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Abstract

Fiscal discipline is commonly evaluated on the basis of the debt-GDP ratio, which exhibits a stock variable measured relative to a flow variable. This way of monitoring debt solvency is arguably not consistent with transversality conditions obtained from optimizing macroeconomic frameworks. In this paper we consider a wealth-based sustainability index of government debt policy derived from a baseline endogenous growth model. We calculate the index from 1999 onwards for countries in which the after-growth real interest rate is positive, consistently with the theoretical setup. Results are radically different from common wisdom. We show that the fiscal position is sustainable for both Germany and Italy, and strongly unsustainable for both Japan and France. Policy implications of our findings are discussed.

JEL codes: E60, E62, H60. Keywords: Fiscal Discipline, Financial Wealth, Sustainability Indicators.

"Along with price stability, low unemployment and balanced growth, external and public debt sustainability is an essential attribute of good macroeconomic policies. Debt sustainability may be seen as a pre-condition of all the other attributes".

Charles Wyplosz (2011, p. 27)

1 Introduction

The sustainability of fiscal policy is arguably one of the most debated issues in current macroeconomics. Following the high debt levels experienced by several developed economies since the early 1980s (see Azzimonti *et al.*, 2014), and especially in the aftermath of the 2007 global crisis, an intense concern over the possible consequences for macroeconomic stability and economic growth is periodically visible both in the academic literature and in the public policy debate.

Fiscal discipline and the sustainability of public finances are commonly evaluated by assessing the time path of the debt-GDP ratio, which displays a stock variable measured relative to a flow variable. In the present paper we argue that this measure is seriously flawed and may lead to wrong and possibly harmful policy measures.

There are at least two major reasons why the debt-GDP ratio is a spurios indicator: (*i*) it is not logically consistent to compare a stock relative to a flow variable, although obvious relationships exist between the two; (*ii*) the implied debt sustainability index is not theoretically consistent with the transversality conditions obtained from dynamic optimizing macroeconomic

frameworks, which instead pertain to the asymptotic behavior of pure stock variables.

To illustrate these points clearly, we show, in the context of an endogenous growth model, that forward-looking agents' optimizing behavior typically gives rise to a *wealth-based* sustainability index of government policy. We are then able to calculate the resulting wealth-based indicator from 1999 onwards for countries which exhibit a positive after-growth real interest rate, in line with asymptotic properties prevailing in growth theory.

Once private wealth is taken into account for an empirical evaluation of the long-run fiscal balance, results appear to be fundamentally different from common wisdom. In particular, we show that the fiscal position is sustainable for both Germany and Italy, and strongly unsustainable for both Japan and France. These findings are obscured if one concentrates on the dynamics of the debt-GDP ratio.

The present paper is connected to a large body of empirical and theoretical literature. Sustainability indicators and tests of debt solvency relying upon the time path of the debt-GDP ratio have been suggested by many authors: see, e.g., Miller (1983), Buiter (1983, 1985, 1987), Blanchard (1990), Horne (1991), Ize (1991), Buiter *et al.* (1993), Croce and Juan-Ramon (2003) for empirical strategies based on indicators, and Hamilton and Flavin (1986), Trehan and Walsh (1988), Bohn (1998, 2008) for strategies based on tests.[1] Recently, analytical frameworks concerned with the sovereign debt sustainability issue are in a voluminous literature dealing with the so-called "fiscal

[1]Literature reviews can be found in Balassone and Franco (2000), Larch and Nogueira Martins (2007), and Marini and Piergallini (2008).

space", defined as the "room" in a government's budget that allows it to increase the deficit without jeopardizing the sustainability of its financial position (see, e.g., Heller, 2005; Ostry *et al.*, 2010, 2015; Baldacci *et al.*, 2011; Bi and Leeper, 2013; Ghosh *et al.*, 2013; Fournier and Fall, 2015). However, no existing indicators are free of major inconsistencies stressed here. Exceptions are Bruce and Turnovsky (1999) and Aizeinman and Jinjarak (2010) who came close to our approach. The first provides a dynamic indicator based only on capital stock and not on total wealth; the second measures the outstanding public debt relative to the *de facto* tax base or the tax-years needed to repay the public debt.

In a different context (the environment), an analogous approach to our own has also been suggested by Arrow *et al.* (2004), who refer to the net worth of an entity (the government or the country) as a base for assessing sustainability.

The policy implications of our findings are straightforward and relevant. Specifically, fiscal rules such as those enshrined in the Fiscal Compact in the European Union, prescribing a reduction of the difference between the debt-GDP ratio and the 60 percent Maastricht reference value at an average rate of one-twentieth per year, are misleading, for they abstract from the evolution of households' total wealth, which is relevant for fiscal solvency. The sustainability results here obtained for both Germany and Italy are instructive.

Overall, the analysis developed in this paper proposes an alternative perspective, largely overlooked by the fiscal policy literature and policy makers, in order to assess the degree of fiscal discipline on the grounds of dynamic

macroeconomic theory. It shows that incorporating agents' wealth in the formulation of budgetary policy indicators turns out to be essential to guarantee logical consistency in monitoring fiscal sustainability and implement proper policy measures.

The paper proceeds as follows. Section 2 sets up an endogenous growth model in the presence of the public sector. Section 3 lays out the optimality conditions. Section 4 focuses on the balanced growth path and examines the model's properties. Section 5 derives the wealth-based fiscal indicator. Section 6 applies the index to data, states the main sustainability results, and discusses the related policy implications. Section 7 provides concluding comments.

2 The Model

To elucidate our argument, consider a continuous-time macroeconomic environment *à la* Bruce and Turnovsky (1999), which allows fiscal policy to play a key role on the long-run economic growth and the intertemporal aspect of changes in the government's budget balance to be addressed in a more natural and convenient way.[2] All variables are time dependent, though the

[2]These features are typical of a set of models notably collected under the heading of endogenous growth models: see, e.g., Barro (1990), Jones and Manueli (1990), Rebelo (1991), Jones *et al.* (1993), Pecorino (1993), Ireland (1994), and Turnovsky (1996, 2000). An extra, worthy advantage of the above analytical framework is that it explicitly models the public investment-growth relationship which the IMF-World Bank staff, following a recurring criticism by many observers, now recognizes to be critical for a comprehensive monitoring of debt sustainability over the long term. See, e.g., Wyplosz (2011), Buffie *et*

time index is suppressed for notational convenience.

The representative household's utility function is described by an intertemporal isoelastic function of the form

$$U = \int_t^{\infty} \frac{1}{\sigma} \left(C G_C^{\varepsilon}\right)^{\sigma} e^{-\beta(v-t)} dv,\ \varepsilon > 0,\ -\infty < \sigma < 1,\ \varepsilon\sigma < 1,\ 1 > \sigma\left(1+\varepsilon\right), \tag{1}$$

where C = private consumption, G_C = government spending on consumption goods, ε = impact of government consumption on the welfare of private agents, σ = parameter linked to the intertemporal elasticity of substitution ξ by $\xi = 1/\left(1-\sigma\right)$ (or $\sigma = \left(\xi - 1\right)/\xi$), and the constraints on the coefficients are imposed to ensure conventional concavity properties.

The household faces the following budget constraint:

$$\dot{W} \equiv \dot{K} + \dot{B} = rB + \left(1-\tau\right)Y - \left(1+\varkappa\right)C - T, \tag{2}$$

where $W \equiv K + B$ = real wealth, K = private capital stock, B = government bonds, r = real rate of interest, τ = (constant) tax rate on income, $\varkappa$ = (constant) tax rate on consumption, T = lump-sum tax (transfer if negative) playing the role of a "balancing item".[3]

The production function is described by

$$Y = A G_I^{\alpha} K^{1-\alpha} = A\left(\frac{G_I}{K}\right)^{\alpha} K,\ 0 \leq \alpha \leq 1, \tag{3}$$

where Y = output, G_I = government spending on infrastructures, A = index of technological knowledge.

al. (2012), and IMF (2012, 2014, 2016).

[3]Notice that, in order to take account of different tax rates on income and the interest on bonds, we set the tax rate on r equal to 0, so that r is also the after-tax real interest rate.

The economy-wide resource constraint is

$$\dot{K} = Y - C - G, \tag{4}$$

where $G \equiv G_c + G_I$.

The government budget constraint is

$$\dot{B} = rB + G - \tau Y - \varkappa C - T. \tag{5}$$

3 Optimality Conditions

The household's optimization problem is given by

$$\max \int_t^\infty \frac{1}{\sigma} \left(C G_C^\varepsilon\right)^\sigma e^{-\beta(v-t)} dv$$

subject to

$$\dot{K} + \dot{B} = rB + (1-\tau) A G_I^\alpha K^{1-\alpha} - (1+\varkappa) C - T.$$

The Lagrangian for this problem is defined as

$$\begin{aligned} L &= \frac{1}{\sigma} \left(C G_C^\varepsilon\right)^\sigma e^{-\beta(v-t)} \\ &\quad + \lambda e^{-\beta(v-t)} \left[rB + (1-\tau) A G_I^\alpha K^{1-\alpha} - (1+\varkappa) C - T - \left(\dot{K} + \dot{B} \right) \right], \end{aligned}$$

where λ is the marginal utility of wealth, and the conditions for an optimum are

$$\begin{aligned} \frac{\partial L}{\partial C} &= 0 \Longrightarrow \left(C G_C^\varepsilon\right)^{\sigma-1} G_C^\varepsilon = \lambda (1+\varkappa), \\ -\dot{\lambda} + \beta\lambda &= \frac{\partial L}{\partial K} \Longrightarrow -\frac{\dot{\lambda}}{\lambda} + \beta = A(1-\alpha)(1-\tau) \left(\frac{G_I}{K}\right)^\alpha, \\ -\dot{\lambda} + \beta\lambda &= \frac{\partial L}{\partial B} \Longrightarrow -\frac{\dot{\lambda}}{\lambda} + \beta = r. \end{aligned}$$

Combining the last two equations, we can express these conditions as

$$(CG_C^{\varepsilon})^{\sigma-1} G_C^{\varepsilon} = \lambda (1 + \varkappa), \tag{6a}$$

$$r = A (1 - \alpha) (1 - \tau) \left(\frac{G_I}{K}\right)^{\alpha} = \beta - \frac{\dot{\lambda}}{\lambda}. \tag{6b}$$

In addition, the transversality conditions

$$\lim_{v \longrightarrow \infty} \lambda B e^{-\beta(v-t)} = \lim_{v \longrightarrow \infty} \lambda K e^{-\beta(v-t)} = \lim_{v \longrightarrow \infty} \lambda W e^{-\beta(v-t)} = 0 \tag{6c}$$

must hold.

Equations (6a) and (6b) are familiar. (6a) equates the marginal utility of consumption to the tax-adjusted marginal utility of wealth; (6b) is the Keynes-Ramsey consumption rule equating the rate of return on savings to the rate of return on consumption.

Using (6b) and differentiating (6a) with respect to time yields the growth relationship

$$(\sigma - 1) \frac{\dot{C}}{C} + (\varepsilon\sigma) \frac{\dot{G}_C}{G_C} = \beta - r; \tag{7a}$$

the first equality of (6b) implies that the interest rate is given by

$$r = A (1 - \alpha) (1 - \tau) \left(\frac{G_I}{K}\right)^{\alpha}. \tag{7b}$$

Thus, a rise in (G_I/K) increases the equilibrium rate of interest r. Finally, using (7b), we can express the aggregate output as

$$Y = \left[\frac{r}{(1 - \alpha) (1 - \tau)}\right] K. \tag{8}$$

4 Balanced Growth

Assume that the government sets its expenditures as constant shares of output, i.e., set

$$G_C = \gamma_C Y,\ G_I = \gamma_I Y,\quad 0 < \gamma_C, \gamma_I < 1; \tag{9}$$

in order to address the issue of long-run fiscal sustanability, assume also that along the balanced growth path all real variables grow at the same constant rate $\mathbf{g}$. Thus,

$$\frac{\dot{Y}}{Y} = \frac{\dot{K}}{K} = \frac{\dot{B}}{B} = \frac{\dot{W}}{W} = \frac{\dot{C}}{C} = \frac{\dot{G_C}}{G_C} = \frac{\dot{G_I}}{G_I} \equiv \mathbf{g}. \tag{10}$$

Combining (10) with (7a) shows that the equilibrium growth rate is given by

$$\mathbf{g} = \frac{r - \beta}{1 - \sigma\,(1 + \varepsilon)}. \tag{11}$$

Also, using the aggregate production function and $G_I = \gamma_I Y$ yields

$$\frac{G_I}{K} = (A\gamma_I)^{\left(\frac{1}{1-\alpha}\right)},$$

which, substituted in (7b), allows the interest rate to be rewritten as

$$r = A(1-\alpha)(1-\tau)(A\gamma_I)^{\left(\frac{\alpha}{1-\alpha}\right)}. \tag{7b'}$$

Next, dividing (4) by K and using (8), we can rewrite the aggregate resource constraint as

$$\frac{\dot{K}}{K} \equiv \mathbf{g} = \frac{r\,(1 - \gamma_C - \gamma_I)}{(1-\alpha)(1-\tau)} - \frac{C}{K},$$

whence

$$\frac{C}{K} \equiv \varphi = \frac{r\,(1 - \gamma_C - \gamma_I)}{(1-\alpha)(1-\tau)} - \mathbf{g}. \tag{12}$$

Finally, dividing (2) by W and using (8), and letting T be equal to zero for simplicity,[4] we can write the consumption- and capital-wealth ratio in the form

$$\frac{K}{W} \equiv \omega = \frac{r - \mathbf{g}}{(1 + \varkappa)\varphi - \dfrac{r\alpha}{1 - \alpha}}, \tag{13a}$$

$$\frac{C}{W} \equiv \eta = \frac{r\left(1 + \dfrac{\alpha\omega}{1 - \alpha}\right) - \mathbf{g}}{(1 + \varkappa)}. \tag{13b}$$

To understand the model's properties, from (7b'), (11), (12) and (13) the following (partial derivative) effects of fiscal changes on key economic variables can be gathered immediately:[5] an increase in the income tax rate, τ, raises the consumption-capital ratio, φ, and reduce both the interest rate, r, and the growth rate, $\mathbf{g}$; an increase in the consumption tax, $\varkappa$, reduces the consumption- wealth ratio, η, and the capital-wealth ratio, ω, but do not affect the the interest rate and the growth rate; an increase in the government consumption ratio, γ_C, crowds out the consumption-capital ratio, reducing φ, but has no effect on either the interest rate or the growth rate; finally, an increase in the government spending ratio on infrastructure, γ_I, raises both the interest rate and the growth rate.

[4]Being T a balancing item, this is only to simplify algebra. The value of T needed to ensure the long-run sustainability of the government debt policy is given further on.

[5]These effects imply the assumption that the fiscal impulse is financed either by lump-sum taxation or by issuing more debt.

5 Long-run Sustainability of Fiscal Policy

To assess the long-run sustainability of fiscal policy, assume, for convenience, that government bonds consist only of perpetuities, paying a coupon rate of one unit. The value of this government bond is $1/r$ and the value of the outstanding debt is $B = b/r$, where b is the number of outstanding bonds. With r constant, this also implies $\overset{\bullet}{B} = \left(\overset{\bullet}{b}/r\right)$.

Using (8), (9), and (12), rewrite now the government budget constraint (5) as

$$\frac{\overset{\bullet}{b}}{r} = b + \left[\frac{\gamma_C + \gamma_I - \tau}{(1-\alpha)(1-\tau)}\right] rK - \varkappa\varphi K - T. \tag{5b'}$$

Next, integrate (5b') over the range $[t, \infty)$, to obtain

$$\begin{aligned}\int_t^\infty T_v e^{-r(v-t)} dv &= \frac{b_t}{r} + \int_t^\infty \left\{ r\left[\frac{\gamma_C + \gamma_I - \tau}{(1-\alpha)(1-\tau)}\right] + \right. \\ &\quad \left. -\varkappa\varphi \right\} K_t e^{-(r-\mathbf{g})(v-t)} dv. \end{aligned} \tag{14}$$

Equation (14) is the intertemporal budget constraint of the government, requiring that the present value of government expenditures less tax receipts on economic activity, that is, the present value of the primary budget deficit, plus the current value of debt, must equal the present value of current and future lump-sum tax payments. Solving (14) under the transversality conditions (6c), and dividing through by the size of the current wealth leads to

$$F \equiv \int_t^\infty \frac{T_v e^{-r(v-t)}}{W_t} dv = \frac{(b_t/r)}{W_t} + \frac{r\left[\frac{\gamma_C + \gamma_I - \tau}{(1-\alpha)(1-\tau)}\right] - \varkappa\varphi}{r - \mathbf{g}}\omega, \tag{15}$$

where the transversality conditions imply

$$r > \mathbf{g}, \tag{16}$$

to ensure that the integral in (14) is well defined.[6]

Equations (7b'), (11), (12), (13) and (15) fully describe the balanced growth economy. (7b'), (11), (12), and (13) determine the state of the economy and its fiscal policy as described by the parameter set $\{\tau, \varkappa, \gamma_C, \gamma_I\}$); (15) determines the present discounted value of T required for the government to be intertemporally solvent.

Equation (15) is a key relationship of the model and provides a sensible index to assess the intertemporal (or long-run) sustainability of a government fiscal balance. It measures the present value of fiscal policy adjustment necessary to ensure the long-run sustainability of government debt. Following Bruce and Turnovsky (1999), we call F a *sustainability index of fiscal policy.*

Further comments are in order to better appreciate the efficacy of the index F. First, observe that all values are derived relative to the current size of wealth, differently from Bruce and Turnovsky (1999) where values are expressed relative to private capital. Overall, this avoids the shortcoming of the debt-GDP ratio, where a stock variable is measured relative to a flow variable. Second, the right-hand side includes two (correctly normalized) components. The first is the current stock of government debt. The second is the present value of the primary budget deficit. Hence, the left-hand side computes the value of fiscal policy adjustment (here assumed to take the form of lump-sum taxes) required to warrant the viability of the long-run fiscal balance as reflected by the two components in the right-hand

[6]Notice that condition (16) is the opposite of that arising in early, backward-loooking models centered on the debt-GDP ratio. The reason is that the dynamics is here forward-looking.

side of (15). Finally, being based on endogenous growth model, the index provides a "dynamic scoring" of government debt that takes into account the intertemporal nature of fiscal policy and its impact on the growth rate and other macroeconomic variables, and by which we can assess a country's fiscal position as follows. When $F \leq 0$, fiscal policy is said to be sustainable; when $0 < F \leq (b_t/r)/W_t$, fiscal policy is said to be weakly unsustainable; when $F > (b_t/r)/W_t$, fiscal policy is said to be strongly unsustainable.

An extra advantage of our sustainability index is that it does not imply any threshold level for the debt, which is puzzling and highly questioned in academic literature.[7] Rather, it provides a well-defined measure of fiscal policy adjustments required to bring back the government balance on a sustainable path. Obviously, we do not believe our index to solve the "impossible mission" of determining exactly which debt is sustainable and which is not (Wyplosz, 2011). Nonetheless, we think it fruitfully answers to the issue of finding a "simple, transparent and standardized tool that can be easily implementable to all countries".[8] It is a dynamic scoring of the government fiscal balance that switches emphasis from levels to paths and computes how much adjustment is required to converge to the stability path. It also implies that the adjustment process need not necessarily occur immediately, but better spanned over a longer planning horizon to avoid the deep recessions resulting from huge fiscal contractions and the risk of possible devilish dynamics driven by self-fulfilling expectations of debt non-sustainability.[9] As

[7]See, e.g., Cordella *et al.* (2010), Wyplosz (2011), Panizza and Presbitero (2014), Pescatori *et al.* (2014), Egert (2015), Schadler (2016), and Chudik *et al.* (2017).

[8]Wyplosz (2011, pp. 10-11).

[9]See, e.g., De Grauwe and Ji (2012), and Canofari *et al.* (2015).

Wyplosz (2011) notes, sacrificing growth in the short and even in the long run to imprecisely known risks concerning a particular debt ceiling can be very costly to any country. Indeed, in the presence of multiple equilibria and self-fulfilling dynamics of debt (un-)sustainability, a fully solvent government with a high level of debt might be moved to implement restrictive fiscal policies to reduce the supposed risks that a change in investors' sentiments would push the country towards the bad equilibrium. Yet, these policies may be very harmful and self-defeating, as they reduce growth and increase the debt-to-GDP ratio especially if implemented during a recession (DeLong and Summers, 2012; Cafiso and Cellini, 2014; House *et al.*, 2017).

6 Empirical Results

We now calculate the index given by (15) for the post-1999 period, focusing on countries in which the after-growth real interest rate is positive, consistently with (16).

We obtained annual fiscal and growth data from the IMF World Economic Outlook. We obtained the nominal interest rate series by dividing interest payments for period t over the stock of nominal debt at the end of period $t-1$, consistently with Bohn (2008). This enables us to take into account the fact that government debt is composed of a portfolio of securities with different interest rates. We obtained annual data for households' net total wealth from the OECD, that are available up to 2013. Therefore, since budgetary forecasts contained in the IMF World Economic Outlook are available up to 2021, the computation of the sustainability index uses averages of fiscal

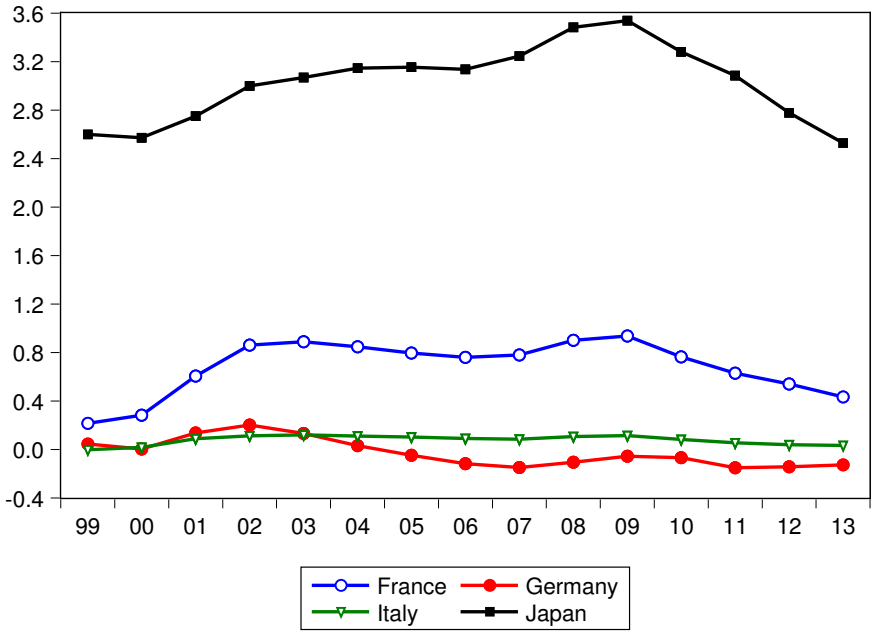

Figure 1: The Wealth-based Sustainability Indicator, 1999-2013

variables over nine years.[10]

Figure 1 shows the behavior of our wealth-based fiscal indicator for Germany, Italy, France and Japan. The United States is not included because it displays a negative after-growth real interest rate as an average over the sample. This observation is consistent with the results shown by Bohn (2008), according to which a sufficiently high "growth dividend" ensures the sustainability of U.S. fiscal policy. The same pattern is observed, remarkably, for the remaining G7 countries, that is, the United Kingdom and Canada.

[10]Details on data and computations are given in the Appendix.

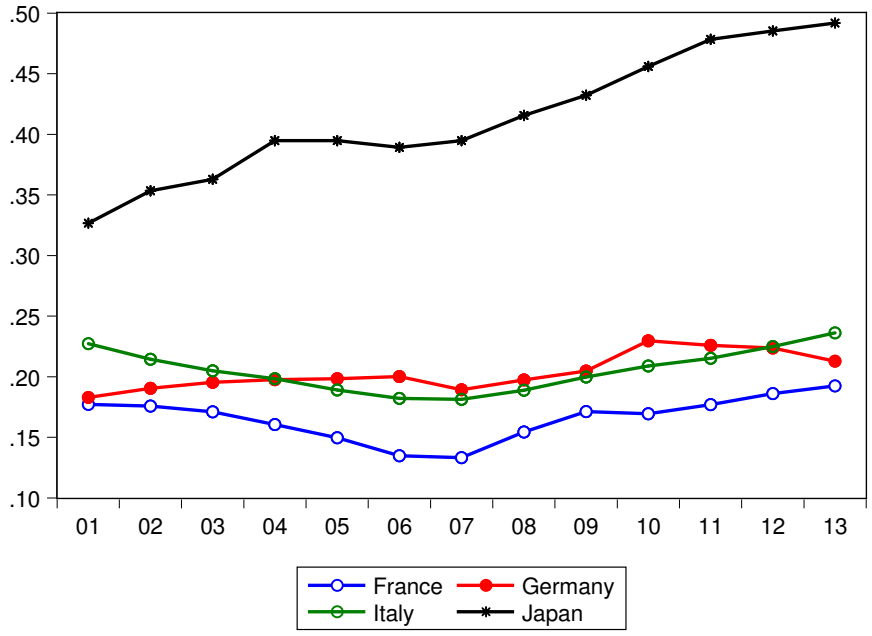

Figure 2: The Government Debt-Wealth Ratio, 1999-2013

According to Figure 1, the path of the fiscal indicator for Germany and Italy is sustainable, because the index converges to a value $F \leq 0$. In this case, primary surpluses along the balanced growth path are sufficient to finance the outstanding debt-wealth ratio. The path for France and Japan is unsustainable, because the index systematically displays a value $F > 0$. In this case, fiscal parameters *per se* do not guarantee the intertemporal viability of the government's budget.

In particular, comparing Figure 1 with Figure 2, showing the behavior of the government debt-wealth ratio, it emerges $F > (b_t/r)/W_t$ for both Japan and France. This denotes that the governments in these two countries are

running primary deficits, which further worsen their initial fiscal position. Thus, from the foregoing perspective, we are led to conclude that the long-run fiscal policy of France and Japan is "strongly" unsustainable.

The above results are very different from conventional views and signal that indicators and tests of government solvency, used in the current fiscal policy literature, are strongly biased and misleading and may lead to wrong and perverse policy strategies. The case of Italy to which unnecessary fiscal restrictions and, hence, undue worsening off effects on output and growth are imposed according to the debt/GDP ratio and the Stability and Growth Pact, is markedly instructive.

7 Conclusions

The evolution of public debt and deficits in OECD countries requires an appropriate monitoring. In academic and public policy debates, the sustainability of fiscal policy is periodically assessed on the basis of the debt-GDP ratio, whereby a stock variable is measured relative to a flow variable. This is logically and theoretically inconsistent if one refers to dynamic macroeconomic theory, whereby forward-looking agents' optimization incorporates transversality conditions ruling out explosive paths in pure state variables. A typical endogenous growth optimizing model indeed leads to a sustainability index of government policy that is wealth-based. Applying the index to post-1999 data for countries that exhibit a positive after-growth real interest rate yields sustainability results which significantly diverge from conventional views. Specifically, fiscal policy is found to be sustainable for both Germany

and Italy, and strongly unsustainable for both Japan and France. This signals that indicators and tests of government solvency, used in the current fiscal policy literature, are distorted because they exclude the debt-wealth ratio from the analysis, in sharp contrast with the theoretical predictions of optimizing macroeconomic frameworks, and may lead to undue and perverse policy strategies. Fiscal rules of the type enshrined in the Fiscal Compact in the European Union, according to which member states shall reduce the difference between the debt-GDP ratio and the 60 percent Maastricht reference value at an average rate of one-twentieth per year, are misleading, because they disregard the time path of households' total wealth, which is crucial to assess the degree of sustainability. The case of Italy to which undue fiscal restrictions are imposed according to the debt-GDP ratio and the Stability and Growth Pact is decidedly instructive.

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Data Appendix

Sample data cover the G7 countries: United States, United Kingdom, Canada, Germany, France, Italy and Japan.

Variable	Description	Source	Sample period
Government debt	Stock of general government gross debt	IMF: World Economic Outlook	1999-2013
Total budget	General government revenue minus total expenditure	IMF: World Economic Outlook	1999-2021
Primary budget	Total budget plus interest expense minus interest revenue	IMF: World Economic Outlook	1999-2021
Present value of primary budget	Average primary budget over nine years period	Own Calculation	1999-2013
Interest payments	Differential between primary and total budget	Own Calculation	1999-2015
Implied interest rate	Interest for period t over the government debt stock at time t-1	Own Calculations	1999-2015
Gross domestic product	Gross domestic product at current prices	IMF: World Economic Outlook	1999-2015
Net financial wealth	Households' financial assets minus financial liabilities	OECD: Dataset 720	1999-2013
Real wealth	Households' non financial assets	OECD: Dataset 9B[11]	1999-2013
After growth interest rate	Average imp. interest rate minus average nom. growth rate	Own Calculations	1999-2015
Net total wealth	Real wealth plus net financial wealth	Own calculation	1999-2013

[11]The source for Italy is Banca d'Italia, "La ricchezza delle famiglie italiane 2014".