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Government Policies and Financial Crises: Mitigation, Postponement or Prevention?

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Working Paper 126

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Jakob Kapeller, Michael Landesmann, Franz X. Mohr and Bernhard Schütz

The Vienna Institute for International Economic Studies
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Government Policies and Financial Crises: Mitigation, Postponement or Prevention?

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Abstract

In the aftermath of the Great Recession, governments have implemented several policy measures to counteract the collapse of the financial sector and the downswing of the real economy. Within a framework of Minsky-Veblen cycles, where relative consumption concerns, a debt-led growth regime and financial sector confidence constitute the main causes of economic fluctuations, we use computer simulations to assess the effectiveness of such measures. We find that the considered policy measures help to mitigate the impact of financial crises, though they do so at the cost of shortening the time between the initial financial crisis and the next. This result is due to an increase in solvency and confidence induced by the policy measures under study, which contribute to an increase in private credit and, thereby, increase effective demand. Our results suggest that without a strengthening of financial regulation any policy intervention remains incomplete.

Keywords: financial crisis, financial regulation, fiscal policies, Minsky-Veblen cycles

JEL classification: E32, E44, E62, E63, G01, G18, G28, H12, H81

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1. Introduction

In the run-up to the Great Recession, a prominent group of countries – among them the United States, the United Kingdom and several EU countries – experienced economic growth based on rising private debt. These 'debt-led growth models' (Stockhammer, 2015) did not follow a uniform pattern, but showed quite different characteristics. In the case of the European Union (Portugal, Greece, Spain) the crisis has been explained mainly with reference to declining international competitiveness and unsustainable expenditures in consumption and residential investment caused by on-going capital inflows (see e.g. Shambough, 2012; Storm and Naastepad, 2015; Stockhammer, 2015). In the case of the two major Anglo-Saxon countries (and also in Ireland) the focus has been on institutional changes in the financial sector that had occurred over the previous decades: According to this account deregulation of financial markets and financial innovation allowed for increased risk-taking behaviour by financial actors, which caused an unsustainable rise in private debt conjoint with corresponding asset bubbles.[1] The more recent interpretations of these developments closely resemble the arguments put forth by Hyman Minsky (1986)[2]: After a period of relative stability, actors in the financial sector and governmental supervisory bodies gradually became less sensitive to the potential uncertainty and destructive dynamics associated with an increasingly complex and ever more leveraged financial system. Backed by the booming housing market the new financial instruments that emerged in this phase – e.g., mortgage backed securities and credit default swaps in the 2000s – initiated a positive feedback-loop, which led to rising leverage ratios and increasing demand for high yielding assets. The fragility inherent in such loops becomes obvious as soon as expectations turn around: when the housing bubble burst, actors started to deleverage, asset prices fell and a significant part of the financial sector was threatened with bankruptcy. International contagion effects led to the transmission of financial fragility to Europe, where particularly the peripheral countries, which had built up high debt positions, suffered from dramatic real economy repercussions.[3] The link between private credit booms and financial crises has recently also been confirmed by Schularick and Taylor (2012), who find that the former are an excellent predictor of the latter.

With respect to the United States, the recent literature has put a lot of emphasis on the role of income inequality and consumer aspirations.[4] This line of argument follows the narrative about relative consumption concerns as introduced by Thorstein Veblen (1899)[5]: As the incomes of many families stagnated and fell behind those of their reference groups (neighbours, family members, media images), efforts to 'keep up with the Joneses' led to falling saving rates and rising credit demand which was willingly satisfied by a 'bubbling' financial sector in the 2000s.

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1 See e.g. Konzelmann et al. (2012).

2 See on this e.g. McCulley (2009) and Whalen (2007).

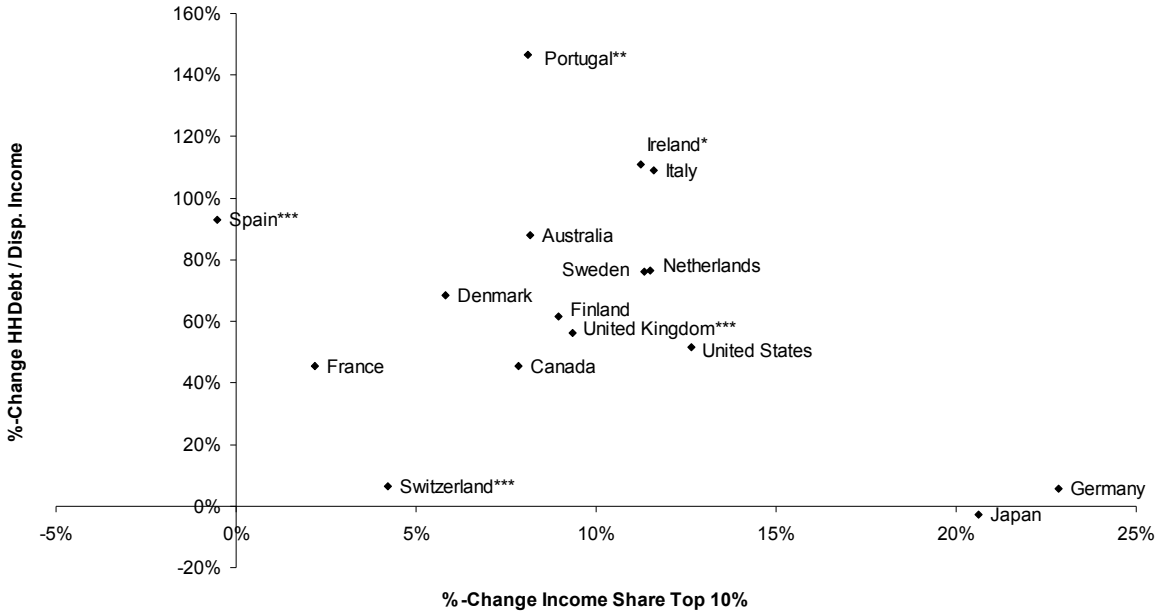
3 See on this also Stockhammer (2015).

4 See Barba and Pivetti (2009), Cynamon and Fazzari (2008, 2013), Evans (2009), Frank (2007), Hein (2011), ILO and IMF (2010), Kumhof and Rancière (2010), Kumhof et al. (2012), Rajan (2010), Reich (2011), Stiglitz (2009), Stockhammer (2012, 2015), UN Commission of Experts (2009), van Treeck (2014), Weller (2007), Wisman (2009, 2013) and Wolff (2010).

5 See also Duesenberry (1962[1949]), who later developed a consumer theory with similar implications.

Empirical evidence for the causal effect of inequality on credit growth is provided in Christen and Morgan (2005) for the recent US experience. Furthermore a number of other studies have produced empirical evidence pointing to the relevance of relative consumption concerns.[6] Although the correlation between rising inequality and credit growth also exists for many other countries (see Figure 1 for a stylised overview), all these studies have focused on the United States. Two recent studies investigate this phenomenon within a global context: Using a multi-country panel, Bordo and Meissner (2012) do not find a statistically significant relationship between inequality and credit. However, Gu and Huang (2014) show that once one takes into account the possibility of heterogeneous impacts across countries ('random effects model'), inequality does have a significant positive influence on credit growth also in this international context.

Figure 1 / Rate of change in the share of the top 10% incomes and the rate of change of the ratio of household debt to household disposable income, 1995-2007



Source: OECD National Accounts Statistics, World Top Incomes Database; *2001-2007, **1995-2005, ***1999-2007.

The relationship between inequality, debt and economic fluctuations is a distinctive feature of a *Minsky-Veblen cycle* as formulated by Kapeller and Schütz (2014): in such a cycle, growing inequality amplifies relative consumption concerns, which leads to a fall in saving rates and rising demand for credit. Following periods of relative financial stability, banks become increasingly willing to provide these loans, causing a consumption boom. As private indebtedness increases and households reduce spending, income stops rising, households become insolvent and the economy experiences a financial crisis. Along with a period of bankruptcies households and financial actors aim for a consolidation of their balance sheets leading to a period of low growth. Gradually, the financial sector regains confidence, financial innovations pick up again and over time regulators may be convinced that 'this time is different', which will eventually give rise to another Minsky-Veblen cycle. The claim that this chain of events can repeat itself is not that farfetched: Also the Great Depression was preceded by (1) a period of rising

[6] See Boushey and Weller (2006), Bowles and Park (2005), Krueger and Perri (2006), Neumark and Postlewaite (1998), Pollin (1988, 1990) and Schor (1998).

inequality[7]; (2) a rapid growth of an innovative financial sector which enabled household debt to increase; and (3) a period in which consumer durables had become the dominant driver of economic growth (Brown, 1997; Livingston, 2009; Wisman, 2014; Wisman and Baker, 2010).

Minsky-Veblen cycles are characterised by a specific type of debt-led growth episodes that have been observed recently. For example, the US economy appears to find itself in the aftermath of such a cycle. After a series of emergency policies (financial sector bailouts, fiscal stimuli, changes in legislature), employment has been recovering in the recent past, though the sustainability of this recovery process is still subject to controversial debates. European policy-makers have reacted differently to the crisis: following a much more restrictive fiscal policy stance, being late both with the use of 'unorthodox' monetary policy measures in the form of quantitative easing as well as in bank restructuring and bank consolidation. The result is a prolonged period of stagnation for the larger part of the continent with virulent economic crises in Europe's periphery. Therefore it remains an important question what economic policy can do in the aftermath of such a financial crisis to mitigate the immediate consequences and to prevent future crises. In order to deal with this question, we proceed as follows: Section 2 discusses economic policy measures undertaken before and after the 2007 downturn. Section 3 examines these measures by building on a theoretical framework initially proposed by Kapeller and Schütz (2014). The final section concludes. Details of the model can be found in the Appendix.

[7] See also Piketty (2014).

2. The Great Recession and government policies: an overview

This section will provide a broad overview on policy measures carried out in the aftermath of 2007. In the United States, the Troubled Asset Relief Program (TARP) was the first public measure imposed to counteract the immediate consequences of the financial crisis. It was passed in October 2008 and included a variety of instruments. Initially Congress authorised USD 700 billion for this programme, which was later reduced to USD 475 billion. A large part of the funds was devoted to stabilising the financial sector through the purchase or insurance of troubled assets as well as the direct purchase of equity in the financial institutions themselves. Further funds were used to stabilise the automotive industry through the purchase of equity. Finally, it also included funds dedicated to support struggling families in avoiding foreclosure through loan modifications that reduce monthly payments to affordable levels (see Table 1).[8]

Table 1 / Composition of the Troubled Asset Relief Program (TARP)

	Denoted amount (in billion USD)	Share in total
Stabilisation of banking institutions	250	53%
Restarting credit markets	27	6%
Stabilisation AIG	70	15%
Stabilisation car industry	82	17%
Helping struggling families to avoid foreclosure	46	10%

Source: US Department of Treasury (2015).

According to the IMF (2011), the total costs of bailing out banks until March 2011 amounted to 5.2% of US GDP (of which 1.8% could be recovered until that date). See Table 2 for a comparison of selected countries.

Table 2 / Costs for bailing out banks in % of GDP in selected countries

	Direct support	Recovery	Net direct cost
Belgium	4.3	0.2	4.1
Ireland	30.0	1.3	28.7
Germany	10.8	0.1	10.7
Greece	5.1	0.1	5.0
Netherlands	14.4	8.4	6.0
Spain	2.9	0.9	2.0
United Kingdom	7.1	1.1	6.0
United States	5.2	1.8	3.4
Average	6.4	1.6	4.8
In billion USD	1,528	379	1,149

Source: IMF (2011, 8).

8 See US Department of Treasury (2015).

Following financial sector bailouts, in 2009 the US Government passed the American Recovery and Reinvestment Act (ARRA) as a fiscal stimulus package accounting for a total of USD 787 billion (5.5% of GDP). It consisted of spending on personal transfers, tax cuts, transfers to state and local governments as well as spending on infrastructure (see Table 3).

Table 3 / Components of the 2009 ARRA stimulus programme

	Funding committed (in billion USD)	Percentage of total funding
Transfers to persons	**271**	**34.7%**
Unemployment insurance	224	28.6%
Tax cuts	**190**	**24.3%**
Higher-income tax cuts	72	9.2%
Lower- and middle-income tax cuts	64	8.2%
Business and other tax incentives	40	5.1%
Transfers to state and local governments	**174**	**22.2%**
Divided equally between Medicaid and education		
Infrastructure and other direct spending	**147**	**18.8%**
Non-traditional infrastructure, including green economy	109	13.9%
Traditional infrastructure	38	4.9%

Source: Pollin (2012, 173); based on data from Blinder and Zandi (2010).

These two major rescue and stimulus packages differed with respect to their main purpose. While TARP mainly aimed at stabilising the financial sector, ARRA was intended to bring the economy out of a deep recession and reduce unemployment. Any assessment of their impact therefore depends on how they succeeded in achieving these distinct goals. In both cases, this assessment goes along with the obvious problem that it is hard to look at them in isolation from other policies. In the case of TARP, entangling its effects from the impact of the measures undertaken by the Federal Reserve at the time proves similarly difficult. The FED policies included monetary policies (lowering the federal funds rate) as well as a set of unconventional policies (new lending programmes to increase liquidity provision, broadening the provision of liquidity beyond banking institutions, large scale asset purchases, relaxing collateral standards). Keeping this limitation in mind, it has become the general perception that TARP did help to stabilise the financial sector (see e.g. Mishkin, 2011).[9]

The fact that it took a while for the US unemployment rate to come close to pre-2007 levels[10] has led several scholars to question the impact of the ARRA. Taylor (2011) argues that (similar to two other fiscal spending initiatives in the 2000s) it was ineffective, because households as well as states and local governments largely saved the granted transfers and tax rebates. Aizenman and Pasricha (2011) point out that when looking at consolidated fiscal expenditures, the stimulus was close to zero, since state and local governments reduced their expenditures by about the same amount as the expansion put into effect by the federal government. Indeed, if only consolidated fiscal expenditure is taken into account, the US fiscal stimulus ranks among the lower third of OECD countries which have implemented

[9] Today, proceeds from the sales of TARP securities have been exceeding total disbursements by USD 13.9 billion; this means that – in contrast to similar measures undertaken in the UK – TARP also earned the US government a net profit (see US Department of Treasury, 2015; Culpepper and Reinke, 2014).

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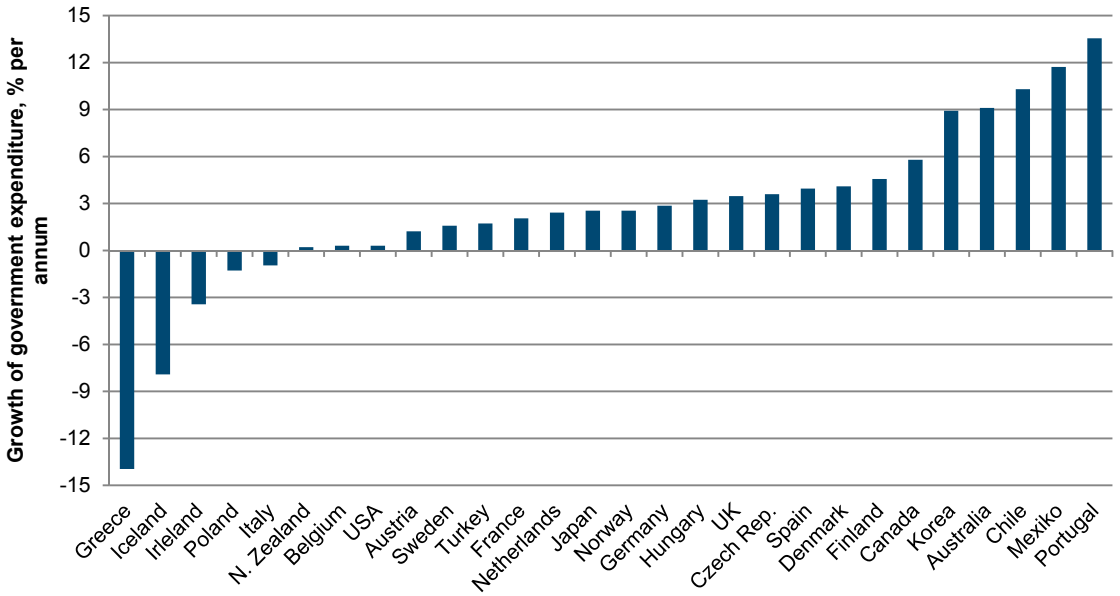
similar measures (see Figure 2): Looking at the period between 2009Q1-2010Q1, the annual growth rate of government consumption plus government investment did not exceed 0.31% (Aizenman and Pasricha, 2013).

Figure 2 / Growth of consolidated government real consumption and investment expenditure, 2009Q1-2010Q1



Source: Aizenman and Pasricha (2013).

Pollin (2012) concludes from a review of the evidence and the related empirical literature on fiscal multipliers, that ARRA relied too heavily on tax cuts (24%, see Table 3) and too little on direct spending initiatives, since fiscal multipliers are considerably higher for the latter.[11] Concerning the quantitative importance of transfers to households, which included mainly unemployment insurance, and local governments, he emphasises that although they did not produce additional net spending, they nevertheless secured a floor to a potential further fall in aggregate demand and thereby prevented the latter from collapsing.

Support for this conjecture comes from the European experience, where a much more hesitant government response to the crisis led to a double-dip recession and a much more prolonged period of deleveraging than in the United States. Between 2009Q1-2010Q1 (Figure 2) annual growth of consolidated fiscal spending was already negative in Greece (-14%), Iceland (-7.9%), Ireland (-3.4%), Poland (-1.3%), Austria (-1.2%) and Italy (-0.95%). While during that period other European economies increased fiscal spending, almost all European countries started to focus on reducing their deficits under the impression of the rise in public debt levels (partly due to financial sector bailouts).[12] By mid-2015, unemployment in the European Union stood at 9.6% compared to 5.3% in the United States.[13]

[11] See the Congressional Budget Office (2011) for a possible range of multipliers across different types of spending.

[12] See on this also Kitson, Martin and Tyler (2011).

[13] OECD Labour market statistics for June 2015.

3. Government policies within a Minsky-Veblen cycle: Breaking the cycle vs bolstering its impact

The policies discussed in the previous section were directed at keeping the financial system from collapsing (e.g. TARP) and ending the recession (e.g. ARRA). From a Minskyan perspective this means that these measures were merely directed at mitigating the consequences of the crisis, without addressing the need to prevent the occurance of the next crisis. It is, however, obvious that if the regulatory environment does not change, the only barrier that stands between the aftermath of this recession and the next boom-bust cycle may be the resurrection of investor confidence and the consolidation of balance sheets, to which e.g. TARP and ARRA are expected to contribute. Therefore, without substantial institutional changes including large scale regulatory measures, these governmental policies contribute and form part of a Boom-Bust-Bailout-Boom cyclical development as sketched by Crotty (2009, 563): '[The] evolution [of the financial sector] has taken the form of cycles in which deregulation accompanied by rapid financial innovation stimulates powerful financial booms that end in crises. Governments respond to crises with bailouts that allow new expansions to begin. As a result, financial markets have become ever larger and financial crises have become more threatening to society, which forces governments to enact ever larger bailouts.'

This claim can be illustrated within a simple model (for details see the Appendix): We build on the theoretical model initially developed by Kapeller and Schütz (2014) and add a government sector to it.[14] In order to capture the core properties of Minsky-Veblen cycles, we assume that households can be divided into three groups: two groups of worker households and the capitalist households representing the sole owners of firms and banks. For simplicity we assume that worker households initially consume all their income while capitalist households save part of it. Furthermore we assume that wage income is distributed equally among worker households to start off with, but in the first 8 periods (we assume that a period reflects one quarter) the second group of households experiences a loss of income relative to the first group of households, whose share in national income remains constant. Moreover we assume that the second group of households partly tries to keep up with the first group of households (the 'Joneses'), which is reflected in the following aggregate consumption function for group 2 households (for the full list of equations and variable descriptions see the Appendix):

$$C_{2,\mathrm{t}} = \begin{cases} Y_{2,t} & for \quad Y_{2,\mathrm{t}} \geq Y_{1,\mathrm{t}}\beta \\ (1-\alpha)Y_{2,\mathrm{t}} + \alpha Y_{1,\mathrm{t}}\beta & for \quad Y_2(t) < Y_{1,\mathrm{t}}\beta \end{cases} \tag{1}$$

[14] The initial model proposed by Kapeller and Schütz (2014) combines the Minskyan notion of financial instability with the Veblenian concept of relative consumption concerns within a Post-Keynesian stock-flow consistent framework (on the latter see Lavoie and Godley, 2002; Godley and Lavoie, 2007). Both features have been addressed in the literature so far, but to our knowledge this is the only framework that combines them within a single model. Minskyan models usually focus on corporate investment (see e.g. Delli Gatti et al., 1994; Dos Santos, 2005; Franke and Semmler, 1989; Keen, 1995, 2013; Meirelles and Lima, 2006; Skott, 1994; Taylor and O'Connell, 1985; Tymoigne, 2006), where Palley (1994, 1997) is the only exception that we are aware of who concentrates on consumption demand. Post-Keynesian models accounting for relative consumption concerns include Barba and Pivetti (2009), Davanzati and Pacella (2010), Dutt (2005, 2006, 2008, 2012), Hein (2012), Kapeller and Schütz (2015), Palley (2010) and Zezza (2008). Another distinct feature in Kapeller and Schütz (2014) is the possibility of household bankruptcies.

According to equation (1) aggregate consumption demand of group 2 households is equal to their disposable income minus debt payments, i.e. wage income minus labour income tax minus interest and instalment payments (Y_2), as long as this income is not below that of group 1 households (Y_1). In this context β represents the ratio of the number of group 2 to group 1 households. As soon as they fall behind in income, their consumption is given by a weighted average of their own income and average consumption of group 1 households. It is assumed that firms' supply adjusts to demand in each period.

Moreover, we assume a Minskyan financial sector that is willing to lend to a group 2 household as long as its disposable income minus debt payments exceeds a certain margin of safety (θ). Assuming that household income *within* groups remains equally distributed and the underlying system is stationary, the relevant condition for judging the creditworthiness of group 2 households is defined as

$$Y_{2,\mathrm{t}} \geq \theta_{2,\mathrm{t}} \tag{2}$$

The concept of this margin of safety is founded in the theory of Minsky (1986), who suggested that within periods of perceived stability, margins of safety would gradually decline, because lenders become more confident and also increasingly base their decisions on (expected) collateral values and less on current income. Moreover, he argued that also regulations become less binding, since regulations are relaxed – partly a function of regulatory capture and also the fact that regulators are outstripped in monitoring capacity relative to a booming financial sector– and the financial sector generates a stream of innovations that allows it to circumvent existing regulations. Minsky argued, however, that when signs of economic distress occur, lenders become more cautious, causing an implicit rise in margins of safety, which could lead to a 'sudden stop' (on further lending). Our model captures this process through a simple relation, whereby we assume that the margin of safety declines slowly within periods of perceived stability and increases rapidly within periods of economic distress. Thereby we define periods of 'perceived stability' as periods without reported bankruptcies and of 'economic distress' as periods in which bankruptcies occur. Moreover, we also assume that increases in the leverage ratio of the financial sector (*LR*) also lead to a gradual increase in the margin of safety as it raises risk perceptions (*D*…total debt outstanding, *E*…bank equity)

$$\theta_t = \theta_{t-1}(1+\mu_t) + \zeta \Delta LR_{t-1} \tag{3}$$

$$\mu_t = \begin{cases} -\gamma & for \quad perceived \quad stability \\ \tau & for \quad economic \quad distress \end{cases} \qquad \tau >> \gamma$$

$LR_{t-1} = \dfrac{D_{t-1}}{E_{t-1}}$, *D* denotes the amount of negative deposits ($M < 0$)

Bankruptcy (i.e. inability to service debt) occurs once debt payments exceed disposable income minus subsistence level consumption (the latter being the absolute lower bound for consumption): $Y_{2,\mathrm{t}} < C_{2,\mathrm{t}}^{\min}$. If this situation occurs, banks have to write off a certain proportion of this household sector's debt.

In order to keep the model as simple as possible, we assume that the government initially runs a balanced budget financed through taxes on income. It will only incur debt in the case of extraordinary

policy measures that will be introduced at a later stage. Firms distribute part of their profits to capitalist households while banks only retain profits when their equity is below target. Aggregate investment depends positively on the utilisation of production capacities (*z*, where *Y* denotes aggregate output and *Y** maximum output determined by the capital stock *K*), the rate of return (*R*, where Π_f denotes firm profits) and government expenditure (*G*), where the latter enters through its impact on infrastructure, education and research through public investment (Dutt, 2013).[15] Moreover, it depends negatively on the leverage ratio of the financial sector (*LR*). The latter allows us to account for the fact that deteriorations of banks' balance sheets lead to tighter credit conditions for firms.

$$I(t) = i_0 + i_1 z_{t-1} + i_2 R_{t-1} + i_3 G_{t-1} - i_4 LR_{t-1}, \tag{4}$$

where $z_t = \frac{Y_t(t)}{Y_t^*}$, $Y_t^* = vK_t$, $R_t = \frac{\Pi_{f,t}}{K_t}$

For a full specification of the model see the Appendix.

3.1. THE LAISSEZ-FAIRE SCENARIO

This extended variant of the model gives the same basic result that Kapeller and Schütz (2014) have referred to as Minsky-Veblen cycles in the absence of any government intervention (see Figure 3): As a result of the fall in wages of group 2 households, GDP rises because workers' consumption declines only marginally (households compensate falling incomes with credit) while at the same time lower wages increase the rate of profit for firms. This leads to higher investment, higher firm profits and (due to interest payments of group 2 households) rising bank profits. These profits again increase the consumption of capitalist households.[16] What corresponds to a debt-led growth phase, however, fades after some time as group 2 households eventually start reducing consumption due to rising debt payments. The reduction in spending gradually leads to a recession, which turns into a financial crisis as soon as banks stop or restrict lending. Hence, when group 2 households' disposable income minus debt payments falls below the margin of safety (see the upper right panel of Figure 1) and banks stop extending further credits, households face a 'sudden stop' forcing them into bankruptcy and to reduce their consumption spending to subsistence level. The resulting drop in consumption leads to a downfall in GDP. In consecutive periods of bankruptcy banks have to write off some portion of their outstanding loans, which reduces their equity and drives up their leverage ratio. In this period of economic distress the margin of safety increases strongly, which cuts off group 2 households from the credit market for an extended period of time as recovery of confidence is only gradual. Government spending also drops sharply as tax revenues decrease and – by assumption in this scenario - the government pursues a balanced budget. Falling capacity utilisation, falling rates of return and falling government spending also reduce investment, which is further depressed by tighter credit provision due to equity losses in the banking sector.

The period of bankruptcies ends when, due to the enforced debt write-offs, the remaining debt of group 2 households has reached a level at which they can start servicing debt payments out of current income. In turn, the economy recovers as gradual repayments decrease the debt-burden of group 2 households

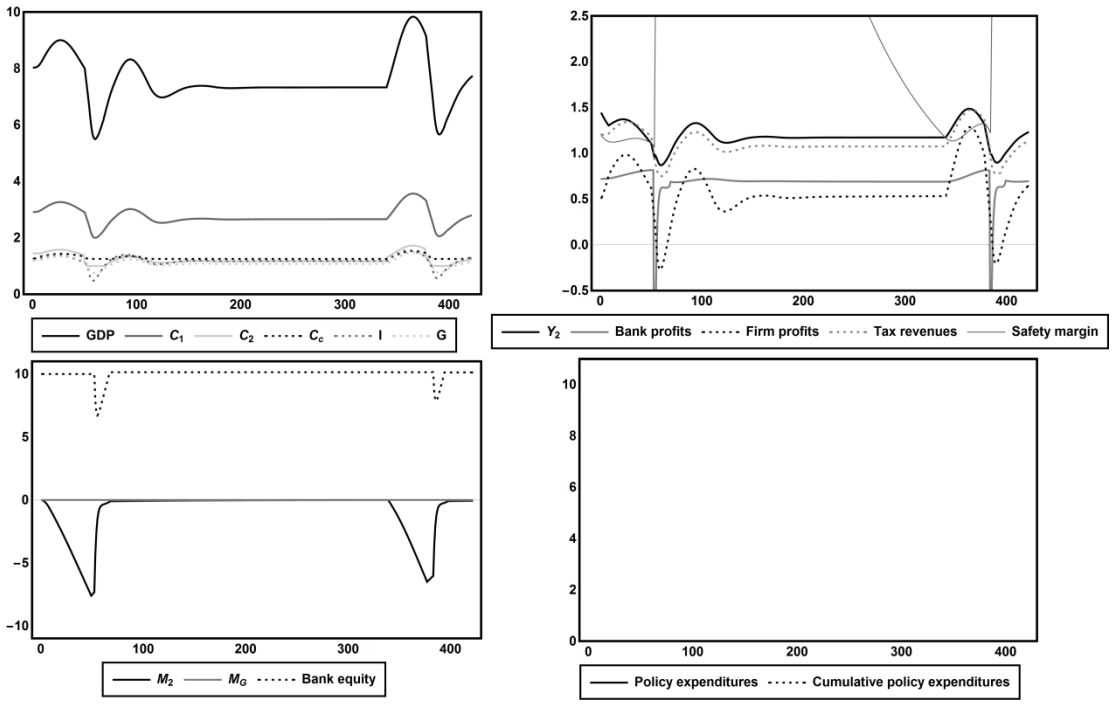
[15] For the empirical evidence see Mazzucato (2014).

[16] Kapeller and Schütz (2015) have also called this phase a 'consumption-driven profit-led regime'.

(lower left panel of Figure 1). Bank equity also recovers when bank profits become positive again and can be used to rebuild equity. As investment and government expenditure also pick up again, the economy recovers and GDP reaches its pre-crisis level for a short time. This follow-up boom and the subsequent recession are part of the cyclical adjustment process that leads to a new temporary level of GDP, which is significantly lower than the level at the beginning, since in the model under study the recovery is wage-led in the absence of consumer credit. Hence, if credit-dynamics does not kick in, redistribution towards profits will depress consumption more than it encourages investment (Kapeller and Schütz, 2015).

In this temporary period of stability, group 2 households are cut off from consumer credit. However, as time goes by the Minskyan dynamics discussed at the beginning sets in, which is reflected in the gradual decline in the margin of safety (upper right panel in Figure 3). Once the margin of safety has declined sufficiently, the next debt-led boom sets in and dynamics repeats itself in the same manner.

Figure 3 / Simulation results for the laissez-faire scenario



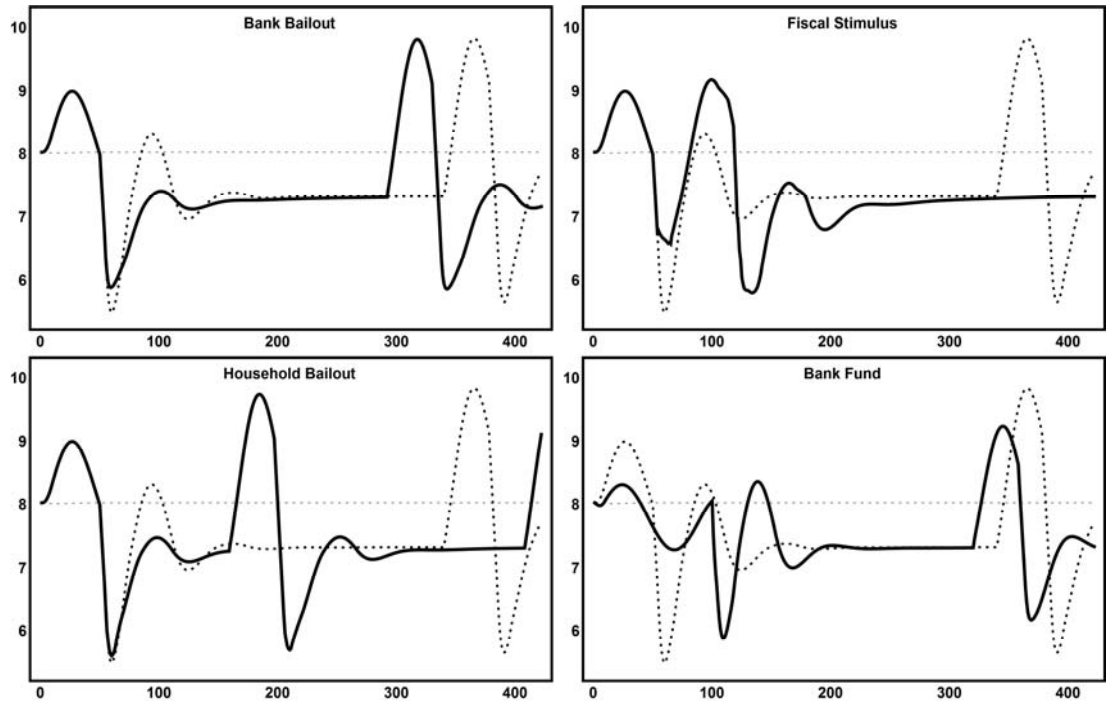
3.2. POLICY SCENARIOS

In a next step we discuss and assess the different policy alternatives in the context of a financial crisis. Specifically, we investigate the consequences of the following five stylised policy options: 1) bailing out banks, 2) fiscal stimulus, 3) bailing out households, 4) establishing a banking fund to safeguard against bank failures, and (5) increasing financial regulation. While the first four options are discussed one at a time, the issue of financial regulation is framed as a possible complement to the other four policies. The results of applying the different policy measures in the simulations of the model for GDP are shown in Figure 4, where each of the four panels compares the respective policy scenario to the *laissez-faire* case

and the level of GDP that would have prevailed if income distribution had stayed constant (in which case there would not be any need for a 'keeping up with the Joneses' and hence no 'Minsky-Veblen cycle'). The whole set of results with regard to these policy scenarios can be found in the Appendix.

In all the policy scenarios we limit the amount of government spending used in scenarios 2 (fiscal stimulus) and 3 (household bailout) by the amount that the government would need to spend on fully bailing out banks in the respective scenario. This is our way to normalise government actions across different scenarios in order to compare the impact of different policy alternatives. Since the results depend to some extent on the parameter values chosen, they should be interpreted in a qualitative rather than a quantitative way.[17] In other words, the purpose of the model is to illustrate whether and how certain policies stabilise the economy and not to make e.g. definite statements about whether average output is greater in one policy scenario compared to the other.

Figure 4 / Comparison of GDP developments under different government policies



3.2.1. Bank bailouts

In the first scenario the government focuses on bailing out the banks as the major policy strategy. For the purpose of our model we assume that the government refunds banks to compensate the losses incurred due to household bankruptcies, i.e. households not being able to repay debts (upper left panel of Figure 4). We see that in this case the government can successfully mitigate the downturn, which is less deep compared to the laissez-faire regime. The reason is that bailouts preserve banks' equity, which avoids some of the credit crunch that the firm sector would have otherwise experienced and thereby avoids some of the negative impact on investment. Another difference to the laissez-faire

[17] For some sensitivity test of the robustness of our results, see Appendix.

scenario is that during the recovery, GDP does not temporarily reach its pre-crisis level. The reason is that government expenditure picks up less during the recovery because the government itself faces debt re-payments, which are serviced as we assume that the government strives for a balanced budget in ordinary times. Later, GDP stabilises again temporarily at a similar level than in the laissez-faire scenario. However, the next boom-bust cycle starts all over again once Minskyan dynamics causes the margin of safety to decline sufficiently. Interestingly the next boom happens significantly earlier than in the laissez-faire scenario as bank bailouts increase the frequency with which the cycle occurs. The reason is that bank bailouts avoid some of the rise in banks' leverage ratios that would have otherwise occurred, which dampens the rise of the margin of safety during crisis.

3.2.2. Fiscal stimulus

In this scenario we assume that the amount of government funds invested in stimulating effective demand is restricted by the amount of funds needed to fully bail out banks in the respective scenario.[18]

The outcome of this scenario can be seen in the upper right panel of Figure 4: The fiscal response dampens the slump in GDP substantially compared to the laissez-faire scenario. The size of the stimulus package in this case is sufficient for the economy to switch back to its initial growth trajectory, with GDP returning to the level of the boom years. The reason for this relatively quick recovery is that the stimulus package dampens the fall in aggregate income and employment, which reduces the losses of banks substantially compared to the laissez-faire case, because it improves the solvency of group 2 households. The resulting flow of income also allows banks to recover their equity faster. Fewer losses combined with the quick recovery of equity cause the margin of safety to increase only moderately, which means that lending to group 2 households can resume after only a few periods since the initial impact of crisis. When this happens, the Minsky-Veblen cycle starts all over again; however, with the difference that this time, when the financial crisis occurs, the slump is much deeper (and would in fact be even deeper if the government would not step in with another fiscal stimulus package). During this slump, household bankruptcies and subsequent bank losses let banks' margin of safety soar, so that households will be cut off from credit for a much longer period of time. The reason for this deeper contraction and more prolonged period of recovery of the banking system lies in the earlier dampening impact of government spending on the size of the first recession and the beneficial impact this had for banks' balance sheets. This means that the financial system did not receive the same degree of 'shock' as in the laissez-faire scenario, hence it did not increase the margin of safety as much and the banks' credit behaviour became risk-seeking more quickly leading to a second and deeper debt crisis and slump. Finally, once the phase of subsequent household bankruptcies and bank losses has stopped, the economy starts to grow again and converges cyclically to a new temporary level of GDP. Since the government has to intervene twice in a row, this scenario witnesses the largest policy expenditures and subsequent increase in government debt (compare the lower right panels in Figures 4-7 in the Appendix). This result implies that while fiscal stimuli are successful in supplementing real economic developments, they have no effect on the underlying causes of financial fragility. On the contrary, they could lead to an even deeper Minsky-Veblen cycle second time round.

[18] Since these amounts can be quite large, we assume that the government does not spend more than 30% of the deviation of current output from its 10 period mean at once. It continues to do so as long as output is below its 10 period trend or until cumulative stimulus expenditures reach the level of implicit bank bailouts.

3.2.3. Household bailout

In the third scenario we assume that the government uses the funds that it would take to bail out banks for bailing out indebted households (lower left panel of Figure 4). In this case we see that policy contributes little to dampening the initial slump: GDP nearly drops to the level of the laissez-faire scenario. It also slows down the initial recovery process because government has to repay incurred debt afterwards and therefore has to cut on spending. However, what changes substantially is that the return to a debt-driven boom happens much earlier compared to the bank bailout scenario.

Why does bailing out households reduce the timespan between two cycles much more than bailing out banks? The reason is that bailing out banks does not make much of a difference to indebted households, but it makes a difference to the banks: Households will not repay the major part of their debt either way in a depressed economy (they repay from income only above their subsistence levels) as they either receive write-offs by banks (as in scenario 1) or a bailout by the government (as in this scenario). However, for the banks it does make a difference: If households are not bailed out, they have to bear the full losses, which makes them more cautious in the future – an effect that persists even after a bank-bailout. If the government does, however, bail out the households, banks do not incur these losses and, hence, also do not change their behaviour. Therefore bailing out households substantially reduces the time between the debt-driven growth cycles, i.e. makes boom-bust credit cycles more frequent.

3.2.4. Bank Fund

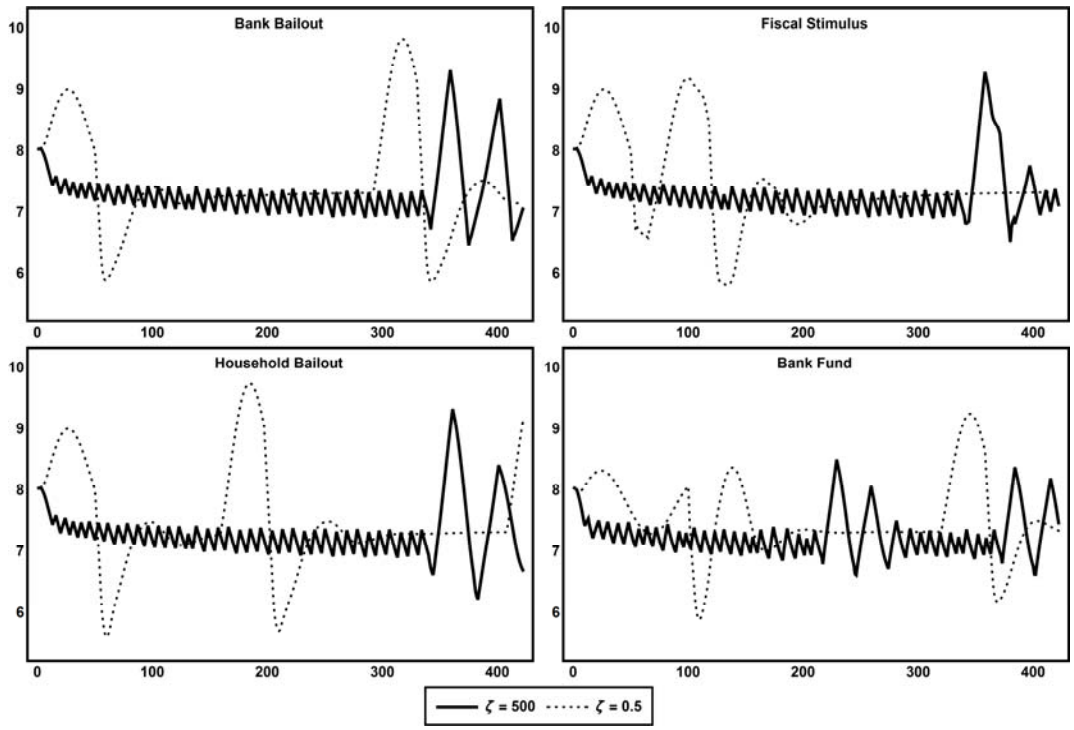
The fourth scenario consists of setting up a Bank Fund (lower right panel of Figure 4): The basic idea of such a fund is to pool a certain share of all banks' profits, which can be used to compensate any losses due to the write-off of household debt in times of crisis. This policy scenario thus corresponds to setting-up a 'self-insurance' fund by the banking system, which has been part of reform measures introduced in many countries following the recent crisis, e.g. the Single Resolution Mechanism (SRM) in the European Union, which became fully operational in January 2016. Obviously, the compensations for non-repayment of loans that can potentially be received by the banks are limited by the amount of assets accumulated in this fund. That is, in this scenario we assume that there will not be any additional bailout by the government if accumulated contributions do not suffice to cover all losses. Under this policy regime, the initial debt-driven boom is significantly dampened due to reduced profits in the banking sector. However, as in the previous scenarios, when household debt grows larger and households reduce consumption, the economy enters recession. This time, however, the recession does not lead straight into a financial crisis: Once households stop cutting back on consumption, GDP growth resumes without banks having to write off loans, because households are not cut off from lending. The latter is due to the fact that the margin of safety does not rise as much in this phase compared to the other scenarios, since the dampened boom goes along with a smaller overall increase in debt (firm investment accelerates less). Nevertheless also the Bank Fund cannot fully avoid the financial crisis. At some point during the second boom (before entering a recession) group 2 households' disposable income minus debt payments falls below banks' margin of safety. The subsequent decision of banks to stop lending leads to an end of the boom and prompts the type of financial crisis we have seen in the previous scenarios. The difference is that this time bank losses are covered by the Bank Fund, meaning that the government does not have to take on debt, which would slow down the recovery process. Consequently, the economy recovers very quickly once sufficient household debt has been written off, though it

reaches pre-crisis levels only shortly before it converges to a new temporary level of GDP. Eventually, the economy enters another boom-bust cycle once the banks' margin of safety has decreased sufficiently. This time the Bank Fund cannot prevent the financial crisis that follows the recession. So the last cycle is similar to the one observed in the laissez-faire case, although the existence of a Bank Fund substantially helps to dampen its amplitude.

3.2.5. Financial market regulation

Finally, we repeat the previous exercises, but this time under the condition of stricter financial regulation. More specifically, we assume that regulation is implemented in such a way that changes in the banks' leverage ratio have a larger impact on their credit provision to the household sector through changes in the margin of safety (ζ in equation [11] increases). The result of these combined scenarios (i.e. stricter financial regulation combined respectively with each of the earlier scenarios) is displayed in Figure 5 for all the previous policy scenarios. For comparison the initial (non-combined) policy scenarios are represented by the dotted lines: Instead of a small number of large cycles, we now get a large number of smaller cycles. In all scenarios the lowest level of GDP observed under the strong regulation scenario is significantly above the lowest point observed in the initial policy scenarios, although financial crises still occur. The strongest stabilising impact is observed in combination with the Bank Fund-proposal (lower left panel of Figure 5).

Figure 5 / Policy scenarios under stricter regulation



4. Concluding thoughts

Taking the theory of Minsky-Veblen cycles (Kapeller and Schütz, 2014) as point of departure, we discussed a set of policy alternatives to confront reoccurring financial crises: bailing out banks, fiscal stimulus, bailing out households and establishing a Bank Fund. All of these policies helped to mitigate the impact of financial crises on aggregate output. However, all of these measures did so at the cost of shortening the time between the initial financial crisis and the next one, as less intense crises also lead to a smaller increase in the financial sectors' attentiveness to financial risk and the possibility of default. By adding stricter financial regulation to these scenarios we increased the frequency of periodic ups and downs of aggregate output, but the amplitude of these cycles was significantly smaller. It follows therefore from our simulation exercise that any government intervention that does not touch on the issue of financial regulation is incomplete, because it runs into danger of clearing the ground for the next financial crisis to occur. Moreover, our results point to the importance of tackling inequality, since in our framework growing inequality not only leads to fluctuations in GDP, but is also accompanied by significantly lower GDP levels for the vast majority of periods (the short boom phases being the only exception).

If the major difference between merely mitigating the periodic downturns and breaking out of the cycle is stricter financial regulation, we may ask ourselves how much progress has been made in this regard. At the international level, the major change in the regulatory environment has been the implementation of the Basel III agreement. Its main contribution consists of raising existing capital requirements (partly on a pro-cyclical basis), while at the same time adding liquidity requirements (targeted to reduce the probability of insolvency due to illiquidity) and a limit to leverage (Fischer, 2014).[19] At the same time Basel III has been criticised for not resolving central issues such as the problem associated with banks using their own models to calculate risk-weighted assets as well as securitisation and shadow banking (Blundell-Wignal and Atkinson, 2010).

Furthermore a lot of the international discussion has concentrated on macro-prudential supervision, which on the one hand refers to the supervision of the financial system as a whole (taking into account macroeconomic repercussions of financial fragility and spillover effects) and on the other hand how to deal with asset price developments with instruments other than the interest rate, i.e. especially sector-specific regulatory and supervisory policies (Fischer, 2014). In the United States this discussion led to the foundation of the Financial Stability Oversight Council (FSOC), which was a central part of the Dodd-Frank Act. The FSOC is a coordinating committee chaired by the Secretary of the Treasury and includes the major US supervisory agencies. While an interdisciplinary agency seems to be a substantial step

[19] Basel III raises the minimum tier 1 capital ratio from 4 to 6 per cent of risk-weighted assets (RWA), requires a minimum common equity tier 1 capital ratio of 4.5 per cent of RWA, a capital conservation buffer of 2.5 per cent of RWA, allows regulators to raise risk-based capital requirements when credit growth is judged to be excessive, sets a minimum international leverage ratio of 3 per cent for tier 1 capital relative to total assets and introduces a risk-based capital surcharge for global systemically important banks. Furthermore it includes a minimum liquidity coverage ratio (LCR) which is based on a self-insurance regime of high-quality liquid assets that should avoid short term illiquidity. In the United States, banks have to use the greater of the two weights produced by internal models and standardised risk weights when assessing risk-weighted assets (Fischer, 2014).

forward, critics have warned that the Dodd-Frank Act fails to tackle the major issue of regulatory capture (see Kane, 2012). Similar discussions also led to the creation of new regulatory bodies at the EU level.[20] Their activities focused on the promotion of stronger cooperation between national supervisors and the regulation of formerly unregulated entities (credit rating agencies and investment funds). However, new or amended rules were largely resisted by individual Member States (i.a. UK, Luxembourg) or watered down in a climate of financial sector lobbying and political disagreement among Member States (Quaglia, 2013). Furthermore we have witnessed first steps towards centralised bank supervision and standardised resolution procedures for failing banks, including a European Single Resolution Fund financed by bank contributions. At the moment the actual structural consequences of these policies are still hard to assess (see Véron, 2015).

In the United States, the Dodd-Frank Act also tried to fill the regulatory gap left by the repeal of the Glass-Steagall Act with the so-called 'Volcker Rule'. However, while the former was structure-based (commercial banks were separated from investment banks by allowing only the latter to hold securities), the latter is transaction-based, meaning that it attempts to forbid commercial banks certain highly risky or speculative trading activities. The problem with this rule is that the definitions are very broad, meaning that they leave bankers a lot of possibilities to turn forbidden trades into permitted ones. This way its impact does not even come close to the one of the Glass-Steagall Act (for a discussion see Chatterjee, 2011). The Vickers reform in the U.K. represents another attempt to separate traditional banking activities from investment banking. Here the intention is to split banks into 'ring-fenced' and 'non-ring-fenced' units, where the former incorporates the systemically important part (the deposit taking one) and is prohibited from undertaking non-traditional banking activities, which is left to the non-ring-fenced units. Capital flows from the deposit taking unit to the non-fenced unit are thereby restricted. Unlike the Volcker Rule, the Vickers reform demands a legal reorganisation of financial institutions. Other national financial sector reforms include the new German restructuring law, which aims at facilitating the resolution of failing banks. It stipulates that in case of bankruptcy, the systemically relevant part of the failing institution has to be transferred to a bridge bank, while the rest of the institution becomes subject to insolvency proceedings. The new law also includes a restructuring fund, which is financed by a – progressive but very low – bank tax. Here it remains to be seen whether it will be feasible to restructure failed institutions within a short period the way it is planned if no legal separation existed before. Switzerland reacted by increasing its capital requirements above Basel III requirements (see Schäfer et al., 2015).

We will see whether these actions are sufficient to avoid or sufficiently mitigate the next boom-bust-bailout cycle. Minsky would probably remain sceptical about their adequacy.

[20] These are the European Systematic Risk Board, the European Banking Authority, the European Insurance and Occupational Pension Authority and the European Securities Markets Authority (Quaglia, 2013).

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Appendix

In what follows we build on the model proposed by Kapeller and Schütz (2014), which uses the method of stock-flow consistent accounting advanced by Lavoie and Godley (2002) and Godley and Lavoie (2007). The model consists of the following equations. We provide a detailed discussion of their properties below.

$$Y_t = C_t + I_t + G_t \tag{A1}$$

$$Y_{i,t} = (1-\sigma_w) w_{i,t} N_{i,t} + \lambda_{t-1} M_{i,t-1}, \tag{A2}$$

where $\lambda_{t-1} = \begin{cases} r_D & for \quad positive \quad deposits \\ r_{L,t-1} + \varphi & for \quad negative \quad deposits \end{cases}$

$$Y_{c,t} = (1-\sigma_c)(\pi_{f,t}\Pi_{f,t} + \pi_{b,t}\Pi_{b,t}) + \lambda_{t-1} M_{c,t-1}, \tag{A3}$$

where $\pi_{b,t} = \begin{cases} 1 & for\ \Pi_{b,t} \geq 0 \quad and \quad E_t \geq \Psi \\ \vartheta & for \quad \Pi_{b,t} \geq 0 \quad and \quad E_t < \Psi \\ 0 & for \quad \Pi_{b,t} < 0 \end{cases}$

$$N_{1,t} = \frac{Y_t}{\psi}\frac{1}{1+\beta} \qquad N_{2,t} = \frac{Y_t}{\psi}\frac{\beta}{1+\beta} \qquad \beta = N_2 / N_1 \tag{A4}$$

$$C_{c,t} = b_0 + b_1(Y_{c,t} - b_0) \qquad 0 < b_1 < 1 \tag{A5}$$

$$C_{1,t} = Y_{1,t}\ , \qquad C_{1,t}^{\min} = \frac{1}{1+\beta} a_0 \tag{A6}$$

$$C_{2,t} = \begin{cases} Y_{2,t} & for \quad Y_{2,t} \geq Y_{1,t}\beta \\ (1-\alpha)Y_{2,t} + \alpha Y_{1,t}\beta & for \quad Y_2(t) < Y_{1,t}\beta \end{cases} \qquad C_{2,t}^{\min} = \frac{\beta}{1+\beta} a_0 \tag{A7}$$

$$Y_{2,t} \geq \theta_{2,t} \tag{A8}$$

$$\theta_{2,t=0} = \eta\left[\frac{\beta}{1+\beta} a_0\right] \tag{A9}$$

$$\theta_t = \theta_{t-1}(1+\mu_t) + \zeta \Delta LR_{t-1} \tag{A10}$$

$$\mu_t = \begin{cases} -\gamma & for \quad perceived \quad stability \\ \tau & for \quad economic \quad distress \end{cases}, \qquad \tau >> \gamma, \; LR_{t-1} = \frac{D_{t-1}}{E_{t-1}},$$

D denotes the amount of negative deposits (*M* < 0)

$$cancel_{2,t} = -\chi_t M_{2,t} \tag{A11}$$

$$\chi_t = \begin{cases} x & if \quad credit \quad constrained \quad and \quad Y_{2,t} < C_2^{\min} \\ 0 & otherwise \end{cases}$$

$$r_{L,t} = r_{L,t-1} + \rho \Delta LR_{t-1} \tag{A12}$$

$$G_t = T_t + \lambda M_{G,t-1} + stimulus_t \tag{A13}$$

$$T_t = \sigma_w \left(w_1 N_{1,\mathrm{t}} + w_{2,t} N_{2,\mathrm{t}} \right) + \sigma_c \left(\pi_{f,t} \Pi_{f,t} + \pi_{b,t} \Pi_{b,t} \right) \tag{A14}$$

$$B_t = T_t + rM_{G,t-1} - G_t \tag{A15}$$

$$I_t = i_0 + i_1 z_{t-1} + i_2 R_{t-1} + i_3 G_{t-1} - i_4 LR_{t-1},$$

where $z_t = \frac{Y_t(t)}{Y_t^*}, \quad Y_t^* = vK_t, \quad R_t = \frac{\Pi_{f,t}}{K_t}$ (A16)

$$K_t = K_{t-1} + I_{t-1} - \delta K_{t-1} \tag{A17}$$

$$\Pi_{f,t} = Y_t - w_1 N_{1,\mathrm{t}} - w_{2,\mathrm{t}} N_{2,\mathrm{t}} + \lambda M_{f,t-1} \tag{A18}$$

$$\Pi_{b,t} = -\left(r_{t-1} M_{1,t-1} + r_{t-1} M_{2,t-1} + r_{t-1} M_{c,t-1} + r_{t-1} M_{f,t-1} + r_{t-1} M_{g,t-1} \right) - cancel_{2,t}(t),$$

where $r_{t-1} = \begin{cases} r_D & for \quad positive \quad deposits \\ r_{L,t-1} & for \quad negative \quad deposits \end{cases}$ (A19)

$$\Delta M_{1,t} = w_1 N_{1,t} + \lambda_{t-1} M_{1,t-1} - C_{1,t} - \varphi M_{1,t-1} \tag{A20}$$

$$\Delta M_{2,t} = w_{2,t} N_{2,t} + \lambda_{t-1} M_{2,t-1} - C_{2,t} + cancel_{2,t} + bailout_{2,t} - \varphi M_{2,t-1}, \tag{A21}$$

where $\varphi = 0$ for $M_{1,2,t-1} \geq 0$

$$\Delta M_{c,t} = \pi_{f,t} \Pi_{f,t} + \pi_{b,t} \Pi_{b,t} + \lambda_{t-1} M_{c,t-1} - C_{c,t} - \varphi M_{t-1}, \tag{A22}$$

where $\varphi = 0$ for $M_{c,t-1} \geq 0$

$$\Delta M_{f,t} = (1-\pi_{f,t})\Pi_{f,t} - I_t - \varphi M_{f,t-1}, \quad \text{(A23)}$$

where $\varphi = 0$ for $M_{f,t-1} \geq 0$

$$\Delta M_{G,t} = B_t - bailout_{b,t} - bailout_{2,t} \quad \text{(A24)}$$

$$\Delta E_t = (1-\pi_{b,t})\Pi_{b,t} + bailout_{b,t} + bailout_{bf,t} \quad \text{(A25)}$$

$$M_{1,t} + M_{2,t} + M_{c,t} + M_{f,t} + M_{G,t} + E_t = 0 \quad \text{(A26)}$$

In each short period output (*Y*) is equal to consumption demand (*C*), realised investment (*I*) and government expenditure (*G*) (A1). The workforce consists of worker households of type $i = 1,2$. Net income of group i households (Y_i) consists of wage income plus (minus) interest income on positive (negative) deposits minus a labour income tax, where w_i denotes group *i*'s nominal wage rate, N_i the labour demand for group i workers, σ_w the labour income tax, M_i deposits of type i households (which is negative when households become net debtors), r_D the interest rate on positive deposits, r_L the interest rate on negative deposits and φ the instalment rate (A2). We assume that household income *within* groups remains equally distributed. Net income of capitalist households (Y_c) equals distributed firm and bank profits minus a capital income tax plus (minus) interest income on positive (negative) deposits, where σ_c denotes the tax rate on capital income, Π_f and Π_b firm and bank profits, π_f and π_b the ratios of distributed firm and bank profits, respectively (A3). In this context losses of firms and banks are absorbed in their balance sheets. Banks distribute all of their profits ($\pi_b = 1$) as long as equity is above their target level Ψ. In the converse case they retain part of their profits (ϑ) until the target is reached. Eventually, M_c collects all deposits of capitalists.

Employment of type 1 and type 2 households depends on aggregate output and labour productivity ψ, where we assume that productivity as well as the ratio of type 2 to type 1 households in the production process (β) is constant (A4).

Consumption of capitalist households depends on an autonomous term b_0 and their disposable income (A5). Equation (A6) and (A7) denote consumption demand of worker households. We assume that as long as these two groups share the same average income, their consumption is fully determined by their disposable income minus debt payments. For simplicity we assume that they do not save and that their consumption cannot fall below subsistence level, where a_0 denotes total subsistence level consumption of the working class. Moreover we assume that once group 2 households' disposable income minus debt payments falls behind the disposable income of group 1 households, the consumption of the former also depends on the consumption of the latter (A7). When type 2 households go into debt to finance consumption banks grant loans to these households as long as their disposable income minus debt payments exceeds a margin of safety θ_2 (A8). Following Minsky (1986), this margin of safety is endogenously determined: it is first defined in multiples of subsistence consumption (A9), decreases slowly during periods of stability and increases rapidly in periods of economic distress (A10), i.e. periods in which household bankruptcies occur. Furthermore we assume that the margin of safety is affected by changes of banks' leverage ratio, where *D* denotes the total amount of outstanding loans (i.e. negative

deposits) and *E* denotes bank equity. When banks stop granting loans to households and the latter cannot afford debt payments, households become bankrupt. In this case banks write off some proportion *x* of existing debt accumulated by group 2 households until these households regain solvency. The amount of debt written off is termed $cancel_2$ (A11). The interest rate on loans r_L is also affected by changes in the leverage ratio (A12).

Government spending G (A13) equals tax income T (A14) minus debt payments on outstanding debt plus fiscal stimulus expenditure ($stimulus$), where M_G denotes the financial balance of the government. In the initial setup we assume that the government runs a balanced budget B as defined in (A15) ($stimulus = 0$).

Realised investment (A16) depends on the past rate of utilisation of the capital stock (*z*), the past rate of return (*R*), government spending (*G*) and the leverage ratio of the banking sector (*LR*), where Y^* denotes potential output and *K* refers to the capital stock. The capital stock evolves dynamically according to equation (A17), where δ denotes the rate of depreciation.

Firm profits (A18) are given by total production (prices are implicitly assumed constant at unity) minus wage costs and payments on outstanding debt, where M_f denotes firm deposits. Bank profits are provided in (A19), while the change in worker deposits is given by equations (A20) and (A21). Debt cancelations ($cancel_2$) as well as bailouts received from the government ($bailout_{2,t}$) improve the financial situations of group 2 households. Equations (A22)-(A23) show the evolution of capitalist and firm deposits. Bailing out households or banks ($bailout_{b,t}$) deteriorates the government's financial position (A24). The development of bank equity is shown by equation (A25), where bank bailouts improve the banks' financial position. Equation (A26) follows from the other equations and states that ultimately deposits and bank equity must sum up to zero. Tables 4 and 5 provide a detailed representation of all stocks and flows incorporated in the model. For a detailed list of all variables and chosen parameter values see Table 6. The detailed simulation results are displayed in Figures 4-7. Results for the bank bailout (section 4.2.1) are sensitive to the magnitude of i_4 in equation (A16), where the stabilising impact of bank bailouts increases relative to the other policies as i_4 increases (Figure 10). On the other hand results for the fiscal stimulus (4.2.2) do not rely on the assumption of $i_4 > 0$ in equation (A16) (Figure 11).[21]

Table 4 / Stock Matrix

	Households			Firms	Government	Banks	Bank Fund	∑
	Worker 1	*Worker 2*	*Capitalists*					
Money deposits	$+M_1$	$+M_2$	$+M_c$	$+M_f$	$+M_g$	+E	$+ M_{bf}$	0
Fixed capital				+K				K
Balance (net worth)	$-V_1$	$-V_2$	$-V_c$	$-V_f$	$-V_g$	$-V_b$	$-V_{bf}$	-K
∑	0	0	0	0	0	0	0	0

Subtracting net worth assures that columns and rows add up to zero. The only row not adding up to zero relates to the capital stock, which is the only stock that is only an asset and not a liability at the same time. See Godley and Lavoie (2007) for further details.

[21] Changing parameters i_3 and i_4 respectively make it necessary to adjust i_0 accordingly in order to start at the same level of investment in period 1.

Table 5 / Flow Matrix

	Households			Firms		Government		Banks		Bank Fund	
	Worker 1	*Worker 2*	*Capitalists*	*Current*	*Capital*	*Current*	*Capital*	*Current*	*Capital*		∑
Consumption	$-C_{1,t}$	$-C_{2,t}$	$-C_{c,t}$	$+C_t$							0
Investment				$+I_t$	$-I_t$						0
Gov. expenditure				$+G_t$		$-G_t$					
[Production]				$[Y_t]$							
				$-w_1N_{1,t}$							
Wages	$+w_1N_{1,t}$	$+w_{2,t}N_{2,t}$		$-w_{2,t}N_{2,t}$							0
Taxes and Bank Fund contributions	$-\sigma_w w_1 N_{1,t}$	$-\sigma_w w_{2,t} N_{2,t}$	$-\sigma_c\,[\pi_{f,t}\Pi_{f,t}+\pi_{b,t}\Pi_{b,t}]$			$+T_t$		$-\Omega_t$		$+\Omega_t$	0
								$-r_{t-1}M_{1,t-1}$			
								$-r_{t-1}M_{2,t-1}$			
								$-r_{t-1}M_{c,t-1}$			
								$-r_{t-1}M_{f,t-1}$			
						$+r_{t-1}M_{g,t-1}$		$-r_{t-1}M_{f,t-1}$			
Interest	$+r_{t-1}M_{1,t-1}$	$+r_{t-1}M_{2,t-1}$	$+r_{t-1}M_{c,t-1}$	$+r_{t-1}M_{f,t-1}$				$-r_{t-1}M_{g,t-1}$			0
	$+\varphi M_{1,t-1}$	$+\varphi M_{2,t-1}$	$+\varphi M_{c,t-1}$	$+\varphi M_{f,t-1}$		$+\varphi M_{g,t-1}$					
Repayment	$-\varphi M_{1,t-1}$	$-\varphi M_{2,t-1}$	$-\varphi M_{c,t-1}$	$-\varphi M_{f,t-1}$		$-\varphi M_{g,t-1}$					0
Debt cancelation		$+cancel_{2,t}$						$-cancel_{2,t}$			0
							$-bailout_{b,t}$		$+bailout_{b,t}$		
Bailouts		$+bailout_{2,t}$					$-bailout_{2,t}$		$+bailout_{bf,t}$	$-bailout_{bf,t}$	0
Profits			$+\pi_{f,t}\Pi_{f,t}+\pi_{b,t}\Pi_{b,t}$	$-\Pi_{f,t}$	$+(1-\pi_{f,t})\Pi_{f,t}$	$-B_t$	$+B_t$	$-\Pi_{b,t}$	$+(1-\pi_{b,t})\Pi_{b,t}$		0
Δ Deposits	$-\Delta M_{1,t}$	$-\Delta M_{2,t}$	$-\Delta M_{c,t}$		$-\Delta M_{f,t}$		$-\Delta M_{g,t}$		$-\Delta E_t$	$-\Delta M_{bf,t}$	0
∑	0	0	0	0	0	0	0	0	0	0	0

Note that $C = C_{w1}+C_{w2}+C_c$ and that for the respective sector $r = r_D$ if its money balance is positive and $r = r_L$ otherwise. Note further that for the respective sector $\varphi = 0$ if its money balance is positive and that repayment of debt is done out of current income (and enters with a positive sign since money deposits are negative for indebted households) and is canceled out in the same column since repayments go directly into the respective deposits. Note finally that all rows and columns add up to zero, assuring the model's stock-flow consistency. See Godley and Lavoie (2007) for further details.

A1. BANK BAILOUT

This scenario assumes that that all the losses incurred by the banking sector in periods where they have to write off household debt are born by the government:

$$bailout_{b,t} = \begin{cases} 0 & for \quad perceived \quad stability \\ -\Pi_{b,t-1} & for \quad economic \quad distress \quad in \quad t-1 \quad and \quad \Pi_{b,t-1} < 0 \end{cases} \tag{A27}$$

A2. FISCAL STIMULUS

In this scenario the amount that would be necessary to compensate the banks for their incurred losses (see condition A26) becomes disposable for a fiscal stimulus. Since these losses can be quite large, we assume that the government spends only 30% of the deviation of current output from its 10 period mean

each period. Spending continues until cumulative stimulus expenditures have reached the level of previous bank losses or output has recovered sufficiently to exceed its 10 period mean ($Y_{t-1} \geq \frac{1}{10}\sum_{i=1}^{10} Y_{t-1-i}$).

$$stimulus_t = 0.3\left(\frac{1}{10}\sum_{i=1}^{10} Y_{t-1-i} - Y_{t-1}\right) \tag{A28}$$

A3. HOUSEHOLD BAILOUT

In this case the money that would be necessary to compensate banks for their losses is used to bailout households.

$$bailout_{2,t} = \begin{cases} 0 & for \quad perceived \quad stability \\ -\Pi_{b,t-1} & for \quad economic \quad distress \quad in \quad t-1 \quad and \quad \Pi_{b,t-1} < 0 \end{cases} \tag{A29}$$

A4. BANK FUND

In each period banks have to make contributions (Ω) to a Bank Fund. They consist of a share σ_{bf} of their net interest receipts minus debt write-offs as long as the former exceed the latter, otherwise $\sigma_{bf} = 0$ (A30). Bank profits change accordingly so that equation (A19) turns into (A19a). In case of bankruptcy-related losses, banks will be bailed out by the fund (A31). Equation (A32) gives the evolution of the Bank Fund. Accordingly, equation (A26) changes into (A26a).

$$\Omega_t = \sigma_{bf,t}\left[-\left(r_{t-1}M_{1,t-1} + r_{t-1}M_{2,t-1} + r_{t-1}M_{c,t-1}(t-1) + r_{t-1}M_{f,t-1} + r_{t-1}M_{g,t-1}\right) - cancel_{2,t}\right] ,$$

where $\sigma_{bf,t} = \begin{cases} \xi & for \quad -\left(r_{t-1}M_{1,t-1} + r_{t-1}M_{2,t-1} + r_{t-1}M_{c,t-1}(t-1) + r_{t-1}M_{f,t-1} + r_{t-1}M_{g,t-1}\right) - cancel_{2,t} > 0 \\ 0 & otherwise \end{cases}$ (A30)

$$\Pi_{b,t} = \left(1 - \sigma_{bf}\right)\left[-\left(r_{t-1}M_{1,t-1} + r_{t-1}M_{2,t-1} + r_{t-1}M_{c,t-1}(t-1) + r_{t-1}M_{f,t-1} + r_{t-1}M_{g,t-1}\right) - cancel_{2,t}\right] ,$$

where $r_{t-1} = \begin{cases} r_D & for \quad positive \quad deposits \\ r_{L,t-1} & for \quad negative \quad deposits \end{cases}$ (A19a)

$$bailout_{bf,t} = \begin{cases} 0 & for \quad perceived \quad stability \\ -\Pi_{b,t-1} & for \quad economic \quad distress \quad in \quad t-1 \quad and \quad \Pi_{b,t-1} < 0 \end{cases} \tag{A31}$$

$$\Delta M_{bf,t} = \Omega_t - bailout_{bf,t} \tag{A32}$$

$$M_{1,t} + M_{2,t} + M_{c,t} + M_{f,t} + M_{G,t} + M_{bf,t} + E_t = 0 \tag{A26a}$$

Figure 6 / Simulation results bank bailout scenario

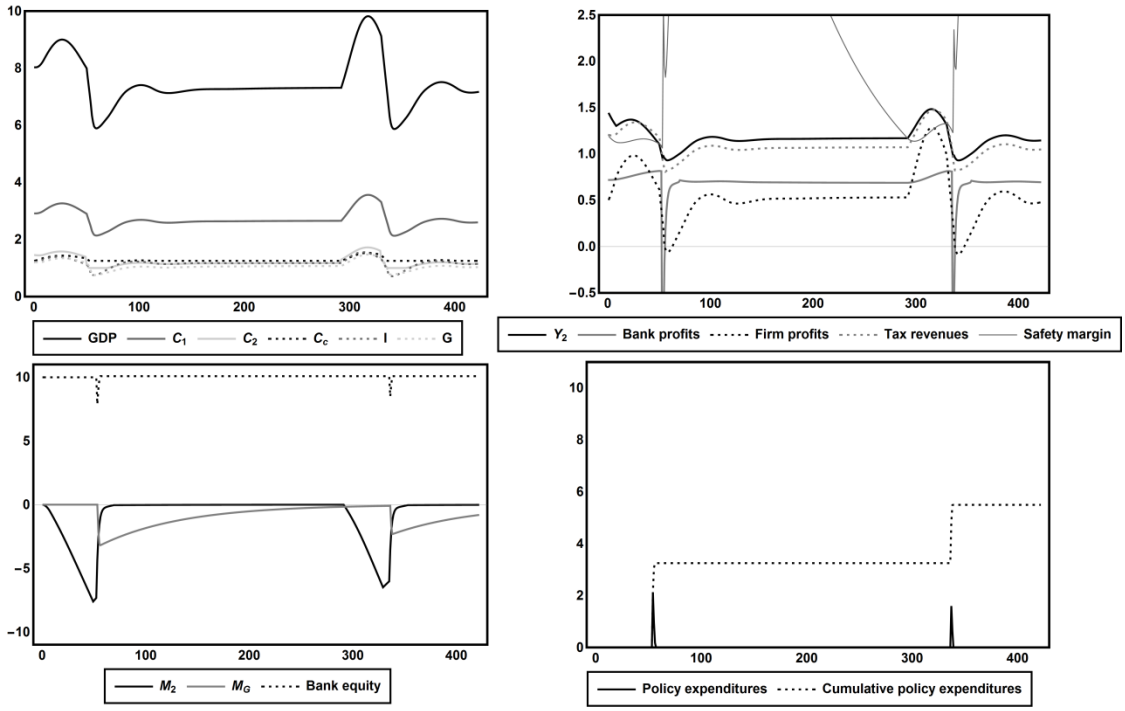

Figure 7 / Simulation results fiscal stimulus scenario

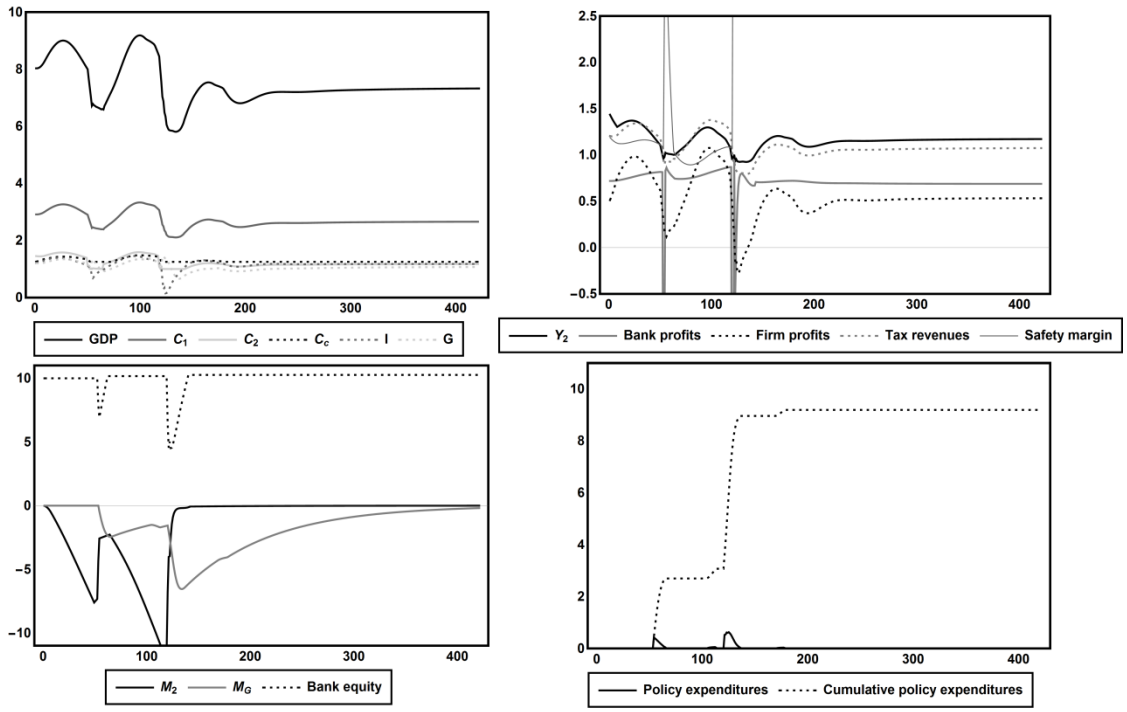

Figure 8 / Simulation results household bailout scenario

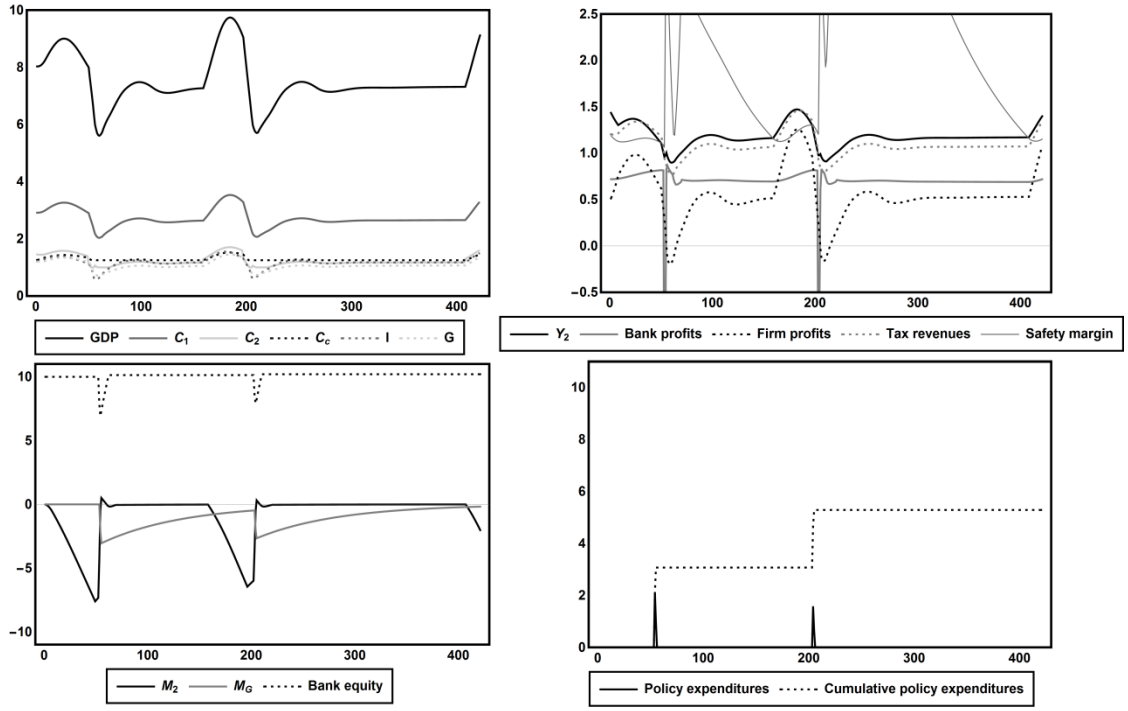

Figure 9 / Simulation results for the Bank Fund scenario

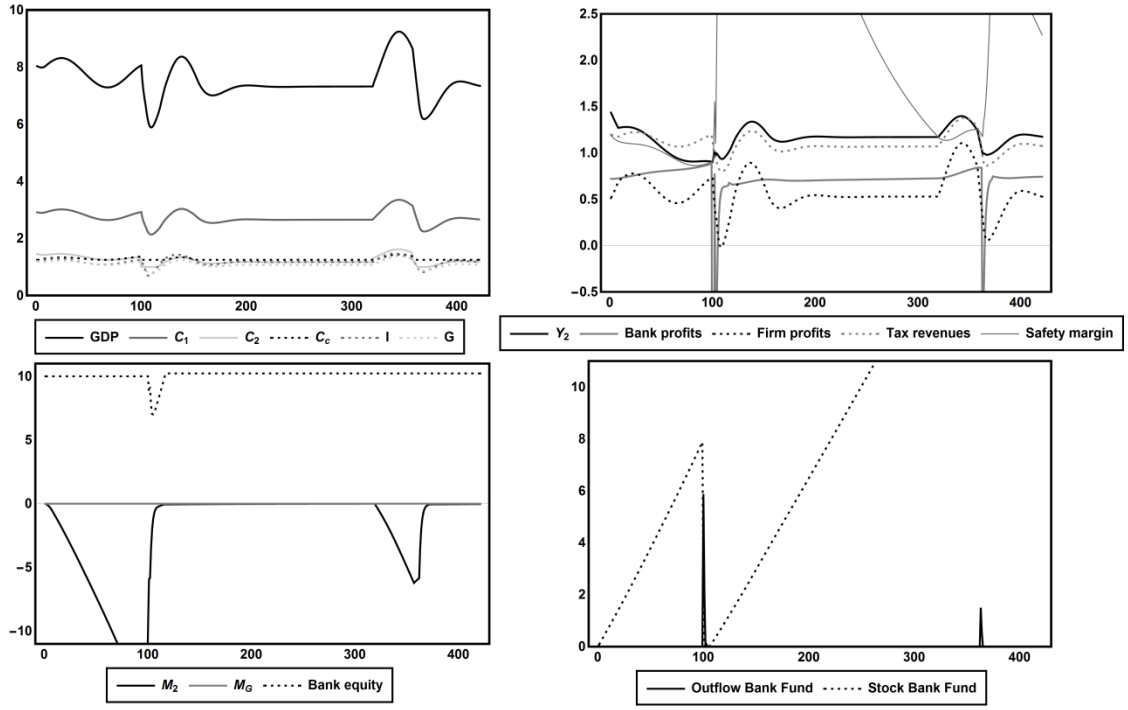

Figure 10 / Simulation results when increasing i_4 by 100%

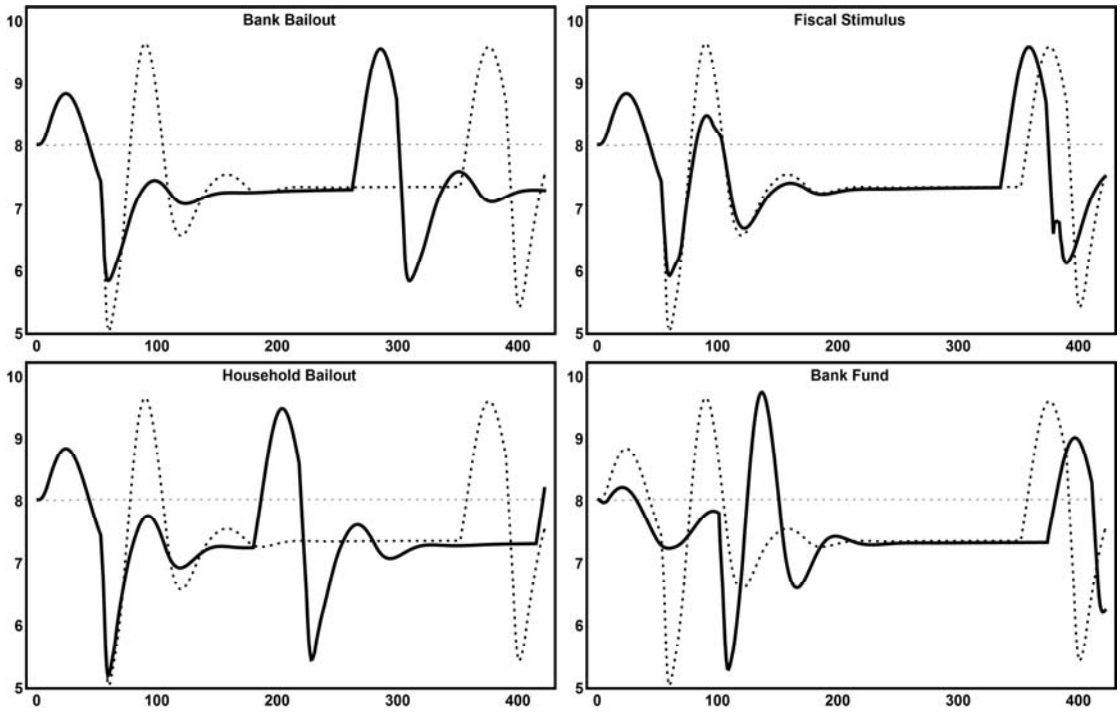

Figure 11 / Simulation results when $i_3 = 0$

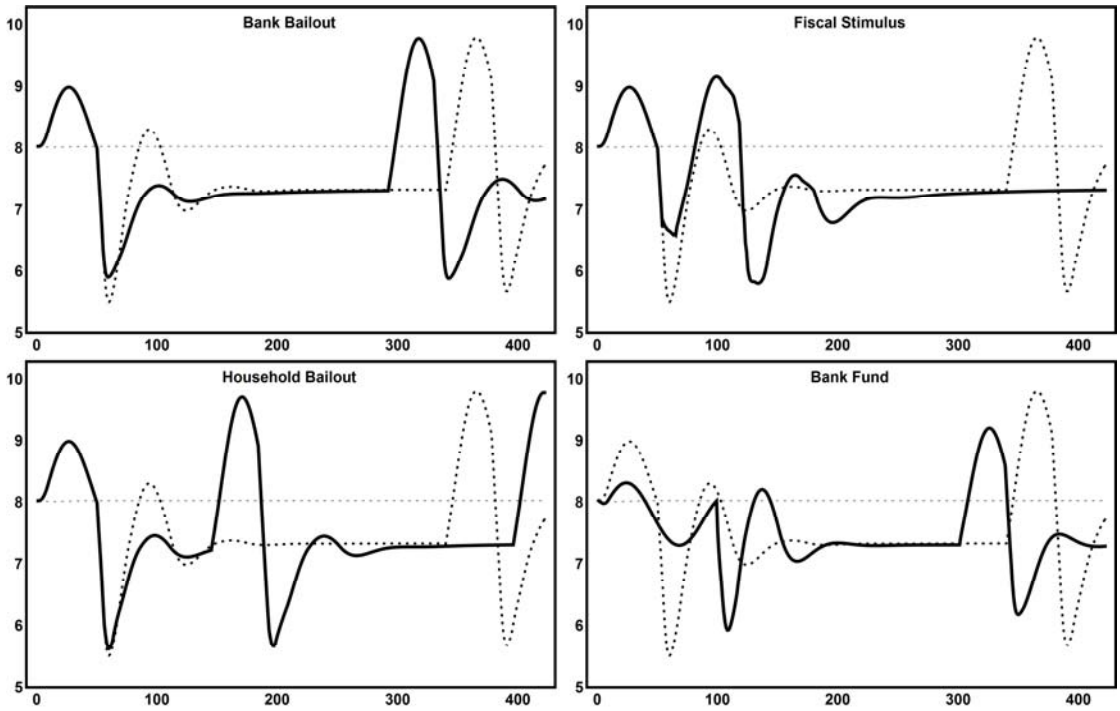

Table 6 / List of variables and parameter values

Variable	Description	Starting value	Laissez-faire	Bank bailout	Stimulus	HH bail-out	Bank Fund	Regu-lation
Aggregate production, employment and demand								
Y	Aggregate output	8.03	endogenous					
C	Aggregate consumption	endogenous						
I	Realised investment	endogenous						
G	Government expenditure	endogenous						
Y_i	Group i households' disposable income minus debt payments	endogenous						
Y_c	Disposable income capitalists	endogenous						
w_1	Real wage rate of group 1 households	0.68						
w_2	Real wage rate of group 2 households	0.68	0.6 (after gradual adjustment within the first 8 periods)					
N_i	Demand for labour of group i households	endogenous						
β	N_2 / N_1	0.5						
ψ	Labour productivity	1						
Money deposits and bank equity								
M_1	Bank account of type 1 workers	0	endogenous					
M_2	Bank account of type 2 workers	0	endogenous					
M_c	Bank account of capitalists	82.44	endogenous					
M_f	Bank account of firms	-92.44	endogenous					
M_G	Bank account of government	0	endogenous					
E	Bank equity	10	endogenous					
Consumer behaviour								
C_i	Consumption demand of type i workers	endogenous						
C_c	Consumption demand of capitalists	endogenous						
a_0	Aggregate subsistence level consumption of the working class (group 1 + group 2 workers)	3						
a_1	Workers' marginal propensity to consume in the absence of relative consumption concerns	1						
b_0	Autonomous consumption of capitalists	1.25						
b_1	Marginal propensity to consume of capitalists	0.4						
α	Relative consumption parameter	0.8						
Government sector								
σ_w	Labour income tax rate	0.2						
σ_c	Profit income tax rate	0.1						
T	Total tax income	endogenous						

(Table ctd.)

Table 6 / ctd.

Variable	Description	Starting value	Laissez-faire	Bank bailout	Stimulus	HH bail-out	Bank Fund	Regu-lation
B	Government budget	endogenous						
$stimulus$	Fiscal stimulus expenditure	NA			endo-genous	NA		endo-genous
$bailout_b$	Government bailout received by banks	NA		endo-genous	NA			endo-genous
$bailout_2$	Government bailout received by group 2 households	NA				end.	NA	endo-genous
$bailout_{bf}$	Bank bailout received from Bank Fund	NA						endo-genous
Ω	Contributions to Bank Fund	NA					endogenous	
σ_{bf}	Share of net interest receipts minus debt write-offs that have to be put into the Bank Fund	NA					endogenous	
ξ	Share of net interest receipts minus debt write-offs that have to be put into the Bank Fund if the former exceed the latter	NA					0.1	
Profits and capital accumulation								
Π_f	Profit firms	0.49	endogenous					
Π_b	Profit banks	endogenous						
π_f	Rate of distributed profits (firms)	v for $\Pi_f \geq 0$ and 0 for $\Pi_f < 0$						
v	Rate of distribution for (positive) firm profits	0.9						
π_b	Rate of distributed profits (banks)	endogenous						
Ψ	Target value of bank equity	10						
ϑ	Rate of distributed bank profits when bank equity is low	0.5						
i_0	Exogenous investment	0.5						
i_1	Influence of *z* on investment	1.5						
i_2	Influence of *R* on investment	15						
i_3	Influence of *G* on investment	0.01						
i_4	Influence of *LR* on investment	-0.05						
K	Capital stock	48.13	endogenous					
v	Relation of *Y** and *K*	0.25						
Y^*	Level of potential output	endogenous						
z	Level of capacity utilisation	endogenous						
R	Rate of return	endogenous						
δ	Depreciation rate	0.1*						
Financial sector								
r	Real interest rate	r_D in case of positive deposits and r_L in case of negative deposits						
λ		r_D in case of positive deposits and $r_L + \varphi$ in case of negative deposits						

(Table ctd.)

Table 6 / ctd.

Variable	Description	Starting value	Laissez-faire	Bank bailout	Stimulus	HH bail-out	Bank Fund	Regu-lation
r_D	Real interest rate on positive deposits	0.01*						
r_L	Real interest rate on negative deposits (loans)	0.045*	endogenous					
φ	Instalment rate	0.05*						
$cancel_2$	Debt cancelation for type 2 households	endogenous						
θ_2	Margin of safety for type 2 households	endogenous						
η	Relation between subsistence level consumption and the initial margin of safety	1.2						
D	Total amount of outstanding loans	endogenous						
LR	Leverage ratio of the financial sector (L/E)	endogenous						
ζ	Influence of a change in the leverage ratio on the margin of safety	0.5						500
μ	Margin of safety parameter	γ in periods of perceived stability and τ in periods of economic distress						
γ	Rate of decrease of the margin of safety during periods of stability	-0.01						
τ	Rate of increase of the margin of safety during periods of economic distress	0.15						
χ	Rate of debt cancelation	endogenous						
x	Rate of debt cancelation in case of bankruptcy	0.4						
ρ	Influence of LR on r_L	0.001						

* We assume one model period to correspond to one quarter; all interest and instalment rates are therefore divided by four before entering the simulation.

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