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ABSTRACT

This article is linked to some recent attempts at including a noncapacity creating autonomous expenditure category as the driver and determinant of growth into Kaleckian distribution and growth models. Whereas previous contributions have focussed on taming Harrodian instability, generated by the deviation of the goods market equilibrium rate of capacity utilization from a normal or target rate, we rather focus on the so-far neglected issues of deficit, debt, and distribution dynamics in such models. For this purpose, we treat the growth of government expenditures on goods and services, financed by credit creation, as the exogenous growth rate driving the system. We examine the long-run convergence of the system toward such a growth rate, analyze the related debt dynamics, and deal with stability and income distribution issues. Finally, we touch upon the economic and, in particular, fiscal policy implications of our model results.

KEYWORDS
Government deficits and debt; Kaleckian distribution and growth model; public expenditure growth

JEL CLASSIFICATIONS
E11, E12, E25, E62

The Great Recession, following the Great Financial Crisis, has shown anew the need for fiscal policies and government deficit expenditures to stabilize the economy in deep recessions and to prevent a longer run depression. It has also marked the complete failure of New Consensus macroeconomics and economic policies, focusing exclusively on flexible labor markets to reduce the nonaccelerating inflation rate of unemployment in the long run, and on interest rate policies of the monetary authorities to stabilize the economy in the short run (Goodfriend and King 1999; Clarida, Gali, and Gertler 1999; Carlin and Soskice 2009, 2015). However, after a short window of opportunity for fiscal policy stabilization, we have seen a worldwide exit from the application of stabilizing fiscal policies and the switch toward austerity policies, in particular in the Eurozone, in an attempt to stop the increase and to reverse the trend of government deficits and debt. This has been combined with ever

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more desperate monetary policy interventions in money and financial markets to reduce long-term interest rates and to stimulate aggregate demand and growth, in a sense "pushing on a string." In particular, the deflationary stagnation in the Euro area since the crisis (Hein 2013/14), but also sluggish recoveries in other mature capitalist economies, indicate the failure of this approach, which has contributed to the recent discussion on secular stagnation (Summers 2014, 2015; Hein 2016, 2017).

Post Keynesian short-run macroeconomic models and the macroeconomic policy implications derived from these models over the last decades, or so, have increasingly focused on active fiscal policies, government deficits, and debt, when it comes to stabilizing the economy, both in the short and the long run (Arestis and Sawyer 2003, 2004; Setterfield 2007; Fontana 2009; Hein and Stockhammer 2010, 2011; Arestis 2013). Several of these models have relied on the application of Lerner's (1943) notion of "functional finance," which holds that governments should make use of fiscal deficits/surpluses to compensate for private sector financial surpluses/deficits with the aim of stabilizing aggregate demand at (noninflationary) full employment levels, irrespective of the concomitant government deficit– or debt–gross domestic product (GDP) ratios. This is also the macroeconomic core of what has become known as modern money theory, linking a chartalist view on money with the concept of functional finance, and, nowadays, the notion of the government as an "employer of last resort" (Tcherneva 2009, 2014; Wray 2012).

Long-run debt and distribution dynamics have not been explored in much detail in these models and approaches. Several papers have referred to the results by Domar (1944), who had shown that, with a constant rate of growth of nominal GDP, a constant government deficit–GDP ratio will lead to the convergence toward a constant government debt–GDP ratio. Furthermore, with the nominal rate of interest on government debt below nominal GDP growth, no primary surpluses and thus no tax revenues are required to satisfy government interest payment requirements to the rentiers, the holders of government debt.[1]

Of course, stock-flow consistent models allow for the systematic treatment of government deficits and debt dynamics. Following Godley and Lavoie (2007a, Chapter 11, 2007b) and Martin (2008), Lavoie (2014, Chapter 5.6.3) has shown that the sustainability of functional finance along an exogenously given full-employment growth path and a convergence toward a constant government debt-income ratio is possible under less restrictive conditions than put forward by Domar (1944), if private consumption out of wealth is included into the model. However, neither investment of firms nor issues of functional income distribution are addressed in detail. Ryoo and Skott

[1]For a rudimentary debate on government debt dynamics, based on the assumption of a stationary economy, see Palley (2015a, 2015b) and Tymoigne and Wray (2015). Sardoni (2016) points out to some strange assumptions being made in this debate and provides solutions in a simple growth context drawing on Domar (1944).

(2013) have dealt with public debt and full employment in a stock-flow consistent model, and they have included distribution issues; however, they start from a basic Harrodian approach with a given normal rate of capacity utilization attained in equilibrium.

In this article we will provide an account of government deficit and debt dynamics, as well as functional income distribution effects in the context of a neo-Kaleckian distribution and growth model. Our article has been motivated by the recent contributions by Allain (2015), Lavoie (2016) and Nah and Lavoie (2017), who have introduced the notion of an exogenous/autonomous growth rate of a noncapacity creating expenditure component into otherwise Kaleckian distribution and growth models. They have shown that, under some weak conditions, in such models Harrodian instability, generated by the deviation of the goods market equilibrium rate of capacity utilization from the normal or the firms' target rate, will be tamed and the economy will converge toward a normal rate of capacity utilization.[2] Simultaneously, the model economy will maintain the main features of the neo-Kaleckian distribution and growth model, the paradox of saving and the paradox of costs. However, a lower propensity to save and a lower profit share will have positive effects only on the traverse toward the long-run equilibrium, and thus only on the long-run growth path, while the long-run equilibrium growth rate will be determined by the autonomous growth rate of a non-capacity creating demand component. But neither Allain (2015), Lavoie (2016) nor Nah and Lavoie (2017) have explored the related deficit, debt and distribution dynamics. Allain (2015) takes government expenditure growth as the driver of growth and assumes a continuously balanced budget and thus avoids the discussion of the dynamics of government deficits or debt. Lavoie (2016) refers to autonomous consumption expenditures as determining long-run growth, but only mentions potential stability problems related to household debt without exploring them in any detail. And Nah and Lavoie (2017) include export growth as the driver of growth without analyzing the related foreign assets or debt dynamics. Generally, the lack of focus on deficit and debt dynamics seems to be true for most of the literature on the Sraffian supermultiplier models emanating from the pioneering work of Serrano (1995), claiming that growth in modern capitalist economies is driven by the growth of a noncapacity creating component of aggregate demand (Dejuan 2005; Cesaratto 2015; Freitas and Serrano 2015). Pariboni (2016), focusing on the dynamics of household debt in a supermultiplier growth model driven by autonomous consumption, is a recent exception.

In this article we will follow Allain (2015) and consider the growth rate of government expenditures on goods and services as the non-capacity creating autonomous expenditure category driving growth in the long run. But

[2]For a recent discussion on the validity of these results, see Skott (2017) and Lavoie (2017).

different from Allain (2015), we will assume that government expenditures are financed by credit and/or money creation. We will not consider taxation issues at all, in order to focus on deficit and debt dynamics and the related distributional effects.[3] Also different from Allain (2015), Lavoie (2016) and Nah and Lavoie (2017), we will refrain from discussing Harrodian instability issues and assume, in line with the arguments proposed in Hein, Lavoie, and van Treeck (2011, 2012) that the target or normal rate of capacity utilization is either not precisely defined in a world dominated by Keynesian fundamental uncertainty, or is not attainable due to inconsistencies with other competing targets, or that there are forces at work that adjust the normal rate of utilization to the actual rate in the long run.

These assumptions will allow us to focus on the deficit, debt, and distributional effects of an exogenous or autonomous growth rate of government expenditures, financed by credit or money creation. From an alternative to mainstream economic policy perspective, this growth rate can be conceived as an economic policy tool that may be geared toward providing aggregate demand growth at noninflationary full employment and hence at potential growth. Our contribution will thus elaborate in a consistent model framework on an economic policy proposal contained in, among others, Hein, Truger, and van Treeck (2012) and Hein and Detzer (2015), for example.

The model and the modelling procedure that we will develop in the following sections are close to what can be found in You and Dutt (1996). However, because we are interested in the government deficit and debt dynamics, as well as in the distribution effects of an autonomous noncapacity creating growth rate of government expenditures driving the system, and in the related economic policy implications, we do not follow their approach toward modelling government expenditures. You and Dutt (1996) treated government expenditures as a fraction of the capital stock as their exogenous policy variable. This means that they do not have to model the dynamics and the stability of this ratio and can focus exclusively on government debt dynamics.[4] Furthermore, by means of considering different tax rates on capital and labor, You and Dutt (1996) are concerned with the after tax functional distribution of income, whereas, given our research focus, we will be contend with examining the outcomes of deficit-financed government expenditures for the pretax functional distribution of market incomes.[5]

[3]See, for example, Dutt (2013), Laramie/Mair (2003), Palley (2013) or You and Dutt (1996) for the inclusion of taxation issues into Kaleckian distribution and growth models.

[4]From an economic policy perspective, it is difficult to consider the government expenditures capital stock-ratio (or the government expenditures–GDP ratio) as a policy instrument, which governments can control. The development of the capital stock (or of GDP) depends on the decisions in the private sector which under the conditions of fundamental uncertainty governments cannot perfectly predict.

[5]Further minor differences between the two modelling approaches can be found in the investment and saving functions. You and Dutt (1996) apply a post-Kaleckian investment function including a positive direct effect of the (after tax) profit share on investment, whereas we will make use of a simple neo-Kaleckian function omitting this effect. And whereas You and Dutt (1996) do not include a wealth effect in their consumption/saving function, such an effect is present in our model.

The paper is structured as follows. In the second section we will present our basic model, and in the third section we will analyse the properties of the short-run equilibrium in which saving and investment will adjust through changes in the rate of capacity utilization. The fourth section will then turn towards the long run in which government expenditures for goods and services grow at a constant rate and capital stock growth, as well as the government primary deficit- and debt-capital ratios become endogenous variables. The final section will summarize the main findings and draw some economic policy implications.

The basic model and the modelling procedure

Our model economy is a standard neo-Kaleckian one-good closed economy model with a private and a government sector.[6] Production of the single good, which can be used for consumption and investment purposes, takes place in the private sector, in which firms use a non-depreciating capital stock and direct labor as inputs applying a given fixed-coefficient production technology. The emanating output is supplied in an imperfectly competitive goods market; firms set prices marking up unit labor costs, which are constant up to full capacity output. The mark-up is mainly determined by the degree of price competition in the goods market and the bargaining power of trade unions in the labor market (Kalecki 1954, Chapters 1–2, Hein 2014, Chapter 5.2). With these determinants given, prices are inelastic with respect to demand; changes in demand will trigger changes in output and capacity utilization. We can thus treat the price level as a constant; nominal values are hence equal to real values in what follows.

Because we intend to focus on the role of government expenditures, deficits, and debt, we keep the private sector of our model economy as simple as possible. We assume that all wages (W) are spent for consumption purposes (C_W), hence workers do not save. All the profits (Π) are distributed as dividends to rentiers, hence there are no retained earnings. Furthermore, we also abstract from the consideration of long-term debt finance of the firms' capital stock. Initial finance for production and investment purposes is provided within the business sector and not explicitly discussed here, so that investment is independent of saving; final finance (or funding) of investment and the capital stock only consists of equity issued by the firms and held by the rentiers.[7]

Adding the government sector to this primitive private sector of our model economy, we abstract from taxation and assume, following Lerner (1943) and the modern chartalists, that government expenditures can either be financed by issuing money or debt. For the sake of simplicity, we shall only include

[6]These models are based on the original contributions by Rowthorn (1981) and Dutt (1984, 1987). See Hein (2014, Chapter 6) for an introduction to Kaleckian distribution and growth models.
[7]For the distinction between initial and final finance in a monetary circuit approach see Graziani (1994), Lavoie (2014, Chapter 4.6.4), Seccareccia (1996) and Hein (2008, Chapter 10.2).

government debt (L) held by rentiers, and we assume that the rate of interest on government debt (i) is under the control of the central bank, as a part of the government.[8] Government debt in each period increases (dL) according to the sum of government expenditures (G) and the interest payments on the accumulated stock of debt (iL). Interest payments are received by rentiers, whose total or disposable income is thus composed of distributed profits plus interest paid by the government. This rentiers' income is partly consumed and partly saved. Saving takes place in terms of accumulating equity issued by firms (dE) and bonds issued by the government (dL). For the sake of simplicity, we do not model the rentiers' portfolio decisions and assume that the proportion of debt and equity accumulation follows the proportion of the supply of these two assets. Table 1 and 2 present the balance sheet and the transaction flow matrices of our simple model economy.

Total disposable income (Y) in our model economy is composed of income from production ($Y_P = W + \Pi$) and financial income ($Y_F = iL$):

$$Y = Y_P + Y_F = W + \Pi + iL \tag{1}$$

The share of profit in the income generated in production:

$$h = \frac{\Pi}{Y_P} \tag{2}$$

is determined by firms' mark-up pricing. It is treated as an exogenous variable in our model. The ratio between financial income and production income is denoted by:

$$\Psi = \frac{Y_F}{Y_P} = \frac{iL}{Y_P} = \frac{i\lambda}{u} \tag{3}$$

and is an endogenous variable in the model. It depends on the rate of interest, which is assumed to be exogenously given, the government debt-capital ratio ($\lambda = L/K$) and the rate of capacity utilization ($u = Y_P/K$), which will each be endogenously determined in what follows. With these definitions, the share of wages in total income (ω) is given as:

$$\omega = \frac{W}{Y} = \frac{(1-h)Y_P}{(1+\Psi)Y_P} = \frac{1-h}{1+\Psi} \tag{4}$$

The share of profits in total income (π) is,

$$\pi = \frac{\Pi}{Y} = \frac{hY_P}{(1+\Psi)Y_P} = \frac{h}{1+\Psi} \tag{5}$$

[8]Including money emission into the model would mean to have a second, non-interest bearing financial asset which could be used as distributional instrument affecting the average rate of interest on the two financial assets in the system. In a more complex model, allowing for price changes in the asset markets, money supply can be used to affect the interest rate in the government bonds market, as suggested by Lerner (1943).

Table 1. Balance sheet matrix.

	Workers	Rentiers	Firms	Government	Σ
Loans		+L		−L	0
Equities		+E	−E		0
Capital			K		K
Σ	0	+L+E	0	−L	K = E

and the share of financial income in total income (φ) is,

$$\varphi = \frac{Y_F}{Y} = \frac{\Psi Y_P}{(1+\Psi)Y_P} = \frac{\Psi}{1+\Psi} \tag{6}$$

Finally, the capital income share is given by:

$$1-\omega = \frac{\Pi + Y_F}{Y} = \frac{h+\Psi}{1+\Psi} = \pi + \varphi \tag{7}$$

Regarding private investment we assume a simple neo-Kaleckian investment function, in which the decisions to invest in the capital stock (I) are determined by animal spirits (α) and by capacity utilization. The rate of capital accumulation (g) is thus given as:

$$g = \frac{I}{K} = \alpha + \beta u, \qquad \beta > 0 \tag{8}$$

Because workers do not save, private saving only consists of saving out of capital income, i.e., saving out of the rentiers' profits and interest incomes. This has to be reduced by rentiers' consumption out of wealth, the latter consisting of the private capital stock (K) and the stock of debt issued by the government (L). We assume a constant propensity to save of the rentiers' households out of current income (s_R) and a constant propensity to consume out of wealth (c_{WR}). For the saving rate (σ), normalizing saving (S) by the capital stock, we obtain,

$$\begin{aligned}\sigma &= \frac{S}{K} = \frac{s_R(hY_P + iL) - c_{WR}(L+K)}{K} \\ &= s_R(hu + i\lambda) - c_{WR}(\lambda + 1), \qquad 1 > s_R, c_{WR} > 0\end{aligned} \tag{9}$$

Table 2. Transaction flow matrix.

	Workers	Rentiers	Firms' current	Firms' capital	Government	Σ
Private consumption	$-C_W$	$-C_R$	$+C_W+C_R$			0
Private investment			+I	−I		0
Government expenditures			+G		−G	0
Wages	+W		-W			0
Profits/dividends		+Π	-Π			0
Interest		+iL			−iL	0
Change in equity		−dE		+dE		0
Change in loans		−dL			+dL	0
Σ	0	0	0	0	0	0

Government expenditures for goods and services are exogenously given and are supposed to grow at a constant rate ($\gamma = dG/G$) in the long run of the model, as proposed by Allain (2015). We thus obtain for the government expenditures–capital ratio (b), which can also be seen as the primary deficit–capital ratio, because it is financed by additional credit in our model:

$$b = \frac{G}{K} = \frac{G_0 e^{\gamma t}}{K}, \qquad \gamma \geq 0 \tag{10}$$

Based on this simple framework, the further modelling procedure is as follow. We will start with the short run in which output adjusts to demand through changes in capacity use, holding government expenditures and the capital stock and thus the government expenditures–capital ratio as well as the government debt–capital ratio constant. Then we will move to the long run in which government expenditures for goods and services grow at the constant rate γ, and capital stock growth, as well as the government deficit– and debt–capital ratios, become endogenous variables.

The short-run equilibrium

For the short-run equilibrium we have the condition that private saving has to be equal to private investment plus government expenditures for goods and services and the interest payments to the private sector:

$$\sigma = g + b + i\lambda \tag{11}$$

The goods markets will clear through variations in output and capacity utilization. For the adjustment process to be stable, saving has to be more responsive to capacity utilization than investment. From the Equations (8) and (9), we hence get the stability condition:

$$\frac{\partial \sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \;\Rightarrow \qquad s_R h - \beta > 0 \tag{12}$$

In what follows, we assume this stability condition to be fulfilled. Inserting Equations (8), (9), and (10) into Equation (11) yields the short-run equilibrium rate of capacity utilization:

$$u^* = \frac{\alpha + b + c_{WR} + \lambda[i(1 - s_R) + c_{WR}]}{s_R h - \beta} \tag{13}$$

Because government debt and the capital stock and thus the government debt-capital ratio are held constant in the short run, the equilibrium rate of capacity utilization from Equation (13) also uniquely determines the functional income shares from Equation (4–6), for given profit shares in production and given interest rates, so that we get:

$$\omega^* = \frac{1-h}{1+\Psi} = \frac{1-h}{1+\frac{i\lambda}{u^*}}, \qquad \frac{\partial \omega^*}{\partial u^*} > 0 \tag{14}$$

$$\pi^* = \frac{h}{1+\Psi} = \frac{h}{1+\frac{i\lambda}{u^*}}, \qquad \frac{\partial \pi^*}{\partial u^*} > 0 \tag{15}$$

$$\varphi^* = \frac{\Psi}{1+\Psi} = \frac{\frac{i\lambda}{u^*}}{1+\frac{i\lambda}{u^*}} = \frac{1}{\frac{u^*}{i\lambda}+1}, \qquad \frac{\partial \varphi^*}{\partial u^*} < 0 \tag{16}$$

As can be seen from Equations (14)–(16), with a constant profit share in production, a constant interest rate and a constant government debt-capital ratio, an increase (a fall) of the short-run equilibrium rate of capacity utilization will raise (lower) the wage share and the profit share in total income, and it will lower (raise) the financial income share.

The comparative statics of the short-run equilibrium are summarized in Table 3. As can be easily seen from the respective equilibrium values, an increase in animal spirits and hence in investment raises equilibrium capacity utilization, and thus the wage share and the profit share, but it lowers the financial income share.

A higher propensity to save reduces equilibrium capacity utilization (i.e., the paradox of saving is valid):

$$\frac{\partial u^*}{\partial s_R} = \frac{-(hu+i\lambda)}{s_R h - \beta} < 0 \tag{13a}$$

Because a higher propensity to save causes a lower rate of utilization, it thus lowers the equilibrium wage and profit shares, but raises the financial income share, as can easily be seen in Equations (14)–(16). A higher propensity to consume out of wealth raises short-run equilibrium utilization and thus equilibrium wage and profit shares. But it reduces the financial income share. A higher profit share has depressing effects on equilibrium capacity utilization (i.e., our model economy is wage led in the short run):

$$\frac{\partial u^*}{\partial h} = \frac{-s_R u}{s_R h - \beta} < 0, \tag{13b}$$

Table 3. Effects of changes in exogenous variables on short-run equilibrium endogenous variables.

	u^*	ω^*	π^*	φ^*
α	+	+	+	−
s_R	−	−	−	+
c_{WR}	+	+	+	−
h	−	−	+/−	+
b	+	+	+	−
i	+	+/−	+/−	+/−
λ	+	+/−	+/−	+/−

The effects of a higher profit share in production on functional income distribution for the economy as a whole are as follows:

First, a rise in the profit share in production has a direct negative effect on the wage share in total income, which is exacerbated by the depressing effect of a higher profit share on capacity utilization:

$$\frac{\partial\omega^*}{\partial h} = \frac{\frac{\partial u}{\partial h}\frac{\Psi\omega}{u} - 1}{1+\Psi} < 0 \tag{14a}$$

Second, the effect of a rise in the profit share in production on the overall profit share is ambiguous. The direct effect will be positive, but the indirect effect via the rate of capacity utilization will be negative, so that the overall effect may be positive or negative, and firms/capitalists may face a kind of "paradox of costs" (i.e., a higher profit share in production being associated with a lower profit share in total income):

$$\frac{\partial\pi^*}{\partial h} = \frac{\frac{\partial u}{\partial h}\frac{\Psi\pi}{u} + 1}{1+\Psi} \tag{15a}$$

Third, the effect of a rise in the profit share in production on the financial income share is unambiguously positive via the negative effect on capacity use:

$$\frac{\partial\varphi^*}{\partial h} = \frac{-\frac{\partial u}{\partial h}\frac{\varphi}{u}}{1+\Psi} > 0 \tag{16a}$$

An increase in the exogenous government expenditure-capital ratio has positive effects on short-run equilibrium capacity utilization (Equation [13]). Through the increase in capacity utilization the effects on the wage share and the profit share (Equations [14] and [15]) are positive, too, whereas the effect on the financial income share is negative (Equation [16]).

A higher interest rate and a higher debt-capital ratio have short-run expansionary effects on equilibrium capacity utilization, because additional income is injected into the system and partly consumed by the rentiers (Equation [13]). However, the effects on functional income distribution are ambiguous. A rise in the interest rate or the government debt-capital ratio has a directly negative effect on the wage share and the profit share, but the indirect effect via rising capacity utilization on these two shares is positive. For the financial income share, the effects are in reverse direction: the direct effect is positive, whereas the indirect effect via a higher rate of capacity utilization is negative:

$$\frac{\partial\omega^*}{\partial i\lambda} = \frac{\frac{\omega}{u}\left(\frac{\partial u}{\partial i\lambda}\Psi - 1\right)}{1+\Psi} \tag{14b}$$

$$\frac{\partial\pi^*}{\partial i\lambda} = \frac{\frac{\pi}{u}\left(\frac{\partial u}{\partial i\lambda}\Psi - 1\right)}{1+\Psi} \tag{15b}$$

$$\frac{\partial\varphi^*}{\partial i\lambda} = \frac{\frac{\varphi}{u}\left(1 - \frac{\partial u}{\partial i\lambda}\Psi\right)}{1 + \Psi} \tag{16b}$$

The long-run equilibrium

Let us now turn to the long run of the model, in which government expenditures grow at the constant rate γ. We will first determine the long-run equilibrium values for the government expenditures-capital ratio and the government debt-capital ratio, as well as for the respective rates of capital accumulation and capacity utilization. Then we will examine the stability properties of the long-run equilibrium and finally we will check the response of the stable non-zero long-run equilibrium toward changes in exogenous variables, in particular.

In the long-run equilibrium, the government expenditures- (or primary deficit-) and debt-capital ratios have to be constant each. Using Equations (8) and (10), as well as the definition for the government debt-capital ratio (λ) introduced above, we have:

$$\dot{b} = b(\gamma - g) = b(\gamma - \alpha - \beta u) \tag{17}$$

and

$$\dot{\lambda} = b + \lambda(i - g) = b + \lambda(i - \alpha - \beta u) \tag{18}$$

with a dot on a variable denoting the time rate of change. Setting Equations (17) and (18) equal to zero and using Equation (13) for the short-run goods market equilibrium rate of capacity utilization, yields the following long-run equilibrium values:

$$b^{**} = \frac{(\gamma - i)[s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})]}{\beta(\gamma - s_R i + c_{WR})} \tag{19}$$

$$\lambda^{**} = \frac{s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})}{\beta(\gamma - s_R i + c_{WR})} \tag{20}$$

$$g^{**} = \gamma \tag{21}$$

$$u^{**} = \frac{\gamma - \alpha}{\beta} \tag{22}$$

Local stability of the long-run equilibrium requires a negative trace and a non-negative determinant for the Jacobian matrix of the dynamic system:[9]

$$J = \begin{pmatrix} \frac{\partial\dot{b}}{\partial b} & \frac{\partial\dot{b}}{\partial\lambda} \\ \frac{\partial\dot{\lambda}}{\partial b} & \frac{\partial\dot{\lambda}}{\partial\lambda} \end{pmatrix} \tag{23}$$

[9]Generally, with a zero determinant and hence one zero eigenvalue, the system displays a continuum of (locally) stable equilibria, as acknowledged by Dutt (1997) and Lavoie (2006), for example.

with the following values of the matrix evaluated at the equilibria b^{**} and λ^{**}:

$$\frac{\partial \dot{b}}{\partial b_{b**,\lambda**}} = \frac{-(\gamma - i)[s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})]}{(s_R h - \beta)(\gamma - s_R i + c_{WR})} \tag{17a}$$

$$\frac{\partial \dot{b}}{\partial \lambda_{b**,\lambda**}} = \frac{-[i(1 - s_R) + c_{WR}](\gamma - i)[s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})]}{(s_R h - \beta)(\gamma - s_R i + c_{WR})} \tag{17b}$$

$$\frac{\partial \dot{\lambda}}{\partial b_{b**,\lambda**}} = \frac{(s_R h - \beta)(\gamma - s_R i + c_{WR}) - [s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})]}{(s_R h - \beta)(\gamma - s_R i + c_{WR})} \tag{18a}$$

$$\frac{\partial \dot{\lambda}}{\partial \lambda_{b**,\lambda**}} = \frac{-(\gamma - i)(s_R h - \beta)(\gamma - s_R i + c_{WR}) - [i(1 - s_R) + c_{WR}][s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})]}{(s_R h - \beta)(\gamma - s_R i + c_{WR})} \tag{18b}$$

We thus obtain the following trace (TrJ) and determinant (DetJ):

$$TrJ_{b**,\lambda**} = \frac{-[s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})] - (\gamma - i)(s_R h - \beta)}{s_R h - \beta} \tag{24}$$

$$DetJ_{b**,\lambda**} = \frac{[s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})](\gamma - i)}{s_R h - \beta} \tag{25}$$

As we assume the goods market stability condition to hold also in the long run, the sign and the local stability of the long-run equilibrium values for the government expenditures- and debt-capital ratios only depend on the signs of three terms, as can be seen in Equations (19), (20), (24), and (25). In effect, long-run stability only depends on the signs of the first two terms shown in Column 2 and 3 of Table 4, which contains all the potential cases. The results

Table 4. Local stability of the long-run equilibrium values of the government expenditures- and the government debt-capital ratios.

Cases	$s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR})$	$\gamma - i$	$\gamma - s_R i + c_{WR}$	b**	λ**	TrJ	DetJ	Stability
1	+	+	+	+	+	−	+	*stable*
2	+	−	+	−	+	−/0/+	−	saddle point unstable
3	+	−	−	+	−	−/0/+	−	saddle point unstable
4	+	*0*	+	*0*	+	−	*0*	*stable*
5	−	+	+	−	−	−/0/+	−	saddle point unstable
6	−	−	+	+	−	+	+	unstable
7	−	−	−	−	+	+	+	unstable
8	−	0	+	0	−	+	0	unstable
9	*0*	+	+	*0*	*0*	−	*0*	*stable*
10	0	−	−/+	0	0	+	0	unstable
11	0	0	+	0	0	0	0	unstable

Notes: From our assumptions regarding s_R and c_{WR} it follows that $\gamma - s_R i + c_{WR} > \gamma - i$. According to Chiang (1984, p. 633, emphasis in original), "a saddle point is generically classified as an *unstable* equilibrium". *Case 11* is classified as unstable, because in this case the Jacobian does not turn towards a zero matrix, since here the element $\frac{\partial \dot{\lambda}}{\partial b_{b**,\lambda**}} = 1$.

regarding stability/instability follow the classification in Chiang (1984, Chapter 14) and Hirsch, Smale, and Devaney (2004, Chapter 4).

As can be seen in Table 4, our simple model logically allows for 11 long-run combinations of the important terms determining equilibria and local stability. But only three combinations provide locally stable equilibria: Case 1 with positive equilibrium government expenditures- and debt-capital ratios; Case 4 with a zero equilibrium government expenditures-capital ratio and a positive debt-capital ratio; and Case 9 with zero equilibrium values for both ratios. Generally, the locally stable cases require the following conditions to hold simultaneously: $s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR}) \geq 0$ and $\gamma - i \geq 0$. The first condition requires both animal spirits (α) and the rentiers' propensity to consume out wealth (c_{WR}) not to be too strong relative to the autonomous growth rate of government expenditures (γ). The second condition requires the exogenous rate of interest on government debt (i) not to exceed the autonomous growth rate of government expenditures (γ), which also determines the long-run growth rate of the system (Equation [21]). Our results are thus in line with Domar's (1944) well-known conclusions regarding the sustainability and stability of government debt, but with our first condition we provide a further qualification. Furthermore, it should be noted that in our model, different from Lavoie (2014, Chapter 5.6.3), the weaker condition $\gamma - s_R i + c_{WR} > 0$ is not sufficient to provide a stable equilibrium, if one of the first two conditions is not met.

Let us now turn to the discussion of the effects of variations in exogenous variables on the long-run equilibrium values of capacity utilization, capital accumulation and growth, the equilibrium government expenditures (primary deficit)- and debt-capital ratios, as well as on our three distributional variables. Here, we will only focus on the Case 1 of locally stable and positive long-run equilibrium government expenditures- and debt-capital ratios. The other two locally stable equilibrium Cases 4 and 9 can be considered as special borderline cases in which either $\gamma - i = 0$ (Case 4) or $s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR}) = 0$ (Case 9) has to hold, which provides a zero determinant going along with a negative trace of the Jacobian in these two cases. The effects of changes in exogenous variables on these equilibria are shown in Tables A1 and A2 in the appendix and shall not be discussed here any further.

For the Case 1 of locally stable and positive long-run equilibrium government expenditures– and debt–capital ratios the effects of changes in exogenous variables on the long-run equilibrium endogenous variables are summarized in Table 5. Changes in the rentiers' propensity to save, their propensity to consume out of wealth, the profit share, and the rate of interest do not affect long-run equilibrium capacity utilization, capital accumulation, and growth (Equations [21] and [22]). A rise in animal spirits is detrimental to capacity utilization, but does not affect accumulation and growth, whereas

Table 5. Effects of changes in exogenous variables on locally stable long-run equilibrium endogenous variables associated with non-zero equilibrium government expenditures- and debt-capital ratios (*case 1* in Table 4: $b^{**} > 0$, $\lambda^{**} > 0$).

	u^{**}	g^{**}	b^{**}	λ^{**}	ω^{**}	π^{**}	φ^{**}
α	−	0	−	−	+	+	−
s_R	0	0	+	+	−	−	+
c_{WR}	0	0	−	−	+	+	−
h	0	0	+	+	−	+/−	+
i	0	0	−	+	−	−	+
γ	+	+	+	+/−	+/−	+/−	+/−

a rise in the rate of growth of government expenditures has expansionary effects on utilization, accumulation, and growth in long-run equilibrium.

Focusing on government expenditures–, and thus primary deficit–, as well as government debt–capital ratios next, we find the following results for the long-run equilibrium (Equations [19] and [20]). A rise in animal spirits will lower both the long-run equilibrium government expenditures– and debt–capital ratios. A higher rentiers' propensity to save will increase both ratios and a rise in the propensity to consume out of wealth will lower them:

$$\frac{\partial b^{**}}{\partial s_R} = \frac{(\gamma - i)(hu + i\lambda)}{\gamma - s_R i + c_{WR}} > 0 \tag{19a}$$

$$\frac{\partial \lambda^{**}}{\partial s_R} = \frac{hu + i\lambda}{\gamma - s_R i + c_{WR}} > 0 \tag{20a}$$

$$\frac{\partial b^{**}}{\partial c_{WR}} = \frac{-(\gamma - i)(1 + \lambda)}{\gamma - s_R i + c_{WR}} < 0 \tag{19b}$$

$$\frac{\partial \lambda^{**}}{\partial c_{WR}} = \frac{-(1 + \lambda)}{\gamma - s_R i + c_{WR}} < 0 \tag{20b}$$

A rise in the profit share in production will also raise the long-run equilibrium government expenditures– and debt–capital ratios, because we require $\gamma - \alpha > 0$ for positive long-run stable equilibria:

$$\frac{\partial b^{**}}{\partial h} = \frac{(\gamma - i)s_R(\gamma - \alpha)}{\beta(\gamma - s_R i + c_{WR})} > 0 \tag{19c}$$

$$\frac{\partial \lambda^{**}}{\partial h} = \frac{s_R(\gamma - \alpha)}{\beta(\gamma - s_R i + c_{WR})} > 0 \tag{20c}$$

A higher interest rate on government debt will mean a lower long-run equilibrium government expenditures–capital ratio, but a higher long-run equilibrium government debt–capital ratio:

$$\frac{\partial b^{**}}{\partial i} = \frac{\lambda[\gamma(s_R - 1) - c_{WR}]}{\gamma - s_R i + c_{WR}} < 0 \tag{19d}$$

$$\frac{\partial \lambda^{**}}{\partial i} = \frac{s_R \lambda}{\gamma - s_R i + c_{WR}} > 0 \tag{20d}$$

A higher rate of growth of government expenditures has the following effects on the long-run equilibrium government expenditures– and debt–capital ratios:

$$\frac{\partial b^{**}}{\partial \gamma} = \frac{\left(\frac{s_R h}{\beta} - 1\right)(\gamma - i) + \lambda[i(1 - s_R) + c_{WR}]}{\gamma - s_R i + c_{WR}} > 0 \tag{19e}$$

$$\frac{\partial \lambda^{**}}{\partial \gamma} = \frac{\frac{s_R h}{\beta} - 1 - \lambda}{\gamma - s_R i + c_{WR}} = \frac{s_R[h(\alpha + c_{WR}) - i(s_R h - \beta)]}{\beta(\gamma - s_R i + c_{WR})^2} \tag{20e}$$

$$\frac{\partial \lambda^{**}}{\partial \gamma} > 0, \qquad \text{if}: \frac{s_R h}{\beta} - 1 > \lambda, \text{ i.e., if}: \ h(\alpha + c_{WR}) > i(s_R h - \beta) \tag{20e$'$}$$

This implies that a higher rate of growth of government expenditures leads to a higher long-run equilibrium government expenditures-capital ratio for the case we are considering here.[10] However, the effect on the long-run equilibrium government debt-capital ratio is not unique and depends on the value of this ratio in the initial equilibrium. If this value falls short of the threshold in (20e'), or, which means the same, if the equivalent condition regarding model coefficients and parameters in (20e') is met, the long-run equilibrium government debt-capital ratio will rise as well. In the traverse to the new equilibrium we will thus see government debt rising faster than the capital stock. If the government debt–capital ratio exceeds the threshold in (20e')—that is, the equivalent condition is not met—a higher rate of growth of government expenditures will cause a lower long-run equilibrium government debt–capital ratio. In the traverse to the new equilibrium we will see government debt rising at a lower pace than the capital stock. In this case, we have a macroeconomic "paradox of debt" (i.e., an increase in the rate of growth of government expenditures and hence in primary government deficits, but a fall in the government debt–capital ratio).

Regarding functional income distribution in long-run equilibrium, we have to consider that any change in exogenous variables will affect distribution through changes in long-run equilibrium capacity utilization and the government debt–capital ratio, because the long-run equilibrium income shares are given as:

$$\omega^{**} = \frac{1 - h}{1 + \Psi} = \frac{1 - h}{1 + \frac{i\lambda^{**}}{u^{**}}}, \qquad \frac{\partial \omega^{**}}{\partial u^{**}} > 0, \frac{\partial \omega^{**}}{\partial \lambda^{**}} < 0 \tag{26}$$

[10]It should be noticed that the short-run goods market equilibrium condition implies that $s_R h/\beta > 1$, so that (19e) is indeed positive.

$$\pi^{**} = \frac{h}{1+\Psi} = \frac{h}{1+\frac{i\lambda^{**}}{u^{**}}}, \qquad \frac{\partial \pi^{**}}{\partial u^{**}} > 0, \frac{\partial \pi^{**}}{\partial \lambda^{**}} < 0 \tag{27}$$

$$\varphi^{**} = \frac{\Psi}{1+\Psi} = \frac{\frac{i\lambda^{**}}{u^{**}}}{1+\frac{i\lambda^{**}}{u^{**}}} = \frac{1}{\frac{u^{**}}{i\lambda^{**}}+1}, \qquad \frac{\partial \varphi^{**}}{\partial u^{**}} < 0, \frac{\partial \varphi^{**}}{\partial \lambda^{**}} > 0 \tag{28}$$

A rise in animal spirits will lower the long-run equilibrium rate of capacity utilization and also the long-run government debt–capital ratio, which have opposite effects on functional income shares. However, calculating the overall effect, we obtain:

$$\frac{\partial \omega^{**}}{\partial \alpha} = \frac{\frac{1-h}{u(1+\Psi)}\left(\frac{\partial u}{\partial \alpha}\Psi - \frac{\partial \lambda}{\partial \alpha} i\right)}{1+\Psi} = \frac{\beta(\gamma + c_{WR})i(1-h)}{(1+\Psi)^2(\gamma-\alpha)^2(\gamma - s_R i + c_{WR})} > 0 \tag{26a}$$

$$\frac{\partial \pi^{**}}{\partial \alpha} = \frac{\frac{h}{u(1+\Psi)}\left(\frac{\partial u}{\partial \alpha}\Psi - \frac{\partial \lambda}{\partial \alpha} i\right)}{1+\Psi} = \frac{\beta(\gamma + c_{WR})ih}{(1+\Psi)^2(\gamma-\alpha)^2(\gamma - s_R i + c_{WR})} > 0 \tag{27a}$$

A rise in animal spirits will thus raise the production income shares (i.e., the wage share and the profit share) and it will therefore lower the long-run equilibrium financial income share:

$$\frac{\partial \varphi^{**}}{\partial \alpha} = \frac{\frac{1}{u(1+\Psi)}\left(\frac{\partial \lambda}{\partial \alpha} i - \frac{\partial u}{\partial \alpha}\Psi\right)}{1+\Psi} = \frac{-\beta(\gamma + c_{WR})i}{(1+\Psi)^2(\gamma-\alpha)^2(\gamma - s_R i + c_{WR})} < 0 \tag{28a}$$

A higher propensity to save will have no effect on long-run equilibrium capacity utilization, but it will cause a higher government debt–capital ratio. Therefore, it will raise the financial income share, and will depress the wage share and the profit share. For the rentiers' propensity to consume out of wealth we get the opposite results: A higher propensity to consume out of wealth will have no effect on long-run equilibrium capacity utilization, but it will cause a lower government debt–capital ratio. Therefore, it will lower the financial income share and will raise the wage share and the profit share in long-run equilibrium.

A higher profit share in production has no effect on long-run equilibrium capacity utilization and it will raise the long-run equilibrium government debt–capital ratio. Therefore, it has a uniquely depressing effect on the wage share and a raising effect on the financial income share. The impact on the profit share in total income is not clear a priori, but it depends on the relative strength of the redistribution of income in production and the effect on the long-run equilibrium government debt-capital ratio. If the latter is very pronounced, the increase in the profit share in production may be associated with the fall in the profit share in total income, and we will again have a kind of paradox of costs.

$$\frac{\partial \omega^{**}}{\partial h} = \frac{-\left[1+\frac{\partial \lambda}{\partial h}\frac{i(1-h)}{u(1+\Psi)}\right]}{1+\Psi} = \frac{-(1+\Psi)(\gamma - s_R i + c_{WR}) - s_R i(1-h)}{(1+\Psi)^2(\gamma - s_R i + c_{WR})} < 0 \tag{26b}$$

$$\frac{\partial \pi^{**}}{\partial h} = \frac{1 - \frac{\partial \lambda}{\partial h} \frac{ih}{u(1+\Psi)}}{1+\Psi} = \frac{(1+\Psi)(\gamma - s_R i + c_{WR}) - s_R ih}{(1+\Psi)^2(\gamma - s_R i + c_{WR})} \tag{27b}$$

$$\frac{\partial \varphi^{**}}{\partial h} = \frac{\frac{\partial \lambda}{\partial h} \frac{i}{u}\left(1 - \frac{\Psi}{1+\Psi}\right)}{1+\Psi} = \frac{s_R i}{(1+\Psi)^2(\gamma - s_R i + c_{WR})} > 0 \tag{26b}$$

A higher interest rate will have no effect on long-run equilibrium capacity utilization, but it will cause a higher government debt–capital ratio. Therefore, a higher rate of interest will raise the financial income ratio, and it will depress the wage and the profit share in total income in long-run equilibrium.

Finally, a higher growth rate of government expenditures increases the long-run equilibrium rate of capacity utilization, which has an expansionary effect on the wage and profit shares, and a contractionary effect on the financial income share. Furthermore, a higher growth rate of government expenditures lowers the long-run equilibrium government debt-capital ratio, if $\frac{s_R h}{\beta} - 1 < \lambda$, i.e., if : $h(\alpha + c_{WR}) < i(s_R h - \beta)$ in Equation (20e), which would then also contribute to a higher wage and a higher profit share, and to a lower financial income share. In this case, therefore, a higher growth rate of government expenditures would uniquely raise the long-run equilibrium wage and profit shares in total income, and it would mean a lower long-run financial income share. However, if a higher growth rate of government expenditures raises the long-run equilibrium government debt-capital ratio, that is, if $\frac{s_R h}{\beta} - 1 > \lambda$, i.e., if : $h(\alpha + c_{WR}) > i(s_R h - \beta)$ in Equation (20e), the overall effect on functional income distribution is indeterminate and will depend on the relative strengths of the individual channels:

$$\frac{\partial \omega^{**}}{\partial \gamma} = \frac{(1-h)}{u(1+\Psi)^2}\left(\frac{\partial u}{\partial \gamma}\Psi - \frac{\partial \lambda}{\partial \gamma} i\right) = \frac{i(1-h)}{u(1+\Psi)^2}\left(\frac{\partial u}{\partial \gamma}\frac{\lambda}{u} - \frac{\partial \lambda}{\partial \gamma}\right) \tag{26c}$$

$$\frac{\partial \pi^{**}}{\partial \gamma} = \frac{h}{u(1+\Psi)^2}\left(\frac{\partial u}{\partial \gamma}\Psi - \frac{\partial \lambda}{\partial \gamma} i\right) = \frac{ih}{u(1+\Psi)^2}\left(\frac{\partial u}{\partial \gamma}\frac{\lambda}{u} - \frac{\partial \lambda}{\partial \gamma}\right) \tag{27c}$$

$$\frac{\partial \varphi^{**}}{\partial \gamma} = \frac{1}{u(1+\Psi)^2}\left(\frac{\partial \lambda}{\partial \gamma} i - \frac{\partial u}{\partial \gamma}\Psi\right) = \frac{i}{u(1+\Psi)^2}\left(\frac{\partial \lambda}{\partial \gamma} - \frac{\partial u}{\partial \gamma}\frac{\lambda}{u}\right) \tag{28c}$$

Main results and economic policy implications

Summing up, our simple model contains several interesting results and provides some important messages for economic policies in general, and for fiscal policies, in particular.

A constant autonomous long-run growth rate of government expenditures financed by credit creation (or money emission) implies that both, the government expenditures- (and thus primary deficit-) capital (or -GDP) ratio and the government debt-capital (or -GDP) ratio will converge toward definite values in the long run. For this to happen, two conditions have to hold simultaneously: $s_R h(\gamma - \alpha) - \beta(\gamma + c_{WR}) \geq 0$ and $\gamma - i \geq 0$. The first condition requires both animal spirits (α) and the rentiers' propensity to consume out wealth (c_{WR}) not to be too strong relative to the autonomous growth rate of government expenditures (γ). The second condition requires the exogenous rate of interest on government debt (i) not to exceed the autonomous growth rate of government expenditures (γ), which also determines the long-run growth rate of the system. If these conditions are met, an increase in the autonomous and deficit-financed growth rate of government expenditures means a higher long-run equilibrium government expenditures– and thus primary deficit–capital ratio, but it may be associated with a higher or lower long-run equilibrium government debt-capital ratio, depending on initial values of this ratio. In other words, our model contains the possibility of a paradox of debt. The latter is the more likely the higher the initial government debt-capital ratio will be.

Overall functional distribution of market incomes is endogenously determined through the endogeneity of both capacity utilization and the government debt–capital ratio, with the interest rate and the wage and profit shares in production exogenously given. This means that in the long run, any change in the autonomous growth rate of government expenditures has potentially contradictory effects on functional income distribution: A higher growth rate of government expenditures means a higher rate of capacity utilization and thus higher wage and profit shares, and a lower financial income share. However, it may, but need not, mean a higher government debt–capital ratio as well, which will have depressive effects on the wage and profit shares, and raise the financial income share. In particular, if the government debt–capital ratio is high in the initial equilibrium, raising the growth rate of government expenditures may trigger a lower long-run equilibrium government debt–capital ratio and thus unambiguously higher wage and profit shares, and a lower financial income share.

Under the conditions mentioned above, a constant long-run growth rate of government expenditures financed by credit creation (or money emission) will provide a stable long-run growth rate of the system to which capital stock, output and income growth will converge. The autonomous growth rate of deficit-financed government expenditures can thus be geared toward maintaining stable noninflationary full employment and to have the system grow at its potential rate of growth, given by labor force growth and productivity growth, provided that discretionary measures have moved the system to full employment in the first place. Regarding potential growth, it needs to be taken into account furthermore that productivity growth to a large extent is endogenous to capital stock and GDP growth (Kaldor's technical progress function, Verdoorn's Law), and thus also to the autonomous growth rate of government expenditures. For the productivity growth effects also the type of government expenditures may be of importance.[11] As a general economic policy conclusion, we can argue that a properly targeted growth rate of credit-financed government expenditures can thus contribute to overcoming current stagnation tendencies without triggering unsustainable government deficit or debt dynamics, provided that the conditions regarding the levels of animal spirits, the propensity to consume out of wealth and the interest rate mentioned above are met.[12]

The changes in other (economic policy) parameters than the growth rate of government expenditures have only short-run utilization and growth effects but may have long-run distribution effects. A lower propensity to save out of current income or a higher propensity to consume out of wealth, as well as a lower profit share in production, boost utilization, capital accumulation, and growth in the short run, but not in the long run. In other words, these changes affect the traverse toward the long-run equilibrium, and thus the growth path, but not the long-run growth rate. But they change income distribution in the long run, in favor of the share of production income and at the expense of the share of financial income. A higher rate of interest on government debt, in this simple model, has short-run expansionary effects on capacity utilization, capital accumulation, and growth, because additional rentiers' income is injected, without any long-run effects on these variables, however. In the long run, only the growth path is affected, and there are distribution effects, which are in favor of the financial income share and at the expense of the production income shares. Furthermore, raising the interest rate above the autonomous growth rate of government expenditures will render the whole system unstable.

Of course, our model should only be seen as first step in the application of the concept of deficit- or money-financed autonomous government expenditures growth as the long-run growth determinant, looking simultaneously at the related deficit, debt, and distribution dynamics. However, we believe that we have derived some important insights and economic policy implications. It remains to be examined to what extent these insight can be sustained in more complex models, which might include taxes and thus the post-tax distribution of income distribution, more complicated investment functions, explicitly considering the issue of investment finance for example, rentiers' portfolio choice, household debt, and deficit-financed private consumption, or a foreign sector, among others.

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[11]See Dutt (2013), Sardoni (2016) and Tavani and Zamparelli (2017) for the discussion on the relationship between government fiscal policies and productivity growth, albeit in different models from the one presented here.

[12]See Hein (2016, 2017) for a more extensive discussion of anti-stagnation policies based on a Steindlian/neo-Kaleckian framework.

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Appendix

Table A1. Effects of changes in exogenous variables on locally stable long-run equilibrium endogenous variables associated with a zero equilibrium government expenditures-ratio and a positive debt-capital ratio (case 4 in Table 4: $b^{**}=0$, $\lambda^{**}>0$) .

	u^{**}	g^{**}	b^{**}	λ^{**}	ω^{**}	π^{**}	φ^{**}	Comments
a	–	0	0	–	+	+	–	
s_R	0	0	0	+	–	–	+	
c_{WR}	0	0	0	–	+	+	–	
h	0	0	0	+	–	+/–	+	
i	0	0	–	+	–	–	+	Shift to unstable case 2
γ	+	+	+	+/–	+/–	+/–	+/–	Shift to stable case 1

Notes: u = use; g = government expenditures; b = ; s_R = save of the rentiers' households out of current income; c_{WR} = constant propensity to consume out of wealth; h = ; i = interest on government debt.

Table A2. Effects of changes in exogenous variables on locally stable long-run equilibrium endogenous variables associated with a zero equilibrium government expenditures-ratio and a zero debt-capital ratios (case 9 in Table 4: $b^{**}=0$, $\lambda^{**}=0$) .

	u^{**}	g^{**}	b^{**}	λ^{**}	ω^{**}	π^{**}	φ^{**}	Comments
a	–	0	–	–	+	+	–	Shift to unstable case 5
s_R	0	0	+	+	–	–	+	Shift to stable case 1
c_{WR}	0	0	–	–	+	+	–	Shift to unstable case 5
h	0	0	+	+	–	+/–	+	Shift to stable case 1
i	0	0	0	0	0	0	0	
γ	+	+	+	+	+/–	+/–	+/–	Shift to stable case 1

Notes: u = use; g = government expenditures; b = ; s_R = save of the rentiers' households out of current income; c_{WR} = constant propensity to consume out of wealth; h = ; i = interest on government debt.