources are devoted to capital expenditures and a smaller share to current expenditures, a primary deficit can be sustainable.
Thus, this perspective does not imply that there should not be any concern for the state’s debt and, in particular, for its possible tendency to explode. A continuously growing ratio of public debt to GDP should be a concern because it reflects the fact that the government is not using resources in an “efficient” manner. The government is spending resources in such a way that the GDP does not grow sufficiently to keep the debt ratio stable.

In this perspective, policies aimed at reducing the debt ratio should be centered on the attempt to increase productive expenditures rather than being concentrated on measures aimed at eliminating deficits through reducing expenditure and ignoring the long-period negative effects of such reductions. The EMU and its fiscal discipline is an evident exemplification of this wrong approach to the problem of public debt. In fact, several economists have been suggesting that the EMU adopt some version of the UK “golden rule”, which deals with government deficits by distinguishing between current and capital expenditures.

However, it is necessary to conclude with a note of caution and to point to the necessity for further developments. The model and the rest of the paper are based on the assumption that a clear-cut distinction between capital and current expenditures can be made as well as on the idea that no current expenditure has positive effects on the economy’s productivity. These clearly are very simplistic assumptions. Domar himself underlines that productive public expenditures are not necessarily to be identified with capital expenditures. Some classes of current expenditures have a positive impact on the economy’s productivity while some sorts of unproductive expenditures can be too easily disguised as capital expenditures. Thus, further developments and, above all, attempts to look at the problems of fiscal and debt sustainability in actual situations should be based on further refinements concerning the classification of the government expenditures and their impact on the economy as a whole.

References