Texto para Discussão 008 | 2026

Discussion Paper 008 | 2026

Austerity and the debt-to-GDP ratio: two tales of the US economy from a Supermultiplier perspective

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Austerity and the debt-to-GDP ratio: two tales of the US economy from a Supermultiplier perspective

March, 2026

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Abstract

This paper aims to analyze fiscal policy and the evolution of the debt-to-GDP ratio for two periods of the US economy: 1993 to 2000 and 2011 to 2016. Both periods are characterized by a reduction in the rate of growth of real government expenditure (austerity), alleged as necessary to lower the debt-to-GDP ratio, but with very different results as regards this goal. To substantiate our analysis, we develop a novel debt-to-GDP level change decomposition that presupposes the validity of the Supermultiplier model and an exogenously determined interest rate. Besides the effects of the real interest rate, our results point to the different outcomes in both periods as resulting fundamentally from the behavior of non-government autonomous expenditure growth and differing degrees of austerity.

Keywords: Demand-led growth; Supermultiplier; Fiscal policy; Public Debt.

JEL codes: E11; E62; H62.

1 Introduction

This paper aims to analyze fiscal policy and its relationship to the evolution of the debt-to-GDP ratio in two periods of the US economy: 1993 to 2000 (Clinton's alleged 'expansionary austerity' period) and 2011 to 2016 (Obama's or U.S. Congress' 'turn to austerity'). These periods are characterized by two episodes of *austerity*, defined in this context as a lower or, at times, even negative real growth rate of government primary expenditure in relation to preceding periods, with very different results in terms of GDP growth and the debt-to-GDP ratio.

The first period was widely held at the time as a successful case of 'expansionary austerity'. with high GDP growth rates and a reduction of the debt-to-GDP ratio. This is in contrast to the second period, which was characterized by low GDP growth rates and a stable to rising debt-to-GDP ratio, even under much lower real interest rates, and somewhat similar results as pertains to the behavior of direct taxation. At the beginning of both periods, austerity was defended by several orthodox economists to be needed in order to lower the debt-to-GDP ratio, but once implemented, it led to opposite results regarding this goal.

In the case of the Clinton period (1993-2000), in line with that pointed out by Serrano and Braga (2006), this was not a case of successful "expansionary austerity" as defended by economists at the time. We can say this since austerity neither caused the decrease in interest rates, nor the lower interest rates led to further business investment. In fact, the very favorable behavior of non-government autonomous expenditure caused the "Clinton boom", which in turn permitted the lowering of the debt-to-GDP ratio. At the time, as pointed out by the same authors, this episode of austerity was defended by several economists associated with the Clinton administration.

Regarding the "turn to austerity" during the second half of Barack Obama's first term and extending well into his second term as President (to at least 2014), it can be said that after a very fiscally expansionist period during the 2008-2009 world financial crisis and its aftermath, there was a definite turn in policy towards austerity. This turn to austerity at the time was also defended in international policy discussion circles such as at the International Monetary Fund – IMF. This process, from a defense in policy circles of

expansionist policy during the crisis to a defense of austerity around 2010 (and in later years back again towards expansionary policy, at least somewhat), is discussed by Fiebiger and Lavoie (2017). This debate had arguments for expansionary austerity put forth by notable economists who defended non-Keynesian effects of fiscal policy, such as Alesina and Ardagna (2010), but also included a discussion of the dangers of high government debt, be it outright default or low growth, as put forth in the second case by Reinhart and Rogoff (2010). The U.S.' prolonged "turn to austerity" seems to have been due to a combination of poor choices by the Obama administration influenced by the economic discussion in international policy circles occurring at the time, Republican Party control of the House of Representatives following the 2010 midterm elections, as well as the turn to austerity in State and Local Government spending about the same time. The decrease in expenditure growth observed was substantial and was defended, at least initially, by several prominent orthodox economists as necessary in order to lower the debt-to-GDP ratio, which was perceived to be 'too high'.

We propose to analyze the effects of fiscal policy in these two periods as connected to the goal of lowering the debt-to-GDP ratio utilizing a debt-to-GDP level decomposition analysis from an autonomous demand-led Supermultiplier growth model perspective (Serrano et al, 2023). It is important to point out that this exercise is not intended as an empirical test of the subjacent theoretical framework, since it assumes from the start that it is a valid interpretation of the behavior of the U. S. economy. At most, we seek to indirectly evaluate its plausibility and consistency when applied to real-world data.

Among the factors behind the evolution of the debt-to-GDP ratio, we have the effects of changes in the average real interest rate on government debt[1] and the behavior of taxation due to policy decisions or other factors (such as the elasticity of tax rates to GDP growth). However, our analysis stresses the role of the relationship between the composition and

[1] According to Serrano and Summa (2015), this supposes that the monetary authority controls the real rate of interest through the manipulation of the nominal interest rate and this, in turn, determines the average real rate of interest on government debt.

the rate of growth of total autonomous expenditures[2] as the crucial driver of the behavior of the debt-to-GDP ratio. More specifically, it points to a relationship between a change in the share of government expenditure and a change in the rate of growth of total autonomous expenditure, which, if in opposite directions, have unambiguous effects on the debt-to-GDP ratio, but, if in the same direction, imply that the final effect depends on the relative magnitudes of the contribution of these changes. In the case of the U. S. economy, which has a relatively low share of exports in total autonomous expenditure, private autonomous domestic expenditure, in particular residential investment and durable goods consumption financed by credit, has a decisive role in explaining the differing effects of fiscal policy.

Thus, in the periods under analysis, we intend to illustrate the workings of our theoretical framework using the aforementioned debt-to-GDP level change decomposition methodology to indicate the relative importance of each exogenous variable and set of parameters in explaining the evolution of the debt-to-GDP ratio. Similar to the conclusions in Serrano and Braga (2006) regarding the first period (1993 to 2000) and in accordance with some of the main theoretical results of Freitas and Christianes (2020), our findings illustrate that the very different outcomes of both periods in terms of the debt-to-GDP ratio, even under much lower real interest rates in the 2011 to 2016 period, are a direct result of the different degrees of austerity and the very different contributions to GDP growth of non-government autonomous expenditures. This last change resulted from different average growth rates for non-government expenditures in both periods and from great shifts that occurred in the composition of autonomous expenditure.

After this introduction, this paper is organized as follows. In Section 2, we present our debt-to-GDP ratio level change decomposition methodology. In the next section (Section 3), we apply this decomposition methodology to data to compare the behavior of the US economy in the two episodes of austerity during the Clinton and Obama administrations. This Section is subdivided into Subsection 3.1, where we present an overview of the U.S.

[2] Just as defined in Serrano et al (2023, p. 5-6) and as in other Supermultiplier models we define as autonomous those expenditures that do not present a general and regular relationship with capitalist production decisions.

economy from 1984 to 2019, and Subsection 3.2 where we compare our two periods of interest. Finally, in Section 4, we offer some concluding remarks.

2 A Supermultiplier debt-to-GDP decomposition

In what follows, we develop a debt-to-GDP level change decomposition methodology that is compatible with the autonomous demand-led Supermultiplier growth model (Serrano et al, 2023). To do this, we start from a disequilibrium extension of the Supermultiplier model developed by Freitas and Christianes (2020), in a similar manner to Ligiéro et al (2021). We also use some elements from the framework established in Haluska et al (2021). We then proceed to develop our debt-to-GDP level change accounting decomposition framework and use it to analyze the data of both periods, in a similar vein to Freitas and Dweck (2013) and Labat-Moles and Summa (2024), which decomposed the changes in the growth rate of GDP from a demand-led Supermultiplier perspective for the Brazilian Economy from 1970 to 2005 and for the Spanish Economy from 1998-2019, respectively.

To start, let us define the meaning of the symbols used to represent the parameters and variables (all measured in nominal values) that will be used in our decomposition methodology:

$Y_t = \ GDP \ or \ total \ \ income \ at \ time \ t$
$M_t = total \ imports \ at \ time \ t$
$C_t = total \ consumption \ at \ time \ t$
$I_t = total \ investment \ at \ time \ t$
$G_t = total \ government \ consumption \ at \ time \ t$
$X_t = total \ exports \ at \ time \ t$
$m_t = share \ of \ imports \ in \ GDP \ at \ time \ t$
$c_t = propensity \ to \ consume \ at \ time \ t$
$Tr_t = total \ governmente \ transfers \ (except \ interest) \ at \ time \ t$
$C_{At} = total \ (autonomous) \ durable \ goods \ consumption \ at \ time \ t$
$IC_t = total \ induced \ consumption \ at \ time \ t$

$I_t^G = total\ government\ investment\ at\ time\ t$

$I_t^R = total\ residential\ investment\ at\ time\ t$

$I_t^{AF} = total\ autonomous\ firm\ investment\ at\ time\ t$

$I_t^{IF} = total\ induced\ firm\ investment\ at\ time\ t$

$Z_t = total\ autonomous\ expenditure\ at\ time\ t$

$ZG_t = total\ autonomous\ goverment\ expenditure\ at\ time\ t$

$ZPr_t = total\ non-government\ autonomous\ expenditure\ at\ time\ t$

$DT_t = total\ revenue\ from\ direct\ taxation\ at\ time\ t$

$IT_t = total\ revenue\ from\ inderect\ taxation\ net\ of\ subsidies\ plus$
$other\ revenue\ excluding\ DT_t\ at\ time\ t$

$h_t = propensity\ to\ invest\ at\ time\ t$

$dt_t = rate\ for\ direct\ taxation\ rate\ at\ time\ t\ as\ a\ share\ of\ income\ Y_t$

$dit_t = rate\ for\ inderect\ taxation\ net\ of\ subsidies$
$plus\ other\ revenue\ excluding\ DT_t\ at\ time\ t\ as\ a\ share\ of\ income\ Y_t$

$tr_t = ratio\ of\ total\ governmente\ transfers\ (except\ interest)$
$to\ income\ Y_t\ at\ time\ t\ .$

$\alpha_t = supermultiplier\ at\ time\ t$

$B_t = total\ government\ debt\ at\ time\ t$

$\sigma_t = share\ of\ government\ expenditure\ in\ total\ autonomous$
$expenditure\ at\ time\ t$

$i_t = nominal\ interest\ rates\ on\ goverment\ debt\ at\ time\ t$

$b_t = government\ debt\ to\ GDP\ ratio\ at\ time\ t$

First, we will seek to find a decomposition of the level change of the debt-to-GDP ratio to be used as an instant measure of quarterly year on year change (Q_t/Q_{t-4}) for the U.S. economy considering the last trailing twelve months. We can then utilize this year-on-year quarterly rate to easily calculate a decomposed accumulated level change at a certain quarter for any period we wish to analyze. This will allow us to compare the differing effects of fiscal policy in general, austerity in particular, and other factors in explaining the evolution of the debt-to-GDP ratio from Q4-1992 to Q4-2000 and from Q4-2010 to Q4-2016. We choose to use nominal variables for our basic model because these allow

for a better understanding of the mechanisms at work (such as differing real and nominal interest rates), but our later analysis will present real variables as needed.

To do this, we start with the System of National Accounts' identity between supply and demand and the following equations in discrete time, considering trailing twelve months quarterly data presented in U.S. national accounts data:[3]

$$Y_t + M_t = C_t + I_t + G_t + X_t \tag{1}$$

$$M_t = m_t\,(C_t + I_t + G_t + X_t) \tag{2}$$

$$C_t = c_t(Y_t - dt_t Y_t) + c_t Tr_t + C_t^A \tag{3}$$

$$IC_t = c_t(Y_t - dt_t Y_t) \tag{3.1}$$

$$I_t = I_t^G + I_t^R + I_t^{AF} + I_t^{IF} \tag{4}$$

$$I_t^{IF} = h_t Y_t \tag{5}$$

$$Z_t = G_t + I_t^G + c_t Tr_t + C_t^A + I_t^R + I_t^{AF} + X_t \tag{6}$$

$$ZG_t = G_t + I_t^G + c_t Tr_t \tag{7}$$

$$ZPr_t = C_t^A + I_t^R + I_t^{AF} + X_t \tag{8}$$

$$Y_t = \{\frac{1 - m_t}{1 - (1 - m_t)[c_t(1 - dt_t) + h_t]}\}Z_t \tag{9}$$

(10)

[3] We choose to remove inventory change from both sides of equation (1), since we feel this variable tends to obscure other variables of the aggregate investment equation we wish to utilize as it tends to reflect measurement error in the national accounts data.

$$Y_t = \alpha_t Z_t$$

The term in braces in equation (9) (α_t) is the supermultiplier in time t. We consider total autonomous expenditure in time t, that is Z_t, as being composed of non-government autonomous expenditure ZPr_t and government autonomous expenditure ZG_t. As is usual in Supermultiplier models, we consider firm capacity creating investment I_t^{IF} to be an induced expenditure.

Now, as regards public debt B_t, we start with the debt change identity formula:

$$\Delta B_t = G_t + I_t^G + Tr_t - DT_t - IT_t - \Delta MB_t + BAdj_t + i_t B_{t-4} \qquad (11)$$

$$\Delta B_t = \sigma_t Z_t + (1 - c_t)Tr_t - DT_t - IT_t - \Delta MB_t + BAdj_t + i_t B_{t-4} \qquad (11.1)$$

where σ_t is the share of government expenditure in total autonomous expenditure at time t (i.e., ZG_t/Z_t), ΔMB_t is the change in the monetary base, $BAdj_t$ is the adjustment in the value of the debt stock to other factors other than interest payments or the primary balance (stock-flow adjustment).

Dividing by Y_t we can work with the debt-to-GDP ratio:

$$\Delta B_t/Y_t = \Delta b_t = \left[B_t/Y_t\right] - \left[B_{t-4}/Y_t\right] = \left[\sigma_t Z_t/Y_t\right] + \left[(1 - c_t)Tr_t/Y_t\right] - \left[DT_t/Y_t\right] - \left[IT_t/Y_t\right] - \left[\Delta MB_t/Y_t\right] + \left[BAdj_t/Y_t\right] + \left[i_t B_{t-4}/Y_t\right]$$

Now, after some manipulation of this equation we obtain:

$$\Delta b_t = \sigma_t z_t + (1 - c_t)tr_t + -dt_t - it_t - \Delta mb_t + badj_t + b_{t-4}\left[\frac{i_t - g_t}{(1 + g_t)}\right]$$

where $z_t = Z_t/Y_t$ is the ratio of total autonomous expenditure to GDP at time t and the variables in lower case $tr_t, dt_t, it_t, \Delta mb_t, badj_t$ all also denote ratios to GDP.

Now, notice that the term z_t is the inverse of the supermultiplier α_t, so we can write:

$$\Delta b_t = \frac{\sigma_t}{\alpha_t} + (1 - c_t)tr_t + -dt_t - it_t - \Delta mb_t + badj_t + b_{t-4}\left[\frac{i_t - g_t}{(1 + g_t)}\right] \quad (12)$$

Equation (12) is equivalent to equation 15 in Freitas and Christianes (2020, p. 8), except our equation here: (i) is in a discrete time setting; (ii) uses nominal variables, including a nominal interest rate; (iii) includes a term for the part of government transfers that is not consumed and affects the debt-to-GDP ratio, but not the supermultiplier; (iv) includes indirect taxation and other revenue net of subsidies; (v) includes a term for the change in the monetary base; and (vi) includes a term for the adjustment in the value of the stock of debt not relative to interest rate expense, the primary balance or monetary base changes (stock-flow adjustment).

Now, before we proceed in our decomposition methodology, it useful to analyze a special case of equation 12 to better understand when austerity, which we define as a lowering of the growth rate of government expenditure, that is $\Delta gZG_t < 0$, will work in its stated goal of lowering the debt-to-GDP ratio.

For this special case let us consider that: (i) all taxation rates to GDP stay constant (i.e., $dt_t = dt$ and $it_t = it$); (ii) the monetary base does not grow and the debt stock suffers no adjustment due to other factors besides interest rate payments and the primary balance (i.e., $\Delta mb_t = badj_t = 0$); (iii) nominal government transfers grow at the same rate as nominal GDP (i.e., $tr_t = tr$); (iv) the supermultiplier and, therefore, the ratio of total autonomous demand to GDP stays constant (i.e., from equation 10 above, $z_t = 1/\alpha_t = 1/\alpha = z$ and we also have $g_t = gZ_t$); and (v) nominal interest rates stay constant (i.e., $i_t = i$). Thus, we will have:

$$\Delta b_t = \frac{\sigma_t}{\alpha} + (1 - c)tr - dt - it + b_{t-4}\left[\frac{i - gZ_t}{(1 + gZ_t)}\right] \quad (12.1)$$

Equation 12 gives a Domar-type dynamic equation for the evolution of the debt-to-GDP ratio. According to it, if the rate of interest tends to be lower than the trend rate of GDP growth (i.e., the Domar stability condition holds), then the debt-to-GDP ratio can tend towards a stationary value even if we have a positive primary government deficit. If, however, it is the other way around, then the equation tells us the magnitude of the primary government surplus necessary to stabilize debt-to-GDP ratio. It also shows us that, everything else constant, higher values of the supermultiplier are associated with reductions of the debt-to-GDP ratio. Finally, it points to the fact that the share of transfers which are not consumed add directly to the debt-to-GDP ratio, via the term $(1-c)tr$, which means that the more these are concentrated in lower income households, the smaller the effect on the debt-to-GDP ratio, as these tend to consume a higher proportion of their income than high income households.

> Thus, we can see the condition needed for austerity to lower the debt-to-GDP ratio is for the RHS side of equation 12 to become negative. To do this, a necessary condition is for austerity to decrease the rate at which the debt-to-GDP ratio grows. Notice from equation 12 that this unequivocally will be the case when we have $\Delta\ \sigma_t < 0$ *and* $\Delta\ gZ_t > 0$ (and the opposite case is also true: if $\Delta\ \sigma_t > 0$ *and* $\Delta\ gZ_t$ <0, then the effect is to unequivocally increase the rate at which the debt-to-GDP ratio grows). This result is summed up by Freitas and Christianes (2020. p. 325):

The general case involves changes in both the rate of growth of autonomous demand and its composition (that is, changes in gZ and σ). As our previous analysis has shown, the impacts of these two sources of changes over the primary-deficit and debt ratios go in different directions. Thus, changes in the pattern of growth of autonomous demand that involve modifications of gZ and σ in different directions have unambiguous impacts on the primary equilibrium deficit and debt ratios. In contrast. While an increase (a decrease) of the rate of growth of autonomous demand brings about a reduction (an increase) in the primary deficit and debt ratios, a rise (fall) in the government share of autonomous demand leads to an increase (a reduction) in both ratios. Hence the impacts of the alternative sources of change go in different directions and, therefore, the final effect over the primary-deficit and debt ratios depends on the relative strength of the impact of the changes in the rate of growth and autonomous demand composition.

On the other hand, if the signs of the changes in σ_t and gZ_t are the same, then the effect of austerity on the debt-to-GDP ratio is ambiguous and depends on relative magnitudes (that is, $\Delta\,\sigma_t < 0$ *and* $\Delta\,gZ_t < 0$ in the relevant case for our discussion). As Freitas and Christianes (2020, p. 326, footnote 15) point out, austerity can still lower the debt-to-GDP ratio in this case, as long as the effect of $\Delta\,\sigma_t < 0$ is strong enough that its effect on the primary deficit is sufficient to overcome the negative effects on the growth of GDP.

Once we accumulate changes, our decomposition allows us to evaluate the effects of this exact condition, as well as all other factors considered, in particular taxation rates, interest rates and supermultiplier size change. It will become clear that the effectiveness or not of austerity depends essentially on: (i) the relative growth rates of autonomous government expenditure gZG_t versus other autonomous expenditure $gZPr_t$ (private and foreign autonomous expenditure); and (ii) the composition of autonomous expenditure regarding these two types of expenditure (that is, the magnitude of the proportion σ_t).

As for the possibility of austerity in lowering the debt-to-GDP ratio in our *ambiguous* condition $\Delta\,\sigma_t < 0$ but with $\Delta\,gZ_t < 0$, this is related mainly to the relationship between the size of the inverse of the supermultiplier and the initial debt-to-GDP ratio, that is, if $\frac{B_{t-4}}{4} > \frac{1}{\alpha_t}\ or\ \frac{B_{t-4}}{Y_{t-4}} < \frac{1}{\alpha_t}$. The importance of the relationship between inverse of the size of the (super)multiplier and the initial debt-to-GDP ratio in these types of discussions has been suggested by Ciccone (2008). Ceteris paribus all other factors that affect the debt-to-GDP ratio, if $\frac{B_{t-4}}{Y_{t-4}} < \frac{1}{\alpha_t}$ that is, if we have an initial lower debt-to-GDP ratio than the inverse of the supermultiplier, austerity will lower the debt-to-GDP ratio even in our ambiguous condition $\Delta\ \sigma_t < 0$ but with $\Delta\ gZ_t < 0$. This has to do with the relative strength of the numerator and denominator effects on the debt-to-GDP ratio of an expansion of government expenditure. This is an important result since it means that, ceteris paribus, with a large multiplier and a large debt-to-GDP ratio, *the best way to lower the debt-to-GDP ratio is to increase spending* and, conversely, *cutting spending increases this ratio* (the debt paradox scenario).

This condition holds perfectly only in a highly unrealistic scenario with a 0% real interest rate, an initial balanced primary balance and when the taxation rate stays constant from

one period to the next. In a more realistic scenario this condition is more complicated and does not appear to have a simple analytical solution, but it introduces a tendency that the larger the (Super)multiplier and the larger the debt-to-GDP ratio, the more likely we will have a situation where decreasing (increasing) spending increases (decreases) the debt-to-GDP ratio.

Now returning to equation 12 and making some manipulations, we have our debt-to-GDP ratio change decomposition formula:

$$\Delta b_t = \frac{\sigma_t}{\alpha_t} + (1 - c_t)tr_t - dt_t - it_t - \Delta mb_t + badj_t + \left[\frac{b_{t-4}}{1+g_t}\right]\{i_t - \sigma_{t-4}[gZG_t] - (1 - \sigma_{t-4})[gZPr_t] - [g\alpha_t] - [g\alpha_t\, gZ_t]\} \quad (13)$$

The thing to notice about equation 13 is that with it we can detail the exact components involved in lowering the debt-to-GDP ratio. We can also isolate the direct contribution to debt-to-GDP level change of austerity, here taken to mean a decrease in government expenditure growth rate (i.e., $\Delta\ gZG_t < 0$). That is, we can have a measure of the contribution of a decrease in government expenditure growth rate in isolation of the contributions regarding changes in nominal interest rates, taxation rates to GDP, monetary base increases and other adjustments to the debt-to-GDP stock irrespective of interest rate payments or the primary balance (a stock-flow adjustment). This will allow us to evaluate the effects of the fulfillment of the unequivocal condition for austerity to lower the debt-to-GDP ratio $\Delta\ \sigma_t < 0$ and $\Delta\ gZ_t > 0$ or, alternatively, the ambiguous condition $\Delta\ \sigma_t < 0$ and $\Delta\ gZ_t < 0$.

For this purpose, we can divide equation 13 into 7 components parts: (i) a primary balance component (as a ratio to GDP); (ii) an interest rate component; (iii) a monetary base/debt stock adjustment component; (iv) a supermultiplier change component; (v) a non-government autonomous expenditure component; (vi) a combined supermultiplier change and autonomous expenditure component: (vii) a government autonomous expenditure component (net of non-consumed transfers);

$$primary\ balance\ \ component\ (ratio\ to\ GDP):$$

$$\frac{\sigma_t}{\alpha_t} + (1 - c_t)tr_t - dt_t - \ it_t$$

$$interest\ rate\ component:$$

$$\left[\frac{b_{t-4}}{1 + g_t}\right] i_t$$

$$monetary\ base\ and\ debt\ stock\ adj.component:$$

$$\left[\frac{b_{t-4}}{1 + g_t}\right] [-\Delta mb_t + badj_t]$$

$$supermultiplier\ change\ component:$$

$$-\left[\frac{b_{t-4}}{1 + g_t}\right] [g\alpha_t]$$

$$non\ gov.autonomous\ expenditure\ component:$$

$$-\left[\frac{b_{t-4}}{1 + g_t}\right] (1 - \sigma_{t-4})[gZPr_t]$$

$$combined\ supermultiplier\ change\ and\ autonomous\ expenditure\ component:$$

$$-\left[\frac{b_{t-4}}{1 + g_t}\right] [g\alpha_t\ gZ_t]$$

$$government\ autonomous\ expenditure\ component:$$

$$-\left[\frac{b_{t-4}}{1 + g_t}\right] \sigma_{t-4}[gZG_t]$$

Thus, we will consider in our analysis of the U.S. case the total effect of each of the several components we defined by way of our decomposition methodology, while also highlighting the effects of austerity ($\Delta gZG_t < 0$). We will also emphasize the importance of the behavior of the growth of private, mostly credit-financed demand, as well as external autonomous expenditure through exports (considered jointly as $gZPr_t$) for our results.

What we seek to point out through this theoretical discussion is that lowering the debt-to-GDP ratio can be a valid objective for distributive reasons in some instances, but there is a particular way to achieve this goal supposing the validity of a Supermultiplier theoretical framework. As suggested by Serrano and Braga (2022), once we have a multi-year GDP growth target achieved through public expenditure, for example, the highest growth rate compatible with the external constraint and internal production bottlenecks, such as in energy production, or seeking full employment of labor), if real (ex post) interest payments are persistently high as a share of GDP, this is a rather regressive income transfer, as public debt is concentrated on high income earners. Thus, it would make sense to have a simultaneous goal of capping interest rate expenses as percentage of GDP, which for a given real interest rate involves lowering the debt-to-GDP ratio. Thus, even considering the validity of a Functional Finance approach as pioneered by Lerner (1943) and defended by many authors such as Wray (2015) more recently, where it is impossible for the market[4] to force a default on the public debt in sovereign domestic currency, it would be a worthwhile goal to lower the debt-to-GDP ratio for distributive reasons (although the issue here is not the size of the debt *per se* being problematic, but regressive real interest payments). In this case, the most effective way to do this would be to maintain our growth target and increase direct taxation on profits or other forms of progressive taxation, to which we add the caveat that this goal will probably only be achievable and desirable if, concurrently, non-government autonomous expenditures grow at reasonable rates.

3 Results for the United States

3.1 Overview of the period Q4-1984 to Q4-2019

Before analyzing the two periods of the U.S. economy we are concerned with, it is worthwhile to present the behavior of some variables from the Q4-1984 to Q4-2019 and the accumulated results of our debt-to-GDP ratio decomposition for this longer period.

[4] Self-imposed limitations, such as legal and institutional constraints, are another issue.

This will permit us to understand the general trends of the U.S. economy in this longer time frame. However, before discussing the data it is important to point out that, as is usual in international comparisons, we use a general government gross debt criterium (Federal plus Sate ant Local Government debt). On the other hand, our nominal interest rate calculations use data from all interest paid in the national accounts by Federal, State and Local government (this leads to higher interest rates than would be suggested from simply consulting federal debt yields, which also only affect new debt issued and thus the debt stock more slowly). When considering accumulated change in growth rates or changes in the debt-to-GDP ratio (including components) we are considering year on year changes in the designated quarters using trailing twelve months data (that is Q_t/Q_(t-4)), so we always have annualized values. Finally, we use the GDP deflator when considering real variables, choosing not to use specific deflators to preserve additivity.

As can be seen in **Figure 1**, after a strong increase up about to the beginnning of the Clinton Administration (1993-2000), with the gross debt ratio peaking at around 80% of GDP, there is a significant reduction to around 66% of GDP in the year 2000. We then observe an increase in this ratio in the following years, returning once again to around 80% and above during the George W. Bush administration (2001-2008), right up to beginning of the 2008-2009 financial crisis. Not only during the peak of the crisis in 2008-2009, but also in the following years including the Obama Administration's second term, the debt-to-GDP ratio continues to grow up to around 120% of GDP at the end of 2013. It then remains relatively stable at around this ratio all the way through to the end of 2019.

Figure 1 – Debt-to-GDP ratio

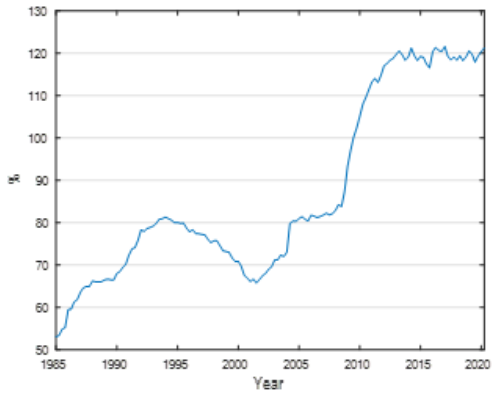
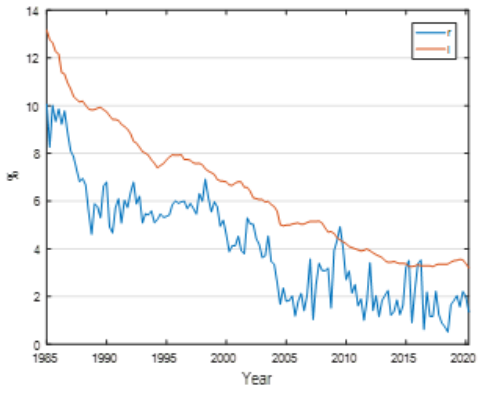


Figure 2 – Interest rates



One important thing to point out, as seen in **Figure 2**, is that, although the entire period Q4-1985 to Q4-2019 is marked by a tendency towards lower nominal interest rates i as time progresses, there is relative stability in real interest rates r for most of the two periods we are interested in. During the Clinton period we observe that real interest rates hover around 5.5-6.5% per year up to about the end of 1998. For the Obama Administration this relative stability is observed during the period 2010-2016, with real interest rates hovering around 1-3% per year.

Concerning the magnitude of the supermultiplier, as can be seen in **Figure 3**, there is a general falling trend from Q4-1985 up to about 2010. From then on there is an initial growing trend and then stabilization in the period 2015-2019. As expected, and illustrated in **Figure 4**, this leads to an initial growing difference in the accumulated real growth of GDP and real total autonomous expenditure Z up to about to about 2010, with a reduction and then stabilization in the following years:

Figure 3 - Supermultiplier

Figure 4 – Acc. real growth comparison Q4

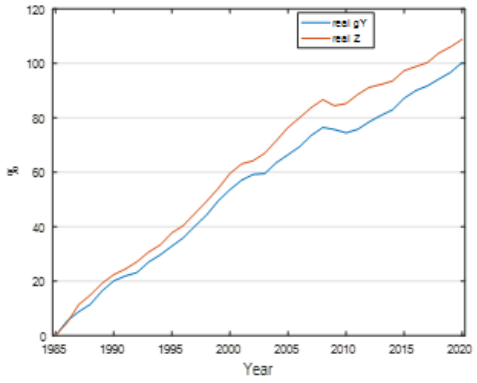


Table 1 presents our full debt-to-GDP level change decomposition for the entire period as well as the average yearly contribution. This decomposition can be seen in a more disaggregated form in Erro! Fonte de referência não encontrada.. In this entire period the debt-to-GDP level increased by 67.3 percentage points, with an average yearly contribution of 1.9 percentage points to this ratio. As can be seen in this Table, the primary balance, interest rates and other combined monetary effects (monetary base changes and the debt stock-flow adjustment) and the denominator effect of total autonomous expenditure *Z* are all significant. Finally, the effects of the supermultiplier change and the

combined effect of the supermultiplier change times total autonomous expenditure change, that is $[g\alpha_t][gZ_t]$, are very small.

Table 1 – Debt-to-GDP level change decomposition - Q4-1984 to Q4-2019

	dez/1984-dez/2019	
	Full period	**avg. contrib./y**
DEBT-TO-GDP LEVEL CHANGE	**67.3%**	**1.9%**
Primary balance component	**120.1%**	**3.4%**
Interest rate	**174.2%**	**5.0%**
Monetary base + B Adjustment	**-91.7%**	**-2.6%**
Supermultiplier change	**4.2%**	**0.1%**
Combined supermultiplier + Z	**0.6%**	**0.0%**
Total Z	**-140.2%**	**-4.0%**
non-government Z	*-75.1%*	*-2.1%*
Goverment Z	*-65.0%*	*-1.9%*

From the decomposition, we can see why the debt-to-GDP ratio grew throughout this period. This growth occurred because the primary balance and interest rate expenses added to the debt-to-GDP ratio and autonomous expenditure was not quite strong enough to lower the debt-to-GDP ratio through its effect on the denominator. This occurred even when considering the effect of the expansion of the monetary base and of adjustments to the debt stock not due to interest expense, the primary balance or monetary base growth (stock-flow adjustment). Finally, the contributions of the supermultiplier change and the combined effect of the supermultiplier and Z were not important in explaining the growth in the debt-to-GDP ratio.

3.2 Comparing the two periods

Now we will compare our two periods of interest: (i) Clinton's period of alleged expansionary austerity Q4-1992 to Q4-2000; and (ii) Obama's and U.S. Congress' turn toward austerity Q4 2010-Q4-2016. For this analysis, we will present some of the same Figures and similar Tables as presented in Subsection 3.1 for the periods Q4-1988 to Q4-

2000 and Q4-2004 to Q4-2016. But differently from Subsection 3.1. to better visualize the data and facilitate our analysis. we will only present tables with yearly averages (growth rates or average contributions). It is also necessary to point out that the choice to present data from the years immediately before our periods of interest is to better illustrate the change in fiscal policy that occurs with the choice to implement austerity ($\Delta \llbracket gZ \rrbracket_t < 0$) as well as the behavior of other variables supposed as exogenous to this choice. Finally, we will emphasize the unequivocal condition for austerity to lower the debt-to-GDP ratio $\Delta \sigma_t < 0$ and $\Delta \llbracket gZ \rrbracket_t > 0$ or the ambiguous condition $\Delta \sigma_t < 0$ and $\Delta \llbracket gZ \rrbracket_t < 0$ we discussed in Section 2.

Starting with the debt-to-GDP ratio, we can see in Figure 5 and Figure 6 bellow that both the Clinton and the Obama periods are preceded by instances of significant growth in the debt-to-GDP ratio.

Figure 5 – Debt-to-GDP ratio Clinton

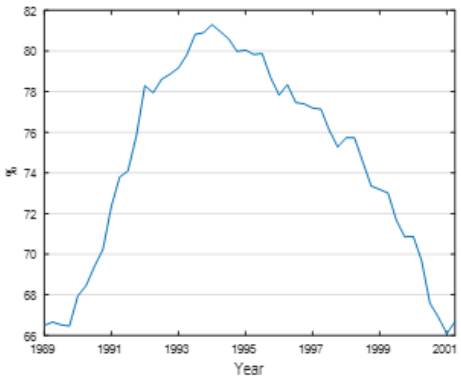
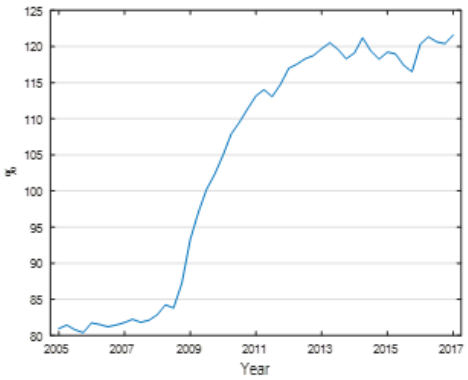


Figure 6 – Debt-to-GDP ratio 2 Obama



We can also see in **Figure 7** and **Figure 8** that both periods are preceded by a slowdown in accumulated real GDP, although this is of course much more severe in the case of Obama due to the 2008-2009 financial crisis downturn. We can also infer that during the Clinton period there is a steady decrease in the supermultiplier which causes real accumulated autonomous expenditure Z and real accumulated GDP Y to diverge more as time progresses. We also infer that during the Obama period there is a great instability in the supermultiplier during the 2008-2009 crisis and its aftermath, but that, with time, autonomous expenditure and GDP start to grow at similar rates and then diverge as the size of the supermultiplier increases.

Figure 7 – Accum. growth rates Clinton Q4

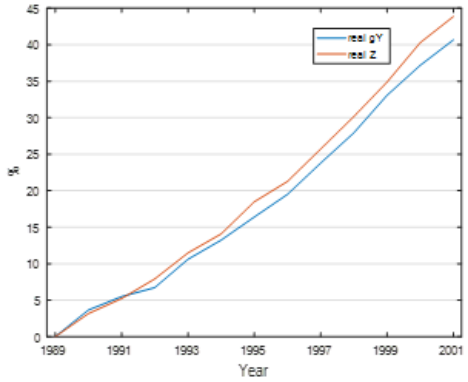
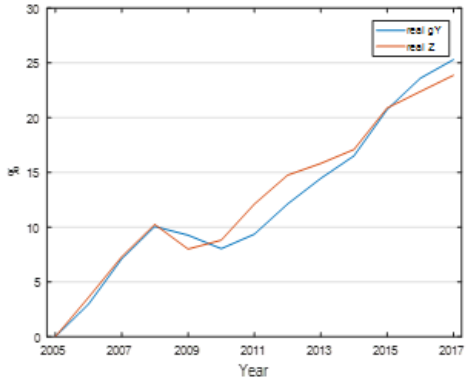


Figure 8 – Accum. growth rates Obama Q4



As regards the share of government autonomous expenditure in total autonomous expenditure, that is σ_t, we can see a similar behavior for both periods in **Figure 9** and **Figure 10** with preceding periods in both cases characterized by a growth and peak in this variable, followed by a large fall in our periods of interest.

Figure 9 – ZG Auton. Expend. Share 1

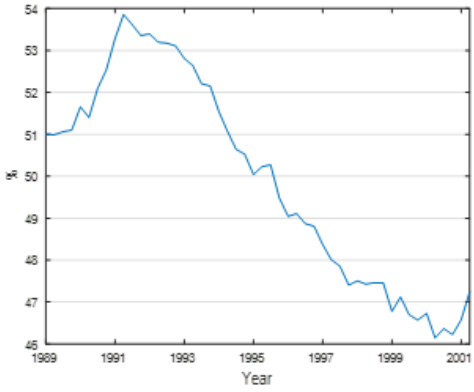
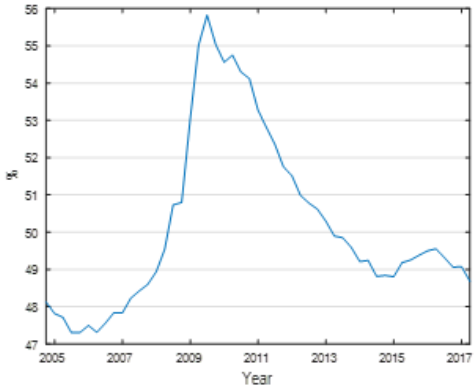


Figure 10 – ZG Auton. Expend. Share 2



So far, there seems to be a somewhat similar behavior in variables, so it is not clear why the outcomes of both periods are so different: high GDP growth and a falling debt-to-GDP ratio in the case of Clinton and low GDP growth and a stable debt-to-GDP ratio under Obama. As we will see in our following discussion, another relevant difference between the two periods is that the real interest rates were much lower in the second case. So why was austerity, that is $\Delta\ 〚gZG〛\_t < 0$, apparently successful under Clinton and a failure under Obama in the goal of lowering the debt-to-GDP ratio, even under much lower real interest rates?

As we will now show, this is explained by two factors: (i) the differing behavior of non-government autonomous expenditure in both periods; and (ii) much more intense austerity under Obama. From **Figure 11** and **Figure 12** we can start to understand how these two factors explain the divergence between the two periods. In Figure 11 preceding the Clinton period (1993-2000) there is a fall in accumulated real non-government expenditure 〖gZPr〗_t, but this is not that pronounced and during the Clinton years this expenditure experiences significant accumulated growth. As regards government autonomous expenditure during the Clinton years, this continues to present significant accumulated growth but grows at a slower pace as expected given its falling share as we pointed out in Figure 9 is $\Delta \sigma_t < 0$. In the case of Obama, as can be seen in Figure 12 the preceding period to our analysis (2008-2010) is characterized by a complete collapse of accumulated real 〖gZPr〗_t. This expenditure only reaches its accumulated former level in 2012. Regarding the accumulated real government autonomous expenditure growth 〖gZG〗_t in this period, it comes to a peak around mid-2010 and then goes through a significant period of decline up to about the beginning of 2014. We also point out that graphs for both periods have very different scales, so accumulated real growth in the case of the Clinton is much larger.

Figure 11 – Accum. growth rates Clinton Q4

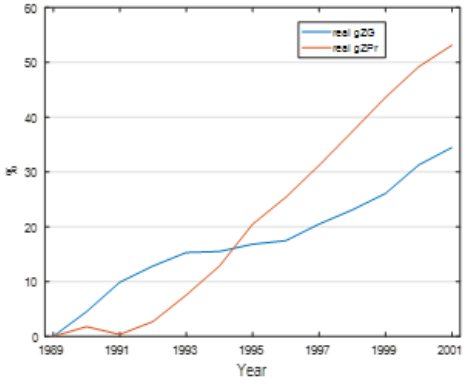
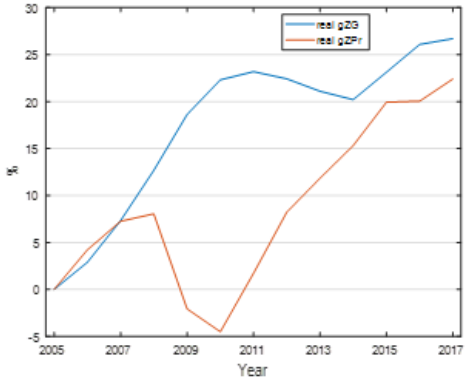


Figure 12 - Accum. growth rates Obama Q4



In **Table 2** and **Table 3** we present data of the periods we are interested in and the immediately preceding periods. Notice that, in the Clinton period (Q4/1992-Q4/2000), the unequivocal condition for austerity to lower the debt-to-GDP ratio $\Delta \sigma_t < 0$ and Δ 〖gZ〗_t> 0 is satisfied when considering real growth rates. As regards the Obama period (Q4-2010-Q4-2016), notice that this condition is not satisfied, and we are left with the ambiguous condition $\Delta \sigma_t < 0$ and Δ 〖gZ〗_t< 0. We also see that austerity, that is Δ

〖gZ〗_t< 0, was much more intense during the Obama period than during the Clinton period, where average real growth of government expenditure is reduced to only 0.6% a year for the period from Q4-2010 to Q4-2016 from 4.7% from Q4/2007-Q4/2009, while during the Clinton period Q4/1992-Q4/2000 this was 2.2% from 3.6% in Q4/1988-Q4/1992.

Table 2 – Selected data Q4–1988 to Q4/2000

Real growth rates	Q4/1988-Q4/1992	Q4/1992-Q4/2000
gZ	2.8%	3.6%
gZG	3.6%	2.2%
gZPr	1.8%	4.8%

Table 3 – Selected data Q4–2007 to Q4/2016

Real growth rates	Q4/2007-Q4/2009	Q4/2009-Q4/2010	Q4/2010-Q4/2016
gZ	-0.7%	3.3%	1.9%
gZG	4.7%	0.9%	0.6%
gZPr	-6.5%	6.2%	3.2%

Now we can compare exactly what happened to the debt-to-GDP ratio utilizing our decomposition methodology. In **Table 4** and **Table 5** we present our decomposition formula presenting only average yearly contributions to the growth of the level of the debt-to-GDP ratio (remembering these are not growth rates but simple averages). When we compare the average contribution to the level of this ratio, that is minus 1.6% per year in the case of the Clinton period and 1.4% in the case of the Obama period, we see that this difference is due especially to the primary balance component (0.1% to 5.5%). We can also see that the average yearly effect of interest rate expenditure was much greater during the Clinton period than the Obama period (5.5% to 4.1%, respectively).

Table 4 – Debt Decomposition Average Yearly Contributions 1

	Q4/1988-Q4/1992	Q4/1992-Q4/2000
DEBT-TO-GDP LEVEL YEARLY CHANGE	**3.2%**	**-1.6%**
Primary balance component	**3.1%**	**0.1%**
Interest rate	**6.5%**	**5.5%**
Monetary base + B Adjustment	**-2.7%**	**-3.1%**
Supermultiplier change	**0.2%**	**0.2%**
Combined supermultiplier + Z	**0.0%**	**0.0%**
Total Z	**-3.9%**	**-4.4%**
non-government Z	*-1.5%*	*-2.9%*
Goverment Z	*-2.3%*	*-1.5%*

Table 5 - Debt Decomposition Average Yearly Contributions 2

	Q4/2007-Q4/2009	Q4/2009-Q4/2010	Q4/2010-Q4/2016
DEBT-TO-GDP LEVEL YEARLY CHANGE	**11.1%**	**8.2%**	**1.4%**
Primary balance component	**10.2%**	**10.4%**	**5.5%**
Interest rate	**4.2%**	**4.3%**	**4.1%**
Monetary base + B Adjustment	**-3.2%**	**-2.9%**	**-3.9%**
Supermultiplier change	**0.3%**	**1.9%**	**-0.8%**
Combined supermultiplier + Z	**0.0%**	**0.1%**	**0.0%**
Total Z	**-0.4%**	**-5.8%**	**-3.5%**
non-government Z	*2.2%*	*-4.0%*	*-2.5%*
Goverment Z	*-2.6%*	*-1.8%*	*-0.9%*

What **Table 4** and **Table 5** show is that other effects are significant, but the difference in the primary balance component is by far the most important effect in explaining the behavior of the debt-to-GDP ratio (0.1% per year for the Clinton period and 5.5% for the Obama period). The issue here is once again the unequivocal condition for austerity to lower the debt-to-GDP ratio $\Delta \sigma_t < 0$ and $\Delta \llbracket gZ \rrbracket_t > 0$, which is satisfied during the Clinton period and not during the Obama period. The thing is, given a public debt stock, higher GDP growth led by non-government autonomous expenditure leads to a much

higher primary surplus with given tax rates. This occurs because non-government autonomous expenditure has no effect on government spending but affects revenue by increasing GDP, so this type of growth pattern is extremely effective in increasing the primary surplus.

But if either austerity is too strong or non-government expenditure growth too weak given its relative share, we will not have σ_t< 0 and Δ 〖gZ〗 _t> 0. Then it becomes very hard for austerity to increase the primary surplus or decrease the primary deficit relative to the debt stock and we will also have a second effect on the denominator of the debt-to-GDP ratio. In the case of the Obama period, we have this exact pattern happening: austerity is very strong (average yearly real growth rate of 〖gZG〗 _t=0.6%) and the growth in non-government autonomous expenditure (real 〖gZPr〗 _t=3.2%) is not strong enough to make up for this contractionary effect, thus leading to low total autonomous expenditure growth (real 〖gZ〗 _t=1.9%) and low GDP growth (real 〖gY〗 _t=2.5%) that was not able to promote an adequate recovery.

In summary, unless the policy choice is explicitly made to seek a lower GDP growth rate, austerity is a bad choice and usually only under the condition Δ σ_t< 0 and Δ 〖gZ〗 _t> 0 it can succeed in its limited goal of lowering a debt-to-GDP ratio, while also appearing not to be contractionary. This is why the idea of expansionary austerity had such attractiveness to orthodox economists during the Clinton era and had such a deep influence on the theoretical and policy discussion in the decades that followed. Unequivocal contractionary austerity is not something that sits well with its defenders.

4 Conclusion

In conclusion, we wish to begin by stressing first there is no expansionary austerity: the (super) multiplier is alive and well. Cutting government autonomous expenditure will always have a contractionary effect, even if growth in non-government autonomous expenditure can countervail this effect. Since strong austerity, that is a very large $|\Delta\, gZG_t < 0|$, will almost certainly lead to a lower growth rate of autonomous expenditure gZ_t and consequently of GDP growth gY_t, it is very hard that this type of

policy will lead to a lowering of the debt-to-GDP ratio, since other factors, such as lower real interest rates, would have to have strong compensatory effects.

Following Serrano and Braga (2022), we believe the policy lesson here is that government spending should be geared to whatever our (multi-year) GDP growth target is. For example, that which respects the external constraint as modelled by Morlin (2022), which is of great interest to peripheral countries, or that which achieves full employment of labor. Another possibility is that the growth target is more concerned with the environmental limits to growth and is geared towards transition goals to a carbon neutral economy. Whatever the case, after a government spending framework is set to this (multi-year) GDP growth target, only then should a potential secondary goal of lowering a debt-to-GDP ratio that is sufficiently large such that (ex post) real interest payments have significant regressive effects should be considered using all policy instruments available, especially direct taxation.

So, is a policy of austerity that seeks to lower the debt-to-GDP ratio bound to failure? Not necessarily. If non-government autonomous expenditure, such as exports or credit financed residential investment and durable goods consumption, has a relatively large share in total autonomous expenditure and grows at a significant rate, austerity that involves a moderate reduction in the rate of growth of government expenditure will probably achieve this goal. The reverse is also true: when non-government autonomous expenditure ZPr grows slowly or even falls, austerity will not only lead to poor GDP growth and even recession, but almost certainly be unsuccessful in lowering the debt-to-GDP ratio.

We believe the important policy lesson here is that lowering the debt-to-GDP ratio when non-government autonomous expenditure grows very slowly or even falls is bad policy and should not be attempted in any circumstance. Conversely, it can be an achievable and a worthwhile policy goal if the opposite is true and ZPr grows relatively well. But as stated before, austerity *is not* the best way to achieve this goal and it only makes sense if the goal *is to lower GDP growth*, since it is always contractionary. As illustrated by cases such as the U.S. and Western Europe following World War II, simultaneous *increases* in spending *and* taxation, preferably that which has a negligible effect on the supermultiplier

such as corporate income tax or on high income earners, are the most effective tool if one intends to lower a debt-to-GDP ratio that is considered too high for distributive reasons.

As explained in Section 2, when there is a high enough debt-to-GDP ratio such that it is larger than the inverse of the supermultiplier, austerity, all else constant, *increases* the debt-to-GDP ratio (the debt paradox scenario) and eventual high growth in non-government expenditure only masks this effect. It is this masking effect that makes it seem that austerity can be an effective tactic in lowering a debt-to-GDP that is considered too high, when it rarely is and often, even when apparently successful, is actually hampering this effort but is being compensated by the behavior of non-government autonomous expenditure.

We believe our decomposition methodology and the case of the U.S. in the two periods analyzed illustrates these two possible outcomes very well. So moderate austerity and very strong non-government autonomous expenditure growth under Clinton allowed for still high GDP growth and a lowering of the debt-to-GDP ratio. While very low accumulated growth in non-government autonomous expenditures, due to an initial collapse during the 2008-2009 crisis, and intense austerity during the Obama period led to very low GDP growth and a complete failure in lowering the debt-to-GDP ratio. The only reason this second case did not result in a continuously *rising* debt-to-GDP ratio was due to much lower real interest rates.

Another important aspect to all this discussion is that booms in non-government autonomous expenditure that allow for the compensation of the contractionary effects of austerity often depend on the prolonged and unsustainable growth of private debt. This in turn tends to lead to bubbles and financial crises. Thus, a growth strategy that relies on the unsustainable expansion of private debt might initially lead to strong GDP growth and a lower public debt-to-GDP ratio, even with moderate austerity, but then can be followed by financial crisis, recession and, ironically, a very high public debt-to-GDP ratio. Public debt represents private wealth allocated in a safe asset for the private sector and thus it is important for there to be a debt-to-GDP ratio that is somewhat substantial for a well-functioning economy. The typical orthodox obsession with lowering government debt under any circumstances when it is in own sovereign currency coupled with the opposing

tendency to often minimize explosive private debt, which was often the case before the 2008-2009 financial crisis, must be challenged.

Finally, we believe the decomposition methodology and other analysis used in this paper can be applied to other countries and will yield similar results, so further research in this manner would be fruitful. A case of interest would be export-led countries, where exports constitute a very high share of autonomous expenditure. We believe other cases of alleged success in promoting austerity to lower the debt-to-GDP ratio will show themselves to be cases where the somewhat limited conditions for "successful" (almost certainly moderate) austerity we outlined in this paper were present, rather than proof that austerity is a recommendable strategy to lower a debt-to-GDP ratio perceived as too high.

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Appendix – Detailed debt to level change decomposition

	dez/1984-dez/2019	
	Full period	**avg. contrib./y**
DEBT-TO-GDP LEVEL CHANGE	**67.3%**	**1.9%**
Primary balance component	**120.1%**	**3.4%**
total primary government expenditure	***1092.5%***	***31.2%***
supermultiplied spending	*931.1%*	*26.6%*
non consumed transfers	*161.3%*	*4.6%*
direct + indirect taxation +other tax rev.	***-972.3%***	***-27.8%***
direct taxation	*-585.2%*	*-16.7%*
indirect taxation + other revenue	*-387.1%*	*-11.1%*
Interest rate	**174.2%**	**5.0%**
Monetary base + B adjustment	**-91.7%**	**-2.6%**
monetary base change	*-23.8%*	*-0.7%*
B Adjustment	*-68.0%*	*-1.9%*
Supermultiplier change	**4.2%**	**0.1%**
Combined supermultiplier + Z	**0.6%**	**0.0%**
Total Z	**-140.2%**	**-4.0%**
non-government Z	*-75.1%*	*-2.1%*
Goverment Z	*-65.0%*	*-1.9%*