Back to fiscal rules:
The insanity of normality, unless the rich pay for it!

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Abstract

With central banks and national governments returning to more conservative monetary and fiscal policies after Covid, the debate about the macroeconomic effects of fiscal rules has revamped. We address this topic via an extended version of the hybrid ABM-SFC model in Botta et al. (2024) that includes a Taylor-type monetary policy rule and a variety of fiscal rules aimed at reducing the public debt-to-GDP ratio. We compare spending-based fiscal rules vastly advocated by international economic institutions with wealth tax-based fiscal policies. We do this in the context of a modern financialized economy where securitization and complex financial products like Asset-Backed Securities (ABS) alter economic dynamics and the effectiveness of monetary policy in controlling inflation. We assume heterogeneous households to track how alternative fiscal strategies affect income and wealth inequality. Our findings are threefold. First, spending-based fiscal rules can reduce the debt-to-GDP ratio in the long term but at the cost of significantly higher unemployment and permanently lower real GDP. Second, wealth tax-based fiscal policies reduce public debt without harming economic performance. Third, perhaps unexpectedly, in a financialized economy, spending-based fiscal austerity may hurt the relative position of rich households in wealth distribution as much as a wealth tax does; this is due to capital losses that spending cuts may eventually induce in households' financial wealth. In the end, wealth taxes are preferable to spending cuts, and the usual political opposition against them by the rich appears largely unfounded given their potential economic benefits compared to spending-based fiscal austerity.

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JEL Classification: E44, E63, H63.

1 Introduction

In the last decade or so, extraordinary policy measures have been taken to tackle equally exceptional shocks. Central banks first adopted quantitative easing in response to the 2007-2008 financial shock, and then revamped it in 2020 in order to back fiscal policy actions against Covid. The governments of most developed countries run unprecedented budget deficits during the pandemic. Fiscal policy rules were suspended everywhere. Record inflation rates since the 1970s finally prompted a sudden and abrupt tightening of monetary policy in 2022. The end of the pandemic and the slowdown of inflation now seem

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to pave the way for the return to *normality*. Whilst central banks seem to consider more accommodating monetary policy stances in the near future (Lane, 2024), fiscal rules are on their way back as guiding principles of fiscal policy (Caselli et al., 2022).

History never repeats itself though, and normality does not look identical to what was before. On the one hand, most countries worldwide now record substantially higher stocks of public debt (with respect to GDP) as lasting consequence of the above-mentioned shocks. International economic institutions do believe that "long-term government debt trajectories pose the biggest threat to macroeconomic and financial stability" (BIS, 2024, p.62), and that safeguarding the sustainability of public debt is the upmost priority of policy makers. New revised EU fiscal rules have been actually adopted to this end. Among other changes, net *primary* government spending now stands as benchmark control variable to stabilize and hopefully reduce public debt. On the other hand, income and wealth inequality worsened even further during pandemic after a secular rise since the beginning of the 1980s (Saez and Zucman, 2020, 2022). The launch of international "Tax the rich" campaign now makes the quest for the introduction of a wealth tax over the wealthiest more compelling than ever.[1]

In this paper, we study this "new" normal. More specifically, we analyze the different macroeconomic implications of different fiscal policies aiming at stabilizing (reducing) public debt that are either focused on the control of public spending or inspired by the need of tackling unacceptably high inequality via increased wealth taxation. We do this by comparing two alternative fiscal policy strategies. On the one hand, consistent with suggestions by the IMF (Eyraud et al., 2018) and with the recently reformed EU Stability and Growth Pact (SGP) - see Darvas et al. (2024) - we consider fiscal policy centred on managing, possibly cutting, net *primary* public spending as the main way to achieve fiscal targets (i.e., a reduction in public debt and a deficit-to-GDP ratio below 3 percent). On the other hand, we consider the alternative option of a wealth tax levied on financial assets held by narrower or wider sets of households in the economy. We conduct such comparison in the context of an extended version of the hybrid ABM-SFC model presented in Botta et al. (2024), where the assumption of heterogeneous households allows us to track the effects of such different fiscal choices over income and wealth inequality, among other variables.

The outcomes of our simulations are qualitative in nature and are not meant to reproduce real data or forecast the evolution of any specific economy. Nor our model is intended to formalize the full intricacy of existing fiscal rules. Nonetheless, our analysis may shed light on some complex effects of the interaction between monetary policy and different types of fiscal adjustments, whilst capturing the in-depth economic philosophies of such alternative fiscal strategies themselves. Three main results are worth stressing.

First, spending-based fiscal rules come at the cost of lower growth (if not recession) and higher unemployment. Due to damages to the real economy, they are self-defeating in the short run, as they cause the debt-to-GDP ratio to rise initially. The debt-to-GDP ratio stabilizes and eventually decreases in the medium-to-long run only. This happens thanks to fiscal policy interaction with more accommodating monetary policy stances that are allowed by lower inflation rates.

Second, an alternative wealth tax-based fiscal policy may equally preserve the sustainability of public budget without detrimental effects over growth and employment. The stabilization and reduction in the debt-to-GDP ratio actually takes place more promptly than in the case of spending cuts.

Third, the outcome of the two policies in terms of wealth inequality are, to a certain extent, unexpected. On the one hand, both a wealth tax on the top 10 percent and the public spending cuts determine a decrease in income inequality. The mechanisms at work are radically different though. While in the former case, it is a plain matter of wealth redistribution, in the second case the recession, triggered by lower public spending, increases the number of non-performing loans, the value of the financial assets held by the top 10 percent therefore decreases. On the other hand, a universal application of the wealth tax, regardless of wealth percentiles, allows to maintain the relative distributive position of the richest, while obtaining the desired results in terms of public finances. This is because it preserves economic dynamics and the accumulation of wealth even at the top of wealth distribution by avoiding the contractionary effects of spending cuts.

All in all, our results suggest that the introduction of a wealth tax may be preferable than public spending cuts in order to improve the sustainability of public debt. And contrary to widespread political

[1]See https://www.tax-the-rich.eu on this. See also Guzzardi et al. (2024) advocating the introduction of a wealth tax in Italy in order to correct existing regressive taxation at the top of the income distribution.

aversion against wealth tax, its introduction may actually be in the self-interest of the rich if it helps to avoid negative consequences for the value of securitized loans incorporated in complex financial products that wealthy households increasingly purchase on financial markets in largely financialized economies.

The paper is organized as follows. Section 2 makes a brief review of most recent developments in advanced economies as to public debt sustainability and fiscal rules, as well as wealth inequality and connected taxation. Section 3 presents the main features of our hybrid ABM-SFC model and of the economy is meant to describe. Section 4 illustrates the main outcomes of our simulations. Section 5 concludes.

2 Post-covid advanced economies' macroeconomy: some stylized facts

Two aspects of advanced economies' macroeconomy have grasped considerable attention in the current economic debate. On the one hand, the issue of public debt sustainability and fiscal consolidation is marked in red on the agenda of policymakers and international economic institutions. On the other hand, several academics and think tanks keep stressing historically high levels of income inequality and wealth concentration characterizing such economies.

As to the first point, most developed countries present substantially higher stocks of public debt than what was recorded at the beginning of the 2000s. Tougher debt burdens are the long-lasting consequences of bold policy interventions taken in response to the 2007-2008 financial shock first and, more recently, to the economic disruptions caused by Covid. In this context, international economic institutions now wonder whether governments still have any fiscal space left to tackle future shocks. They raise increasing concern about the sustainability of public debt in a possibly less favourable economic scenario featuring the progressive slowdown in post-Covid economic dynamism (i.e., lower nominal GDP growth rate) and considerably higher interest rates with respect to the low-for-long interest rate environment of the 2010s. Credible, vigorous, and prolonged fiscal tightening is the suggested recipe against risks posed by previous fiscal slippages. The Bank for International Settlements, for instance, bluntly states in its 2023 annual report that "there is urgent need to consolidate fiscal positions" (BIS, 2023, p.69). In a similar vein, the IMF claims that "durable fiscal consolidation efforts are needed to safeguard sustainable public finances and rebuild buffers in a context of slowing medium-term growth prospects and high real interest rates" (IMF, 2024, p.xi).

When it comes to inequality, increased income inequality and wealth concentration are not a new feature of developed countries. They are the outcome of a secular rising trend that, since the beginning of the 1980s, has brought back inequality standards close to historically high levels recorded in the first decade of the previous century (Piketty, 2014; Piketty et al., 2018). What is new is that Covid seems to have exacerbated inequality even further with a jump in the degree of wealth concentration at the very top of the distribution, at least in the US (Saez and Zucman, 2022). Extremely high inequality records may obviously raise some moral issues. More importantly for the present analysis, they may also pose some threats to the well-functioning of the economy. For instance, several economists have identified increased inequality as a possible source of permanent slack in aggregate demand, excess savings, and, eventually, secular stagnation (Summers, 2015; Eggertsson et al., 2019; Palagi et al., 2023).

These two seemingly unrelated features of modern advanced economies are actually united by a very relevant point: they both bear important implications in terms of the conduction of fiscal policy. On the one hand, the above-mentioned international economic institutions and most mainstream economists shape their quest for fiscal consolidation in the form of a return to fiscal rules. After being suspended during Covid, the revamp of fiscal rules should introduce some relevant changes though. Reforms should be oriented to make fiscal rules simpler, more flexible, and, at the same time, more enforceable. A corner-stone aspect of suggested novelties is the adoption of a public spending rule as the unique operational rule for the implication of fiscal policy[2]. This is actually part of the revised EU SGP agreed by EU Member

[2]The adoption of a public spending rule is expected to improve the enforcement of fiscal rules' by making them hinged upon a well-defined macro variable, which is openly observable and measurable. This is in stark contrast with fiscal rules previously centred around the cyclically adjusted (or structural) public balance, i.e., a quite abstract theoretical concept

States in April 2024. The economic rationale behind this principle is fairly simple. Governments should pursue their (medium-term) fiscal targets by primarily managing their *net primary* spending. These are spending that governments can directly control and that are computed net of interest payments and cyclical components such as unemployment benefits. In such an amended fiscal framework, fiscal consolidation and projected reductions in the public debt burden would be achieved via slower growth, if not straight cuts, of net primary public spending with respect to potential GDP growth. On the other hand, rising wealth concentration has induced consensus among a wide range of economists and public opinion, even amongst wealthy people[3], about the need of introducing a tax on wealth. The "Tax the rich" campaign recently launched in Europe is a clear example of such spreading demand. Saez and Zucman (2022) document wealth taxes introduced in the US and in some European countries in the past. They stress the little contribution such taxes gave to overall fiscal revenues due to generous exemptions, large avoidance, or vast evasion by taxpayers. They simulate the introduction of a 1 percent progressive wealth tax on top 1 percent wealthiest tax units. According to their estimations, revenues could be up to about 1 percent of GDP in some European countries, and even more in the case of the US. Saez and Zucman (2022) do not discuss how governments should deploy the revenues of the wealth tax. Nonetheless, they can certainly contribute to the reduction of accumulated debt. In a similar way, Kapeller et al. (2021) suggest that funds raised via the introduction of a European wealth tax should provide finance for post-Covid recovery and the green transition. The financing of policies against climate change will constitute a tremendous challenge for fiscal solidity. The proposed wealth tax may surely help to tackle it and improve fiscal balance's sustainability.

In this paper, we analyze the macroeconomic implications of these two different, albeit not necessarily incompatible, fiscal strategies. We compare the outcomes of a spending-based fiscal rule aiming at keeping the fiscal balance under control (below the 3 percent deficit-to-GDP threshold) and, this way, reducing the debt-to-GDP ratio, with respect to the effects of a wealth tax on the wealthiest households (see more on this below). We carry out our study in the context of a *financialized* advanced economy. Financialization is described as an economy featuring a fairly complex financial system that produces complex financial products (i.e., Asset-Backed Securities - ABS) by using securitized loans extended by commercial banks to households and non-financial firms as "intermediate inputs". Very importantly, such financial mechanisms do create an implicit connection between different layers of income and wealth distribution. The debt of low-middle income households, originated by commercial banks and then sold and put out of their balance sheet via securitization, become part of financial assets possibly purchased by wealthier households (via holdings of invest funds' shares). In a way, our goal is to study the complex macroeconomic, financial, and distributional consequences of the above-mentioned alternative fiscal policies once we take into due account how financialization jointly influences the functioning of the economy (by affecting inflation dynamics and, hence, central bank's monetary policy stance, for instance - see Botta et al. (2024)), as well as distributive records.

We conduct our analysis by means of an extended version of the hybrid AB-SFC model by Botta et al. (2022, 2024) that now includes, among other aspects (more details are provided in section 3 below), a richer description of the interaction between monetary and fiscal rules. Important for the sake of our analysis, we neglect to consider the housing sector in our model. We do so for two reasons. First, given the quite high degree of complexity characterizing the financial side of our simulated economy, this assumption keeps the model more tractable and understandable without altering its rationale. Second, and perhaps more relevantly, our analysis focuses on the macroeconomic effects of the introduction of a *wealth* tax. Consistent with Saez and Zucman (2022), this should not be wrongly misunderstood as a *property* tax. Indeed, property taxes already exist in most advanced economies and target, albeit with very large exemptions, *non-financial* wealth, namely houses. What Saez and Zucman (2022) advise (among many others), and we try to model, is the imposition of a tax on *financial* wealth (holdings of stocks, bonds or investment funds' shares, for instance), for which track records about implementation

that is not observable in the data and that must be computed through debatable techniques and assumptions. Attention paid to public spending net of interest payments and cyclical outlays would also allow automatic stabilizers to operate in full and fiscal policy to remain counter-cyclical in the event of severe negative economic shocks

[3]This is the case, for instance, of the so-called "Millionaires for humanity". See https://millionairesforhumanity.org about this.

and proceeds are much more limited.[4] In the end, our decision not to formalize the housing sector is fully consistent with our primary attention given to the taxation of financial wealth.

3 The model

The model builds upon Botta et al. (2022, 2024). It is an *hybrid* Agent-Based-Stock-Flow-Consistent (AB-SFC) model that includes one heterogeneous sector - there are $\bar{N}$ heterogeneous households - and six aggregate sectors: *commercial banks, special purpose vehicles* (SPV), *investment funds* (IF), *non-financial firms*, the *government*, and the *central bank.* Nonetheless, we extend previous versions of our model in several directions. First, we explicitly model households' defaults on borrowed money whenever they are unable to meet loan installments. This point captures a very relevant aspect of a financialized economy, where the debt of some households, and their ability to repay it, influences the value of the financial assets held by other households (via securitization, the production of ABSs, and the purchase of IFs' shares). Indeed, the outbreak and propagation of the 2007-2008 financial shock were triggered by indebted low-middle income households defaulting on risky loans packaged into complex financial products massively sold to investment institutions such as hedge funds (Lysandrou, 2012; Goda and Lysandrou, 2014). Second, and perhaps more importantly for our study, we embed in our model a more detailed description of monetary and, above all, fiscal policy. Monetary policy is modelled as a fairly standard Taylor rule, according to which the central bank changes its policy rate (and, hence, the cost of credit in the economy) in order to control inflation dynamics. Fiscal policy, instead, is modelled in a variety of different ways according to whether the stabilization of public debt and fiscal sustainability are pursued via the implementation of a spending-based fiscal rule or through the introduction of a wealth tax.

As usual in the SFC approach, the structure of the economy and the interconnection between its different sectors is grasped by a set of accounting matrices: the *aggregate balance sheet*, which portrays the stocks of assets at the beginning of every period (table 1); the *transaction flow matrix*, showing all the monetary flows (table 2); the *revaluation matrix*, which accounts for changes in asset values not determined by new flows (table 3). Consistent with the description of monetary policy as a fairly simple (policy) interest rate setting by the central bank (see section 3.2), the central bank itself does not appear in the above-mentioned matrices as it does not hold any asset or liability. Conversely, SPVs are portrayed in the matrices but they will not appear in section 3.2, where behavioral equations are discussed. Indeed, this sector is conceived as a passive pass-through, which purchases a portion (z) of the loans (L) granted by commercial banks to households and non-financial firms. These loans are then securitized, transformed into ABSs, and sold to IFs. The size of (z) is endogenously determined by IFs' demand for ABSs. This is the core of the *securitizing system* as reproduced in our model. Next to ABSs, IFs' portfolio choice includes deposits (D) and public bonds (B). To finance their investment, IFs will issue shares bought by households. We will go through the remaining elements of the accounting matrices while presenting the timeline of events.

	Households	Banks	SPV	IF	Firms	Gov	Total
Deposits	$+D_H$	$-D$	$+D_{IF}$	$+D_{SPV}$	$+D_F$		0
Capital					$+K$		$+K$
Shares	$+Sh$			$-Sh$			0
Bonds		$+B_B$		$+B_{IF}$		$-B$	0
Loans	$-Lh$	$+(1-z)L$	$+zL$		$-Lf$		0
Derivatives			$-ABS$	$+ABS$			0
Own Funds	$+OF$	$-OF_B$			$-OF_F$		0

Table 1: Aggregate Balance Sheet

[4] The much narrower history of tax on financial wealth is somehow due to its misconception as property tax and the quite widespread unpopularity of the latter as a consequence of possible liquidity issue it may cause. Wealthy people have frequently and successfully lobbied against the introduction of the former by leveraging general political aversion towards property taxes.

	Households	Banks		SPV		IF		Firms		Govt.	Σ
		CA	KA	CA	KA	CA	KA	CA	KA		
Consumption	$-C$							$+C$			0
Publ. Exp.								$+G$		$-G$	0
Investment								$+I$	$-I$		0
Wages	$+W$							$-W$			0
Dole	$+Do$									$-Do$	0
Taxes	$-T_H$	$-T_B$						$-T_F$		$+T$	0
Int. on Loans	$-i^h_{t-1}Lh_{t-1}$	$+i_{t-1}(1-z)L_{t-1}$		$+i_{t-1}zL_{t-1}$				$-i^f_{t-1}Lf_{t-1}$			0
Ret. on Deriv.				$-r^{abs}_{t-1}ABS_{t-1}$		$+r^{abs}_{t-1}ABS_{t-1}$					0
Ret. on Shares	$+r^{sh}_{t-1}Sh_{t-1}$					$-r^{sh}_{t-1}Sh_{t-1}$					0
Int. on Bonds		$+ib_{t-1}B_B, t-1$				$+ib_{t-1}B_{IF,t-1}$				$-ib_{t-1}B$	
Dividends	$+Div_{t-1}$	$-Div_{B,t-1}$						$-Div_{F,t-1}$			0
Profits		$-\Pi_B$	$+\Pi_B$					$-\Pi_F$	$+\Pi_F$		0
Change in the stocks of											
Deposits	$-\Delta D_H$		$+\Delta D$				$-\Delta D_{IF}$		$-\Delta D_F$		0
Loans	$+\Delta Lh$		$-\Delta(1-z)L$		$-\Delta zL$				$+\Delta Lf$		0
Derivatives					$+\Delta ABS$		$-\Delta ABS$				0
Shares	$-\Delta Sh$						$+\Delta Sh$				0
Bonds			$-\Delta B_B$				$-\Delta B_{IF}$			$+\Delta B$	0
Loan Defaults	$+NPL$		$-NPL$								0
Δ Total	0	0	0	0	0	0	0	0	0	0	0

Table 2: Aggregate Transaction Flow Matrix

	Households	Banks	SPV	IF	Firms	Gov	Total
Own Funds	$+\Delta OF$	$-\Delta OF_B$			$-\Delta OF_F$		0

Table 3: Revaluation Matrix

3.1 Timeline of the events

1. The level of production is set by the non-financial firm sector. Firms decide how much to produce by adjusting previous period desired production in light of the observed gap between demand and desired supply. Actual production is defined according to a Leontief production function.

2. Once production plans are defined, firms determine employment. Nominal wages come next. They are set according to a Philips curve-type process. The dynamics of employment and of wage inflation jointly determine the total wage bill (W).

3. Prices (hence inflation) are defined according to a mark-up pricing rule on total variable costs including labour and financial costs.

4. Employed households receive wages and pay taxes on it, while those unemployed receive a dole from the government.

5. Financial payments take place. These include:

   (a) Interests on previous period households' and firms' loans, both securitized (e.g. $i^h_{t-1} \cdot z \cdot Lh_{t-1}$) and non-securitized (e.g. $i^h_{t-1} \cdot (1-z) \cdot Lh_{t-1}$);

(b) Repayment of a fixed portion (ϵ) of loans' principals. This, together with the new inflow of credit, will determine the change in the stock of loans of both households (ΔLh) and non-financial firms (ΔLf);

(c) Returns on ABSs ($f_{t-1}ABS_{t-1}$), equal to interests paid on the fraction z of loans securitized and bundled in such financial products;

(d) Interests on previous periods stock of public bonds (e.g. $ib_{t-1} \cdot B_{B,t-1}$);

(e) Returns on IFs' shares ($r^{sh}_{t-1}Sh_{t-1}$), which are equal to all interests received by IFs on their assets;

(f) Dividends (Div_{t-1}) set aside by non-financial firms and commercial banks at the end of the previous period and distributed to households in proportion to their wealth at the beginning of the current one.

6. Households may default. This happens when the sum of disposable income and previous period deposit stock does not cover the (exogenously-set) level of subsistence consumption plus installment (i.e., interest and principal payments) on accumulated debt stock. When the borrower defaults, the portion of debt not repaid is computed as non-performing loan (*NPL*).

7. At macro level, *NPL*s are computed as the sum of missing principals. They have numerous consequences:

   (a) Insolvent households are cut off from credit for the next four periods as a consequence of "shaky" credit history from creditors' perspective.

   (b) Capital losses, determined by missing principal repayments, are passed onto the balance sheets of IFs and commercial banks according to the proportion of securitized (z) and non-securitized loans (*1-z*). In IFs portfolio this translates into a loss in the value of ABS.

   (c) On the liability side, for IFs, the value of their shares (Sh) diminishes by the same amount of capital losses registered on ABSs. In the case of commercial banks, their fraction of non-performing loans is eventually matched by an equal reduction in banks' Own Funds (OF_B). In both cases, capital losses are eventually suffered by households holding financial wealth (either IF shares or bank equities).

   (d) Returns on ABSs and, therefore, IF shares also decrease by the amount of missing interest payments on securitized loans.

   (e) When securitized loans are repaid instead, maturing loans are converted into IFs' deposits.

8. Households set their desired level of consumption and financial assets' holdings (deposits and shares), hence defining their demand for credit.

9. Credit market: commercial banks set the borrower-specific interest rates for individual households and for non-financial firms, and decide whether to fully accommodate households' credit demand.

10. If credit is rationed, households revise their plans through a pecking order process. They first scale down their demand and, if needed, their holding of shares; they then do the same with deposits; eventually they cut consumption to a minimum subsistence level.

11. Public expenditure and investment take place: the government purchases goods from non-financial firms, which in turn purchase capital goods from themselves.

12. The goods market: the goods market clears. Goods are assumed as perishable. In case of excess supply, excess production wipes out. In the case of excess demand, the rationing is proportional to individual components of aggregate demand.

13. Government collects taxes and, if needed, issues bonds to finance the public deficit.

14. Financial assets: IFs purchase ABSs and public bonds, the latter being bought also by commercial banks.

15. Commercial banks set the amount of retained earnings based on their capital needs.
16. The central bank sets the policy rate according to an *inertial* Taylor rule aimed at stabilizing inflation.

3.2 The equations

A complete list of equations can be found in the appendix A.II. Here, we present key behavioural choices. The suffices i and t define individual households and the simulation period throughout all the model, respectively.[5] Asterisks are used to identify all quantities whose original value may differ from what is eventually set, as in the case of desired or target levels.

3.2.1 Non-financial firms

Non financial firms is an aggregate sector that uses capital and labor to produce a single good for both consumption and investment purposes according to a Leontief production function. For the sake of simplicity, we do not consider inventories. However, possible excess supply (with respect to aggregate demand) is taken into account by firms in the revision of their production plans and in the definition of profit margins over average total costs.

The first set of equations describing the behaviour of this sector concerns the choice of the production level, and with it, the level of employment. Firms decide how much to produce (Equation (1)) updating previous period desired level of production according to two elements: (i) the distance between previous period desired levels of supply ($Y^*_{S,t-1}$) and aggregate demand ($Y^*_{D,t-1}$); (ii) an exogenous growth component (υ_2). In line with the post-Keynesian literature (Lavoie, 2014), parameter (υ_2), together with parameter (γ_1) in non-financial firms' investment function (see Equation (12) below), capture "Keynesian animal spirits", i.e., non-financial firms "spontaneous urge to action rather than inaction (Keynes, 1936, p.161)" in the words of Keynes himself. A production function à la Leontief determines the maximum level of production (Equation 4) according to available productive inputs and corresponding productivity. (K_{t-1}) is installed capital stock and ($\bar{N}$) is the total labor force. (X^K) and (X^L_t) stand for capital and labour productivity, respectively. Firms will set the actual level of aggregate supply (Equation (5)) equal to the desired level, as determined in Equation 1, only if this does not exceed maximum production capacity. While capital productivity is fixed, labor productivity increases through time. The growth rate of labor productivity depends positively on the exogenous parameter χ^L_1, and on the observed growth rate of aggregate demand. This latter component captures a Kaldor-Verdoorn type effect (Equation (6)). Once set, the production level, divided by labor productivity (Equation (7)), determines employment. As we do not include part-time jobs, the result of Equation (6) is rounded down to the closer integer.

$$Y^*_S = \left[Y^*_{S,t-1} + \upsilon_1 \cdot (Y^*_{D,t-1} - Y^*_{S,t-1})\right] \cdot (1+\upsilon_2) \tag{1}$$

$$Y^{MAX}_K = K_{t-1} \cdot \bar{X}^K \tag{2}$$

$$Y^{MAX}_L = \bar{N} \cdot X^L_t \tag{3}$$

$$Y^{MAX} = min(Y^{MAX}_K, Y^{MAX}_L) \tag{4}$$

$$Y_S = \begin{cases} \text{if } Y^*_S \leq Y^{MAX} \Longrightarrow Y_S = Y^*_S \\ \text{if } Y^*_S > Y^{MAX} \Longrightarrow Y_S = Y^{MAX} \end{cases} \tag{5}$$

$$X^L_t = X^L_{t-1} \cdot \left[\chi^L_1 + \chi^L_2 \cdot \left(\frac{Y^*_{D,t}}{Y^*_{D,t-1}} - 1\right)\right] \tag{6}$$

$$N_t = \frac{Y_S}{X^L_t} \tag{7}$$

The second group of firms' choices refers to prices and wages. Wage inflation, *i.e.* the rate of growth of the wage rate (see Equation (8)), is first linked to observed previous period price inflation (π_{t-1}).

[5] Whenever a household sector variable does not include the suffice i, it refers to the sector as a whole and its value is given by the sum of individual variables.

This term is meant to capture trade unions' attempt to maintain workers' purchasing power by tracking observed increases in prices at time *t-1*. The growth rate of nominal wages then depends negatively on the unemployment rate (un_t), according to a Phillips curve-type argument,[6] while it responds positively to increases in labor productivity via parameter ω_3. Equation (9) shows updates in the wage bill, which, next to wage inflation, also takes into account for changes in the employment level.

Once defined labor costs, non-financial firms set prices by applying a mark-up (μ_t) over average total costs. These are given by total costs, which include both the wage bill (W_t) and financial payments ($\mathrm{i}^f_{t-1} \cdot L_{t-1}$), over supply (Equation (10)). The markup moves endogenously (see Equation (11)) once given a minimum acceptable value (μ_{MIN}) to which mark-up would asymptotically tend in the (hypothetical) event of an infinitely large excess supply. The markup increases (decreases) with previous period excess demand (supply). .

$$\omega_t = (1 + \pi_{t-1}) \cdot \left[\frac{\omega_1}{(\omega_2 + un_t)} + \omega_3 \cdot \frac{X^L_t - X^L_{t-1}}{X^L_{t-1}} \right] \tag{8}$$

$$W_t = W_{t-1} \cdot \left[1 + \omega_t + (\frac{N_t}{N_{t-1}} - 1) \right] \tag{9}$$

$$p_t = (1 + \mu_t) \cdot \left[\frac{W_t + i^f_{t-1} \cdot Lf_{t-1}}{Y_S} \right] \tag{10}$$

$$\mu_t = \mu_{MIN} + \mu_{t-1} \cdot \frac{Y^*_{D,t-1}}{Y_{S,t-1}} \tag{11}$$

Finally, firms will take their investment decisions. The desired rate of growth of real capital stock (Equation (12)) depends on three elements: (i) a positive autonomous component (γ_1) - as said, Keynesian "animal spirits" in investment decisions; (ii) previous period profit share; (iii) the distance between the actual and the exogenous *normal* (u_N) level of capacity utilization. Firms finance their investment through retained profits, which are a fixed portion of net profit, and banks' loan (more on this in Section 3.2.4). Desired and realized investment may differ: whenever demand, given by the sum of the desired levels of consumption, investment, and public expenditure, exceeds supply, rationing takes place. Each component of aggregate demand, investment included, is reduced proportionally.

$$g^*_t = \gamma_1 + \gamma_2 \cdot \frac{\Pi_{t-1}}{Y_{t-1}} + \gamma_3 \cdot (u_{t-1} - u_N) \tag{12}$$

$$I^*_t = K_{t-1} \cdot g^*_t \tag{13}$$

$$K = K_{t-1} + I_t - \delta \cdot K_{t-1} \tag{14}$$

3.2.2 Households

The households sector is populated by $\bar{N}$ heterogeneous agents characterized by different levels of income, consumption, savings, wealth, and indebtedness. Household disposable income (Equation (15)) consists of three entries. Households first receive a nominal wage $w_{i,t}$ if employed, or a dole paid by the government in case they are unemployed. Financial income accrues to households in the form of (i) interest receivables from IFs' shares eventually held at the beginning of the period ($r^{sh}_{t-1} Sh_{t-1} \cdot sh_{i,t-1}$); (ii) dividends ($Div_{i,t-1}$) from banks and non-financial firms. For the sake of simplicity, we do not explicitly model the equity market. We assume households own non-financial firms and commercial banks in proportion of their wealth, and that dividends are distributed accordingly. Outlays are taxes on income ($tax^w_{i,t}$), and "effective" interest payment. The latter is given by individual interest rate ($i^h_{i,t-1}$) times the previous period stock of debt (*i.e.* bank loan $Lh_{i,t-1}$). It is labelled "effective" and signalled by the tilde in (Equation (15)) as it is diminished by the part of due payments that households may not be able to meet.

$$yd_{i,t} = w_{i,t} - tax^w_{i,t} + r^{sh}_{t-1} Sh_{i,t-1} + Div_{i,t-1} - \widetilde{i^h_{i,t-1} \cdot Lh_{i,t-1}} \tag{15}$$

[6]Parameters ω_1 and ω_2 give the shape of such Phillips curve function.

In any period of time, the wage bill (see Section (3.2.1)) is distributed among employed households following a log-normal distribution set at the beginning of the simulations with log-standard deviation θ. Given the aggregate unemployment rate, the employment status of each household is set by a random draw. This aims to capture the impact of unforeseen events, like transitory unemployment, which may impact disposable income.[7]

Taxation is progressive. There are two tax rates on income, with the higher applied to the part of wage exceeding a threshold (median wage). In one of the scenarios of the simulation, we introduced the possibility for the government to decide to introduce a tax on wealth above a certain exemption threshold or to a certain group of people (say households at the top of the income distribution) if needed to stabilize the public debt. Indebted households use their net income and accumulated stock of deposits to meet their financial commitments (i.e., interest payments and principal repayment), with the exception of the amount required for subsistence consumption, set as a portion of previous median consumption. Note that part of the financial income obtained on IFs' shares depends on ABSs that convey interest payments from indebted households to those having invested in IFs themselves. Households make default whenever what is left after covering subsistence consumption is not enough to meet expected installments fully. Principal that is not repaid therefore is registered as *non-performing loan* (NPL).

Desired consumption is computed according to a variety of factors. It first depends on the different components of disposable income $yd_{i,t}$: (c_w) is the propensity to consume out of net wage income $yw_{i,t}$; (c_r), instead, is the propensity to consume out of financial incomes, i.e., returns on IFs' share and distributed dividends. Consistent with the empirical findings by Onaran et al. (2011), as well as previous SFC models on inequality (see, for instance van Treeck, 2011; Detzer, 2018), this assumption captures different consumption (and hence saving) propensities out of wages and of financial income, the former being higher than the latter. Second, consistent with Caceres (2019) and De Bondt et al. (2019), desired consumption is also defined according to household propensity to consume out of (net) wealth. In equation (16), parameter (c_{wealth}), once multiplied for household net wealth $(NW_{i,t})$, captures such element in household consumption decisions. Last but not least, the social component of desired consumption, i.e., a sort of "keep up with the Joneses" argument, is given by a proportion (c_n) of previous period average consumption.

Two reasons may lead to the final level of consumption differing from what desired. First, commercial banks may ration credit (see more on this below). Second, if excess aggregate demand is recorded in the economy. In this latter event, each household will be forced to reduce its consumption by an amount proportional to its desired level as it will be in the case of all other components of aggregate demand.

$$c^*_{i,t} = c_w \cdot (yw_{i,t}) + c_r \cdot [r^{sh}_{t-1} Sh_{i,t-1} + Div_{i,t-1}] + c_{wealth} \cdot (NW_{i,t}) + c_n \cdot \bar{c}_{t-1} \tag{16}$$

Once defined desired consumption (and savings), households set their desired stock of financial assets. Desired deposits (Equation (17)) are a fixed portion (η_H) of previous period individual wealth stock. The desired level of IFs shares is the result of an adaptive process: previous period individual stock of shares is adjusted according to the observed difference between the returns on the shares issued by investment funds $(rsh_{i,t-1}/Sh_{i,t-1})$ and the cost of external financing $(i^h_{i,t-1})$ for indebted households.[8] Demand for loans (Equation (19)) eventually results from the difference between the desired flows of financial assets and desired/planned saving (S^*), as given by disposable income minus desired consumption (Equation (19)).

$$Dh^*_{i,t} = \eta_H \cdot Wh_{i,t-1} \tag{17}$$

$$Sh^*_{i,t} = Sh_{i,t-1} \cdot [1 + \sigma(\frac{r^{sh}_{t-1} Sh_{i,t-1}}{Sh_{i,t-1}} - i^h_{i,t-1})] \tag{18}$$

$$\Delta Lh^*_{i,t} = \Delta Dh^*_{i,t} + \Delta Sh^*_{i,t} - S^*_{i,t} \tag{19}$$

[7]On the interaction between wage and income distribution, and on the impacts that securitization exerts on it, see Botta et al. (2021).

[8]This last component is zero for non-indebted households.

As mentioned above, whenever rationed, households revise their choices following a pecking order procedure. First, they reduce the expansion of shares and, then, deposits. If needed, financial assets' holding could also be diminished by, say, redeeming IFs shares. As last resort, households may reduce their consumption down to a minimum subsistence level (see Equation (A.31) in the appendix for a more formalized representation of this point).

3.2.3 Government and the central bank

The public sector of the economy is composed by the government and the central bank. As said at the beginning of this paper, a central goal of our study is to analyze the complex interaction of such institutions in the conduction of their respective policies in the context of an advanced financialized economy. More specifically, simulations' results presented in section 4 will describe the macro-financial consequences of different fiscal strategies, namely spending-based fiscal rules or the introduction of a wealth tax, aimed at putting the dynamics of public debt-to-GDP ratio under control. We leave the detailed description of such alternative fiscal policies, and the way they interact with monetary policy, to section 4 itself. In this present section, instead, we present the "backbone" elements on which the implementation of monetary and, above all, fiscal policy do rest.

The government is responsible for social security and the implementation of fiscal policy. The former consists in the provision of a dole transferred to unemployed households. All unemployed households receive a public dole set equal to 75 percent of previous period lowest wage. Such unemployment benefit embodies the counter-cyclical component of public spending linked to the functioning of automatic stabilizers. As we will see in more details below, and consistent with (new) fiscal rules supported by international economic organizations and envisaged by the revised EU Stability and Growth Pact (SGP), this component of public spending will not be affected by any policy action meant to curtail fiscal outlays and stabilize (reduce) public debt. Beyond the functioning of automatic stabilizers, other sources of public spending and fiscal revenues are modelled as follows.

First, the government purchases goods to offer public services. Public purchases (Equation (20)) are modelled in the simplest way possible. They first revolve around their previous period's level (given hysteresis in government purchases) through parameter ξ_1 in Equation (20). Then, they are linked positively to aggregate consumption through parameter ξ_2 to capture observed proportionality among demand injections in aggregate demand.

Second, fiscal revenues arise from the collection of income taxes on income, commercial banks' and non-financial firms' profits ($\tau_\pi \cdot \Pi_t$). As said before, taxes on households' income are progressive, with different tax rates for (the part of) households' income that fall below or above the median one. As part of policy packages aimed at ensuring fiscal sustainability, the government could also introduce a tax (τ_i^{WH}) on households' wealth ($WH_{i,t}$) - more on this in section 4. If so, we assume the the wealth tax will be collected automatically, at the beginning of each period, by deducing it from accumulated households deposits. As such, it does not contribute to determine disposable income, but it may certainly influence consumption choices via households' propensity to consume out of wealth (see 16).

$$G_t = \xi_1 \cdot G_{t-1} + (1 - \xi_1) \cdot \xi_2 \cdot C_t \tag{20}$$

$$T_t = \tau_\pi \cdot \Pi_t + \sum_{i=1}^{N} \tau_i^w w_{i,t} + \sum_{i=1}^{N} \tau_i^{WH} WH_{i,t-1} \tag{21}$$

$$\Delta GD_t = G_t + dole \cdot \left[\bar{N} - N_t\right] + i_{t-1}^b \cdot GD_{t-1} - T_t \tag{22}$$

$$i_t^b = i_{t-1}^T \cdot [1 + \alpha(\frac{B_{B,t}}{GD_t} - \frac{B_{B,t-1}}{GD_{t-1}})] \tag{23}$$

In the event a fiscal deficit should emerge, the government issues public bonds. They are purchased by IFs and commercial banks. The interest rate on public bonds is defined through a recursive mechanism (see Equation (23)) anchored to previous period policy rate. Starting from its previous period level (i_{t-1}^T), the interest rate on bond changes with the portion of debt purchased by commercial banks. Since commercial banks buy all the bonds not purchased by IFs, an increase in the share they hold proxies a lower demand for public securities and, as such, leads to a higher interest rate. Since a higher interest rate determines a higher demand by investment funds, a new round begins. The process comes to an end whenever the increase in interest rate, determined within a round, is below a threshold (ϕ). Interests paid on public debt stock obviously represent an additional source of spending by the government. They are not accounted in the primary balance though. As such, they will not be the target of any fiscal rule driving the implementation of fiscal policy.

The central bank is responsible for monetary policy instead. For the sake of simplicity, we model the conduction of monetary policy in the simplest way possible. The central bank sets its policy rate, which then serves as "anchor" for the determination of the other interest rates in the economy, with the aim of controlling inflation. It does so via the so-called "*inertial*" Taylor rule (see Woodford, 2003; Bernanke, 2004; Stein and Sunderam, 2018) as formalized in equation (24) below:[9]

$$i_t^T = \rho \cdot i_{t-1}^T + (1-\rho) \cdot \left\{\pi_t + \rho_\pi \cdot [\pi_t - \pi^T]\right\} \tag{24}$$

The first element in equation (24) captures, via parameter ρ, the degree of "gradualism" with which the central bank adjusts its policy rate from period to the next one.[10] The second element, instead, is related to the inflation threshold (π^T) set by the central bank itself. The higher current inflation (π_t) and its (positive) gap with respect to central bank's target, the more vigorously the central banks will revise upward its policy rate in comparison to the previous period.

The fairly simple representation of monetary policy provided by this model implies that the central bank does not hold assets (ex: advances to commercial banks) nor liabilities (commercial banks' reserves). It just establishes the policy rate. As such, the central bank does not appear in the balance sheet and transaction flow matrices reported in Tables 1 and 2, respectively.

3.2.4 Commercial banks

The aggregate banking sector plays a pivotal role in our model. On the one hand, through credit creation, it feeds both production and the purchases of consumption goods, investment goods, and financial assets. On the other hand, through lending, it "supplies" the inputs for the securitization process and, hence, the production of ABSs (Lysandrou, 2011; Adrian and Ashcraft, 2012; Caverzasi et al., 2019). Moreover, it buys all the public bonds that remain unsold on financial markets (*i.e.,* that are not purchased by IFs).

The credit creation process is based on commercial banks' assessment of potential borrowers' creditworthiness. Credits to households may be rationed in the event of a negative evaluation by commercial banks' about households' financial solidity. Rationing takes place when households applying for new credit from commercial banks present track records of non-performing loans. We assume that, in the event households are unable to service their debt and declare default, they are excluded from new rounds of loans concession in the following four periods of simulation. Even without previous evidence of weak borrowing scores, households need to satisfy certain criteria in order to be eligible for commercial banks' loans. Commercial banks establish them as follows. Commercial banks first define the "*expected*" household-specific interest rate $i_{i,t}^{e,h}$. This is the interest rate each household might have to pay based on its demand for new loans (see Equation (25)). It is computed as a mark-up on the observed (i.e., previous period) central bank's policy rate (i_{t-1}^T). Through parameter (ι), the markup increases with the financial fragility of the borrower. This is proxied by the product between the observed policy rate (i_{t-1}^T) and the ratio between the new desired level of indebtedness - previous period stock ($Lh_{i,t-1}$) plus new desired loans ($\Delta Lh_{i,t}^*$) - and household's net income $yn_{i,t}$. Once defined $i_{i,t}^{e,h}$, $mh_{i,t}^*$ stands for the "*notional*" debt-service ratio each single household would bear in the event new loans were granted (see Equation (27)).

[9]Following Stein and Sunderam (2018), equation (24) may well capture the *modus operandi* of most central banks, the US Federal Reserve first and foremost, when they effectively have to define their policy rate. This is the result of a weighted average between the lagged funds rate and some functions of the inflation gap, or of inflation and output gaps together.

[10]Bernanke (2004), in his description of the behaviour of the FED, defines gradualism as the FED adjusting "interest rates incrementally, in a series of small or moderate steps in the same direction." We set the value of parameter ρ equal to 0.8. This in line with but slightly below the one (i.e., 0.85) traditionally associated to the FED (see, for instance, Coibion and Gorodnichenko, 2012), given current central banks' primary concern about tackling inflation and recent relatively swift changes in their policy rates.

$$i^{e,h}_{i,t} = i^T_{t-1} + \iota_h \cdot i^T_{t-1} \cdot \frac{Lh_{i,t-1} + \Delta Lh^*_{i,t}}{yn_{i,t}} \tag{25}$$

$$i^f_t = i^T_{t-1} + \iota_f \cdot i^T_{t-1} \cdot \frac{Lf_{t-1} + \Delta Lf_t}{Pf_t} \tag{26}$$

$$mh^*_{i,t} = i^{e,h}_{i,t} \cdot \frac{Lh_{i,t-1} + \Delta Lh^*_{i,t}}{yn_{i,t}} \tag{27}$$

The evaluation of households' creditworthiness is performed by comparing "*notional*" debt-service ratio and the endogenous parameter Ψ_t, which represents commercial banks' acceptable level of borrower's debt burden. Commercial banks will extend credit to households if households' *notional* debt-service ratio falls lower than banks' "acceptability" threshold. Rationing takes place in the opposite case. This condition is formally stated in equation (28) below:

$$\text{if } m^*_{i,t} < \Psi_t \text{ then } \Delta Lh_{i,t} = \Delta Lh^*_{i,t} \text{ and } i^h_{i,t} = i^{e,h}_{i,t} \tag{28}$$

Credit constraints do not apply to non-financial firms. This choice is motivated by the consideration that non-financial firms constitute an aggregate sector. As such, an *on-off* constraint on external financing applied to an entire economic sector may prove to be brutal at the macro level. The interest rate on firms' loans is set in Equation (26) in a similar fashion as the one charged on credit to households. The interest rate non-financial firms will have to pay increases with the rise in their "updated" debt-service ratio (i.e., the accumulated stock of loans plus the new demand for credit), now computed with respect to firms net profits (Pf_t).

Commercial banks define the value of Ψ_t by setting it endogenously within a corridor, whose floor and ceiling are parameters Ψ_{min} and Ψ_{max}, respectively - see Equation (29). Increasing (decreasing) values of (Ψ_t) stand for more relaxed (tighter) lending standards. Within such corridor, Ψ_t decreases with the ratio of non-performing loans (NPL) over due installments (see Equation (30)). This element of Equation (30) captures the idea that, witnessing higher default rates, banks become more prudent and make lending standards more stringent. On top of this, Ψ_t increases with the degree of commercial banks' compliance with regulatory capital adequacy requirements. This is modeled as the distance between commercial banks' *actual* own capital-asset ratio ($k_{B,t}$) - see Equation (31) below, i.e., a measure of commercial banks' leverage, and a Basel-type exogenous regulatory capital adequacy ratio ($\bar{k}$).[11] This element suggests that the more leveraged the banking sector is, the more likely it will avoid risky loans. Other way around, when commercial banks are well within regulatory limits (i.e. $k_{B,t} > \bar{k}$), they are more prone to exploit the space of manoeuvre in their balance sheet to expand their business.

Equation (31) defines commercial banks' actual capital-asset ratio. It is given by the ratio between *observed* commercial banks' own funds ($\widetilde{\Omega^B_t}$) over their total *on-balance sheet* assets. Commercial banks' *observed* own funds are given by the stock of commercial banks' own funds from the previous period (Ω^B_{t-1}) once adjusted for the amount of (NPLs) suffered by banks on non-securitzed loans (see Equation 32). Commercial banks' assets, instead, are constituted by the sum between banks' stock of public bonds ($B_{B,t}$) and the amount of outstanding loans net of the portion (z) moved to SPVs' balance sheet in the securitization process. Two things are worth stressing here. First, ($NPLs$) affect banks' credit policy twice. As said, they *directly* influence the determination of commercial banks' acceptable risk threshold via parameter ψ_1 and banks' perception of credit riskiness. On top of this, they may also *indirectly* induce more prudent credit policies by impinging upon banks' own capital-to-asset ratio. Indeed, rising (NPLs) erode banks' own funds ($\widetilde{\Omega^B_{t-1}}$) and cause $k_{B,t}$ to decline. Whilst this may force commercial banks to distribute less dividends and retain more profits in order to make up for capital losses (see more on this below), it will also make credit eligibility criteria more stringent. Second, it is worth noting the role played by the amount of loans generated and then securitized (z) in defining banks' actual capital-asset ratio. Indeed, the higher the amount of securitized loans, the better is commercial banks' capital-asset ratio. Consistent with this, Ψ_t increases (see Equations (29) and (30)), and banks become *less* risk adverse. In

[11] Basel-type exogenous regulatory capital adequacy ratio ($\bar{k}$) is set equal to 8 percent.

the end, commercial banks can use securitization to actively manage their balance sheet and open more space for extending more loans to the economy.

$$\Psi_t = max\left[\Psi_{min}, min(\Psi_{max}, \Psi^*)\right] \tag{29}$$

$$\Psi^* = \bar{\Psi}_{min} - \psi_1 \cdot \frac{NPL}{\epsilon \cdot Lh_{t-1}} + \psi_2 \cdot (k_{B,t} - \bar{k}) \tag{30}$$

$$k_{B,t} = \frac{\widetilde{\Omega}^B_{t-1}}{[(1-z_t)L_t + B_{B,t}]} \tag{31}$$

$$\widetilde{\Omega}^B_t = \Omega^B_{t-1} - (1 - z_{t-1}) \cdot NPL_t \tag{32}$$

In the present model, following Botta et al. (2021, 2022), and consistent with Lysandrou (2011) and Goda and Lysandrou (2014), commercial banks securitize loans in the amount needed to satisfy the demand of ABSs (see more on this below) by IFs via SPV. For this reason, (z) is an endogenous variable that adjusts “on demand”. It is equal to the fraction between demanded ABS and outstanding households' and non-financial firms' loans (see Equation 33). The demand for ABSs will be satisfied up to the point no more loans are available for securitization.

$$z_t = \min(1, \frac{ABS^D_{IF}}{L_t}) \tag{33}$$

At the end of each period, banks decide the share of net profit P^B_t (see Equation (34)) to distribute and temporarily shelved as dividend payable (*i.e.,* dividends determined at time t are paid in the following period *t+1*). This choice is ultimately based on banks' financial conditions and on Basel-type regulation. First, banks compute the level of own capital that, given their stock of assets, would meet the required capital adequacy ratio $(\bar{k})$ - see Equation (35). Second, they set the desired level of capital injection $(\Delta\Omega^*)$ and, hence, retained profits. This is either a fixed share (ζ_B) of the distance between required and observed own capital, whenever needed (*i.e.* $k_{B,t} < \bar{k}$), or zero otherwise. This implies that banks attempt to adjust their balance sheet to comply with regulation takes place in a progressive manner.

Finally, Equation (37) tells us that whenever net profits are higher than required capital injections, dividends payable result as residual after retained profits are detracted from banks' net profits (P^B_t) - see Equation (37). Otherwise net profits are fully retained as banks' *actual* capital injection is lower than the required desired one (see Equation (38)).

$$P^B_t = \Pi^B_t(1 - \tau_\pi) \tag{34}$$

$$\bar{\Omega}^B_t = \Big[(1-z)L_t + B_{B,t}\Big] \cdot \bar{k} \tag{35}$$

$$\Delta\Omega^*_t = \begin{cases} \text{if } k_{B,t} & < \bar{k} \Longrightarrow \Delta\Omega^*_t = \zeta_B \cdot (\bar{\Omega}^B_t - \Omega^B_{t-1}) \\ \text{if } k_{B,t} & \geq \bar{k} \Longrightarrow \Delta\Omega^*_t = 0 \end{cases} \tag{36}$$

$$\text{if } \ \Delta\Omega^*_t \leq P^B_t \Longrightarrow \begin{cases} \Omega_t = \Omega_{t-1} + \Delta\Omega^*_t \\ Div_B = P^B_t - \Delta\Omega^*_t \end{cases} \tag{37}$$

$$\text{if } \ \Delta\Omega^*_t > P^B_t \Longrightarrow \begin{cases} \Omega t = \Omega_{t-1} + P^B_t \\ Div_B = 0 \end{cases} \tag{38}$$

3.2.5 Investment Funds

IFs represent financial markets' operators that collect funds, i.e., IFs shares (Sh_t), that households want to invest in financial markets. Somehow, they are households' access gate to financial markets and, possibly, financial speculation, i.e., the allocation of funds between different financial assets characterized by different returns.

At the beginning of each period, IFs first update their assets and liabilities based on the amount of securitized loans incorporated in ABSs that are repaid or not. As indicated in section 3.1, successful repayments of principals of securitized loans are "converted" into IFs' deposits. The portion of NPLs that come from securitized loans give rise to capital losses in the form of matching reductions in the value of outstanding ABSs. Such losses on the asset side of IFs are then passed onto corresponding reductions in their liabilities, i.e., IFs' shares held by households.

After the "update" of invested funds is completed, IFs plan next round of financial investment and portfolio allocation. IFs keep a portion (η_{IF}) of collected funds in the form of deposits (Equation (39)) for precautionary reasons. This is done to meet possible demands for shares' redemption by households. This is particularly true during periods of financial turmoil, when capital losses on ABS and, hence, IFs' shares could induce households to increasingly redeem invested funds, i.e., divest away from IFs shares. Once defined deposits, IFs allocate the remaining between ABSs and public bonds according to changes in their relative returns. Equation (40) formalizes this allocation choice. The quota ($q^b_{if,t}$) assigned to the purchasing of public bonds is set through an adaptive rule, and decreases when the spread between the return on ABSs, (r^{abs}), and the interest rate on public bonds (i^B) observed in the current period is higher than in the previous one. In other words, the higher the return on ABSs with respect to public bonds, the lower will be the demand for the latter. The positive parameter (β) modules the strength of the impact of the variation in the spread over this choice. Demand for public bonds (see Equation (41)) is obtained multiplying ($q^b_{if,t}$) for the amount of funds collected by IFs and not held in the form of deposits ($Sh_t(1-\eta_{IF})$). Demand for ABSs results as a residual (see Equation (42)). Finally, Equation (43) shows that in case of excess demand for ABSs, ABSs held by IFs at the end of the period will adapt to supply. As said, this is given, by construction, by securitized loans. Other way around, IFs purchase ABSs as far as there are loans available for securitization.

$$D_{IF,t} = \eta_{IF} \cdot Sh_t \tag{39}$$
$$q^b_{if,t} = q^b_{if,t-1} \cdot \left\{1 - \beta[(r^{abs}_t - i^B_t) - (r^{abs}_{t-1} - i^B_{t-1})]\right\} \tag{40}$$
$$B^D_{IF,t} = q^b_{if,t} \cdot SH_t \cdot (1-\eta_{IF}) \tag{41}$$
$$ABS^{*D}_{IF,t} = Sh_t \cdot (1-\eta_{IF}) - B_{IF,t} \tag{42}$$
$$ABS_{IF,t} = min(z_t L_t, ABS^{D*}_{IF,t}) \tag{43}$$
$$\tag{44}$$

4 Simulations

4.1 Spending-based fiscal rule vs. wealth tax

In this section of the paper, we present the results of our simulation analysis. As said, the economy is populated by one thousand heterogeneous households ($\bar{N} = 1000$). All stocks are initially set equal to zero but a few ones, productive capital for instance, that need to take positive values to activate the economy. In what follows, we thus illustrate the last 150 periods of simulations only in order to get rid of the ensuing initial transient dynamics. The first 10 periods portrayed in the plots show the evolution of the economy in a quasi-steady state before the introduction of any fiscal policy action aimed at reducing public debt. The following 140 periods, instead, show how the economy responds to the two alternative fiscal policy measures taken into account in our study. In Figures 1 - 14, we thus compare three different scenarios. First, in the *Baseline* (BL) scenario, we describe the evolution of the economy under the behavioral rules presented in the previous sections of the paper when no fiscal policy is implemented to control public deficit and diminish public debt. Second, the *Spending-Based Fiscal Rule* (SBFR) scenario mimics the situation in which the government aims at putting public debt under control by following fiscal rules that see cuts in *primary non-cyclical* public spending as the primary tool to achieve fiscal consolidation. Third, the *Wealth-tax* (WT) scenario shows the effects of the government's decision to pursue fiscal consolidation via the introduction of a wealth tax raising fiscal revenues.

The primary goal of our study is to contribute to the ongoing debate about the return to fiscal rules and fiscal consolidation. Our analysis does not aim at replicating (or forecasting) the evolution of any specific economy. It rather looks at the *qualitative* interaction between fiscal and monetary policy, and the complex co-evolution of a variety of macro-financial-distributive variables under different fiscal policy "regimes". For this purpose, we simulate the macro-financial consequences of alternative fiscal consolidation strategies carried out in an economic environment that, in the *baseline*, features what might be commonly perceived as a high (equilibrium) value of the public debt in the order of about 140 percent of GDP.[12] In this context, we also assume the central bank to define its monetary policy stance according to an inflation target or, better to say, inflation "threshold" equal to 4 percent. Following Rudd (2022), Korenok et al. (2023) and Pfauti (2024), this is the value of inflation above which "accelerationist" patterns may settle in the US economy (among others) due to rising economic agents' attention to the dynamics of aggregate prices. Monetary institutions tend to avoid spiraling inflation pressures to build up as they may then require much tougher restrictive measures to bring inflation back under control. In line with this evidence, we model monetary policy so that it remains exclusively committed to keeping inflation at low one-digit values *below*, perhaps close to, 4 percent. This "parametrization" of central bank behaviour (at least in relation to its inflation goals) in turn helps us to avoid fiscal instability that, at quite high public debt levels, can possibly be caused by more stringent inflation targets inducing excessively harsh monetary policy stances and too high policy rates.

In line with above-mentioned literature on "optimal" designing of fiscal rules, in the SBFR scenario, we assume that the government takes *primary non-cyclical* public spending as reference policy variable to control public deficit and possibly reduce public debt. We operationalize the spending-based fiscal rule by modifying equation (20) that defines public purchases. In its revised version (see Equation (45) below), we in fact endogenize the parameter linking public purchases to aggregate consumption as signaled by the tilde over (ξ_2). More specifically, we assume the domestic government revises (ξ_2) downward whenever previous period observed public deficit-to-GDP ratio (def_{t-1}) has turned higher than a public deficit "*anchor*" (def^T) set equal to 3 percent. This is the reference value that the government uses to control and manage actual public deficit.[13] In the event of an observed public deficit-to-GDP ratio greater than (def^T), the government diminishes ($\tilde{\xi_2}$), hence primary non-cyclical public purchases, proportionally to the distance between (def_{t-1}) and (def^T). In other words, the greater the "excessive" public deficit with respect to the anchor, the harsher the spending cut. Conversely, if the observed public deficit is below or equal (def^T), ξ_2 remains at its original value.

$$\begin{aligned} G_t \quad &= \xi_1 \cdot G_{t-1} + (1-\xi_1) \cdot \tilde{\xi_2} \cdot C_t \\ &\text{if } def_{t-1} > def^T \Longrightarrow \tilde{\xi_2} = \xi_2 \cdot \left[1 - (def_{t-1} - def^T)\right] \\ &\text{if } def_{t-1} \leq def^T \Longrightarrow \tilde{\xi_2} = \xi_2 \end{aligned} \tag{45}$$

In the WT scenario, we simulate the effects of the alternative fiscal policy strategy based on the introduction of a tax on wealth. The purpose of the wealth tax is certainly to tackle increasingly high income inequality and wealth concentration featured by most developed countries (the US in particular) in the last four decades. Here, however, we are also interested in studying its wider macro-financial consequences. For this reason, for the sake of comparability with the SBFR scenario, we design the wealth tax in such a way that, in the long term, it leads to a similar reduction in the public debt-to-GDP ratio to that one achieved via the spending-based fiscal rule. More specifically, we assume the government to apply a fixed permanent 0.35 percent tax rate over total wealth held by the top 10 percent richest households in the economy.

In the following graphical representation, the two different fiscal policies characterizing the SBFR and the WT scenarios are implemented in the last 140 periods of simulation. Until that moment, the three scenarios are equivalent. Results referring to the Baseline are represented by a blue line. The orange and yellow lines, instead, represent the SBFR and the WT scenarios, respectively.

[12] At the end of 2021, with economies recovering out of Covid-19 pandemic, the (unweighted) average of the debt-to-GDP ratio in G7 economies was actually quite close to this value and equal to 132.4 percent. All countries but Germany recorded public debt stocks substantially higher than 100 percent of GDP. The decline in such ratios in the following years has been primarily due to well-known spike in inflation rates.

[13] For the sake of clarity, given the qualitative nature of our study, it is important to emphasize that such public deficit "*anchor*" (def^T) does not aim at mimicking public deficit "targets" or "ceilings" that characterize EU-type fiscal rules - see Kamps and Leiner-Killinger (2019) for a detailed analysis and comparison of these terms. It simply represents a sort of "term of comparison" that the domestic government may use to control and govern public deficit consistently with a certain reduction path in the public debt stock.

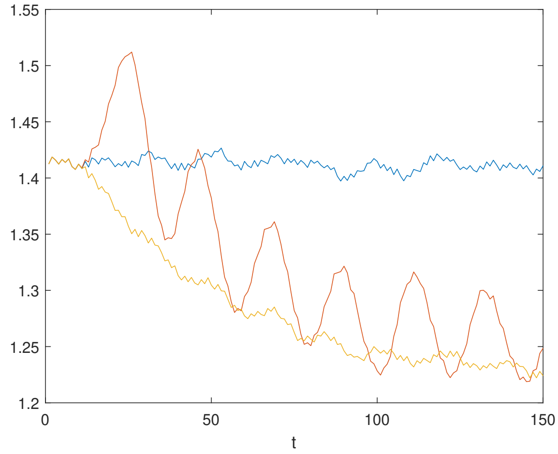

Figure 1: Public debt-to-GDP ratio

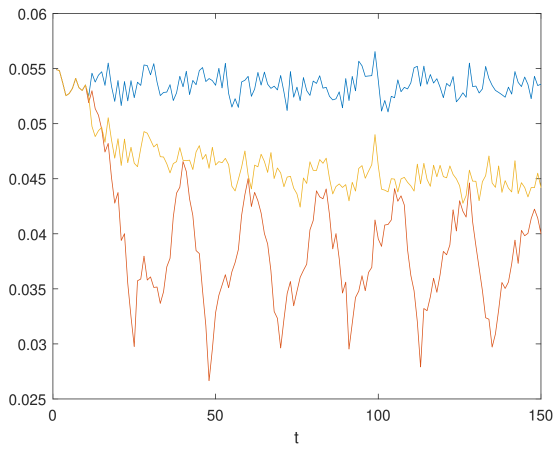

Figure 2: Public deficit-to-GDP ratio

4.1.1 Debt Sustainability

Figures 1 and 2 show the evolution of the public debt-to-GDP and deficit-to-GDP ratios in the last 150 periods of simulation. Before the introduction of fiscal adjustments, the three scenarios all display the same dynamics and the economy exhibits a stable cyclical pattern. In the baseline, the public debt-to-GDP ratio stabilizes around 140 percent, whilst the public deficit is in the order of 5.5 percent of GDP[14].

The government may take the baseline values of the above fiscal variables as too high and decides for the implementation of fiscal consolidation programs. As it emerges clearly from Figures 1 and 2, both the spending-based fiscal rule and the wealth tax succeed in reducing quite significantly the debt-to-GDP. In the SBFC scenario, the spending-based fiscal rule brings the debt-to-GDP ratio to decline by about 20 percentage points after 140 periods from its introduction. As said, we design the wealth tax to give rise to a closely similar outcome.

Despite similar results in the long-run trend evolution of public debt, the two scenarios differ remarkably as to the "traverse" towards the new equilibrium and in their effects over the economy. First, while the introduction of the wealth tax is able to reduce the debt-to-GDP ratio immediately, the SBFR appears to be self-defeating in the short/medium run. Indeed, in the aftermath of the implementation of this policy, public debt bounces from about 140 percent of GDP to around 150 percent. It then gradually diminishes. Only after about 25 periods since the implementation of fiscal "austerity" the debt-to-GDP ratio falls below its initial level. Second, whilst the wealth tax produces an almost monotonic reduction of the debt-to-GDP ratio, such variable presents a quite marked cyclical pattern in the SBFC scenario. As it will become clearer later on, this is due to the effects that the spending-based fiscal rule induces over the real sector of the economy, and the way it interacts with monetary policy. Third, similar reductions in the public debt-to-GDP ratio are achieved via different dynamics of the public deficit (see Figure 2). In fact, fiscal deficits progressively declines towards about 4.5 percent of GDP in the WT scenario. In the SBFC scenario, instead, it must contracts to quite substantially lower values. It oscillates around 3.5 percent of GDP, and sometimes reaches values lower than 3 percent. Even in this case, the explanatory factors of this pattern are the effects of the SBFC over the real economy and its interaction with monetary policy.

[14] As a term of comparison, according to the IMF's World Economics Outlook Dataset, USA's average public deficit-to-GDP ratio between 2001 and 2023 is equal to 6.2 percent. After the large deficits due to responses to the 2007-2008 financial shock and the Covid-19 crisis, US public deficits still remains as high as 4.8 of GDP.

4.1.2 The real economy

The explanation for different trajectories towards similar long-run values of the public debt-to-GDP ratio in the SBFR and WT scenarios can be easily found in Figure 3. It portrays the evolution of real GDP (here expressed in log terms). In the SBFR scenario, the attempt of consolidating public finances via cuts in primary non-cyclical public purchases hinders economic growth and ignites a prolonged recession. In fact, public spending cuts depresses aggregate demand, which in turn translates into excess supply in the current period. When facing unsatisfactory low levels of capacity utilization (see Figure 4), firms downscale production plans in the following period, and curtail investment (see Figure 5). All these forces ignite a self-reinforcing downward spiral between aggregate demand and production that inevitably leads unemployment to rise (see Figure 6). The ensuing contraction of private consumption exacerbates the recession dragging down even further the real GDP. Automatic stabilizers in the form of public dole to unemployed people can certainly tame the fall of the economy. However, they cannot fully compensate for the SBFR-induced drop in aggregate demand, despite the disbursed amount of the public dole rising from well below 1 percent of GDP to almost 3 percent.

The negative effects of public spending cuts over real GDP explain a good deal of the initial self-defeating outcomes of the SBFR. On the onset of such policy measures, the public debt-to-GDP ratio rises because the denominator drops. On top of this, the implementation of the SBFR also bears major impacts over the composition of public spending. In our model, total public outlays are made up by three components: (i) primary non-cyclical public purchases, i.e., the target variable of the SBFR; (ii) the public dole to unemployed people; (iii) interest payments on the accumulated stock of public debt. Whilst the SBFR search for reductions in public deficits and debt via cuts in the first item, economic recession and higher unemployment lead to a rise in the second. With the rates of unemployment, peaking at about 14 percent and then stabilizing at around 14 percent (see Figure 6), the public doles become a significant burden on public finances that partially offsets the public savings obtained via lower public purchases. The reversal in the initial unstable dynamics of the public debt-to-GDP ratio and its long-run reduction will be only achieved thanks to the reduction in the policy rate carried out by the central bank in response to the decline in inflation (see more on this below). On the one hand, this will reduce the interest "bill" over the accumulated stock of public debt with obvious benefits in terms of lower public deficits. On the other hand, it will prompt the upturn of the business cycle, thus raising real GDP and further contributing to reducing the public debt-to-GDP ratio.
Note, finally, that the SBFR does not only have a negative cyclical impact over the dynamics of the economy. In fact, the initial loss in real GDP will never be fully recovered (see Figure 3) and the SBFR will have a permanent negative "*level effect*" over real GDP. In the SBFR scenario, the level of real GDP will be permanently lower than the one achieved in the baseline and in the WT scenarios.

In the WT scenario, the introduction of the wealth tax bears negligible negative effects in terms of the dynamics of the real GDP and of unemployment. The evolution of real GDP actually tracks quite closely the one observed in the baseline. The small reduction in real GDP taking place in the WT scenario mostly comes from the contractionary effect induced over aggregate consumption. Indeed, in Equation (16), aggregate consumption depends on wealth via two channels: a direct one linked to the propensity to consume out of wealth; an indirect one related to the propensity to consume out of financial incomes, namely dividends and return on shares, both of which stem from households' accumulated wealth stock. The implicit tax-led reduction in the wealth stock held by top 10 percent richest households eventually lowers aggregate consumption, diminishes production and slows down real GDP dynamics. Such negative effect is very mild though (certainly far milder than the one triggered off by SBFR), given the relatively low propensity to consume out of wealth and financial incomes characterizing wealthy households at the top of income and wealth distribution. In a very similar vein, also the unemployment rate is only marginally higher in the WT scenario with respect to the baseline.

In the end, the fact that the wealth tax procures very little harm, if any, to the real economy explains why this fiscal policy recipe seems to perform better than the SBFR in its attempt to stabilize public finances. In the WT scenario, there is no sign of initial self-defeating mechanisms and the public debt-to-GDP ratio immediately decreases to lower values. More than this, such appreciable result is obtained without the painful squeeze of public purchases and of public deficits such as those observed in the

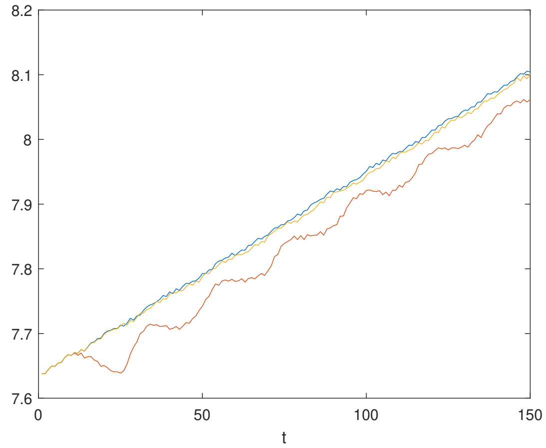

Figure 3: Dynamics of real GDP (log value)

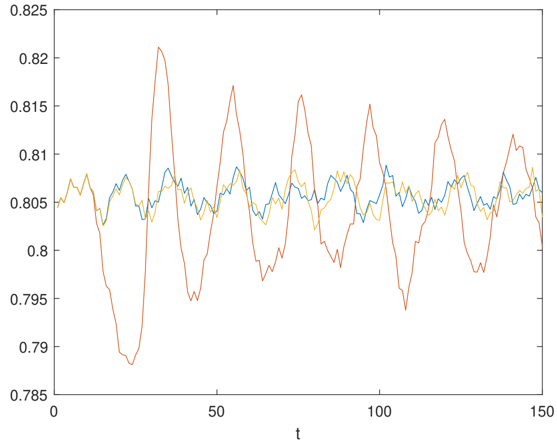

Figure 4: Capacity utilization in the NF firm sector

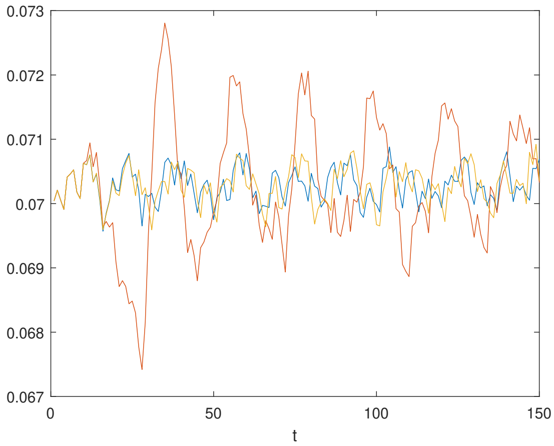

Figure 5: NF firms' investment in productive capital

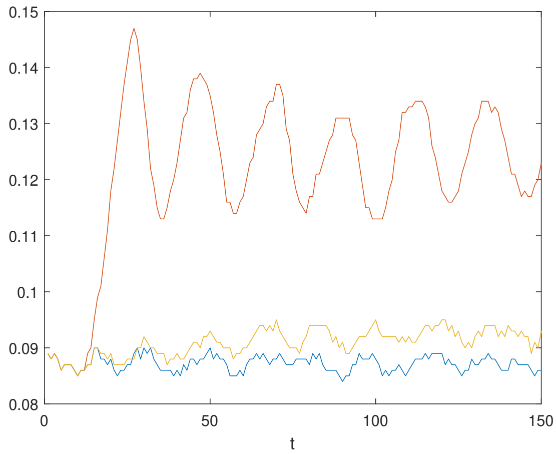

Figure 6: Rate of unemployment

presence of the spending-based fiscal rule.

4.1.3 Inflation, monetary and interaction with fiscal policy

Figure 7 reveals the quite substantial differences that divide the baseline and WT scenarios on the one side and the SBFC case on the other. The relatively minor real economy consequences generated by the introduction of the wealth tax with respect to the baseline are mirrored in rather similar inflation dynamics. Consistent with the central bank goals, inflation remains constantly below 4 percent with an average value around about 3.5 percent in both cases. A modest increase in unemployment after the introduction of the wealth tax is thus matched by slightly lower inflation in comparison to the baseline.

In the SBFC scenario, inflation follows wider cycles and drops, on average, to significantly lower values around 2.5 percent. The more significant although more volatile slowdown in price dynamics observed in the case of a spending-based fiscal rule is once again the result of the much harsher economic contraction such fiscal policy gives rise to. On the one hand, higher unemployment weakens the bargaining power of trade unions and thus reduces wage inflation according to a standard Phillips-type curve mechanism. On the other hand, larger excess capacity induces non-financial firms to reduce the mark-up and cut prices. Both forces ultimately contribute to lower inflation rates.

From a policy perspective, the different evolution of inflation in the three regimes must be analyzed

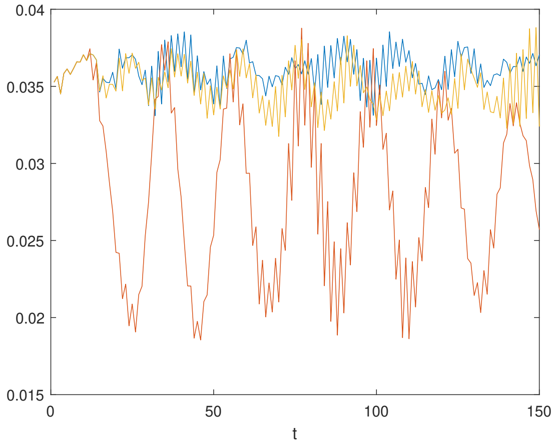

Figure 7: Inflation rate

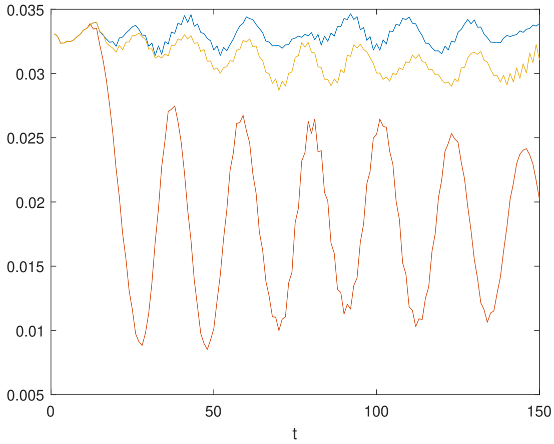

Figure 8: Central Bank's policy rate

in conjunction with the policy rate set by the central bank. In Equation (24), we assume the central bank follows an *inertial* Taylor rule through which it responds to changes in price dynamics and, at the same time, it tries to keep inflation below the 4 percent "threshold" level. Inflation and the central bank policy rate thus co-evolve endogenously. In this context, the introduction of fiscal consolidation, with its negative effects over aggregate demand, production, employment, and ultimately inflation, also *indirectly* induces a reduction in the policy rate with respect to the baseline (see Figure 8). In the WT scenario, the reduction in the policy rate and the difference with respect to the baseline are very mild. They are much more substantial in the SBFR instead.

The *average* lower policy rate recorded in the SBFR scenario, as well as its more pronounced cyclical pattern (see more on this below), are tightly connected to the interaction between fiscal and monetary policy, and to the chain of events triggered off by spending-based austerity itself. Due to its initial self-defeating outcome, the SBFR does not succeed in bringing public deficit within the target. Fiscal consolidation is prolonged, stifling economic growth and generating a *self-imposed* recession. Unemployment augments to double-digit levels and inflation plummets. The very substantial slowdown in price dynamics reverberates into the central bank's behaviour, which cuts the policy rate accordingly. Policy rate's cut can be as large as 250 *bps* from about 3.5 percent down to 1 percent. The permanent negative *level* effect that SBFR carries out over real GDP, unemployment, and inflation ultimately "forces" the central bank to maintain a low interest rate. A more expansionary, on average, monetary policy stance somehow becomes the *new normal* when SBFR is implemented with respect to the baseline and WT scenarios.

The reduction in the policy rate, and the ensuing lower cost of credit, have a twofold positive effect on the economy. On the one hand, it reduces the burden of public debt service, improves fiscal balance, and makes the government's compliance with the SBFR easier. When this happens, the government gains wider margins of maneuver. Spending cuts are removed or at least softened. Such a more expansionary fiscal policy stance in turn spurs economic recovery. On the other hand, the introduction of the SBFR also caused creditworthy borrowers to initially decrease alongside with the number of employed households. With rising NPLs, a higher portion of households got credit rationed and a credit crunch took place (see more on this below). Since credit is also used to realize consumption plans, lower credit supply hit aggregate demand further and exacerbated the initial economic downfall. The central banks helps to interrupt the credit crunch and to revert the cycle by pursuing a more expansionary monetary policy stance. Indeed, more households obtain loans and are able to fulfill their consumption plans when the policy rate and, hence, interest rates on banks' credit reach sufficiently low values. Thus, the economy rebounds also thank to a new wave of monetary policy-led credit expansion broadening the number of creditworthy borrowers. Economic recovery and expansion continue insofar as they create pressures on inflation and induce monetary authorities to tighten monetary policy. When the monetary authorities progressively “normalizes” the policy rate by raising it (albeit at values still below what observed in the baseline) in response to rising inflation, the above sequence of events happens again and the upward phase of the cycle eventually wipes out. In the end, the interplay between spending-based fiscal policy and inflation-focus monetary policy lies behind the relatively more acute cyclicality of the economy in the SBFR scenario.

4.1.4 Credit market and the financial sector

Figures 9 and 12 provide more details about the effects of austerity measures, of spending cuts first and foremost, over the financial side of the economy.

Figure 9 documents the increase in NPLs briefly mentioned above. Fiscal austerity leads to a rise in households’ NPLs due to its detrimental effects over economic activity, employment in particular. In this sense, the rise in NPLs is particularly evident in the SBFR scenario. Indeed, spending cuts cause a cascade of defaults, with NPLs peaking in correspondence of the “throat” of the austerity-induced crisis at values that are roughly 50 percent higher those observed in the baseline. As said, this clearly contributes to the aforementioned credit crunch, as those households who default on debt are excluded from credit for the following four periods due to poor credit ratings. The higher default rate persists in the remaining of the simulation with more pronounced cycles in the SBFR scenario. The interaction between fiscal and monetary policy is, once again, the driving force of this dynamics. At the bottom of the recession, expansionary monetary policy and the ensuing lower interest rates will make it easier for households to get access to bank credit. Credit expansion feeds the recovery and, at the same time, gets facilitated by improving economic conditions also prompted by the softening of austerity and (at least partial) removal of spending cuts that expansionary monetary policy opens space for. Those households who get access to credit may eventually find themselves unable to meet their debt obligations in the future with the new progressive tightening of monetary and, hence, fiscal policy along the upward phase of the cycle.

Figure 10 portrays the evolution of households’ debt-to-disposable income ratio instead. The substantially more acute cyclical pattern characterizing the SBFC scenario must be interpreted in light of the credit cycle just described. In fact, the reduction in household debt (to-income ratio) that is observed at the macro level when recession unfolds is the result of “*forced*” deleveraging households have to go through when they default on accumulated debt (which thus “disappears” from their balance sheets) and/or when they become credit-rationed. The other way around, this is an emerging macro property of the economy that hinges upon a micro-level phenomenon.

It is interesting to note that households’ debt to disposable income ratio gets slightly lower also in the WT scenario than in the baseline. This may appear surprising at first, considering the quite different economic mechanisms activated by the imposition of a wealth tax with respect to spending cuts. This result finds an explanation in the functioning of the financial market, the market for ABSs more specifically. In our financialized economy, loans are securitized “on demand” in order to provide the inputs for the production of ABSs. The demand (and, hence, production) of ABSs in turn depends on household (indirect) wealth allocation via IFs’ portfolio choices. Households purchase shares issued by IFs, which then use collected funds to buy either public bonds or ABS according to their relative returns. In the end, the higher household wealth, and the higher the relative return from ABS, the more loans will be securitized, thus permitting commercial banks to extend more credit to the economy. In the WT scenario, two elements contribute to reducing the demand for ABS: the tax on wealth and the lower interest rate, which decrease, respectively, the stock of resources that households can invest in IFs’ shares, and the returns on ABSs. The lower demand for ABSs in turn causes securitization to slow down and banks to adopt more conservative credit policies. The result of all this is lower households’ debt due to more stringent access to bank’s credit as well as a (moderate) deceleration of the economy with respect to the baseline (see Figure 3).

To be fair, this last mechanism is at work in the SBFR scenario as well. Also in this case the demand for ABSs and, therefore, securitization fall. However, the main driver of these outcomes is the evolution of the relative returns of ABSs versus public bonds (see Figure11). At the onset of austerity, the spread between ABSs and public bonds rises. Since the economic situation worsens due to the spending cuts,

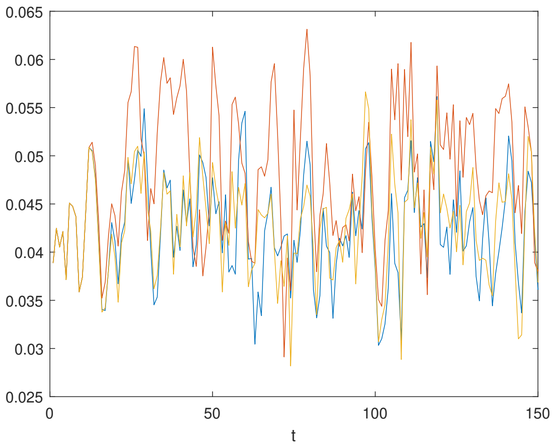

Figure 9: Percentage of non-performing loans

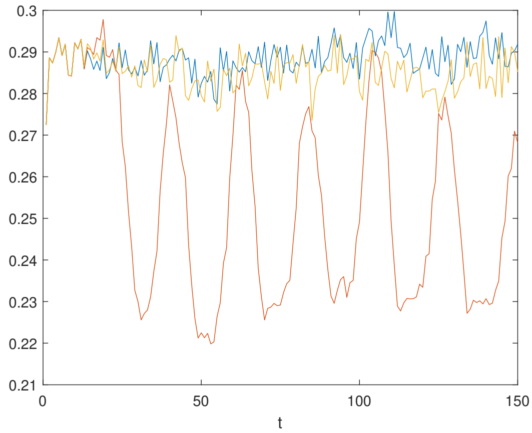

Figure 10: Households' debt over disposable income

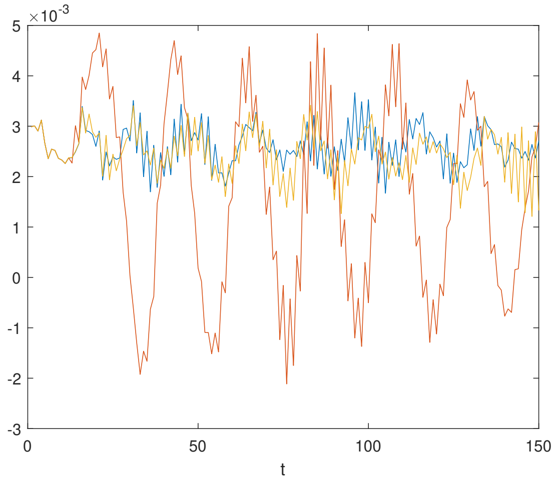

Figure 11: ABSs-public bonds spread

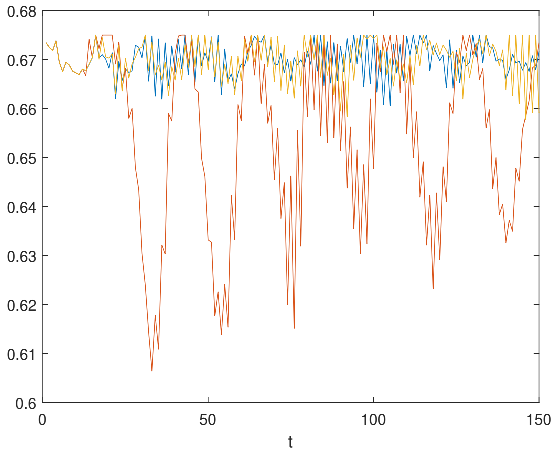

Figure 12: Share of ABSs in IFs portfolio

firms' revenues and wages start falling. This means that both households and firms become riskier borrowers. Commercial banks apply a higher mark-up when setting the interest rate on their loans, both for individual households and for the firm sector. The increase in the interest rate on bank loans "passes through" into higher (relative) returns on ABSs, which use securitized loans as underlying assets. When the credit crunch unfolds and NPLs start rising, things revert and ABSs' spread falls into negative territory due to mounting unpaid interests on non-performing securitized loans. Such a negative spread obviously drags the demand for ABSs down, hence the recomposition of IFs' portfolio away from ABSs reported in Figure 12. Also in the SBFR scenario, and more strongly than in the other cases, credit supply will eventually get compressed since the ABS-securitization-banks' loan "production chain" (i.e., the essence of the "originate and distribute" banking model) seizes up, at least temporarily.

4.1.5 Inequality

A core motivation behind campaigns asking for the introduction of a wealth tax is increasingly (unacceptably) high wealth concentration and the spreading perceived need to tackle it. Figures 13 and 14 describe the evolution of income and wealth inequality, respectively, in the three scenarios considered in our analysis.

Gross income inequality rises in the SBFR scenario compared to the baseline. On the one hand, the

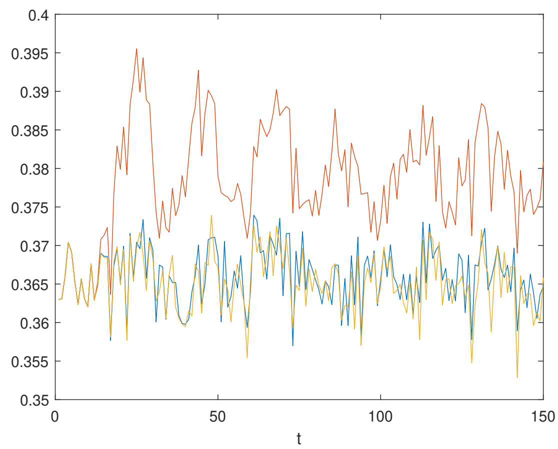

Figure 13: Gross Income Inequality (Gini Index).eps

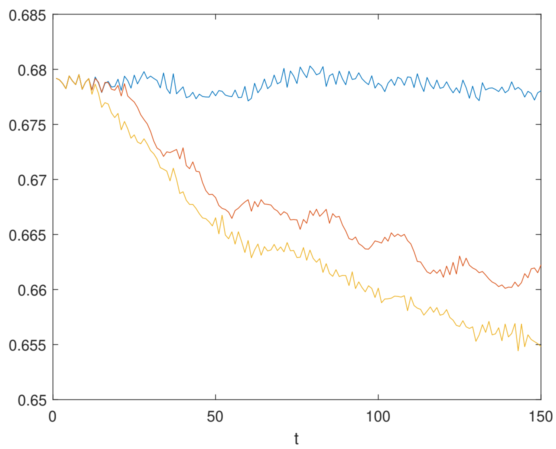

Figure 14: Wealth inequality (Gini index)

financial components of gross income (i.e., non-financial firms' and commercial banks' dividends as well as returns on IFs' shares) tend to decrease. These types of income, which mostly accrue to wealthy households at the top of the distribution, are reduced by spending-based austerity-led recession, rising NPLs and the indirect effects of spending cuts over ABSs' (and, hence, IFs' shares) returns just discussed in the previous section. On the other hand, however, spending cuts hit the real economy severely and cause a permanent increase in unemployment. The consequent fall in wage income makes the brunt of spending-based austerity fall on the shoulders of wage earners, so that, in the end, income inequality increases substantially when spending cuts are implemented.

Income inequality slightly decreases in the WT scenario with respect to the baseline instead. In this regard, it is important to remark that, in our model, fiscal revenues from wealth tax are aimed at improving fiscal balance only. They are not meant to finance any transfer or public policy in support of low-middle income households. As such, they do not give rise to any redistribution, at least directly. The small positive effect of the wealth tax in terms of marginally lower income inequality comes, once again, from the effects such fiscal measure induces over the market for ABSs. Indeed, reduced wealth concentration lowers the demand for IFs' shares and, hence, that for ABSs. This in turn reduces the extent of the securitization process. Lower-scale securitization implies that a lower portion of interests paid by indebted households to service their debt eventually goes into the hands of wealthy households holding IFs' shares (Botta et al., 2021), hence the ultimate positive impact over income inequality.

Figure 14 shows what happens to the level of wealth inequality in the three scenarios. As expected, the imposition of a wealth tax over 10 percent richest households gives rise to a reduction in wealth concentration and lower wealth inequality. What might appear to be quite surprising is that also the introduction of spending cuts induce a remarkable reduction in wealth inequality with respect to the baseline not that much dissimilar to what observed in the WT scenario. This outcome may be seen as unexpected even in light of increased income inequality discussed before. The economic mechanisms leading to lower wealth inequality in the SBFR scenario are fundamentally different from those at work in the WT scenario though. In the SBFR scenario, the main source of falling wealth inequality are NPLs and balance sheet interconnections. Indeed, in our financialized economy, the securitization process transforms original commercial bank assets into the ABSs which underlying the shares issue by IFs and held by (wealthy) households. Whenever spending cuts lead the economy to slow down and unemployment to soar, more unemployed households become unable to repay principals and default on their debt. Part of households' debt has been securitized, so that NPLs do not only reduce commercial bank assets but also (pro quota) the value of IFs' shares. The default of indebted households that characterizes the financial turmoil ignited by spending cuts thus leads to capital losses and a deterioration of wealth in the upper ranks of wealth distribution. Such downward trend in the (relative) wealth of the richer is also reinforced by the fall in financial income due lower interest rates and lower financial incomes documented above.

An important result emerges from our simulations. If we look at the relative wealth position of high-income vs. low-middle income households, the usual political aversion of wealthy people against wealth taxation in comparison to spending cuts may well be misplaced. In a financialized economy where financial income accruing to and financial wealth held by rich households depend on the ability of indebted (low-middle income) households to honor their debt, spending cuts that impinge upon the financial solidity of the latter eventually cause wealth losses to the former. In a financialzied economy, fiscal consolidation based on the introduction of a wealth tax may become preferable with respect to harsh public spending cuts. We elaborate on this result more in the two next sections.

4.2 Comparing different wealth tax scenarios

Given the results of the simulations described in Section 4.1, here we conduct some additional experiments focusing on the WT scenario. We consider different wealth tax regimes in terms of coverage and tax rate. For the sake of comparability, we calibrate the different tax rates in such a way they all lead to closely similar values of the debt-to-GDP ratio in the long run. In Figures 15 - 18 below, the yellow line still represents the "benchmark" wealth tax regime considered in Section 4.1, with a tax rate equal to 0.35 percent applied to the top 10 percent richest households in the economy. The blue line, instead, now represents a wealth tax regime that targets the wealthiest 1 percent households only and imposing a tax rate equal to 2.5 percent. In the wealth tax regime expressed in orange colour, finally, tax rate is reduced down to 0.15 percent and it is levied on all households populating the economy.

With the public debt-to-GDP ratio that, by construction, follows very similar trajectories in the three regimes considered in this experiment (see Figures 15), Figures 16 and 17 reveal that significant differences do not emerge either in the evolution of the real GDP or income inequality. What may initially appear as a surprising result can actually be understood by recalling that wealth taxes are not meant to produce any direct redistribution from high-income households to low-middle income ones. In our model, additional fiscal revenues from the wealth tax have the exclusive purpose of improving the fiscal balance and favouring the reduction of public debt. As such, it is not surprising at all that different wealth tax regimes designed to carry out similar effects over public debt will not carry out substantially different implication for the real economy.

What is different in the these three alternative wealth tax regimes is the evolution of wealth inequality instead. The reduction in wealth inequality is much more sizable when the wealth tax concentrates on top 1 percent richest households only (see blue line in Figure 18). A wealth tax regime in which all households are equally subjected to such fiscal imposition (see orange line in Figure 18) records a way more modest reduction in wealth inequality. More than this, the mild decrease in wealth inequality observed in this last scenario is mostly due to somehow "perverse" mechanisms. Wealth tax collection imposed on low-income households may in fact imply some of them will not be able to service their accumulated debt anymore. As already described before, higher households' delinquency rates and rising NPLs will be transformed into capital losses for wealthy households via commercial banks' loans to defaulting households that were previously securitized and used for the production of ABSs.

In the end, given fiscal consolidation's goals in terms of "desired" reduction in the stock of public debt, it is up to the government to decide which type of wealth tax regime to adopt according to its own political preferences. Figures 15 and 18 jointly indicate that a lower level of the public debt-to-GDP ratio can be equally achieved in a more or less equitable way depending on governmental decision about who will be liable to pay the wealth tax.

4.3 Fiscal policy implication of securitization

The "financial side of financialization" (Caverzasi et al., 2019), namely securitization and the production of structured financial products, is a distinguishing feature of the economy described in this paper. It represents a structural change in the way financial system works with relevant implications on income and wealth inequality (Botta et al., 2021, 2022). More than this, it influences the functioning of the economy as a whole (Botta et al., 2024). The simulations we describe in the present Section are meant to clarify this last point. We compare two different cases, one in which securitization is allowed (orange

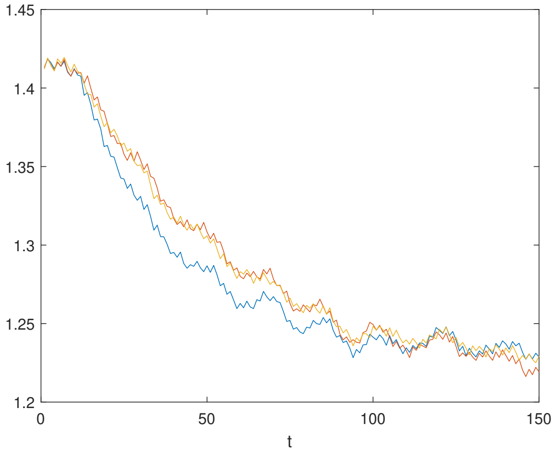

Figure 15: Evolution of public-to-GDP ratio under alternative wealth tax regimes.

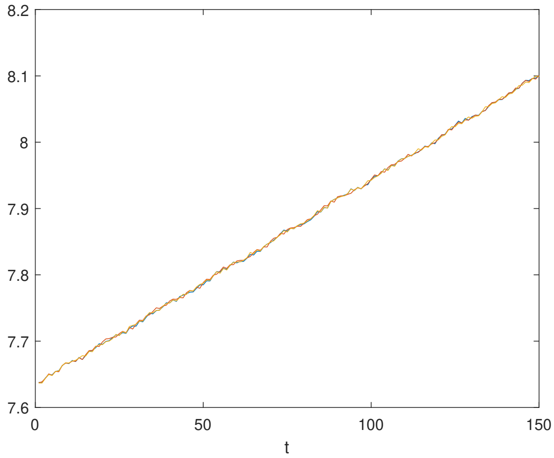

Figure 16: Real GDP dynamics under alternative wealth tax regimes.

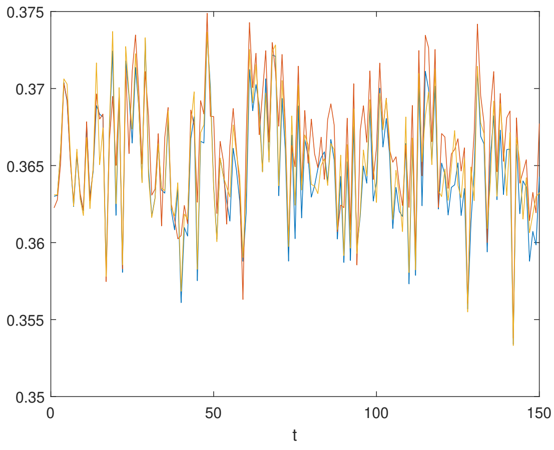

Figure 17: Evolution of income inequality under alternative wealth tax regimes.

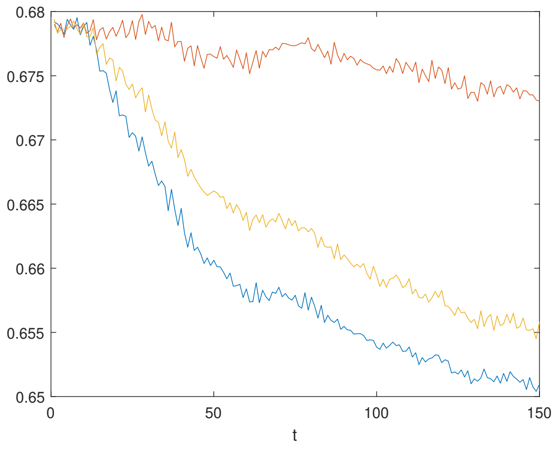

Figure 18: Evolution of wealth inequality under alternative wealth tax regimes.

lines in Figures 19 - 24 below) and one in which it is not (blue lines). We focus on the implications of securitization on public finances and, hence, on the implementation of the alternative fiscal strategies described so far. For the sake of space and clarity, we present a few figures on real GDP dynamics and the evolution of public debt-to-GDP ratio per each scenario. Figures 19 - 20 refer to the baseline with and without securitization. Figures 21 - 22 show what happens to the economy (to the above-mentioned variables, more precisely) when the SBFR is adopted in the two different "financial systems". Figures 23 - 24, finally, present the case of the (benchmark) wealth tax (namely, 0.35% on the top 10%).

Figure 19 somehow portrays the possible virtuous of securitization. Consistent with Jorda et al. (2017), securitization may push the economy to grow slightly faster and may help to smooth "normal" business cycles with respect to an economy without securitization.[15] This is due to the higher and more stable amount of credit that securitization allows commercial banks to extend to the economy. These benefits do not come without costs though. As already discussed in Botta et al. (2024), securitization forces the central bank to pursue a permanently more restrictive monetary policy stance in order to keep inflation under control. This in turn reverberates into a substantially higher public debt burden (with respect to the "no securitization" environment). This is primarily caused by the tougher interest rate "bill" the government has to pay on accumulated debt.

What if the domestic government responds to allegedly too-high public debt by implementing spending-based fiscal austerity? Figures 21 and 22 that the possible pro-growth effects of securitization are reverted when it is coupled with the SBFR. Indeed, in the SBFR scenario, the economy displays a more stable pattern and a generally higher real GDP level (blue line generally above the orange one) when securitization is absent. This is due to the fact that the higher public deficit and public debt characterizing the "securitization" environment make the SBFR more binding than in the "no securitization" case. Whilst the SBFR eventually succeeds in bringing public debt down in the long run thanks to the interaction with monetary policy, it also makes the economy more volatile. In the "no securitization" case instead, spending cuts are less stringent, thus jeopardizing economic dynamics less. In this case, since lower public deficits may often leave the SBFR inactive, there are no significant reductions in the level of public debt with respect to the baseline. However, its evolution becomes more stable fluctuating around 105 percent of GDP.

Figures 23 and 24 move the attention to the WT scenario. The introduction of the WT prompts a reduction of public debt in both the "securitization" and "no securitization" case. In the latter, despite some volatility, the public-debt-to-GDP ratio progressively declines to values below 100 percent of GDP. More importantly, the WT seems to preserve the possible pro-growth virtues of securitization whilst consolidating the fiscal position of the government. In the WT scenario, much like in the baseline, the economy records slighly higher and more stable values of real GDP when securitization is present with respect when it is not. In a way, this result suggests that there may be an intrinsic trade-off in modern financialized economies between securitization and, say, "conventional" fiscal consolidation programs centered on cuts to public spending. If governments and regulators want to maintain securitization-related practices in place, with the ensuing effects over the macroeconomy, and, at the same time, ensure fiscal sustainability, the introduction of some form of taxation on wealth is the way to prefer with respect to SBFRs.

In the end, when thinking about the return to fiscal "normality" after a protracted period of relaxed fiscal rules, this cannot be the same as it was before Covid and the GFC. In an increasingly unequal financialized world, wealthy people cannot keep the cake (read securitization with its rentier-friendly outcomes) and eat it too (i.e., do not pay for their augmented "privileges")! If the governments want to return to normality, also wealthy people have to contribute to it.

[15] To be sure, securitization may significantly contribute to feed asset bubbles, housing bubbles in particular, and expose the economy to tail financial risks, as Jorda et al. (2017) themselves recognize. In the present paper, we are not interested in studying such eventuality, which will likely modify the political-economic environment in which fiscal and monetary policies are defined. Unconventional policies adopted in the aftermath of the GFC are a clear example of this. Here we rather focus on how securitization may modify the implementation of and interaction between fiscal and monetary policy in "normal times". It is also for this reason that we try to keep the present model as simple as possible and we do not consider economic sectors such as the real estate that are more likely affected by potentially disruptive boom-and-bust cycles.

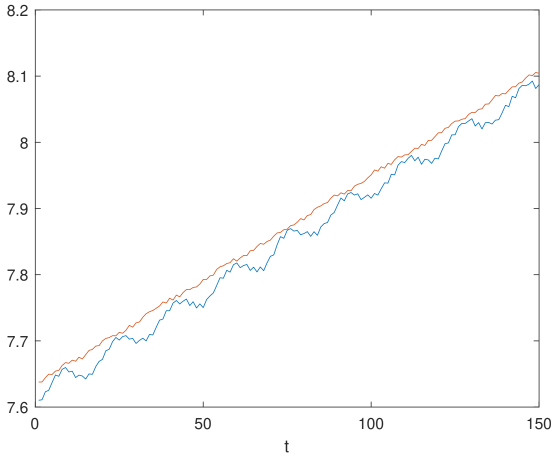

Figure 19: Real GDP *with* (orange line) and *without* (blue line) securitization in the baseline.

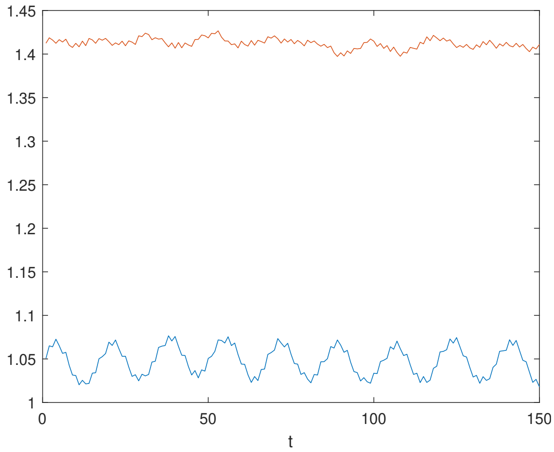

Figure 20: Public debt-to-GDP ratio *with* (orange line) and *without* (blue line) securitization in the baseline.

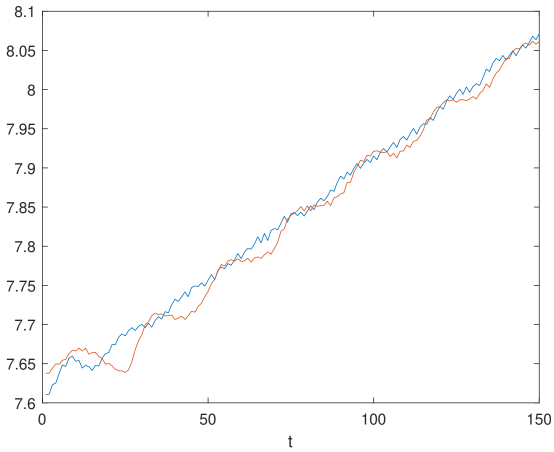

Figure 21: Real GDP *with* (orange line) and *without* (blue line) securitization in the SBFR scenario.

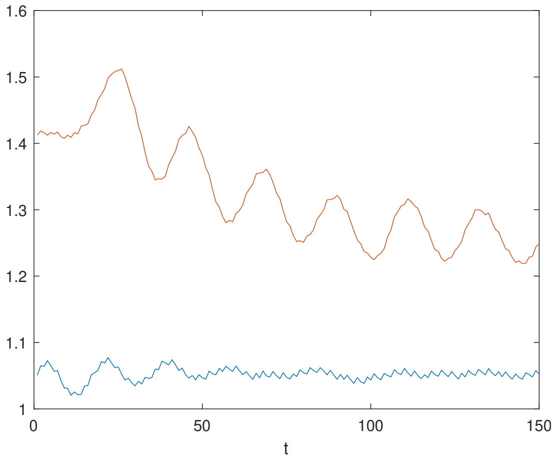

Figure 22: Public debt-to-GDP ratio *with* (orange line) and *without* (blue line) securitization in the SBFR scenario.

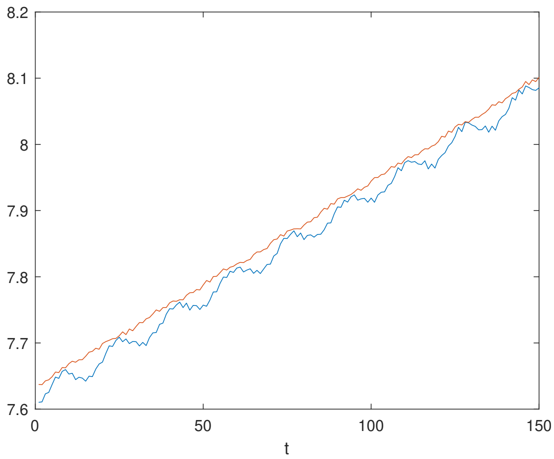

Figure 23: Real GDP *with* (orange line) and *without* (blue line) securitization in the WT scenario.

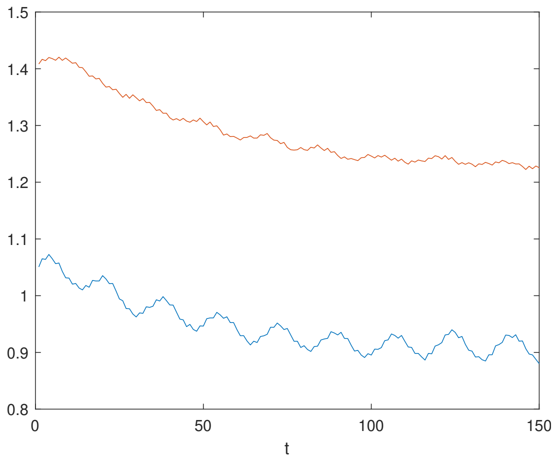

Figure 24: Public debt-to-GDP ratio *with* (orange line) and *without* (blue line) securitization in the WT scenario.

5 Conclusion

The reaction of the governments to the Covid crisis has determined a rise in the stocks of public debt in most advanced economies. The ensuing concerns on debt sustainability translated into fiscal consolidation making its return to the very centre of the economic agenda (BIS, 2023; IMF, 2024). In this paper, we investigate the impact of two alternative kinds of policies aiming at bringing public debt under control, one focusing on public spending and the other on wealth taxation. The first one - in line with the suggestions by the IMF and (Eyraud et al., 2018), as well as with the recent reforms of the EU Stability and Growth Pact (Darvas et al., 2024) - consists in a reduction of net primary *non-cyclical* government spending. The second one is the introduction of a wealth tax, thus, next to public debt sustainability, it aims to tackle an additional issue characterizing today's advanced economic system, namely inequality. Each of the two is represented as an alternative scenario - the *Spending Based Fiscal Rule* scenario (SBFR) and the *Wealth-tax* (WT) scenario - in our simulation exercises. Moreover, the impacts of the two policies are tested both with and without the financial system implementing securitization. This allows us to assess the interaction between the two fiscal consolidation strategies and advanced financial systems, where bank loans are transformed into securities. The results of our simulations cast doubts on the opportunity of reverting to a spending-based strategy to pursue fiscal consolidation. Indeed we find public that spending cuts bring about major economic distress and are not the most effective way to obtain the desired goal. The main findings are the following:

First, the consolidation via the introduction of a wealth tax seems to outperform the alternative strategy based on spending cuts. Indeed, while both policies succeed in lowering the public debt-to-GDP ratio in the longer term, their short-term impacts and general economic implications differ. The Spending Based Fiscal rule appears to be self-defeating in the short-medium run and is overall characterized by less stable results. The debt-to-GDP ratio decreases but becomes significantly more cyclical.

Second, the overall economy becomes significantly more volatile when the *non-cyclical* spending cuts are implemented. The cuts in public spending trigger a vicious cycle in which together with public expenditure, employment, bank loans, consumption, and investment decrease. The downturn comes to an end when the fiscal target is met and the government can take a more accommodating fiscal stance. However, when the deficit increases again new cuts with consequent economic downturn take place, determining a cyclical pattern.

Third, the dynamics emerging from our simulation strongly suggest that fiscal and monetary policy cannot be considered independent from one another. The cuts in public expenditure of the *SBFR scenario* necessitate to be coupled with an expansionary monetary policy. This is imperative for two reasons. On the one hand, in order to keep the economy floating. Indeed, the intervention of the central bank lessens the economic downfall, lowering the credit crunch. Nonetheless, even with the policy rate close to zero, unemployment and non-performing loans skyrocket. A less accommodative monetary stance would therefore be irreconcilable with economic stability. On the other hand, the automatic stabilizers, here embodied by the public dole, determine a monetary outflow for the public sector. This restrains the gains of the cuts in terms of public expenditure. It is the Central Bank intervention that leads to a reduction of the interest rate on public bonds, which allows to effectively curb public expenditure. In this regard, it is crucial to underline a characteristic of our model, which increases the importance of this result. The interest rate on public bonds is here linked to the policy rate and therefore only to a minor extent is determined by financial market demand. With completely market-driven interest rates, the outflow of money to service public bonds would rise dramatically, potentially offsetting the gains in terms of financial consolidation of the spending cuts. In sum, this kind of fiscal adjustment would not be sustainable if not coupled with a very expansionary monetary policy. This would be even more problematic in an open economy because of the role of the exchange rate.

Fourth, the choice of the policy to obtain the fiscal adjustments has important distributive implications. While the spending-based fiscal rule and the wealth tax may have similar results in terms of wealth inequality, the former determines a more unequal income distribution, in other terms the burden of the adjustment lays disproportionately on lower-income households. Moreover, even within the wealth tax scenario, it is possible to obtain akin results in terms of fiscal consolidation and economic impacts, but diverse distributive outcomes, according to the design of the wealth tax (*i.e.* tax rates and the percentiles of the population involved). In sum, fiscal consolidation is not a neutral policy, and the wealthier should not have an *a priori* aversion to the wealth tax, as their relative position, in terms of wealth, is not weakened and the overall economy is better off.

Finally, taking into account the role of advanced financial markets, before fiscal consolidation securitization seems to be associated with higher economic activity but also higher public debt. A spending-based fiscal rule appears to cancel the positive effects of this financial practice on growth. There may be therefore an intrinsic trade-off in modern financialized economies between securitization and "conventional" fiscal consolidation programs centred on cuts to public spending. A tax on wealth emerge as a possible solution in order for securitization effects on growth to coexist with sound public finances.

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A.I Appendix I: Parameters

Symbol	*Description*	*Baseline*
α	Sensitivity in public bonds' interest rate setting	0.01
β	Weight of CDO-bond spread in IF portfolio allocation	100
γ_1	Autonomous component desired capital growth	0.1
γ_2	Sensitivity to profit rate, capital growth	0.1
γ_3	Sensitivity to capacity utilization share, capital growth	0.3
δ	Capital depreciation rate	0.1
ϵ	Quota of the principle, debt service	0.1
ζ_B	Rate of adjustment, banks' own capital	0.1
η_F	Firms desired deposits to capital ratio	0.25
η_H	Households desired deposits, quota of wealth	0.25
η_{IF}	Investment funds desired deposits, quota of wealth	0.25
θ	Log-standard deviation (wage distribution)	0.5
ι_f	Sensitivity to the debt service ratio, Firms interest rate setting	0.1
ι_h	Sensitivity to the debt service ratio, HH interest rate setting	0.3
μ_1	Autonomous mark-up on costs (price determination)	0.15
μ_{MAX}	Ceiling mark-up on costs (price determination)	0.3
ξ	Sensitivity to consumption (public purchases)	0.6
π^T	Inflation threshold	0.4
ρ	Degree of 'gradualism', interest rate target setting	0.8
ρ_π	Sensitivity to inflation gap, interest rate target setting	0.8
σ	Sensitivity to return on share/base rate spread, household portfolio choice)	5
τ_1^w	Tax rate on lower income	0.2
τ_2^w	Tax rate on higher income	0.45
τ_π	Tax rate on profit (firms and banks)	0.3
υ_1	Sensitivity to production gap, firms desired supply	0.5
υ_2	Exp production autonomous growth	0.05
ϕ	Threshold recursive process, interest rate setting	0.01
χ_1^L	Productivity autonomous growth	0.003
χ_2^L	Demand led productivity growth	0.05
ψ_1	Sensitivity to NPI (threshold for debt service ratio)	0.1
ψ_2	Sensitivity to distance from regulatory limits (threshold for debt service ratio)	0.1
Ψ_{min}	Lower limit, threshold for debt service ratio	0.05
Ψ_{max}	Upper limit, threshold for debt service ratio	1/3
ω_1	Wage inflation sensitivity to unemployment (numerator)	0.005
ω_2	Wage inflation sensitivity to unemployment (denominator)	0.05
ω_3	Wage inflation sensitivity to labor productivity	0.5
c_n	'Socially determined' consumption	0.3
c_r	Propensity to consume out of financial income	0.40
c_w	Propensity to consume out of net wage income	0.65
$\bar{k}$	Regulatory limit for leverage	0.08

Table 4: Parameters

A.II Appendix II: Equations

Firms

$$X_t^L = X_{t-1}^L \cdot \Big[\chi_1^L + \chi_2^L \cdot \Big(\frac{Y_{D,t}^*}{Y_{D,t-1}^*} - 1\Big)\Big] \tag{A.1}$$

$$Y_D^* = \frac{(C_t^* + p_t \cdot I^* + G^*)}{p_t} \tag{A.2}$$

$$X^K = \bar{X}^K \tag{A.3}$$

$$Y_S^* = \big[Y_{S,t-1}^* + \upsilon_1 \cdot (Y_{D,t-1}^* - Y_{S,t-1}^*)\big] \cdot (1 + \upsilon_2) \tag{A.4}$$

$$Y_K^{MAX} = K_{t-1} \cdot X^K \tag{A.5}$$

$$Y_L^{MAX} = \bar{N} \cdot X_t^L \tag{A.6}$$

$$Y^{MAX} = min(Y_K^{MAX}, Y_L^{MAX}) \tag{A.7}$$

$$Y_S = \begin{cases} \text{if } Y_S^* \leq Y^{MAX} \Longrightarrow Y_S = Y_S^* \\ \text{if } Y_S^* > Y^{MAX} \Longrightarrow Y_S = Y^{MAX} \end{cases} \tag{A.8}$$

$$N_t = \frac{Y_S}{X_t^L} \tag{A.9}$$

$$u_t = \frac{Y_S}{X^K K_{t-1}} \tag{A.10}$$

$$Un_t = \bar{N} - N_t \tag{A.11}$$

$$un_t = \frac{Un_t}{\bar{N}} \tag{A.12}$$

$$\omega_t = (\pi_{t-1}) \cdot \left[\frac{\omega_1}{(\omega_2 + un_t)} + \omega_3 \cdot \frac{X_t^L - X_{t-1}^L}{X_{t-1}^L}\right] \tag{A.13}$$

$$W_t = W_{t-1} \cdot \left[1 + \omega_t + (\frac{N_t}{N_{t-1}} - 1)\right] \tag{A.14}$$

$$g_t^* = \gamma_1 + \gamma_2 \frac{\Pi_{t-1}}{Y_{t-1}} + \gamma_3(u_{t-1} - u_N) \tag{A.15}$$

$$I_t^* = K_{t-1} \cdot g_t^* \tag{A.16}$$

$$K = K_{t-1} + I_t - \delta K_{t-1} \tag{A.17}$$

$$\mu_t = max\Big(\mu_{MAX}, \mu_1 + \mu_{t-1} \cdot \frac{Y_{D,t-1}^*}{Y_{S,t-1}}\Big) \tag{A.18}$$

$$p_t = \frac{W_t + i_{t-1}^f \cdot Lf_{t-1}}{Y_S} \cdot (1 + \mu_t) \tag{A.19}$$

Households

$$yd_{i,t} = w_{i,t} - tax^w_{i,t} + rsh_{t-1} \cdot Sh_{i,t-1} + Div_{i,t-1} - i^h_{i,t-1} \cdot \widetilde{Lh_{i,t-1}} \tag{A.20}$$

$$r^{sh}_{i,t} = z \cdot (r^f_{t-1} \cdot L_{f,t-1} + \sum r^f_{t-1} \cdot Lh_{i,t-1}) \cdot \frac{1}{Sh_{t-1}} \tag{A.21}$$

$$tax^w_{i,t} = \tau^w_j w_{i,t} \begin{cases} \text{if } w_{i,t} < \hat{w}_t & \Longrightarrow tax^w = \tau^w_1 \cdot w_{i,t} \\ \text{if } w_{i,t} \geq \hat{w}_t & \Longrightarrow tax^w = \tau^w_1 \cdot \hat{w} + \tau^w_2 \cdot (w_{i,t} - \hat{w}_t) \end{cases} \tag{A.22}$$

$$c^*_{i,t} = c_w \cdot (yw_{i,t}) + c_r \cdot [r^{sh} \cdot Sh_{i,t} + Div_{i,t}] + c_{wealth} \cdot (NW_{i,t}) + c_n \cdot \bar{c}_{t-1} \tag{A.23}$$

$$s^*_{i,t} = yd_{i,t} - c^*_{i,t} \tag{A.24}$$

$$Dh^*_{i,t} = \eta_H \cdot Wh_{i,t-1} \tag{A.25}$$

$$\Delta Dh^*_{i,t} = Dh^* - Dh_{i,t-1} \tag{A.26}$$

$$Sh^*_{i,t} = Sh_{i,t-1} \cdot [1 + \sigma(\frac{r^{sh}_{t-1} Sh_{i,t-1}}{Sh_{i,t-1}} - i^B_{i,t-1})] \tag{A.27}$$

$$\Delta Sh^*_{i,t} = Sh^*_{i,t} - Sh_{i,t-1} \tag{A.28}$$

$$\Delta Lh^*_{i,t} = \Delta Dh^*_{i,t} + \Delta Sh^*_{i,t} - S^*_{i,t} \tag{A.29}$$

$$\text{if } m^*_{i,t} < \Psi_t \Longrightarrow \begin{cases} \Delta Lh_{i,t} = & \Delta Lh^*_{i,t} \\ \Delta Sh_{i,t} = & \Delta Sh^*_{i,t} \\ \Delta Dh_{i,t} = & \Delta Dh^*_{i,t} \\ c_{i,t} = & c^*_{i,t} \end{cases} \quad WH_{i,t} = Dh_{i,t} + Sh_{i,t} \tag{A.30}$$

$$\text{if } m^*_{i,t} > \Psi_t \Rightarrow Lh_{i,t} = 0 \Rightarrow \begin{cases} \text{if } s^*_{i,t} > \Delta Dh^*_{i,t} \Rightarrow \begin{cases} \Delta Sh_{i,t} > 0 \\ \Delta Sh_{i,t} = s^*_{i,t} - \Delta Dh^*_{i,t} \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \\ \text{if } s^*_{i,t} < \Delta Dh^*_{i,t} \text{ and } s^*_{i,t} + Sh_{i,t-1} > \Delta Dh^*_{i,t} \Rightarrow \begin{cases} \Delta Sh_{i,t} < 0 \\ \Delta Sh_{i,t} = s^*_{i,t} - \Delta Dh^*_{i,t} \\ \Delta Dh_{i,t} = \Delta Dh^*_{i,t} \\ c_{i,t} = c^*_{i,t} \end{cases} \\ \text{if } s^*_{i,t} + Sh_{i,t-1} < \Delta Dh^*_{i,t} \text{ and } s^*_{i,t} + Sh_{i,t-1} > 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ \Delta Dh_{i,t} > 0 \\ \Delta Dh_{i,t} = s^*_{i,t} + Sh_{i,t-1} \\ c_{i,t} = c^*_{i,t} \end{cases} \\ \text{if } s^*_{i,t} + Sh_{i,t-1} < 0 \text{ and } s^*_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} > 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ \Delta Dh_{i,t} < 0 \\ \Delta Dh_{i,t} = s^*_{i,t} + Sh_{i,t-1} \\ c_{i,t} = c^*_{i,t} \end{cases} \\ \text{if } s^*_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} < 0 \Rightarrow \begin{cases} Sh_{i,t} = 0 \\ \Delta Sh_{i,t} = -Sh_{i,t-1} \\ Dh_{i,t} = 0 \\ \Delta Dh_{i,t} = -Dh_{i,t-1} \\ c_{i,t} \geq \tilde{c} \\ c_{i,t} = yd_{i,t} + Sh_{i,t-1} + Dh_{i,t-1} \end{cases} \end{cases} \tag{A.31}$$

Government

$$G_t = \xi_1 \cdot G_{t-1} + (1-\xi_1) \cdot \xi_2 \cdot C_t \tag{A.32}$$

$$T_t = \tau_\pi \cdot \Pi_t + \sum_{i=1}^{N} \tau_i^w w_{i,t} + \sum_{i=1}^{N} \tau_i^{WH} WH_{i,t-1} \tag{A.33}$$

$$\Delta GD_t = G_t + dole \cdot \left[\bar{N} - N_t\right] + i_{t-1}^b \cdot GD_{t-1} - T_t \tag{A.34}$$

$$i_t^b = i_{t-1}^b \cdot [1 + \alpha(\frac{B_{B,t}}{GD_t} - \frac{B_{B,t-1}}{GD_{t-1}})] \tag{A.35}$$

Commercial Banks

$$i_{i,t}^{e,h} = i_{t-1}^T + \iota_h \cdot i_{t-1}^T \cdot \frac{Lh_{i,t-1} + \Delta Lh_{i,t}^*}{yn_{i,t}} \tag{A.36}$$

$$i_t^f = i_{t-1}^T + \iota_f \cdot i_{t-1}^T \cdot \frac{Lf_{t-1} + \Delta Lf_t}{Pf_t} \tag{A.37}$$

$$mh_{i,t}^* = i_{i,t}^{e,h} \cdot \frac{Lh_{i,t-1} + \Delta Lh_{i,t}^*}{yn_{i,t}} \tag{A.38}$$

$$\Psi_t = max\left[\Psi_{min}, min(\Psi_{max}, \Psi^*)\right] \tag{A.39}$$

$$\Psi^* = \bar{\Psi}_{min} - \psi_1 \cdot \frac{NPL}{\epsilon \cdot Lh_{t-1}} + \psi_2 \cdot (k_{B,t} - \bar{k}) \tag{A.40}$$

$$k_{B,t} = \frac{\widetilde{\Omega}_{t-1}^B}{[(1-z_t)L_t + B_{B,t}]} \tag{A.41}$$

$$\widetilde{\Omega}_t^B = \Omega_{t-1}^B - (1 - z_{t-1}) \cdot NPL_t \tag{A.42}$$

$$\text{if } mh_{i,t}^* < \Psi_t \text{ then } i_{i,t}^h = i_{i,t}^{e,h} \text{ and } \Delta Lh_{i,t} = \Delta Lh_{i,t}^* \tag{A.43}$$

$$P_t^B = \Pi_t^B(1-\tau_\pi) \tag{A.44}$$

$$\bar{\Omega}_t^B = \Big[(1-z)L_t + B_{B,t}\Big] \cdot \bar{k} \tag{A.45}$$

$$\Delta\Omega_t^* = \begin{cases} \text{if } k_{B,t} & < \bar{k} \Longrightarrow \Delta\Omega_t^* = \zeta_B \cdot (\bar{\Omega}_t^B - \Omega_{t-1}^B) \\ \text{if } k_{B,t} & \geq \bar{k} \Longrightarrow \Delta\Omega_t^* = 0 \end{cases} \tag{A.46}$$

$$\text{if } \ \Delta\Omega_t^* \leq P_t^B \Longrightarrow \begin{cases} \Omega_t = \Omega_{t-1} + \Delta\Omega_t^* \\ Div_B = P_t^B - \Delta\Omega_t^* \end{cases} \tag{A.47}$$

$$\text{if } \ \Delta\Omega_t^* > P_t^B \Longrightarrow \begin{cases} \Omega t = \Omega_{t-1} + P_t^B \\ Div_B = 0 \end{cases} \tag{A.48}$$

$$B_{B,t} = GD_t - B_{IF,t} \tag{A.49}$$

$$RL_{B,t}^h t = \sum_{i=1}^{N} (1 - z_{t-1}) \cdot [\widetilde{i_{i,t-1}^h \cdot Lh_{i,t-1}}] \tag{A.50}$$

$$RL_{B,t}^f = (1 - z_{t-1}) \cdot [i_{t-1}^f \cdot Lf_{t-1}] \tag{A.51}$$

$$RB_{B,t} = i_{t-1}^b \cdot B_{B,t-1} \tag{A.52}$$

$$\Pi_{B,t} = RL_{B,t}^h + RL_{B,t}^f + RB_{B,t} \tag{A.53}$$

$$ABS_{if,t} = z_t \cdot \sum_{i=1}^{N} Lh_{i,t} + z_t \cdot Lf_t \tag{A.54}$$

$$z_t = min(1, \frac{ABS_{IF}}{L_t}) \tag{A.55}$$

$$r_t^{abs} = \frac{z_t[(\sum_{i=1}^{N} \widetilde{i_{i,t-1}^h \cdot Lh_{i,t-1}}) + i_{t-1}^f Lf_{t-1}]}{ABS_{if,t-1}} \tag{A.56}$$

Investment Funds

$$D_{IF,t} = \eta_{IF} \cdot Sh_t \tag{A.57}$$

$$q^b_{if,t} = q^b_{if,t-1} \cdot \left\{1 - \beta[(r^{abs}_t - i^B_t) - (r^{abs}_{t-1} - i^B_{t-1})]\right\} \tag{A.58}$$

$$B^D_{IF,t} = q^b_{if,t} \cdot (1 - \eta_{IF}) \cdot Sh_t \tag{A.59}$$

$$ABS^{*D}_{IF,t} = Sh_t \cdot (1 - \eta_{IF}) - B_{IF,t} \tag{A.60}$$

$$ABS^{*}_{IF,t} = min(z_t L_t, ABS^{D*}_{IF,t}) \tag{A.61}$$

$$RABS_{IF,t} = r^{abs}_{t-1} \cdot ABS_{t-1} \tag{A.62}$$

$$RB_{IF,t} = i^B_{t-1} \cdot B_{IF,t-1} \tag{A.63}$$

$$RSH_t = RABS_{IF,t} + RB_{IF,t} \tag{A.64}$$

$$r^{sh}_{i,t} = RSH \cdot \frac{sh_{i,t-1}}{SH_{t-1}} \tag{A.65}$$