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Frontiers of Heterodox Macroeconomics

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International Papers in Political Economy

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This series consists of an annual volume with a single theme. The objective of the IPPE is the publication of papers dealing with important topics within the broad framework of Political Economy.

The original series of *International Papers in Political Economy* started in 1993, until the new series began in 2005, and was published in the form of three issues a year with each issue containing a single extensive paper. Information on the old series and back copies can be obtained from the editors: Philip Arestis (pa267@cam.ac.uk) and Malcolm Sawyer (e-mail: mcs@lubs.leeds.ac.uk).

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Preface

This is the sixteenth volume of the series of *International Papers in Political Economy* (*IPPE*). This series consists of an annual volume with eight papers on a single theme. The objective of the *IPPE* is the publication of papers dealing with important topics within the broad framework of Political Economy.

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The theme of this sixteenth volume of eight papers is *Frontiers of Heterodox Macroeconomics*. The papers in this volume were initially presented at a one-day conference in Cambridge, UK (Downing College), March 28, 2019. The conference was organised by the Department of Land Economy, University of Cambridge, under the aegis of the Cambridge Trust for New Thinking in Economics, entitled *Frontiers of Heterodox Macroeconomics*. The Cambridge Trust for New Thinking in Economics fully supported and financed the conference. The papers

were subsequently presented at the 16th International Conference, entitled *Developments in Economic Theory and Policy*, held at the University of the Basque Country UPV/EHU, Bilbao, Spain, June 27–28, 2019, which was fully supported and funded the special sessions to which the papers included in this volume were presented. We are grateful to the organisers of the Bilbao conference and to the Cambridge Trust for all the help and funding provided.

Cambridge, UK — Philip Arestis
Leeds, UK — Malcolm Sawyer

Contents

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1

Critique of the New Consensus Macroeconomics and a Proposal for a More Keynesian Macroeconomic Model

Philip Arestis

1 Introduction

This contribution begins with the New Consensus Macroeconomics (NCM) in the case of an open economy (see also, Arestis 2007a, b, 2009b, 2011; Arestis and González Martinez 2015), which is critically discussed. We should note that the 'Global Financial Crisis' (GFC) and the 'Great Recession' (GR) have forced the profession to begin to reexamine the theoretical and policy propositions of the NCM. Blanchard (2011), for example, argues that the crisis "forces us to do a wholesale reexamination of those principles" (p. 1). It is true that following the GR some aspects of the NCM have been questioned and relevant changes undertaken. Still problems remain. We propose a new theoretical framework that goes well beyond the NCM and its main inflation targeting policy (see also, Arestis 2007b, 2009b, 2010). We discuss our theoretical framework along with its economic policies, and suggest

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that in addition to fiscal and monetary policies, which should be properly coordinated, two 'new' policy dimensions, which had been ignored prior to the GFC, are proposed. These policies are distributional effects and financial stability, both of which are necessary to avoid crises similar to the GFC, and the subsequent GR.

We proceed in Sect. 2 with the open economy theoretical framework of the NCM and its policy implications; we critically appraise the NCM and its policy implications. Section 3 deals with our proposal of a different theoretical framework, along with its economic policy implications, emphasising distributional, and financial stability policies. Section 4 summarises and concludes.

2 New Consensus Macroeconomics and Policy Implications

We discuss in this section the open economy NCM model, along with its policy implications.

2.1 The Open Economy NCM Model

We employ the following six-equation model for the open economy NCM model.[1]

$$Y_t^g = a_0 + a_1 Y_{t-1}^g + a_2 E_t\left(Y_{t+1}^g\right) + a_3\left[R_t - E_t(p_{t+1})\right] + a_4(rer)_t + s_1 \quad (1)$$

$$p_t = b_1 Y_t^g + b_2 p_{t-1} + b_3 E_t\left(p_{t+1}\right) + b_4\left[E_t\left(p_{wt+1}\right) - E_t \Delta(er)_t\right] + s_2 \quad (2)$$

$$R_t = (1 - c_3)\left[RR^* + E_t(p_{t+1}) + c_1 Y_{t-1}^g + c_2\left(p_{t-1} - p^T\right)\right] + c_3 R_{t-1} + s_3 \quad (3)$$

[1]The six equations draw on Arestis (2007b, 2011); see also, Angeriz and Arestis (2007), and Arestis and González Martinez (2015). We add relevant revisions and arguments as necessary.

$$(rer_t) = d_0 + d_1\left[\left[(R_t) - E_t(p_{t+1})\right] - \left[(R_{wt}) - E(p_{wt+1})\right]\right] + d_2(CA)_t + d_3E(rer)_{t+1} + s_4 \quad (4)$$

$$(CA)_t = e_0 + e_1(rer)_t + e_2Y_t^g + e_3Y_{wt}^g + s_5 \quad (5)$$

$$er_t = rer_t + P_{wt} - P_t \quad (6)$$

The symbols have the following meaning: a_0, d_0, and e_0 are constants; Y^g is the domestic output gap (the difference between actual and trend output; the latter is the output that prevails when prices are perfectly flexible, and as such it is a long-run variable, determined by the supply-side of the economy); Y_w^g is world output gap, R is nominal rate of interest, R_w the world nominal interest rate, p is the rate of domestic inflation, p_w the world inflation rate, and p^T is the target inflation rate to be achieved by the independent Central Bank. RR^* is the 'equilibrium' real rate of interest, that is the rate of interest consistent with zero output gap, which implies from Eq. (2) a constant rate of inflation; (*rer*) stands for the real exchange rate, and (*er*) for the nominal exchange rate, defined as in Eq. (6) and expressed as foreign currency units per domestic currency unit. *CA* is the current account of the balance of payments, s_i (with $i = 1, 2, 3, 4, 5$) represents stochastic shocks, and E_t refers to expectations held at time *t*. P_w and P (both in logarithms) are world and domestic price levels, respectively. The change in the nominal exchange rate can be derived from Eq. (6) as in $\Delta er = \Delta rer + p_{wt} - p_t$.

Equation (1) is the aggregate demand equation with the current output gap determined by past and expected future output gap, the real rate of interest and the real exchange rate (through effects on the demand for exports and imports). Equation (1) emanates from intertemporal optimisation of expected lifetime utility of the representative agent who never defaults on debts, and under the assumption of short-run wage and price rigidities or frictions of the Calvo (1983) type. This optimisation reflects optimal consumption smoothing subject to a budget constraint, and based on the transversality condition that all debts are ultimately paid in full. The latter condition means that all economic agents with their rational expectations are perfectly

credit worthy, and agents would never default. There is, thus, no need for a specific monetary asset. Under such circumstances, no individual economic agent or firm is liquidity constrained, which implies that there is no need for financial intermediaries (commercial/investment banks or other non-bank financial intermediaries) and money (see also, Goodhart 2004, 2007, 2009).

The non-appearance of money in the model is justified on the assumption that the Central Bank allows the money stock to be a residual to achieve the desired real rate of interest (Woodford 2008). Thereby money plays no role other than being a unit of account (Galí and Gertler 2007). Furthermore, there is the question of the role for investment, introduced in terms of the expansion of the capital stock that is required to underpin the growth of income. There is then by assumption, no independent investment function that arises from firms' decisions (Woodford 2003, Chapter 4).

Equation (2) is a Phillips curve, derived from the intertemporal-optimising representative firm in a model of staggered price setting as, for example, in Calvo (1983). Inflation in Eq. (2) is based on the current output gap, past and future inflation, expected changes in the nominal exchange rate, and expected world prices; the latter accounts for imported inflation. The model allows for sticky prices in the short run, the lagged price level in this relationship, and full price flexibility in the long run. It is assumed that $b_2 + b_3 + b_4 = 1$, thereby implying a vertical Phillips curve in the long run at the point of the Non-Accelerating Inflation Rate of Unemployment (NAIRU). The term $E_t(p_{t+1})$ captures the forward-looking aspect of inflation determination. It implies that the Central Bank's success to achieve its inflation target not only does it depend on its current policy stance but also on what economic agents perceive that stance to be in the future. The assumption of rational expectations is important in this respect. Agents are in a position to know the consequences of current policy actions on the future inflation rate. Consequently, the term $E_t(p_{t+1})$ is viewed to reflect Central Bank credibility. If the Central Bank can achieve its inflation target, then expectations of inflation are contained. Expected changes in import prices and in the nominal exchange rate are another two important determinants of inflation as shown in Eq. (2).

Equation (3) is a monetary policy rule of the Taylor (1993, 1999, 2001) type. It is derived from the optimisation of the monetary authorities' loss function subject to the model utilised. The nominal interest rate, thereby derived, is related to the equilibrium rate of interest (*RR**), defined as the "equilibrium real rate of return when prices are fully flexible" (Woodford 2003, p. 248), expected inflation, output gap, deviation of inflation from target, and with the lagged interest rate representing the monetary authorities' interest rate 'smoothing'. The exchange rate is assumed to play no role in the setting of interest rates (except in so far as changes in the exchange rate have an effect on the rate of inflation, which clearly would feed into the interest rate rule). When inflation is on target and output gap is zero, the actual real rate is equal to the equilibrium rate of interest *RR**. This implies that provided the Central Bank has an accurate estimate of *RR** then the economy can be guided to an equilibrium of the form of a zero output gap and constant targeted inflation rate. In this case, Eq. (1) indicates that aggregate demand is at a level that is consistent with a zero output gap. This would imply that the real interest rate *RR** brings equality between (*ex ante*) savings and investment, which corresponds to the Wicksellian 'natural rate' of interest (Wicksell 1898).

Equation (4) determines the exchange rate as a function of the difference between domestic and world interest rates, current account, and expectations of future exchange rates. Equation (5) determines the current account as a function of the real exchange rate, domestic and world output gaps. Equation (6) expresses the nominal exchange rate in terms of the real exchange rate. It should be emphasised that since the exchange rate does not play any direct role in the setting of interest rates by the Central Bank (as in Eq. 3), the NCM framework has been criticised by, for example, Angeriz and Arestis (2007). The criticism is that ignoring it there is the danger of a combination of internal price stability and exchange rate instability. It is thereby suggested that the exchange rate should be included in Eq. (3).

There are six equations and six unknowns: output, interest rate, inflation, real exchange rate, current account, and nominal exchange rate.

We proceed in Sect. 2.2 to discuss the economic policy implications of the NCM model.

2.2 Economic Policy Implications of the NCM Model

The NCM model is a framework in which there is no role for 'banking and money', and there is only a single rate of interest. Price stability is the primary objective of monetary policy. Inflation is a monetary phenomenon and as such, it can only be controlled by monetary policy; this being the rate of interest set by the Central Bank. Monetary policy is thereby undertaken through inflation targeting (IT), which requires Central Banks to utilise inflation as an indicator of when to expand or contract monetary policy. Central Banks should be independent and should not be affected by politicians. Monetary policy is thereby upgraded with its major objective being the maintenance of 'price stability'. It is also assumed that once price stability is achieved, macroeconomic and financial stability emerge. Fiscal policy is downgraded as an active instrument of economic policy. It should only rely on automatic stabilisers, but more importantly, it should be concerned with broadly balancing the government budget. This is based on crowding out of government deficits, the rational expectations hypothesis and the Ricardian Equivalence Theorem.

Another important assumption is the existence of short-run nominal rigidities in the form of sticky wages, prices, and information. This is so in view of firms set their prices based on current and future marginal costs. The future marginal costs, though, are relatively unaffected by monetary policy; inflation thereby is not affected by changes in the nominal rate of interest in the short run (Christiano et al. 2018, p. 116). However, real interest rate changes, which affect current consumption, lead to a change in labour income, thereby affecting contemporaneously consumption and employment. Employment influences wages and marginal costs, thereby influencing inflation in the medium to long run. The role of 'expected inflation', included in Eq. (3), is also important. The inflation target itself and the forecasts of the Central Bank are thought of as providing a strong steer to the perception of expected inflation. Given the lags in the transmission mechanism of the rate of interest to inflation, and the imperfect control of inflation, inflation forecasts become the intermediate target of monetary policy with the ultimate target being the actual inflation rate (Svensson 1997, 1999).

2.3 Assessing the New Consensus Macroeconomics

We begin by noting that there is insufficient evidence that the NCM theoretical propositions are empirically validated (Arestis and Sawyer 2004b, 2008; Arestis 2013). Another example on this score is the Kaplan and Violante (2018) conclusion that "The high sensitivity of consumption to interest rates is not well supported by macro or micro data. Analyses using aggregate time-series data typically find that, after controlling for aggregate income, consumption is not very responsive to changes in interest rates" (p. 172). Furthermore, the NCM model is characterised by an interest rate rule, where the money market and financial institutions are not modelled. The downgrading of monetary aggregates in NCM models has gone too far as, for example, Goodhart (2007) suggests. Not accounting for banks is a serious omission. Banks and their decisions play a considerably significant role in the transmission mechanism of monetary policy. In addition, the perfect capital market assumption implies the absence of credit-rationing, with the only effect of monetary policy being the 'price effect' in response to changes in the rate of interest.

Countries that do not pursue IT policies have done as well as the IT countries in terms of inflation and locking-in inflation expectations at low levels of inflation (Angeriz and Arestis 2007, 2008). A related issue is the notion of independent Central Banks, which is criticised by Angeriz et al. (2008) in that only a marginal effect of such independence is in evidence in terms of its impact on inflation, inflation persistence and containment of inflationary expectations. Angeriz and Arestis (2007, 2008) also show that low inflation and price stability do not always lead to macroeconomic stability. The GFC/GR provides ample evidence of this conclusion. But even prior to the GFC/GR, steady output growth and stable inflation had been associated with growing imbalances, essentially in the balance sheets of households, firms, and financial institutions. All these imbalances proved to have been very costly indeed (Arestis and Karakitsos 2011); especially for households, as Mian and Sufi (2018) demonstrate, in view of the household debt, which increases suddenly and generates a boom-bust cycle in real economic activity. Such debt expansion is generated by enhanced

willingness of banks to lend and the pressures on households to borrow. Mian and Sufi (op. cit.) refer to evidence that shows that a sudden increase in the household debt-to-GDP ratio generates a boom-bust cycle in the real economy that is similar to the credit cycle. In terms of the supply shocks, the authors suggest that based on an analysis of historical episodes, a shock that leads to a rapid influx of capital into the financial system often results in an expansion in credit supply. The International Monetary Fund (2017) report concludes that increases in household debt enhance growth in the short-term but may produce macroeconomic and financial stability risks in the medium term. Furthermore, Angeriz and Arestis (2007) argue that insufficient attention is paid to the exchange rate in that it is not accounted in the monetary policy rule. Yet it should be noted that the real exchange rate affects the demand for imports and exports, and thereby the level of demand and economic activity; but it is not included in Eq. (3) as mentioned above. In addition, the IT policy framework assumes that only demand-pull inflation can be tackled; supply/cost-push inflation is not taken on board (Arestis and Sawyer 2008).

The NCM downgrades fiscal policy as an instrument of economic policy. However, there is insufficient evidence on this score in terms of both theoretical (see, for example, Arestis 2009a, 2012; Arestis and Sawyer 2003, 2004a; see also, Pesaran and Smith 2011) and empirical (see, for example, Angeriz and Arestis 2009; Arestis 2012) grounds. The relevant unrealistic assumptions, which lack relevant empirical evidence, are: rational expectations and the Ricardian Equivalence Theorem, the existence of perfect capital markets, the ability for individuals to borrow and save whenever they want, the assumption that individuals are willing to save for future tax increases (Arestis and Sawyer 2003, 2004a; see also, Bernheim 1987). Furthermore, and as Arestis (2015) shows, fiscal policy can cure unemployment, especially when coordinated with monetary and financial stability policies. Furthermore, there is insufficient evidence for a long-run vertical Phillips curve and for the relevant NCM assumption that NAIRU is only affected by the supply-side of the economy but unaffected by aggregate demand and economic policy (Juselius 2008; Sawyer 2010). In addition, the assumption of a vertical long-run Phillips curve implies no voluntary unemployment.

This is clearly not acceptable, as some contributors have argued (see, for example, Blanchard 2008). The IMF (2013) study, for example, suggests that "Some have inferred that the failure of inflation to fall is evidence that output gaps are small and that the large increases in unemployment are mostly structural ……. Others have argued that the stability of inflation reflects the success of Central Banks inflation-targeting in anchoring inflation expectations and, thus, inflation" (pp. 1–2). Gilchrist et al. (2017) propose that "financial frictions closely relate to the Phillips curve flattening in view of financially constrained firms increased prices in 2008 while their unconstrained parts cut prices" (p. 10). The IMF (2013) study provides relevant evidence, and concludes, "inflation has been quiescent recently because expectations have become more anchored and the relationship between cyclical unemployment and inflation has become more muted" (p. 2). This raises the issue of whether IT makes sense with a flatten Phillips Curve. The IMF (2013) study discusses this issue to conclude that a 'flexible inflation targeting' that also targets output and unemployment gaps is desirable if no conflict exists with IT. It is also suggested that inflation measures should account for large asset price increases, and 'labour earnings net of productivity gains'.

There are major and insurmountable problems with the notion of a representative agent. Solow (2008) argues that "a modern economy is populated by consumers, workers, pensioners, owners, managers, investors, entrepreneurs, bankers, and others, with different and sometimes conflicting desires, information, expectations, capacities, beliefs, and rules of behaviour" (p. 243; see also, Colander et al. 2009). Caballero (2010) suggests that the parameter to calibrate the intertemporal substitution elasticity of a representative agent is estimated from micro data, and then utilised at the macro level. But the relevant question is 'what does it have to do with the aggregate?' Kaplan and Violante (2018) argue, "Consumption behaviour in representative agent models is inconsistent with empirical evidence" (p. 171). A related problem is the argument of the NCM supporters that the incorporation of microfoundations in the NCM macroeconomics has contributed to a better appreciation of economics. Hartley (1997) is right to suggest, "Scientific progress has not been kind to the myth of microfoundations.

As we learn more and more, it becomes ever more apparent that Keynes was right, that it is not possible to provide microfoundations now nor will it be at any foreseeable point in the future. The realisation is spreading slowly that the golden fleece is not really at the end of the ocean, that we need once again to take up the task Keynes set for us of building up theories of aggregate economics" (p. 177). There is also the related question of whether they are the correct microfoundations, and if not, whether serious problems and weaknesses may be present (King 2012; Sawyer 2018). These aspects are important and related to the assumption of the 'representative agent' and its implications. The representative consumer is assumed to maximise her/his utility function subject to the budget constraint in order to derive her/his demand function. This individual demand curve is utilised as the exact specification of the aggregate demand curve; and as Hartley (1997) notes, "the aggregate curve must be exactly the same as the rigorously derived individual curve" (p. 4), which is an important requirement of the NCM representative agent. However, such requirement is clearly a major weakness of the NCM usage of the 'representative agent' dimension. This is so since "In these models, the macroeconomy is studied not by working out theories regarding how aggregate economies behave, but rather by working out theories regarding how an individual behaves and transferring these rules of behaviour to the aggregate level" (Hartley, op. cit., p. 3). There is also, in this context, the problem Keynes (1936) identified as the 'fallacy of composition'. Hartley (1997) suggests on this issue, "The fallacy of composition is an inherent part of using a representative agent model. In fact, quite remarkably, the representative agent model is exactly the embodiment of the fallacy of composition" (p. 171).

The NCM theoretical framework adopts the assumption of the 'Efficient Markets Hypothesis' (EMH); namely that all unfettered markets clear continuously, thereby making disequilibria, such as bubbles, highly unlikely as the root of crises. Thereby economic policies designed to eliminate bubbles are not needed. However, the GFC/GR clearly demonstrated the failure of the EMH. A related and serious NCM omission is the role of what Keynes (1936) described as 'animal spirits'. Failure to account for 'animal spirits', in the conduct of monetary policy, can lead to wrong conclusions. For under such circumstances,

monetary policy can become ineffective. Witness the experience since the GR, a period over which interest rates have been reduced substantially; but have had a feeble effect. Also relevant in this context is the approach of Minsky (1986), which elaborates on the 'boom and bust' nature of the financial system. It does not lead to regular uniform cycles but does indicate the ways in which a period of apparent stability with optimism, encouragement of risk-taking, development of asset bubbles, etc., leads into a fragile financial system.[2]

The equilibrium real rate of interest and its discrepancy from the actual real rate of interest, which has been termed the real interest rate gap, can be used to evaluate the stance of monetary policy. It is thereby a useful concept in the analysis of the relationship between the independence of monetary policy and economic fluctuations (Weber et al. 2008). In terms of the six equations above, and Eq. (3) in particular, the equilibrium real rate of interest secures zero output gap consistent with the inflation target; therefore, once the equilibrium real rate of interest is reached, there is no deficient or excessive aggregate demand. Weber et al. (2008) demonstrate persuasively that although the real rate of interest could play an important role in the conduct of current monetary policy there are serious problems with it. The main problem is that it "is not a sufficient summary variable reflecting the overall pressure on inflation in the sense that it captures all possible determinants of price changes" (p. 13). Cost-push shocks are a significant source to inflation and an important element of inflation information to monetary policymakers; but it "is not mirrored by the natural rate of interest" (p. 13). Furthermore, the empirical estimates for RR^* are extremely imprecise, so that the real equilibrium rate of interest "is not readily computable from observable economic data" (Weber et al., op. cit., p. 13).

Further problems with the NCM model relate to the Dynamic Stochastic General Equilibrium (DSGE) model, the focus of the NCM in terms of its econometric modelling. Academic macroeconomists

[2]Minsky (1986) is supported by policy makers. See, for example, Kohn (2018) who suggests that "Hyman Minsky was right: long periods of prosperity contain the seeds of their own destruction, operating through the financial system".

and the research departments of Central Banks around the world have accepted the NCM, and especially the DSGE. And as Edge and Gürkaynak (2010) note, the "DSGE models are now quite prominent tools for macroeconomic analysis at many policy institutions, with forecasting being one of the key areas where these models are used, in conjunction with other forecasting methods" (p. 201). Central Banks have increasingly emphasised the usefulness of DSGE models for monetary policy analysis and forecasting. Edge and Gürkaynak (op. cit.) evaluate the DSGE models as utilised by Central Banks to conclude that the DSGE model forecasts of inflation and GDP growth are very poor. They also argue that the forecasting ability of the DSGE models prior to GFC, and during the Great Moderation, is not a 'good metric' to judge models. An interesting and relevant question, and in view of these limitations of the DSGE models, is how useful they can be to Central Banks, especially so in view of the absence of the financial sector from these models. This exclusion of "formal modeling of financial markets or financial frictions, the current benchmark DSGE model fails to explain important regularities of the business cycle" and in so doing it puts "too much weight on, say, monetary policy or productivity shocks" (Tovar 2009, p. 6). But even when financial frictions are included there are still problems; and as Kohn (2018) suggests "We built models in which financial frictions played no serious role". Indeed, and as stated in Edge and Gürkaynak (2010), "The models not only failed to predict the crisis but also were unable to provide an interpretation of the events after the fact, because for the most part they omitted a financial sector" (p. 246; see also, Caballero 2010).

It should be further noted that DSGE models have become largely discredited, but not in the eyes of central banks and other proponents, especially so by not accounting for the financial sector. They have also been criticised that financial frictions ('difficulties in conducting transactions') were not properly considered prior to the GFC/GR, and they were light in terms of their effects. It is the case, though, that financial frictions have been incorporated more extensively since the GFC/GR (see, for example, Gertler and Gilchrist 2018; Christiano et al. 2018). However, such inclusion has been characterised by varied success. Despite low levels of unemployment, economies have remained

with low-level expansion, with low productivity and low inflation. These results are contrary to what the DSGE models suggest (Goodhart 2018). Interestingly enough, Gali (2018) proposes that none of the extensions proposed since the GFC/GR have been able to capture an important aspect of the GFC/GR, namely the enormous build-up of financial imbalances, which led to defaults and substantial decreases in aggregate demand, output and employment. Despite the above criticisms, the NCM "arguably remains the dominant framework in the classroom, in academic research, and in policy modelling" (Gali 2018, p. 1).

In terms of the assumption of the representative agent, still employed (Stiglitz 2017), it implies that NCM does not account for inequality. The proponents suggest three reasons. The first is that models with heterogeneous agents require the use of non-trivial computational techniques; it is the case that technological constraints are real and binding as Christiano et al. (2018) suggest. Kehoe et al. (2018) also argue that "the key features of the model, namely the consumers' heterogeneous responses to monetary shocks, are not disciplined by the data. Moreover, computational limitations force the authors to consider only one-time unanticipated shocks, so that the implications of the model for business cycles are not yet known" (p. 152). The second is that proponents believe that heterogeneity has only minor additional explanatory power for aggregate phenomena (Krusell and Smith 1998). The third is that redistribution is a separate issue of aggregate demand management (Auclert 2017). It is the case, though, that since the GFC and GR further relevant developments on the NCM have been undertaken. They account for heterogeneous agent DSGE models, which combine nominal rigidities with household heterogeneity and market incompleteness. They suggest that such models have "a higher average MPC, a more realistic distribution of MPCs, and a lower sensitivity to interest rates, which makes the general equilibrium effects of aggregate demand fluctuations much more salient in the heterogeneous agent version" (Kaplan and Violante 2018, p. 173). Christiano et al. (2018, p. 21), though, suggest that these developments are still young and not substantial improvements in terms of the DSGE models have emerged on this important subject. Kaplan and Violante (2018) also suggest that

the DSGE model's relevant "framework is still in its infancy" (p. 188), and that there are no banks in the heterogeneous models. Fiscal authorities provide the relevant assets directly and cover future tax revenues (p. 189); however, this is not relevant in the real world.

3 Our Theoretical Macroeconomic Model

We discuss in this section our theoretical framework that underpins our proposed economic policies. The overall focus of our economic analysis is on sustainable and equitable economic development and growth at full employment. Achieving such an objective requires the maintenance of a high level of aggregate demand and sufficient productive capacity. A free-market economy is inherently unstable and generates forces within the system that are responsible for the instability and fluctuations in economic activity. Economic reality is thereby very important and theory should account for it as accurately as possible. The general background of this theoretical framework relates to an economy, which has degrees of instability and is prone to crisis. In such an uncertain world, the state of expectations has a significant and unavoidable impact on economic events. And as Keynes (1936) suggested, "By uncertain knowledge….. I do not mean merely to distinguish what is known for certain from what is only probable….. About these matters there is no scientific basis to form any calculable probability whatever. We simply do not know" (pp. 113–114). Our model also relates to a monetary production economy in which finance and credit play a significant role; distributional aspects are also seriously taken on board in view of the fact that economies are class-divided societies.

Our model comprises of five blocks, which we discuss in the following subsection, and based on Arestis (2018a) but extended as necessary.

3.1 The Model

We begin with Block I (Eqs. 7–13), based on the aggregate demand- and supply-side of the economy. This relates to expenditure,

income, employment, and on the supply output and corresponding employment. The level of economic activity is set by aggregate demand. Distributional effects are paramount and we account for them. Changes in economic activity affect the rate of change of prices and wages, and consequent changes in the distribution of income between wages and profits emerge. Changes in the distribution of income have effects on the level of aggregate demand, which has a dual characteristic in this model: it is a relatively volatile component; and it is also a creator of productive potential. This establishes interdependence between demand and supply. The supply-side of the economy is viewed in terms of the following characteristics: the interaction between production decisions of firms in the light of the (expected) level of aggregate demand; and the consequent decisions on employment. An important part of aggregate demand is investment, which influences the supply-side of the economy since it is the principal determinant of po-tential output and labour productivity in the long run. It is also viewed in terms of the relationship between prices and wages, and their setting. Clearly, this approach denies the validity of the NCM approach that portrays the long run as characterised by a supply-side equilibrium (at NAIRU), with aggregate demand having no impact whatsoever.

The following relationships summarise Block I. We start with the standard income identity as in Eq. (7):

$$Y = C + I + G + (X - Q) \tag{7}$$

where Y is national income, C is consumption, I is investment, G is government expenditure, X is exports and Q is imports, and thus $(X - Q)$ is net exports (NE), including net income flows.

We proceed to endogenise C and I, with G discussed in block IV, and $(X - Q)$ endogenised in Block V. We begin with the consumption function:

$$\underset{+}{C = C[(WE(1 - tw)}, \underset{+}{\Pi(1 - t\pi)}, \underset{-}{R}, \underset{+}{\Delta BLP_h}] \tag{8}$$

where W is wages, E total employment so WE is the wage bill, tw is the tax rate on wages, Π is total profits, $t\pi$ is the tax rate on profits, R is the rate of interest, and ΔBLP_h is changes in bank lending to households.

The consumption function relates to the net of tax wages and profits, the distribution of income variables, along with the rate of interest and bank lending to households.

The signs reported below the variables are the signs of the partial derivatives of the dependent variable in relation to the independent variables; this is also the case with all the below equations.

Next, we endogenise the investment relationship.

$$I = I(\Pi/K,\ Y/Ya,\ R,\ \Delta BLP_f) \quad (9)$$
$$\quad\ +\quad\ +\quad -\quad\ +$$

where the symbols are as above with the exception of K, which is capital stock, Ya, which is a measure of capacity output and corresponds to the 'desired level' of operation, and ΔBLP_f that stands for changes in bank lending to firms. Equation (9) relates to Kalecki's (1971) proposition that the most important variable is profits in relation to capital; we also include the rate of interest. In addition, our investment relationship is related to the ratio of output to capacity output, and bank lending to firms.

Capacity output is endogenised next:

$$Ya = Ya(E,\ K,\ ST) \quad (10)$$
$$\quad\ +\ +\ +$$

so that Ya would change over time in the same direction as changes in employment, capital stock and the state of technology (ST).

There is a level of employment (Ea) that corresponds to the capacity-output measure:

$$Ea = Ea(Y/Ya,\ K,\ ST) \quad (11)$$
$$\quad\ +\ +\ +$$

Where Ya is taken as a benchmark output for firms' investment decisions and employment.

The aggregate supply of output (Ys) is endogenised as follows:

$$Ys = Ys(E,\ K,\ ST) \quad (12)$$
$$\quad\ +\ +\ +$$

where the aggregate supply output is determined by employment, capital stock and state of technology, with all three affecting the aggregate supply of output positively. The symbols are defined as above.

There is a level of employment (Es) that corresponds to the aggregate supply of output (Ys):

$$\underset{+}{Es} = \underset{+}{Es}(\underset{+}{Y}, \underset{-}{K}, \underset{-}{ST}) \tag{13}$$

and the variables are as above. Output influences the level of employment that corresponds to the aggregate supply of output positively, while capital and state of technology negatively.

We proceed with Block II (Eqs. 14–19), which relates to the distributional aspects and the inflationary process. The range of factors, which impact the variables of this block includes: struggle over income shares; the level and rate of change of the level of aggregate demand; cost-push factors emanating notably from the foreign sector (changes in import prices and the exchange rate), and other ones.

The following relationships summarise Block II. We begin with the profit rate relationship:

$$\underset{+}{\pi} = \underset{+}{\pi}\ [\underset{+}{(P/ULC)}, \underset{+}{Y/Ya}, \underset{-}{R}, \underset{-}{dR_f}] \tag{14}$$

where the variables, in addition to the ones already defined, are: π is the profit rate, P is the level of prices, ULC is unit labour cost, and dR_f is the debt ratio of firms, defined as total debt to total assets of firms. So the ratio of the level of prices in relation to the unit labour cost, the ratio of output to capacity output, the rate of interest and the debt ratio of firms are the variables that affect profitability as shown in Eq. (14).

The unit labour cost is defined as in Eq. (15):

$$ULC = W/PR \tag{15}$$

where W is the level of wages, and PR is productivity, which is treated as exogenous.

The wage rate relationship, as in (16), is firmly based on conflict theory:

$$w = w\{\underset{+}{[(W/P)^d - (W/P)]}, \underset{+}{(Y/Ya)}, \underset{+}{p}, \underset{-}{U}, \underset{+}{\pi}, \underset{+}{w^e}\} \tag{16}$$

where the variables are as above with the exception of the wage rate (w), the bargaining position of workers, defined as the difference between their desired real wage $[(W/P)^d]$ and the actual real wage (W/P); p is inflation, U is unemployment, which is taken in relation to labour force, and w^e stands for expectations of the wage rate. The difference between the workers' desired real wage $[(W/P)^d]$ and their actual real wage (W/P) is the variable that portrays the struggle of workers over income shares. It is important to emphasise in this sense that trade unions bargain with employers over conditions of employment in general but wages in particular. There is thus a conflict of interest in this case, so that the distribution between wages and profits is determined by the real wage demands of labour and the profit objective of firms. The unemployment variable relates to the state of the labour market in that unemployment may condition the extent to which unions are able to press for their claims. A related question is on the determination of the desired real wage. We assume that it is predetermined, generated by the expectations and aspirations of unions and workers.

Unemployment is negatively related to the ratio of output to capacity output and productivity as shown in Eq. (17):

$$U = U[\underset{-}{(Y/Ya)}, \underset{-}{PR}] \tag{17}$$

where the variables are as defined above.

Inflation as in Eq. (18) is related to the wage rate, the ratio of output to capacity output and rate of change of productivity, inflation expectations, foreign factors, namely the rate of change of the nominal exchange rate, and also the rate of change of raw material prices.

$$p = p[\underset{+}{w}, \underset{+}{(Y/Ya)}, \underset{-}{q}, \underset{-}{er}, \underset{+}{p_{rm}}, \underset{+}{p^e}] \tag{18}$$

where the variables are as defined above, with the exception of q, which is the rate of change of productivity, er is the rate of change of the nominal exchange rate, p_{rm} is the rate of change of the prices of raw materials, and p^e that stands for inflation expectations. The last equation of Block II is the rate of change of the prices of raw materials as in Eq. (19), which relates to the rate of change of the exchange rate and world trade:

$$p_{rm} = \underset{-}{p_{rm}}(\underset{-}{er}, \underset{+}{WT}) \tag{19}$$

where the variables are as defined above with the exception of WT that stands for world trade.

Block III (Eqs. 20–24) relates to money, credit, and other financial aspects. Money is essentially endogenously created within the private sector of a credit money economy responding to changes in the behaviour of the private economic units rather than mainly to the behaviour of the monetary authorities. The behaviour of banks and related credit institutions, especially banking ones, become important for the economy. Their willingness or otherwise to create loans and the terms upon which they are provided impact on the level and structure of demand. The supply of credit essentially depends upon its demand. It is the determinants of demand that influence the flow of credit and thus money. Central Banks cannot have a firm control over the quantity of money. They can only control the supply price of credit money via discount rate adjustments or through intervention in the open market. Thereby the Central Bank can set the key policy interest rate, which governs the terms upon which the Central Bank provides the 'base' money to the banking system. Financial stability policies, such as credit-rationing by the authorities, which can control the financial sector, are also important. The aim of financial stability should be to discourage financial institutions to devote their funds for speculation rather than for productive activities. In the case, then, when speculation causes liquidity to increase excessively, direct controls should be implemented to curb it. These aspects are highlighted below as in Eqs. (22) and (23), and discussed further as part of 'financial stability' policies of Sect. 3.2.2.

The following relationships summarise Block III:

$$\Delta M = \Delta BRBC + \Delta BDP \tag{20}$$

where ΔM is changes in the money supply, which is equal to the sum of changes in bank reserves with the Central Bank, including currency ($\Delta BRBC$), and changes in bank deposits to the public (ΔBDP). In view of the small proportion of $\Delta BRBC$ of the total money supply, we treat it as the residual in the following identity:

$$\Delta BRBC = \Delta BLP + \Delta BLG + \Delta BLES + \Delta NBL - \Delta BDP \tag{21}$$

Identity (21) then defines $\Delta BRBC$ as the sum of changes in bank lending to the public (ΔBLP) and to the government (ΔBLG) as well as of changes in bank lending to the external sector ($\Delta BLES$), and changes in non-bank lending (ΔNBL), which includes lending provided by the shadow banking and other relevant issues like securitisation, derivatives and collateralised debt obligations, minus ΔBDP. $\Delta BLES$ and ΔNBL are treated as exogenous variables and with ΔBLG endogenised in Block IV (see Eq. 25), the remaining variables in Eq. (21) are endogenised as follows.

We endogenise changes in bank lending to the public as in Eq. (22).

$$\underset{\quad +}{\Delta BLP} = \Delta BLP(\underset{+}{\Delta Y}, \underset{-}{\Delta R}, \underset{-}{MP1}) \tag{22}$$

where the variables are as defined above, with the exception of the variable $MP1$, which stands for monetary policy variables such as credit-rationing by the authorities; this is of course in addition to changes in the rate of interest, which as Eq. (24) below shows, are influenced by changes in the bank rate. Changes in bank lending to the public depend, therefore, on changes in the level of income and interest rate as well as monetary policy variables.

Changes in bank deposits to the public are endogenised as in Eq. (23):

$$\underset{\quad +}{\Delta BDP} = \Delta BDP(\underset{+}{\Delta Y}, \underset{-}{\Delta R}, \underset{-}{MP2}) \tag{23}$$

with the variables as defined above, with the exception of *MP*2 that stands for monetary policy variables. Changes in bank deposits to the public depend, therefore, on changes in the level of income, reflecting the flow of funds into the banking sector as a result of changes in the level of economic activity; interest rate changes that account for possible portfolio effects, as well as monetary policy variables.

Both *MP*1 (Eq. 22) and *MP*2 (Eq. 23) can be thought of as financial stability policy variables as discussed in Sect. 3.2.2 below.

Finally in terms of Block III, changes in the rate of interest are explained as in Eq. (24):

$$\underset{}{\Delta R} \; = \; \underset{+}{\Delta R(\Delta BR}, \; \underset{-}{\Delta EF}, \; \underset{+}{\Delta PDC}) \tag{24}$$

where in addition to the ΔR variable as defined above, ΔBR stands for changes in the bank rate, ΔEF stands for changes in external financing, defined as in Eq. (30), and ΔPDC that stands for sales of public debt to the non-bank public including currency. Changes in the rate of interest are related to changes in the bank rate, thereby the Central Bank is able to exert considerable influence on the rate of interest. Changes in the external financing can also have an impact on changes in the interest rate, reflecting foreign demand for domestic government securities. Also, sales of public debt to the non-bank public have an impact on changes in the rate of interest.

It clearly follows from Block III that the demand and supply of money are interdependent. This is so since the determinants of demand influence the flow of credit and thus money. Central Banks cannot have a grip over the quantity of money; they can only control the supply price of money via the discount rate, which is under their control.

Block IV (Eqs. 25–29) portrays the government sector. The government sector with its expenditure and taxes along with the public sector borrowing requirement, are taken on board and endogenised as necessary. The relevant relationships are as follows.

$$\Delta BLG \; = \; \text{PSBR} \; + \; \Delta EF \; - \; \Delta PDC \tag{25}$$

where the variables are defined as above with the exception of *PSBR* that stands for the public sector borrowing requirement.

The Bank of England (1982) is clear on this point, "Normally, that part of Government's borrowing requirement which is not financed by the sale of debt outside the banking system is met by the sale of debt – in particular Treasury bills – to the banking system, which thus acts as the residual source of borrowing for the Government" (p. 87).

PSBR, as portrayed in Eq. (26), is simply defined as the difference between government expenditure (G) and tax revenues (T) along with other government revenues (OGR).

$$PSBR = G - T - OGR \tag{26}$$

We treat OGR as exogenous and hypothesise G and T to be determined as shown below in Eqs. (27) and (29) respectively.

$$G = P_G Q_Q + WE_G + UU_B + ID \tag{27}$$

where the symbols, with the exception of G, W, and U, are defined as follows: $Q_{Q,}$ the amount of goods and services bought by the government, with P_G being their prices; $E_{G,}$ the number of employees in the government sector, $U_{B,}$ unemployment benefits, and ID, interest payments on government debt. E_G is defined as in Eq. (28), with the rest of the variables treated exogenously, with the exception of U that is endogenised as in Eq. (17):

$$E_G = E - E_P - U \tag{28}$$

where E is is total working population, as defined above for the purposes of Eq. (8), and E_p is employment in the private sector. Clearly $E_G + E_P = E$ that is total employment.

Taxes are endogenised as in Eq. (29) in terms of wage earners' and profit earners' incomes:

$$\begin{matrix} T = T(WE, \Pi) \\ \qquad + \quad + \end{matrix} \tag{29}$$

Finally, Block V (Eqs. 30–33) covers the open economy. A relevant and significant aspect of the foreign sector is that imports and exports are included in the aggregate demand equation, and endogenised in this block. This inclusion also reflects the effects on demand (and hence

employment) of variations in the exchange rate. We begin with the identity for changes in external financing:

$$\Delta EF = CB + \Delta KM - OEF \tag{30}$$

where ΔEF is equal to the current balance of international payments (CB) plus changes in capital movements (ΔKM) minus other external financing (OEF); the latter variable includes external lending to the public sector plus domestic bank lending to the public sector in foreign currencies. We treat OEF as exogenous and endogenise CB and ΔKM.

The current balance of international payments is the sum of net exports and other current balance as in Eq. (31):

$$\begin{aligned} CB = NE + OCB &= X(WT, RER) - Q([WE(1 - tw), \Pi(1 - t\pi), RER) + OCB \\ &\quad + \quad - \quad + \quad + \quad + \quad + \end{aligned} \tag{31}$$

where in addition to CB, NE, and WT as above, OCB stands for other earnings on foreign investments minus payments made to foreign investors; RER is the real exchange rate (where the exchange rate is defined as foreign to domestic currency), with $WE(1 - tw)$ and $\Pi(1 - t\pi)$ being the income distribution terms as they influence imports. All these variables are in real terms.

Equation (32) defines ΔKM:

$$\begin{aligned} \Delta KM &= \Delta KM[(R/R_W), (er)^e] \\ &\quad + \quad - \end{aligned} \tag{32}$$

where the ratio of domestic interest rates (R) to world interest rates (R_W) is included, along with the expected rate of change of the nominal exchange rate variable $(er)^e$. The variables that influence ΔKM depend on the assumption that capital flows are sensitive to returns available internationally and on expected exchange rate movements.

Equation (33) endogenises the real exchange rate:

$$\begin{aligned} RER &= RER[(R/R_W), Y, WT, (er)^e] \\ &\quad + \quad - \quad + \quad + \end{aligned} \tag{33}$$

where the variables are as defined above. The real exchange rate relates to the ratio of domestic to world interest rates, income, the world trade, and expected rate of change of the nominal exchange rate variable.

The model just presented is cyclical and could potentially produce periods of instability. It is, thus, paramount that economic policies to stabilise the economy and lead it to high levels of employment and output are necessary. It is important to emphasise in this respect the role of public institutions in the economy, especially in terms of Blocks III, IV, and V. Governments can and should pursue policies in an attempt to reduce the amplitude of the cyclical behaviour of their economies. Central Banks should help their banking and non-banking sectors to create credit, which they are able to undertake in view of their role as lenders of last resort. There are also the international institutions, which interact with national institutions in terms of the 'open' economy.

Our discussion of relevant economic policies is undertaken in the subsection that follows, where we concentrate more closely on 'new' economic policies rather than on the traditional ones, which we also discuss.

3.2 Economic Policies

Maintaining a high level of aggregate demand and sufficient productive capacity, along with full employment of the labour force, should be the objectives of economic policy to achieve full utilisation of capacity. It is clear from the analysis of our theoretical model that traditional fiscal and monetary policies employed in a coordinated manner (see also, Arestis 2012, 2015) could potentially help on this score, as argued below. Our theoretical analysis, however, suggests that further economic policies for the achievement of the above-mentioned objectives are paramount. Relevant economic policies for a fair distribution of income and financial stability (see also, Arestis 2016, 2018b), which have not been sufficiently considered previously, especially so prior to the GFC, are very important as it is also clear from our theoretical model. We elaborate on these two types of economic policy in the subsections that follow.

3.2.1 Distributional Policies

Distributional effects should be a major objective of policy as this is crystal clear from our theoretical model (see also, Arestis and González Martinez 2015). Recent evidence of a steady but sharp rise in inequality is very supportive of this proposition. Inequality had risen prior to the emergence of the GFC/GR, and has continued since then. Rising income inequality is evident in developed, emerging, and developing countries (Dabla-Norris et al. 2015). Distribution of income became more polarised in the OECD countries (OECD 2008, 2011), with the top income groups increasing their shares substantially, especially the financial sector. In fact, Arestis and Karakitsos (2011, 2013) and Arestis (2016) argue that inequality was one of the main causes of the GFC. This was particularly the case in the Anglo-Saxon countries, and especially so in the US (Atkinson et al. 2011; Arestis 2016). Real wage growth has lagged behind productivity growth since the 1980s in the advanced economies, and since the 1990s in developing and emerging economies; thereby the labour share has declined.

The declining wage and rising profits share produced an increasing concentration of earnings at the top, especially in the financial sector. An important piece of evidence in the case of the US is the share of the financial sector to GDP, which almost doubled in size between 1981 and 2007, and subsequently accounted for 8% of the US GDP (Philippon 2008). Between 1981 and 2007 the US financial sector, as measured by the ratio of private credit to GDP, grew from 90 to 210%; also, a sharp, nearly sixfold increase occurred in their profitability as from 1982 and beyond. Similar but less pronounced financial shares are relevant in many other countries. An interesting example is China. As discussed in Arestis (2018b), in China the top 1% income share gradually increased from 2.6% in 1986 to 5.9% in 2003. In terms of the Gini coefficient, measured on the 0–100 scale, it has risen by 15 points since 1990 to 50 currently (Jain-Chandra 2018). The financial intermediary shares to GDP in China rose from 1.6% in 1980 to 5.4% in 2008 (Greenspan 2010, p. 15). Germany and the UK are two further examples but many more could be cited (see OECD 2008, for relevant discussion

and empirical evidence on these economies; and Alvaredo et al. 2017). Wealth and gender inequalities are also important and relevant issues (see, for example, Arestis and Sawyer 2018, Chapters 6 and 7).

Distributional effects, therefore, should be a major objective of economic policy. We have also argued for the importance of accounting for 'distributional effects' in both economic theory and policy, which have been ignored (see also, Arestis 2016; Arestis and González Martinez 2016). Consequently, it is vital that not only should economic policies focus on achieving full employment but should also be geared towards reducing inequality. There is relevant empirical evidence that supports these propositions, as for example, the findings of Onaran and Galanis (2013), and Lavoie and Stockhammer (2013). Economic policies to account for distributional effects should include pro-labour distributional policies that promote wage policies, strengthening the status of labour unions, and collective bargaining. Such policies should be supported by fiscal and monetary policies, along with proper coordination of them, with the clear objective of full employment. Fiscal policy in particular is an important dimension in this regard (Arestis 2012, 2015). Another relevant study (Muinelo-Gallo and Roca-Sagalés 2011), which employs an endogenous growth model that incorporates fiscal policy and economic growth along with their effects on income inequality, strongly supports fiscal policy on this issue. Pooled-panel estimations are undertaken for 43 upper-middle and high-income countries for the period 1972–2006 to conclude that increases in public investment expenditure reduce inequality without harming output, regardless of whether they are financed through direct or indirect taxes. It is also the case that social spending, which includes investment in skills and education, is also important from the government spending point of view; also reforming taxes to make them progressive is another important aspect of fiscal policy. Berg and Ostry (2011) suggest that a redistributive tax system is associated with higher and more sustainable economic growth and thereby less inequality. Also, and as argued in *The Economist* (2014), raising the minimum wage and indexing it to inflation is another important tool to fight inequality. A further important policy dimension is the removal of subsidies for the 'too-big-to-fail' financial institutions. As argued in Arestis and Karakitsos (2011, 2013;

see also, Arestis 2016) such policy initiative would help to remove, to a large extent, the distribution of income and wealth to the top of income distribution and to the financial sector in particular, which was one of the main causes of the GFC of 2007/2008.

Addressing income inequality is even more important today in view of the above analysis and the acceptance of a wage-led view throughout in view of theoretical and empirical support (see, for example, Onaran and Galanis 2013).

A recovery led by domestic demand and an increase in the wage share in the economy would help to reverse the major factor of inequality. It is indeed the case that a combination of economic policies to tackle inequality, such as progressive taxation and public expenditure policies, social welfare, industrial relations,[3] are all relevant and important. Most important of it all is the suggestion by Atkinson (2015) to introduce "a more progressive structure for the personal income tax" (p. 290). Atkinson (op. cit.) also suggests that it is of paramount importance to have in place proper distributional policies along with wage policies, and a 'basic income' approach, if a viable growth regime, and fairer distribution of income and wealth, would emerge. We would go further, though, and suggest that to reduce inequality significantly, proper coordination of monetary and fiscal policies along with financial stability, the focus of monetary policy, would be the best way forward (see also, Arestis 2012, 2015, 2016, 2018b). Fiscal policy should concentrate on reducing inequality through appropriate expenditure and progressive tax policies, which should be supported by monetary and financial stability policies. The latter should be concerned with reforms in an attempt to regulate and avoid the type of financial architecture that led to the GFC (Arestis 2016); for it is the case that such regulation had been neglected prior to the GFC. Neglect of proper regulation of the financial system does not work as the proponents argue; indeed, it leads to greater inequality (see, for example, Angeriz and Arestis 2008; Angeriz et al. 2008; Stiglitz 2013, Chapter 9; Arestis 2016).

[3]An important aspect of industrial relations is the change in labour markets over the recent years in terms of the substantial reduction of the role of trade unions. Strengthening the role of trade unions is crucial for the significant reduction of inequality.

3.2.2 Financial Stability Policies

Financial stability had not been taken seriously prior to the GFC/GR. Indeed, and as Aikman et al. (2018c) suggest: "One of the greatest intellectual errors made in the run-up to the crisis was a classic 'fallacy of composition': it was assumed that the resilience of individual financial institutions was both a necessary and sufficient condition to ensure the resilience of the financial system as a whole" (p. 30). Financial stability should actually be the priority of the relevant regulatory agency. The focus of financial stability should be on the proper control of the financial sector so that it becomes socially and economically useful to the economy and to the productive sectors in particular. Financial deregulation entails redistribution effects in favour of the financial sector by allowing for greater risk-taking and higher profits. Redistribution thereby emerges from workers to bankers, enabling them to undertake greater risks, which can lead to a credit crunch (Arestis 2016). Banks should serve the needs of their customers rather than taking excessive risks. An interesting development has emerged from the Bank of England's Financial Policy Committee (FPC) in the assessment and implementation of financial stability tools. The Bank of England (2016) states that "The primary responsibility of the Financial Policy Committee (FPC) ……. is to contribute to the Bank of England's objective for maintaining financial stability. It does this primarily by identifying, monitoring and taking action to remove or reduce systemic risks, with a view to protecting and enhancing the resilience of the UK financial system". In this sense, the aim of financial stability is to provide essential services to the real economy. However, this requires the development of alternative policy instruments alongside the downgrading of interest rate policy, as the only instrument of monetary policy, and of any notion of price stability as the only objective of policy.

Prior to GFC/GR, and as Arestis and Karakitsos (2013) suggest, a variety of regulatory policies had been in place but those policies were primarily focused on the stability and viability of individual banking institutions, the microprudential type of policies; they were not embracing the whole of the financial system, the macroprudential

type of policies. The latter policies should be comprehensive in their application, and cover the whole financial system. They should account for the potential failures of the system: low levels of liquid assets; inadequate levels of capital with which to absorb losses; too big a financial sector; too leveraged a sector with high risks to the taxpayer and the economy. Thus, macroprudential financial instruments should be able to control the size, leverage, fragility, and risks of the financial system. Central Banks should go beyond the traditional single objective of targeting inflation; they should monitor price fluctuations of assets, especially housing, by targeting net wealth as a percentage of disposable income (Arestis and Karakitsos 2011, 2013), along with concerns over economic activity. Of equal importance is the further proposition, discussed below, which suggests that coordination of macroprudential and monetary policies, along with fiscal policy is paramount.

A relevant question is the extent to which national macroprudential regulators could avoid a similar crisis to the GFC/GR. Aikman et al. (2018a) discuss this question by focusing on the required policy interventions to address it. They account for the US and UK relevant institutions (the Financial Stability Oversight Council in the US and the Financial Policy Committee in the UK). They conclude that in the US the answer is negative since no 'macroprudential levers' are in place. In effect, the US committee does not have appropriate macroprudential powers under its control. In the UK by contrast the chance of avoiding a similar crisis to the GFC "stands a better chance" (Aikman et al., op. cit., p. 3). For such a success, though, it is suggested that political backing is necessary to allow the authorities to also regulate the non-bank financial institutions. Edge and Liang (2017) examine more relevant country cases. They show that many countries, fifty-eight in total, have created financial stability committees to introduce relevant policies. However, and as the authors suggest, only eleven of the relevant committees have direct control of macroprudential policy tools. Their overall conclusion, though, is that most committees are not properly set up to produce and account for countercyclical macroprudential policies. Under such circumstances, these committees are not in a position to provide meaningful options to address financial stability concerns.

Aikman et al. (2018b) suggest that prior to the GFC/GR "prudential regulations sought to ensure the safety of individual banks. This regime allowed major fault-lines in the financial system to develop unchecked, which materialised to devastating effect in 2007–2008. Macroprudential frameworks were a 'missing ingredient' from the pre-crisis regime (Bank of England 2009), and their development has been one of the major policy responses to the crisis" (p. 1). Aikman et al. (op. cit.) also suggest that financial stability is an important aspect of Central Bank policy and countercyclical capital buffers should be adopted and implemented. Such buffers should be tightened in a credit boom along with loosening monetary policy to account for adverse macroeconomic impacts. The level of the rate of interest and countercyclical capital buffers should be employed simultaneously to minimise the Central Bank's loss function. This, therefore, provides the authorities with a means of increasing capital requirements when risks are thought to be building (see also, Kohn 2018). Clearly, then, such combination "boosts the resilience of the banking system and reduces the likelihood of a financial crisis occurring for a given path of credit growth" (Aikman et al. 2018b, p. 3). A further question is how large the gains from such policy coordination might be. Aikman et al. (2018b) examine this question empirically and conclude that the gains are significant. This result leads to the conclusion that deploying 'countercyclical capital buffers' with interest rate monetary policy improves the relevant outcomes significantly in relation to employing monetary policy alone.[4] Macroprudential policy should also be considered in relation to other relevant policies that affect cyclical fluctuations, and should be properly coordinated with monetary policy to avoid conflicting policies and results.[5] Policymakers should avoid rules and employ instead judgement

[4]A good and relevant example is provided by Nakamura and Steinsson (2018), where it is stated that in the case of "Models that can match a large regional multiplier typically imply that output responds strongly to demand shocks. In these models, the aggregate multiplier is large when monetary policy is accommodative (for example, at the zero lower bound). For this reason, the recent literature on the regional fiscal multiplier has been able to provide powerful indirect evidence on the effectiveness of aggregate fiscal stimulus" (p. 61).

[5]Another contribution (Van der Ghote 2018), utilising a dynamic calibrated macroeconomic model that contains a financial intermediary sector with a leverage constraint and the common objective of maximising social welfare, concludes that coordination of monetary and

and thus discretion. Aikman et al. (2018c) discuss the 'discretion versus rules' case to conclude that 'constrained discretion' has emerged since the GFC/GR in view of the fact that "Regulatory rules provide the constraint within which policymakers exercise discretion" (p. 24).

Coordination of financial stability with monetary policy requires the development of a range of policy instruments. A problem under such coordination relates to the notion of independent Central Banks, based on the idea of price stability being the single objective of economic policy, which the Central Banks should pursue through manipulating their rate of interest. Such notion substantially weakens the idea of financial stability. With multiple objectives pursued by multiple instruments, there is a need for coordination between the macroeconomic authorities (the Ministry of Finance/Economics and the Central Bank), which is precluded by the independent Central Bank notion. This suggestion also reinforces the argument for coordination of financial stability with both monetary and fiscal policies (Arestis 2015). Ryan-Collins and van Lerven (2018) examine fiscal and monetary policy coordination in the twentieth century focusing in particular over the period 1930s to 1970s to provide examples when Central Banks and Ministers of Finance/Economics cooperated closely. They conclude that the number of cases examined clearly support fiscal and monetary policy coordination. Such coordination would direct resources into the most productive areas of the economy, with resulting multiplier effects, and stimulated demand. Combes et al. (2018) examine a mix of economic policies in terms of IT and fiscal rules, and provide empirical evidence in the case of 140 advanced and developing countries over the period 1990–2009 to conclude that "it is likely to better coordinate the policy mix around socially desirable standards of price stability and fiscal discipline" (p. 2781). The GFC and GR have demonstrated the need for more than one objective

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macroprudential policies reduces the risk of a financial crisis and helps to exit from a crisis. The gains are with financial stability and social welfare, which are bigger than the losses with the macroeconomic stability.

of economic policy to be in place, and indeed proper coordination of the economic instruments to achieve the relevant objectives.

Further empirical evidence is supportive of policy coordination. It suggests that under fiscal and monetary policy (including financial stability) coordination, fiscal multipliers are higher than when no policy coordination prevails, even bigger than the Keynesian ones (Eggertsson 2006, 2011). These results suggest that macroeconomic stability is the joint responsibility of the monetary and fiscal authorities: potentially destabilising behaviour by one authority can be offset by an appropriate stance of the other authority. This is possible, it is suggested (Eggertsson 2006; see also, Arestis 2015), as long as the fiscal and monetary authorities have common objectives. The multiplier under fiscal and monetary policy coordination, and in the case of deficit spending, is calculated to be of the order of 3.8 (Eggertsson 2006). The inflation expectations channel explains this large fiscal multiplier. Fiscal expansion increases expectations about future inflation, which reduces the real rate of interest, and thereby spending is stimulated. Expectations of future income also improve, which stimulates spending further (Eggertsson 2011). These results are particularly important in view of the current NCM theory and policy that assert fiscal policy is not an effective policy other than just being an automatic stabiliser; and suggest nothing positive on the budget deficit and its scale.

It is the case that proposals, which aim to ensure financial stability, have been put forward since the GFC and GR and we briefly comment on them. The most important is the US proposal, which was signed into law on 21 July 2010, and became the Dodd-Frank Act. The Act contains a number of important constituent elements; the most important and relevant to this contribution is the following. Eliminate proprietary investments (namely to prohibit banks that take insured deposits from running their own trading operations), and not allow ownership of hedge funds by banks. In the final Act, this was modified so that banks could hold proprietary investments of 3% of their core capital. The current President of the US has repeatedly suggested that the Dodd-Frank should be repealed. This, in this view, is simply because the Act has prevented banks to provide credit where is needed. The President ordered a review of Dodd-Frank in early February 2017. The US Treasury released

on 12 June 2017 a report on financial regulation reform. The report suggests that the current system of excessive financial regulations has undermined the ability of banks to provide credit to account for the needs of the economy; and has constrained economic growth. Since the crisis, the report suggests, lending has only risen by 25%, far less than in previous recoveries, and GDP growth has been sluggish. Although it does not reject the Dodd-Frank Act proposals, it recommends that they are applied with less rigour. In terms of the proprietary investments, it proposes that it is only applied in the case of very big banks engaged in large scale operations. The US Federal Reserve Board voted unanimously on 30 May 2018, to relax the rules that would limit banks' ability to engage in proprietary trading. If the Federal Reserve Board proposal goes through, the situation will go back where it was before the GFC.[6]

The Bank of England officials followed the US proposals. A government-appointed commission on banking was set up in the summer of 2010 to provide a yearlong analysis of whether banks should be split up into commercial and investment entities, and whether a version of the Dodd-Frank Act would be appropriate for the UK banking. The Vickers report produced preliminary thinking in September 2010, its interim Report in April 2011 and its final Report in September 2011. It recommends 'ring-fencing' banks' retail operations from their investment banking activities. It thereby aims to protect retail-banking activities from losses incurred in investment banking operations. There are problems with the Vickers Report. The main problem is that banks may be encouraged to take greater risk within their ring-fencing activities, such as mortgages, corporate and personal assets. This could very well be so since the authorities would most likely bail out such activities. Another problem with the Vickers Report is that the regulators are concerned that banks may fail to meet the 2019 deadline of their 'ring-fencing' retail operations from their investment banking activities.

[6]It is also important to note that in the case of the US credit rating agencies, it has been revealed that they had given triple-A ratings to useless financial instruments (Arestis 2016). One of them admitted so in 2015, but still so many years after that finding and the very same credit rating agents remain de facto regulators of the global bond market and affecting interest rates. Reforming the credit rating agents in terms of their operations is urgently needed.

A further problem is that the Bank of England has not adopted the Vickers Report recommendation that banks should ring-fence extra capital equivalent to 3% of their Risk-Weighted Assets (RWA). The BoE suggests that 1.3% would be sufficient. Not much progress is there then in terms of the Vickers report.

A similar trading ring-fence proposal emerged from the European Commission's proposed Committee, and headed by the Governor of the Finnish Central Bank, Erkki Liikanen, in 2012. The committee suggests ring-fencing banks' trading business, not their retail activities as in the Vickers report. In October 2017, however, the European Commission withdrew its proposal. The main reason was the lack of progress; also in view of the objectives of the proposal had already been accounted by other regulations.

A complement to these regulatory reforms is to tax the financial sector. The IMF has proposed taxing financial institutions in the case of the G20 finance ministers to ensure that financial institutions bear the direct costs of future failures or crises, and not the taxpayers. In this way, banks would fund future bailouts, paying the costs of financial and economic rescue packages. International agreement on such proposals is paramount. Not likely, though, in view of disagreements among the G20 members. The Central Banks of mainly Australia, Brazil, Canada, and Japan, the least affected countries by the GFC and the GR, raised objections to this proposal based on the argument that taxing banks reduces in effect their capital thereby making them more, not less, vulnerable to financial crises.

The 27-member countries of the International 'Basel Committee on Banking Supervision' (BCBS) of the Bank for International Settlements with the Group of Central Bank Governors and Heads of Supervision at their meeting on 12 September 2010 reached an agreement on regulatory issues; further discussion took place at the first 2011 G20 meeting in Paris. The so-called 'Basel III package' is concerned with bank capital and liquidity standards. The new ruling, phased in from January 2013 with full implementation to be achieved by January 2019, requires banks to hold equity requirements to 9.5% of their RWAs; and a liquidity coverage ratio, which requires banks to meet a 3% leverage ratio. A problem with the Basel III proposal is that it has failed to achieve agreement on its key risk measure. The countries involved could not

agree at their meeting of 28/29 November 2016 on the ratio of equity to RWAs. Another postponement took place subsequently of a relevant and planned meeting on 7/8 January 2017. Their disagreement was on the definition of the RWAs. In December 2017, the BCBS published a package of proposed reforms for the global financial regulatory framework, referred to as 'Basel IV'. The principal feature of Basel IV is the way banks calculate their RWAs; it proposes that a calculation of a bank's RWAs using internal models should not fall below 72.5% of the calculation using standardised models. The BCBS proposes a five-year 'phase-in' period to commence on 1 January 2022, with full implementation foreseen from 1 January 2027. Overall, and given the key role of the BCBS in the global regulatory system, it would appear that financial stability remains unresolved and elusive.

Then the case is that despite the financial stability schemes around the globe, progress on financial reforms of the kind discussed in this subsection is extremely slow and in some cases abandoned. Moreover, and as the IMF managing director (Lagarde 2014) suggests, "The bad news is that progress is still too slow, and the finish line is still too far". Kohn (2018) reinforces this position when he argues, "Public distrust of technocrats has greatly increased since the GFC. Many factors have contributed to that, but a sense that the crisis response favoured the financial sector over the public has surely played a role. We didn't do as well as we needed to connecting the actions to stabilize the financial system and encourage the recovery to the welfare of individual households and businesses". It is the case that positive action on financial stability remains a work in progress across the world.

4 Summary and Conclusions

We have discussed the current NCM macroeconomic model, both from the point of view of its theoretical framework and policy implications. We have suggested a number of criticisms, most important of which are the representative agent and complete luck of the financial sector within the NCM. Developments have emerged since the GFC and GR but still the relevant criticisms are valid.

We then put forward a theoretical framework, which avoids a number of the main criticisms discussed in the case of NCM. A number of economic policies follow from our theoretical framework, but two 'new' economic policies emerge. Financial stability is paramount, along with pursuit of distributional policies. Relevant economic policies should be considered and have been suggested. Inequality is strongly correlated with less economic growth over time; inequality, therefore, matters for it does have an important impact on economic growth (see Berg and Ostry 2011; see also, Stiglitz 2013). It clearly is the case, then, that reducing inequality and promoting economic growth are "two sides of the same coin" (Berg and Ostry 2011, p. 3). Of equal importance is the pursuit and implementation of financial stability policies by the Central Banks, a rather slow process currently. These are important policy aspects, which should be accounted and implemented. Especially so when Lagarde (2018) states that since the GFC/GR "All told, twenty-four countries fell victim to banking crises, and economic activity has still not returned to trend in most of them". Lagarde (op. cit.) proceeds to argue that since the GFC/GR "We have come a long way, but not far enough. The system is safer, but not safe enough. Growth has rebounded but is not shared enough"; and "We are now facing new, post-crisis, fault lines—from the potential rollback of financial regulation, to the fallout from excessive inequality, to protectionism and inward-looking policies, to rising global imbalances". It is the case, then, that policymakers, in effect, have not tried hard enough to produce a better future that would avoid crises of the type of GFC/GR.

References

Aikman, D., Bridges, J., Kashyap, A., & Siegert, C. (2018a, August). *Would Macroprudential Regulation Have Prevented the Last Crisis?* (Bank of England Staff Working Paper No. 747). Available at: www.bankofengland.co.uk/working-paper/Working-papers.

Aikman, D., Giese, J., Kapadia, S., & McLeay, M. (2018b, June). *Targeting Financial Stability: Macroprudential or Monetary Policy?* (Bank of England Staff Working Paper No. 734). Available at: www.bankofengland.co.uk/working-paper/Working-papers.

Aikman, D., Haldane, G. A., Hinterschweiger, M., & Kapadia, S. (2018c, February). *Rethinking Financial Stability* (Bank of England Staff Working Paper No. 712). Available at: www.bankofengland.co.uk/working-paper/Working-papers.

Alvaredo, F., Chancel, L., Piketty, T., Saez, E., & Zucman, G. (2017). Global Inequality Dynamics: New Findings from WID.world. *American Economic Review: Papers and Proceedings, 107*(5), 404–409.

Angeriz, A., & Arestis, P. (2007). Monetary Policy in the UK. *Cambridge Journal of Economics, 31*(6), 863–884.

Angeriz, A., & Arestis, P. (2008). Assessing Inflation Targeting Through Intervention Analysis. *Oxford Economic Papers, 60*(2), 293–317.

Angeriz, A., & Arestis, P. (2009). The Consensus View on Interest Rates and Fiscal Policy: Reality or Innocent Fraud? *Journal of Post Keynesian Economics, 31*(4), 567–586.

Angeriz, A., Arestis, P., & McCombie, J. (2008). *Does Central Bank Independence Affect Inflation Persistence and Volatility?* (CCEPP Working Paper). Cambridge Centre for Economic and Public Policy, Department of Land Economy, University of Cambridge.

Arestis, P. (Ed.). (2007a). *Is There a New Consensus in Macroeconomics?* Houndmills, Basingstoke: Palgrave Macmillan.

Arestis, P. (2007b). What Is the New Consensus in Macroeconomics? Chapter 2. In P. Arestis (2007a).

Arestis, P. (2009a). Fiscal Policy Within the 'New Consensus Macroeconomics' Framework. In J. Creel & M. Sawyer (Eds.), *Current Thinking on Fiscal Policy*. Houndmills, Basingstoke: Palgrave Macmillan.

Arestis, P. (2009b). New Consensus Macroeconomics and Keynesian Critique. In E. Hein, T. Niechoj, & E. Stockhammer (Eds.), *Macroeconomic Policies on Shaky Foundations—Whither Mainstream Economics?* Marburg, Germany: Metropolis-Verlag.

Arestis, P. (2010). Economic Policies After the New Concensus Macroeconomics. In S. Dullien, E. Hein, A. Truger, & T. van Treeck (Eds.), *The World Economy in Crisis—The Return of Keynesianism?* (pp. 271–294). Marburg: Metropolis.

Arestis, P. (2011). Keynesian Economics and the New Consensus in Macroeconomics. In E. Hein & E. Stockhammer (Eds.), *A Modern Guide to Keynesian Macroeconomics and Economic Policies*. Cheltenham: Edward Elgar.

Arestis, P. (2012). Fiscal Policy: A Strong Macroeconomic Role. *Review of Keynesian Economics, 1*(1), 93–108.

Arestis, P. (2013). Economic Policies of the New Consensus Macroeconomics: A Critical Appraisal. In G. C. Harcourt & J. Pixley (Eds.), *Financial Crises and the Nature of Capitalist Money: Mutual Developments from the Work of Geoffrey Ingham*. Basingstoke: Palgrave Macmillan.

Arestis, P. (2015). Coordination of Fiscal with Monetary and Financial Stability Policies Can Better Cure Unemployment. *Review of Keynesian Economics, 3*(2), 233–247.

Arestis, P. (2016). Main and Contributory Causes of the Recent Financial Crisis and Economic Policy Implications. In P. Arestis & M. C. Sawyer (Eds.), *Emerging Economies During and After the Great Recession*. Annual Edition of *International Papers in Political Economy*. London: Palgrave Macmillan.

Arestis, P. (2018a). A Coherent Approach to Macroeconomic Theory and Economic Policies. In P. Arestis (Ed.), *Alternative Approaches in Macroeconomics: Essays in Honour of John McCombie*. London: Palgrave Macmillan.

Arestis, P. (2018b). Importance of Tackling Income Inequality and Relevant Economic Policies. In P. Arestis & M. Sawyer (Eds.), *Inequality: Trends, Causes, Consequences, Relevant Policies*. Annual edition of *International Papers in Political Economy*. London: Palgrave Macmillan.

Arestis, P., & González Martinez, A. R. (2015). The Absence of Environmental Issues in the New Consensus Macroeconomics is only One of Numerous Criticisms. In P. Arestis & M. Sawyer (Eds.), *Finance and the Macroeconomics of Environmental Policies*. Annual Edition of *International Papers in Political Economy*. London: Palgrave Macmillan.

Arestis, P., & González Martinez, A. R. (2016). Income Inequality: Implications and Relevant Economic Policies. *Panoeconomicus, 63*(1), 1–24.

Arestis, P., & Karakitsos, E. (2011). Current Crisis in the US and Economic Policy Implications. In P. Arestis, R. Sobreira, & J. L. Oreiro (Eds.), *An Assessment of the Global Impact of the Financial Crisis*. Basingstoke: Houndmills, Palgrave Macmillan.

Arestis, P., & Karakitsos, E. (2013). *Financial Stability in the Aftermath of the 'Great Recession'*. Houndmills, Basingstoke: Palgrave Macmillan.

Arestis, P., & Sawyer, M. (2003). Reinstating Fiscal Policy. *Journal of Post Keynesian Economics, 26*(1), 3–25.

Arestis, P., & Sawyer, M. (2004a). *Re-examining Monetary and Fiscal Policies in the Twenty First Century*. Cheltenham: Edward Elgar.

Arestis, P., & Sawyer, M. C. (2004b). Can Monetary Policy Affect the Real Economy? *European Review of Economics and Finance, 3*(3), 3–26.

Arestis, P., & Sawyer, M. C. (2008). A Critical Reconsideration of the Foundations of Monetary Policy in the New Consensus Macroeconomics Framework. *Cambridge Journal of Economics, 32*(5), 761–779.

Arestis, P., & Sawyer, M. (2018). *Inequality: Trends, Causes, Consequences, Relevant Policies.* Annual edition of *International Papers in Political Economy*. London: Palgrave Macmillan.

Atkinson, A. B. (2015). *Inequality: What Can Be Done?* Cambridge, MA: Harvard University Press.

Atkinson, A. B., Piketty, T., & Saez, E. (2011). Top Incomes in the Long Run of History. *Journal of Economic Literature, 49*(1), 3–71.

Auclert, A. (2017). *Monetary Policy and the Redistribution Channel* (NBER Working Paper No. 2345). Cambridge MA: National Bureau of Economic Research.

Bank of England. (1982, March). The Role of the Bank of England in the Money Market. *Bank of England Quarterly Bulletin, 22,* 86–94.

Bank of England. (2009, November 19). *The Role of Macroprudential Policy* (Bank of England Discussion Paper). Available at: www.bankofengland.co.uk/working-paper/Working-papers.

Bank of England. (2016, November). *Financial Stability Report*. Presented to Parliament Pursuant to Section 9 W(10) of the Bank of England Act 1998 as Amended by the Financial Services Act 2012, *Issue No. 40*. Available at: https://www.google.com/search?q=Bank+of+England+%282016%29%2C+Financial+Stability+Report%2C+November+2016%2C+Issue+No.+40.&ie=utf-8&oe=utf-8&client=firefox-b-ab.

Berg, A. G., & Ostry, J. D. (2011). *Inequality and Unsustainable Growth: Two Sides of the Same Coin?* (IMF Staff Discussion Note 11/08). Washington, DC: International Monetary Fund. Available at: http://www.imf.org/external/pubs/ft/sdn/2011/sdn1108.pdf.

Bernheim, B. D. (1987). *Ricardian Equivalence: Theory and Evidence* (NBER Working Paper Series No. 2330). Cambridge, MA: National Bureau of Economic Research.

Blanchard, O. J. (2008). *The State of Macro* (Working Paper Series No. 08–17). Cambridge, MA: Department of Economics, Massachusetts Institute of Technology.

Blanchard, O. J. (2011, March 4). Rewriting the Macroeconomists' Playbook in the Wake of the Crisis. *IMFdirect, The International Monetary Fund's Global Economic Forum*. Washington, DC: International Monetary Fund.

Caballero, R. J. (2010). Macroeconomics After the Crisis: Time to Deal with the Pretense-of-Knowledge Syndrome. *Journal of Economic Perspectives, 24*(4), 85–102.

Calvo, G. A. (1983). Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics, 12*(2), 383–398.

Christiano, L. J., Eichenbaum, M. S., & Trabandt, M. (2018). On DSGE Models. *Journal of Economic Perspectives, 32*(3), 113–140.

Colander, D., Föllmer, H., Haas, A., Goldberg, M., Juselius, K., Kirman, A., et al. (2009, February). *The Financial Crisis and the Systemic Failure of Academic Economics* (Kiel Working Paper No. 1489). Kiel, Germany: Kiel Institute for the World Economy.

Combes, J. L., Debrun, X., Minea, A., & Tapsoba, R. (2018). Inflation Targeting, Fiscal Rules and the Policy Mix: Cross Effects and Interactions. *Economic Journal, 128*(615), 2755–2784.

Dabla-Norris, E., Kochhar, K., Suphaphiphat, N., Ricka, F., & Tsounta, E. (2015). Causes and Consequences of Income Inequality: A Global Perspective. *IMF Staff Discussion Note, 15*(13). Available at: https://www.imf.org/external/pubs/ft/sdn/2015/sdn1513.pdf.

Edge, R. M., & Gürkaynak, R. S. (2010). How Useful are Estimated DSGE Model Forecasts for Central Bankers? *Brookings Papers on Economic Activity, 41,* 209–259.

Edge, R. M., & Liang, I. N. (2017). *Who Is in Charge of Financial Stability, Why, and What They Do* (Hutchins Center Working Paper No. 32).

Eggertsson, G. B. (2006). *Fiscal Multipliers and Policy Coordination* (Federal Reserve Bank of New York Staff Reports, No. 241). New York: Federal Reserve Bank of New York.

Eggertsson, G. (2011). What Fiscal Policy Is Effective at Zero Interest Rates. *NBER Macroeconomics Annual, 25,* 59–112.

Gali, J. (2018). The State of New Keynesian Economics: A Partial Assessment. *Journal of Economic Perspectives, 32*(3), 87–112.

Galí, J., & Gertler, M. (2007). Macroeconomic Modelling for Monetary Policy Evaluation. *Journal of Economic Perspectives, 21*(4), 25–45.

Gertler, M., & Gilchrist, S. (2018). What Happened: Financial Factors in the Great Recession. *Journal of Economic Perspectives, 32*(3), 3–30.

Gilchrist, S., Schoenle, R., Sim, J., & Zakrajsek, E. (2017). Inflation Dynamics During the Financial Crisis. *American Economic Review, 107*(3), 785–823.

Goodhart, C. A. E. (2004). Review of *Interest and Prices* by M. Woodford. *Journal of Economics, 82*(2), 195–200.

Goodhart, C. A. E. (2007, February 28). *Whatever Became of the Monetary Aggregates?* The Peston Lecture Delivered in Honour of Maurice, Lord Peston, Queen Mary, University of London.

Goodhart, C. A. E. (2009). The Continuing Muddles of Monetary Theory: A Steadfast Refusal to Face Facts. In E. Hein, T. Niechoj, & E. Stockhammer (Eds.), *Macroeconomic Policies on Shaky Foundations—Whither Mainstream Economics?* Marburg, Germany: Metropolis-Verlag.

Goodhart, G. (2018). Central Bank Policies in Recent Years. *Central Bank of Malta's Quarterly Review, 51*(2), 71–78. Current version available at: http://eprints.lse.ac.uk/880078.

Greenspan, A. (2010). *The Crisis* (Brookings Papers on Economic Activity). Available at: http://www.brookings.edu/~/media/Files/Programs/ES/BPEA/2010_spring_bpea_papers/spring2010_greenspan.pdf.

Hartley, J. E. (1997). *The Representative Agent in Macroeconomics*. London and New York: Routledge.

International Monetary Fund. (2013). The Dog That Didn't Bark: Has Inflation Been Muzzled or Was It Just Sleeping? IMF *World Economic Outlook: Hopes, Realities, Risks*, Chapter 3.

International Monetary Fund. (2017). Household Debt and Financial Stability, Chapter 2. In *Global Financial Stability Report*, IMF, *October 2017: Is Growth at Risk*.

Jain-Chandra, S. (2018, September 20). *Chart of the Week: Inequality in China*. IMF Blog.

Juselius, M. (2008). Testing the New Keynesian Model on US and Euro Area Data. *Economics E-Journal, 2*(1), 1–26.

Kalecki, M. (1971). *Selected Essays on the Dynamics of the Capitalist Economy, 1933–70*. Cambridge: Cambridge University Press.

Kaplan, G., & Violante, G. L. (2018). Microeconomic Heterogeneity and Macroeconomic Shocks. *Journal of Economic Perspectives, 32*(3), 167–194.

Kehoe, P. J., Midrigan, V., & Pastorino, E. (2018). Evolution of Modern Business Cycle Models: Accounting for the Great Recession. *Journal of Economic Perspectives, 32*(3), 141–166.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London: Macmillan.

King, M. (2012). *The Microfoundations Delusion: Metaphor and Dogma in the History of Macroeconomics*. Cheltenham: Edward Elgar.

Kohn, D. (2018, September 7). *From the Great Moderation to the Great Recession and Beyond—How Did We Get Here and What Lessons Have We Learned?* Speech Given at the 200th Anniversary of Denmarks Nationalbank Conference, Copenhagen. Available at: www.bankofengland.co.uk/speeches.

Krusell, P., & Smith, A. A., Jr. (1998). Income and Wealth Heterogeneity in the Macroeconomy. *Journal of Political Economy, 106*(5), 867–896.

Lagarde, C. (2014, May 27). Economic Inclusion and Financial Integrity. In *Speech Given at the Conference on Inclusive Capitalism*. London. Available at: http://www.inc-cap.com/IC_ESSAY_Book_Introduction_Keynotes.pdf.

Lagarde, C. (2018, September 5). *Ten Years After Lehman—Lessons Learned and Challenges Ahead*. IMF Blog. Available at: https://blogs.imf.org/2018/09/05/ten-years-after-lehman-lessons-learned-and-challenges-ahead/?utm_medium=email&utm_source=govdelivery.

Lavoie, M., & Stockhammer, E. (2013). Wage-Led Growth: Concept, Theories and Policies. In M. Lavoie & E. Stockhammer (Eds.), *Wage-Led Growth: An Equitable Strategy for Economic Recovery*. Houndmills, Basingstoke: Palgrave Macmillan and the International Labour Office.

Mian, A., & Sufi, A. (2018). Finance and Business Cycles: The Credit-Driven Household Demand Channel. *Journal of Economic Perspectives, 32*(3), 31–58.

Minsky, H. P. (1986). *Stabilizing an Unstable Economy*. New Haven: Yale University Press.

Muinelo-Gallo, L., & Roca-Sagalés, O. (2011). Economic Growth and Inequality: The Role of Fiscal Policies. *Australian Economic Papers, 50*(2–3), 74–97.

Nakamura, E., & Steinsson, J. (2018). Identification in Macroeconomics. *Journal of Economic Perspectives, 32*(3), 59–86.

OECD. (2008). *Growing Unequal? Income Distribution and Poverty in OECD Countries*. Paris: OECD Publishing.

OECD. (2011). *Divided We Stand: Why Inequality Keeps Rising*. Paris: OECD Publishing.

Onaran, O., & Galanis, G. (2013). Is Aggregate Demand Wage-Led or Profit-led? A Global Model, Chapter 3. In M. Lavoie & E. Stockhammer (Eds.), *Wage-Led Growth: An Equitable Strategy for Economic Recovery* (pp. 71–99). Houndmills, Basingstoke: Palgrave Macmillan (Also, International Labour Organization, Geneva: Switzerland).

Pesaran, H., & Smith, R. P. (2011). *Beyond the DSGE Straitjacket* (CESifo Working Paper No. 3447). Available at: www.cesifo.org/wp.

Philippon, T. (2008, November). *The Evolution of of the U.S. Financial Industry from 1860 to 2007* (Working Paper). New York University.

Ryan-Collins, J., & van Lerven, F. (2018). *Bringing the Helicopter to Ground: A Historical Review of Fiscal-Monetary Coordination to Support Economic Growth in the 20th Century* (UCL Institute for Innovation and Public Purpose [IIPP] Working Paper Series 2018–08). Available at: https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-08.

Sawyer, M. (2010). Philips' Curve, Independence of Central Banks and Inflation Targeting, Chapter 8. In G. Fontana, J. McCombie, & M. Sawyer (Eds.), *Macroeconomics, Finance and Money: Essays in Honour of Philip Arestis*. Houndmills, Basingstoke: Palgrave Macmillan.

Sawyer, M. (2018). Microeconomics, Mesoeconomics and Macroeconomics, Chapter 5. In P. Arestis (Ed.), *Alternative Approaches in Macroeconomics: Essays in Honour of John Mccombie*. London: Palgrave Macmillan.

Solow, R. M. (2008). The State of Macroeconomics. *Journal of Economic Perspectives, 22*(1), 243–246.

Stiglitz, J. E. (2013). *The Price of Inequality: How Today's Divided Society Endangers Our Future*. Allen Lane: Penguin Books Ltd.

Stiglitz, J. E. (2017). *Where Modern Macroeconomics Went Wrong* (NBER Working Paper No. 23795).

Svensson, L. E. O. (1997). Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets. *European Economic Review, 41*(6), 1111–1146.

Svensson, L. E. O. (1999). Inflation Targeting as a Monetary Policy Rule. *Journal of Monetary Economics, 43*(3), 607–654.

Taylor, J. B. (1993, December). Discretion Versus Policy Rules in Practice. *Carnegie-Rochester Conference Series on Public Policy, 39,* 195–214.

Taylor, J. B. (1999). A Historical Analysis of Monetary Policy Rules. In J. B. Taylor (Ed.), *Monetary Policy Rules*. Chicago: Chicago University Press.

Taylor, J. B. (2001). The Role of the Exchange Rate in Monetary-Policy Rules. *American Economic Review, 91*(2), 263–267.

The Economist. (2014, March 1). Inequality v Growth.

Tovar, C. E. (2009). DSGE Models and Central Banks. *Economics: The Open Access, Open Assessment E-Journal, 3*(16). Available at: http://www.economics-ejournal.org/economics/journalarticles/2009-16.

Van der Ghote, A. (2018, June). *Coordinating Monetary and Financial Regulatory Policies* (ECB Working Paper Series, No. 2155).

Weber, A., Lemke, W., & Worms, A. (2008). How Useful Is the Concept of the Natural Real Rate of Interest for Monetary Policy? *Cambridge Journal of Economics, 32*(1), 49–63.

Wicksell, K. (1898). *Geldzins und Güterpreise*. Frankfurt: Verlag Gustav Fischer. English translation in R. F. Kahn (1965), *Interest and Prices*. New York: Kelley.

Woodford, M. (2003). *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton: Princeton University Press.

Woodford, M. (2008). How Important Is Money in the Conduct of Monetary Policy? *Journal of Money, Credit and Banking, 40*(8), 1561–1598.

2

Approaching Budget Deficits, Debts and Money in a Socially Responsible Manner

Malcolm Sawyer

1 Introduction

This paper is focused on the socially responsible use of fiscal and budgetary policy. Social responsibility is viewed in terms of achieving high employment—the highest level of employment consistent with an economy's productive capacity. This focus on fiscal and budgetary policies comes with the associated view that social responsibility should also be reflected in decisions made over the structure of public expenditure, transfers and of taxation, particularly with regard to income distribution and social benefits, and to ensure environmental sustainability.

The paper opens in Sect. 2 with a detailed discussion of the relationships between the creation of central bank money and budget deficits. Whilse central bank can always enable government expenditure to proceed, the interesting questions are how any government expenditure will

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be funded, through a combination of tax revenues, bond sales and net increase in central bank money in the private sector and the availability of resources.

Section 3 examines proposals for so-called people's quantitative easing (and similar). It is argued that such QE does not add anything to that which can be secured through conventional fiscal policy and risks placing expenditure decisions in the hands of the central bank.

In Sect. 4 it is argued that the so-called 'golden rule of public finance' should be regarded as tarnished and that it has little to recommend its adoption other than its political rhetorical appeal.

In Sect. 5 the main theme is that, following the path set by 'functional finance', the budget position should be set seeking to secure high levels of employment. This is followed in Sect. 6 by viewing the political and social obstacles to full employment budget deficit. It is argued in Sect. 7 that the range of estimates of the multiplier (relating to difference in output to difference in government expenditure), particularly as between periods of low levels of economic activity and high levels of economic activity, indicates practical difficulties in the operation of fiscal policy designed to achieve high levels of employment. In Sect. 8, the ideas surrounding a balanced structural budget are critically examined with emphasis on the problematic nature of 'potential output', and the argument that the achievement of a balanced structural budget may not be feasible. Section 9 presents a brief discussion on the use of interest rates to achieve a high level of demand. In Sect. 10 issues of the sustainability of debt are considered where it is argued that a deficit set in accordance with the requirements of a high level of employment does not raise significant issues of sustainability, and that high levels of public debt relative to GDP do not adversely affect the rate of growth. It is also argued that issues of the sustainability of private debt are more significant. Section 11 critically reviews notions of 'fiscal space', and argues that full use of fiscal space corresponds to the general line of argument of the paper through disputing the constraints imposed by existing debt levels. Section 12 offers a summary and some concluding comments.

2 Money Creation and Budget Deficits

Money consists of the financial instruments, which are a generally accepted means of payment. These financial instruments are usually denominated in terms of a government-approved unit of account, though there are examples of financial instruments in different units of account circulating side by side (e.g. Lebanon). Under present institutional arrangements, money predominantly takes two forms, which is termed central bank money and clearing bank money. Both are, of course, denominated in the country's unit of account, and can usually be exchanged on a one-for-one basis.

The creation of money comes through decisions taken by the banks (central, clearing) and their customers. Government spends by drawing on its own bank account with the central bank, and the central bank can provide overdraft facilities to the government if it wishes. When the government spends, it injects central bank money into the economy that is held by the clearing banks (as reserves) and the public (as notes and coins). Further, the banks holding of central bank reserves is matched by bank deposits held by the public, which can serve as money. In the case of clearing banks, in the process of providing loans, bank deposits are created which are transferable between people and is treated as money in the sense of being a generally accepted means of payment. Clearing bank money that forms the bulk of what is regarded as money under present institutional arrangements. It is the creation and destruction of central bank money, which are closely related with government expenditure and tax revenue receipts which is the centre of attention here. Just as firms cannot finance their "initial spending by future revenues that do not yet exist and, therefore, must rely on bank credit, the same would apply to the state. In both cases, when firms and the state engage in spending, there must be money creation" (Bougrine and Seccareccia 2002, p. 66).

Taxes are paid to government in the form of money that is accepted by government, and taxes cannot be paid unless money has already been created.[1] There is then a sense in which government expenditure precedes taxation—the government expenditure goes alongside money being injected into the economy, and taxes can only be paid through the use of money. If money has not been introduced into the economy, then it cannot be used to pay taxes to the government. In this context, money refers to central bank money that is accepted by government as payment of taxes. When an individual pays their taxes, the usual process would be to write a cheque or authorise an electronic transfer to the tax authorities—but the final stage would be for the individual's bank to transfer central bank money to the government.

Phrases such 'there is no magic money tree' are often used to denigrate and dismiss serious proposals for public expenditure and conjures up false images of the ways in which expenditure is financed and funded. The phrase 'magic money tree' is highly misleading for the images that it conjures up and for seeking to block off serious discussion of the desirability and feasibility of particular proposals for public expenditure.

First, there is nothing magic about the creation of money—it is just double entry book keeping! A bank provides a loan (which is an asset for the bank and a liability for the economic agent taking out the loan) and creates a bank deposit (which is a liability for the bank and an asset for the holder of the deposit).

Second, the metaphor of 'tree' suggests taking from the tree—instead of picking apples, it is money that is picked. This completely ignores that money has to be created and is not grown. It ignores that money is not net wealth (whereas as an apple plucked from a tree is) but is an asset and a liability of equal magnitude. It also ignores that money is not only created but also destroyed.

The cry often goes up that 'there is no money left'. It conjures up the image of a person having a money box from which he/she draws money to spend and then finds that the money box is empty, and that money

[1]See, for example, Cesaratto (2016) on the general topic of 'the State spends first'.

Table 1 Changes in assets and liabilities following government expenditure

	Assets	Liabilities
Central bank		Reserves
Banks	Reserves	Bank deposits
Private sector	Bank deposits	

Source Own construction

box is his/her only source of money. However, at the level of the economy, money is readily added to 'at the stroke of a pen'. Money is being continuously created (and also destroyed) by the central bank and by banks. For the government it can spend as long as the central bank facilitates that expenditure—that is by permitting the government to draw down on its account with the central bank. Whether a budget deficit is to be deemed too high or too low should be judged by reference to the idea that the objective of fiscal and budgetary policy should be the achievement of a high level of employment and capacity utilisation.

The question so often raised to any proposal for increased public expenditure of 'where's the money coming from?' is readily answered—the government draws down on its account with the central bank. It comes from the same place that money for public expenditure always comes from.

When people buy bonds from government, money is received by the government into its account with the central bank. As far as the private sector is concerned, money has been withdrawn from circulation in payment for the bonds. In the case of clearing bank money, the repayment of loans by the public destroys bank deposits. This notion that money is both created and destroyed underpins the view that the amount of money in existence is heavily dependent on the willingness of people to hold money (generally, and misleadingly, referred to as the demand for money as money is held in order to get rid of it through spending).[2]

Consider the immediate consequences of government expenditure that is financed by the government drawing down on its account with the central bank. In Table 1, there is a simple representation of the changes in assets and liabilities that occur.

[2]I have argued that at length in Sawyer (2017a).

It is helpful to draw on the distinction made in the monetary circuit literature between what is termed there 'initial finance' and 'final finance' which I prefer to refer to as (initial) finance and funding.[3] Initial finance is the idea that in order to be able to spend prior possession of money is required. Funding (final finance) relates to funds used (from receipts, from borrowing, and from use of own assets) to cover expenditure. The (initial) financing of government expenditure can only come from the government's account with the central bank. In contrast, the funding of government expenditure comes, as discussed below, from a combination of tax revenues and borrowing.

An obvious, though it seems often forgotten, feature of money is that once it has been created it has to be held by someone. The question arises as to whether the amount of money which has been created (whether by the central bank or through clearing banks) is in some sense held willingly by individuals and firms. In answering that question, the two functions of money mentioned above have to be recognised. Money as a means of payment is only held temporarily between the time of its receipt and the time of expenditure of the money. Money as a store of value is held on a longer term basis. The average amount of money that an individual seeks to hold in respect of means of payment is often summarised as the transactions demand for money.

Turning to the funding of public expenditure, and consider accounts relating to a specific period of time (say a year). Then for the government (excluding central bank):

$$G = T + DB \tag{1}$$

that is government expenditure G is funded by tax revenues T and the net sale of government bonds (DB). The government expenditure will have been initially financed by the use of central bank money, and the equation here refers to the final funding of government expenditure. The tax receipts and the sale of bonds by the government will withdraw money from circulation.

[3]The terminology comes from the circuitist literature: see Graziani (2003). For discussion of government and central bank money in a circuitist context, see Sawyer (2014).

Some of the government bonds will have been acquired by the central bank through forms of open market operations. Then

$$DCBM = DBb \tag{2}$$

where *DCBM* is the net increase in central bank money (held as reserves by banks) and *DBb* is the quantity of bonds purchased by the central bank. This net increase in central bank money comes about because of a gross increase from the financing of government expenditure and the decrease from tax receipts.

The consolidated accounts of central government and central bank would then read:

$$G = T + DBh + DBb = T + DBh + DCBM \tag{3}$$

where *DBh* is the net increase in bonds held by the public. At the consolidated level government expenditure is funded by a combination of tax receipts, bonds and increase in central bank money held by banks (where for convenience the notes and coins issued by the central bank and held by the public are ignored).

There is a straightforward relationship between private savings and investment and the budget deficit (here for simplicity, the case of a closed economy is assumed):

$$S - I = G - T, \tag{4}$$

where S is private savings and I private investment (over the relevant time period).

In turn, this provides:

$$S - I = DBh + DCBM = DBh + DBD \tag{5}$$

where *DBD* is the increase in bank deposits which correspond to the increase in bank reserves with the central bank, which are equal to *DCBM*.

Thus, there is the funding of budget deficit by a mixture of sale of bonds to the public and the increase of central bank money held in the private sector. The mix is influenced by monetary policy and open market operations and by the willingness of the public to hold bonds and to hold bank deposits. It is also the case that private savings are held in

the form of the funding of investment (generally indirectly), bonds and bank deposits.

If the budget deficit were entirely funded by an increase by the equivalent of public holding of central bank money (banks would hold the increase in central bank money as reserves, public would hold bank deposits of an equivalent amount), then the public would be holding the equivalent of net private savings (excess of private savings over private investment) in the form of bank deposits. The banks would be holding additional reserves of an equivalent amount. The specific reactions of banks and depositors would depend on any interest paid by central bank on the reserves. Although it has often been the case that no interest was paid by central bank, that is a position which has tended to change in recent years. The Bank of England, for example, pays interest on those reserves at the bank rate. The bank rate is the rate of interest paid on reserves held by commercial banks at the Bank of England, which in turn has a strong influence on the interest rates on loans and deposits.[4]

The above discussion relates to a closed economy in which government expenditure is financed by domestic currency. Government expenditure is mainly, but not entirely made domestically, and as such central bank money is provided to enable the expenditure to proceed and that money is accepted by the private sector. When the economy is open, the question arises as to how government finances (in the initial finance sense) imports (e.g. purchase of missiles) and transfers (e.g. payments to international organisations). In the case of an open economy, two related issues arise.[5]

First, insofar as government expenditure involves imported goods and services there is question of the currency in which payment is made and whether foreigners will accept the domestic currency. In general, this involves somewhere along the line exchange of domestic currency for foreign currency. There can then be limits on the volume of government transactions in so far as payment in a foreign currency is required.

Second, in terms of funding, the size of the current account position changes (directly from the government expenditure on imported goods

[4]See https://bankunderground.co.uk/2015/09/28/are-reserves-still-special/.

[5]These remarks are much influenced by Coppola (2018).

and services and indirectly through multiplier effects on the private demand for imported goods and services. From a funding perspective (and the sectoral balances).

The other issue concerns the funding of current account deficit that may result.

$$G - T = S - I + CA \tag{6}$$

where *CA* is capital account inflow, which is required to cover current account deficit.

From given level of economic activity, current account deficit would arise: the question is whether that can be covered by capital account inflows and at what price. If government borrowing is denominated in its own currency whether from overseas or internal, then 'print money' to pay interest and repay principal.

Arestis and Flavio (2015) use a finance-investment and saving-funding circuit to investigate some of the divisions of funding between domestic savings and the capital account inflows. The general framework is similar to that adopted here. They show that "the distribution of aggregate savings between the national and foreign parts depends on the RER [real exchange rate] level" (p. 455). Arestis et al. (2017) analyse the finance-investment and saving-funding (FISF) circuit in a closed and in an open economy setting including government. They "show that the basic features of the FISF circuit remain unchanged for the closed and open economies when government is considered in the circuit" (p. 832).

3 'People's Quantitative Easing'

There are a range of policies under headings such as 'helicopter money', overt monetary financing, strategic QE (Quantitative Easing), green QE, peoples' QE and sovereign money creation (van Lerven 2016). These proposals, particularly in the titles adopted, have echoes with the QE programmes of many central banks (which in general are now being unwound), but with differences of purpose and of operation. van Lerven (2016) provides an overview of the proposals under the general heading of 'public money creation'.

The proposals have involved the central bank creating money to finance various forms of expenditure, including by private bodies (usually some forms of infrastructure and green investment) and a variety of expenditures are proposed by different bodies though often include enhanced income transfers (basic or citizen's income being a favourite), and investment (often with a focus on 'green investment'). The expenditure proposals are generally designed to appeal to progressive minded people—I haven't yet heard of 'quantitative easing to buy Trident' or 'QE' to build nuclear power stations!

The key feature of QE is that the central bank purchases financial assets from the private sector to reach a target level of purchases and then holding of financial assets. QE is at heart a balance sheet rearrangement from which some changes to asset prices, interest rates and spending may follow. The central bank buys bonds from banks and the public. The central bank's balance sheet changes are illustrated in Table 2.

The central bank now owns more interest-bearing assets than before. The banks hold reserves with the central bank, and as their reserve ratio is now much higher (and in effect not able to reverse the change), the hope is that they would be encouraged to extend loans, though in order to do so there would need to be an increase in demand for loans from credit-worthy customers. The public may feel in a more liquid position with the rise in bank deposits at the expense of decline in bonds held. The hope of QE is indeed that there would be favourable effects of spending decisions. What is in effect an increased demand (from the central bank) for bonds may serve to raise the price of bonds, and as such to aid the balance sheets of holders of bonds.

Table 2 Simple balance sheets of central bank, banks and public

Assets	Liabilities
Central bank	
Bonds purchased	Central bank money issued
Banks	
Central bank money held	Bank deposits
Public	
Bank deposits	Bonds sold

Source Own construction

The central bank has enabled central bank money to enter into the private economy. Could that money creation not be used instead to finance some elements of public expenditure (or indeed private expenditure)? Recall that if public expenditure is to occur then it has to be (initially) financed, and this is done through the issue of central bank money. In the nature of money creation as a bookkeeping entry, from the money finance perspective the two are by no means mutually exclusive. Using central bank money to finance public expenditure is to be treated as fiscal policy. However, people's quantitative easing appears to place decisions on the scale, composition and timing of public expenditure into the hands of the central bank. The timing of parts of public expenditure becomes tied to the timing of quantitative easing—if there is deemed to be a monetary policy need for further quantitative easing, then additional public expenditure can be sanctioned. Decisions on the appropriate composition of public expenditure have to be made, and it remains unclear in whose hands those decisions would lie. However, people's quantitative easing may place decisions on the scale and composition of public expenditure into the hands of the central bank.

There is a conflation here between QE, which involves the exchange of one set of financial assets for money, and 'public money creation', which involves the creation of money to finance expenditure. The former can have effects on asset prices, on the reserve position of the banks, etc., which may have some indirect effects on expenditure decisions. The latter involves direct expenditure, which is resource-using and income-generating. Further, money is being continuously created and destroyed—in the case of central bank money, destroyed when taxes are paid and when new bonds are sold. Whether 'public money creation' would enlarge the stock of central bank money would depend on the extent to which that money creation was followed by money destruction.

Decisions over the scale, composition and timing of public expenditure should rest firmly in the hands of the government answerable to Parliament and debate. It can always be (initially) financed by government drawing on its account with the central bank. There are then further decisions to be made on how the public expenditure is funded—what mix of tax revenues, bonds and money is appropriate.

4 The Tarnished 'Golden Rule of Public Finance'

The basis of the so-called 'golden rule' of public finances is that (at least averaged over the business cycle) the budget position with regard to current expenditure and tax revenue should be in balance, and that government borrowing can be undertaken for public investment. A similar rule can be set where it is the structural current budget, which is to be in balance. The rationale for the 'golden rule' is straightforward and has some common features with a similar rule for personal finance. An individual (or firm) may wish to stick to something like the golden rule for one of (at least) two rules. First, the individual would wish to avoid the situation where her current expenditure always exceeds her income since that would mean borrowing more and more, and hence paying more and more interest, which is ultimately unsustainable (not least because of a lack of financial institutions willing to finance the continuing deficit). Second, when capital expenditure produces future income for the individual, there is the hope that the capital expenditure will pay off in that the future additional income more than compensates for the costs of the capital expenditure.

The justification for the 'golden rule' has been expressed in the following terms. "The basic principle is clear. Spending that produces benefits that are consumed in the same year as the spending occurs is classed as current spending. By contrast, spending that produces a stream of services over time (in excess of one) is classed as capital expenditure" (p. 159). "It is not practical … to match the timing of the streams of costs and benefits for each and every spending proposal. But, in aggregate, the Government takes the view that current spending, which mainly provides benefits to existing taxpayers, should be paid for by the current generation of taxpayers. Similarly, because capital spending produces a stream of services over time, it is *fair* that this form of spending is financed initially through borrowing. This behaviour should ensure that, to the extent practicable, each generation pays for the benefits of the public services it consumes" (HM Treasury 2002, p. 162).

The operation of 'golden rule' runs into a series of issues, which are placed here under four headings.

First, in this context public investment refers to net fixed capital formation. It does not follow the general notion of investment as the use of resources in the present in the hope of securing future benefits. Capital investment in its present definition includes investment in areas which are non-productive (e.g. defence equipment) and does not regard expenditure on education and health. The investment covered by the golden rule is physical infrastructure investment but not social infrastructure investment. Investment in social infrastructure, social and health care, etc. is not included in this measure of public investment. There is no case (as argued above) for allowing borrowing for investment as currently defined but not for other public expenditure.

Second, the argument for 'borrowing to invest' comes across as treating government like a firm on the basis that investment is undertaken to yield future returns and that the returns on investment will cover the interest payments on the borrowing. It is analogous to the way in which the government is often treated akin to a household, and suffers from the same difficulties. Public investment is (or should be) undertaken on a social benefit/social cost basis, and not on the basis of 'private' costs and returns to the government. In general, public investment does not yield direct financial returns to the government (though some such as social housing for rent and toll roads would), though it yields indirect financial returns through tax revenues generated by the construction of the public investment and any further private investment and growth stimulated by the public investment. These indirect financial returns can be, of course, difficult to predict and to measure.

Third, the 'golden rule' says nothing on the appropriate scale of public investment or the appropriate scale of government borrowing, which would thereby be entailed. In this context, the way in which Keynes (1980) advocated what appears to be a 'golden rule' is of interest. Keynes (op. cit.) appeared to consider capital expenditure as yielding profits: "the very reason that capital expenditure is capable of paying for itself makes it much better budgetwise and does not involve the progressive increase of budgetary difficulties, which deficit budgeting

for the sake of consumption may bring about or, at any rate, would be accused of bringing about" (p. 321).

Fourth, the 'golden rule' has political rhetorical appeal coming from the (implied) comparison of government with private firm as mentioned above, in a similar manner to the appeal which 'government must balance its books' has by comparison with households and 'not spending beyond your means'. Using a term like investment suggests prudent use of resources, though obviously 'white elephant' projects are by no means excluded!

From the perspective of fiscal policy and its effects, capital expenditure is similar to current expenditure in being resource-using and requiring to be financed and funded. From the perspective of fiscal policy and the appropriate level of budget deficit (or surplus) there is not any rationale for the separation of current expenditure from capital expenditure (in the ways in which the two are defined in the national accounting framework). For other government decision-making purposes there would be justification for thinking in terms of the extent to which resources are to be devoted now to provide future benefits relative to using resources for generation of immediate benefits.

5 What Should the Budget Position Be and How Should It Be Funded?

The basis of the approach adopted here is that the budget position (whether deficit or surplus) should be targeted to achieve a high level of employment which is as close to full employment as possible given the productive capacities of the economy and their locational distribution.[6] This general stance follows the positions of Lerner (1943) and Kalecki (1944a) that fiscal policy should be seeking to balance the economy at full employment rather than balance the budget. Lerner (1943)

[6]This is to recognise that the achievement of full employment requires not only an appropriate level of demand but also sufficient capital equipment in the relevant locations, and that industrial and regional policies are needed to complement fiscal policy.

used the term 'functional finance' which rejected "completely the traditional doctrines of 'sound finance' and the principle of trying to balance the budget over a solar year or any other arbitrary period" (p. 355), and adjustment of total spending to eliminate both unemployment and inflation. Kalecki's (1944b) argument was that a budget deficit was generally required to correct a deficiency of aggregate demand, and it is precisely in conditions of deficient aggregate demand that funds will be available to fund the budget deficit since the propensity to save runs ahead of the propensity to invest. The running of a budget enabled the excess of savings over investment to be realised. Kalecki (op. cit.), like Lerner (1943), envisaged the need for long-term budget deficits. Many have though argued that budget position should fluctuate over the trade cycle rising in times of recession and falling in times of boom, with deficits and surpluses averaging out: the present incarnation of this view is the arguments for a balanced structural budget, which are examined below. An early expression of this came in the UK White Paper on Employment Policy of 1944. It stated that "to the extent that the policies proposed in this Paper affect the balancing of the Budget in a particular year, they certainly do not contemplate any departure from the principle that the Budget must be balanced over a longer period" (Ministry of Reconstruction 1944, p. 25). In contrast, Kalecki (1944a) argued that the 1944 White Paper on Employment Policy did not provide a programme for achieving lasting full employment, which would have to be based on a long-run budget deficit policy or the redistribution of income towards wages thereby stimulating aggregate demand. He argued that even if countercyclical were successful in stabilising effective demand, it did not follow that full employment would be achieved. The simple reason was that the relatively stable level of private investment may well fall below the level required to match savings out of full employment income (Kalecki 1997, pp. 243–244).

Domar (1944) noted that "it is possible that private investment will be able to absorb all savings year in and year out, or that private investment will at least fluctuate around a sufficiently high average so that deficits which may be incurred by the government in some years will be offset by surpluses made in others". But this could not be assured and he examined the case "where private investment is insufficient to absorb intended

savings over a relatively long period of time" (p. 798). He argued that "since government is absorbing a part of savings, it is of course desirable that its expenditures be productive" (p. 820) where he interpreted productive in a broad sense including expenditure on education and health.

These basic arguments from Lerner (1943), Kalecki (1944b) and Domar (1944) remain highly relevant and form the basis of the elaborations in this section. The achievement of a high level of employment essentially depends on the level of aggregate demand, and hence the target budget position depends on the forecast level of private demand. It has to be acknowledged that the actual budget position not only does it depend on the tax structure and rates and public expenditure plans but also on the state of economic activity, which itself is influenced by the tax and expenditure decisions.

The idea that the budget position should be set to be consistent with a high level of employment means that the tax rates and public expenditure plans conform to the Eq. (1) for budget deficit.

$$G - T\left(Y^*\right) = S\left(Y^*\right) - I\left(Y^*\right) - CA\left(Y^*\right) \tag{7}$$

where Y^* is the level of output/income consistent with a high level of employment and CA is the current account position. The appropriate scale of the budget deficit or surplus then depends on savings, investment and the current account position functions, and as those functions shift around so would the appropriate budget position. It clearly follows that if the right-hand side of the equation equalled zero, then the appropriate budget position would be in balance, and if the right-hand side were negative, then a budget surplus would be appropriate.

A belief that, whether through interest rate variations or otherwise, there is a strong tendency for intended savings and intended investment to come into balance at full employment, combined with exchange rate adjustment, which lead to a current account balance, would lead to a balanced budget being appropriate. Outside of such a belief, the appropriate budget position could be a deficit or a surplus. That should not be regarded as a universal truth—at the present time, Germany has a small budget surplus and a high level of employment (unemployment

rate of below 4%) though aided by a large current account surplus that offsets a high level of savings relative to investment.

There should be full recognition that the budget deficit position of government is endogenous in two senses: tax rates, expenditure set—the resulting deficit depends on private decisions; deficit/surplus required to achieve full capacity utilisation depends on propensities to save and to invest.

The fine-tuning of the macroeconomy under which government expenditure and tax rates would be varied on a frequent basis to seek secure continuous high levels of employment, faces difficulties of information (data on position of economy inevitably lags behind), difficulties of implementation, etc. It may though be possible to design the tax system so that it is progressive (and hence rising incomes raises tax revenues disproportionately), which would aid to some degree fine-tuning. However, budget decisions are taken on an annual basis, and for whatever reasons tax rates and expenditure plans are adjusted annually.

It has been argued above that the availability of money to pay for public expenditure is not a constraint in so far as the central bank is willing to permit the government to spend. There can be constraints on the expenditure actually occurring through unavailability of the relevant resources. From a funding perspective, $G = T +$ net borrowing, and the net borrowing comes from the private and foreign sectors and is equal to $S - I + FA\ (= -CA)$. The funding constraint on government expenditure then appears to be tax revenue and borrowing. Nevertheless, the level of government expenditure is a significant determinant of tax revenue, savings, investment and the financial account position. The funding constraint is then the sum of net private savings and financial account position generated at a high level of employment. This can be written in terms of the funding limits on the budget position that

$$BD \leq S^* - I^* + FA^* \tag{8}$$

where * after variable signifies its level if a high level of employment was achieved.

The question can also be asked as to the appropriate manner in which the budget deficit be funded as between issue of bonds and of (central bank)

money. Recall from above that $BD = DB + DCB = S - I + FA$. In other words, the net private savings and borrowing from overseas have to be held as a combination of bonds and central bank money. As explained above, the central bank money is held as bank reserves to which there is a counterpart in the form of bank deposits held by the public. The limitation on the use of money funding of budget deficit then comes from limits on the willingness of people to hold their (additional) savings in the form of bank deposits (and for the banks to accept holding reserves with the central bank as assets corresponding to their liabilities in the form of bank deposits).

An economic agent may face a liquidity constraint on their expenditure plans—they do not have money immediately available to finance those plans. The government does not face such a liquidity constraint in so far as the central bank can (and usually will) always provide any required liquidity. An economic agent faces a funding constraint in so far as expenditure = income plus borrowing. At the individual level, there is a tendency to think in terms of a budget constraint as being that income constrains expenditure, though the constraint can be eased by borrowing. However, it is feasible to think in terms of expenditure 'constraining' income, in that someone who wishes to pursue a frugal lifestyle with low expenditure only requires a low income and may adjust their work/life balance accordingly. There is a funding relationship on government, which specifies that government expenditure is equal to tax revenue plus borrowing. For government, tax revenue depends on tax rates and level of income, which in turn will be influenced by the level of government expenditure. Its ability to borrow depends on the willingness of the private sector to lend to—and that in effect depends on the excess of private savings over private investment.

There is then the question of how much should the government be prepared to borrow. The thrust of the argument here is sufficient to secure full employment. These arguments are simply illustrated in Fig. 1. A line, such as $s(Y) - I(a)$ in Fig. 1, for savings minus investment in effect forms an upper boundary for government borrowing in light of what people wish to save and firms wish to invest. Reaching point such as A for the size of budget deficit would require some combination 'forced savings' and below desired investment.

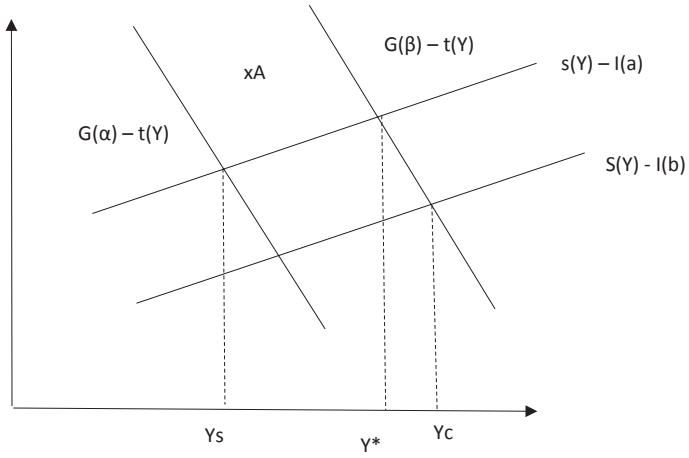

Fig. 1 Budget deficits and the level of income (*Source* Own construction)

With 'animal spirits' at a with corresponding investment $I(a)$, and government expenditure at $G(\alpha)$, and treating the savings and tax revenue functions as dependent on Y and not subject to shifts, the equilibrium value of income would be at Y_s. A shift in the budget deficit function to $G(\beta) - t(Y)$ would lead to an equilibrium level of income equal to Y^* which is deemed to correspond to the high level of employment. The appropriate size of the budget deficit for a high level of employment can then be read off. Now if 'animal spirits' shift to b and investment function becomes $I(b)$ it is evident from Fig. 1 that the equilibrium level of income Y_c would be above the high level of employment. For some this could signal inflationary pressures and for others would be infeasible. At Y^*, the budget deficit would exceed the available net private savings. In the equivalent of these circumstances it would be the case that the attempted budget deficit is too large; in the first scenario portrayed the budget deficit would be too small.

It is argued here that the appropriate target for budget deficit should relate to the overall budget position including current and capital expenditure as it is that position which is relevant for aggregate demand purposes. The objective (as argued above) should be a fiscal stance consistent with a high level of employment. Over a five-year time horizon,

it is difficult, if not impossible, to formulate what the scale of budget deficit (however defined) should be, which corresponds to a high level of employment, and put a corresponding commitment in a political manifesto. As indicated above, the appropriate size would depend on the path of private demand.

The basic proposition is to seek to set the budget deficit to secure a high level of employment. In doing so, as argued above, recognises that fine-tuning is problematic and that the scale of the required budget deficit varies over time. The budget deficit appropriate for fiscal policy purposes is the overall budget deficit. In the case of an ongoing total deficit, it can readily be shown that the debt to GDP ratio converges on debt = deficit/g[7] where g is the nominal growth rate. For a primary budget deficit, the debt to GDP ratio converges on deficit/$(g - r)$, where r is the nominal rate of interest payable on government debt, and hence depends on the relative size of g, r for sustainability. A given primary budget deficit would lead to perpetually rising debt if $r > g$, and over time the balance between public expenditure (other than interest payments) and tax revenues would need to be adjusted.

What may be termed the optimal sustainable level of government debt (relative to GDP) would be c^*/g where c^* is the desired budget deficit—that is the budget deficit which secures high levels of employment. This is not to underestimate the difficulties of calculating what c^* would be nor that it would shift over time as there are shifts in investment, savings behaviour and the in the current account deficit. With that in mind, c^* is interpreted as an average of the budget deficits required to secure full employment. At any time, it will be difficult to ascertain what the average desired budget deficit is (and indeed it will evolve over time as private sector behaviour changes) and the corresponding appropriate debt to GDP ratio. The significant point here is that the appropriate ratio should not be plucked out of the air (as has happened with the 60% ratio in the Stability and Growth Pact, and is

[7]Hence, the convergence criteria for membership of the euro under the Maastricht Treaty of 3% deficit, 60% debt ratio can be viewed as mutually consistent under conditions of 5% nominal growth.

used in the 'fiscal space' literature as noted below). Nor should the figure be derived from some phoney assessment of a 'tipping point' for the debt ratio beyond, which the economic performance suffers. It is rather to assess the debt ratio, as the deficit position, with assessments of what is needed to underpin high level of employment.

The position with regard to the level of public debt (relative to GDP) depends in an arithmetical manner on the relationship between the present debt ratio and the one implied by the budget deficit. Whether it is appropriate to aim for a declining debt ratio obviously depends on an assessment of whether in some sense the current debt ratio is too high, that is interpreted as highly relative to the equivalent of c^*/g. A period of budget deficits higher than required to sustain full employment, for example, could lead to a debt ratio above c^*/g. This would though not include cases where what appears to be a high debt ratio has come about through large budget deficits necessary to maintain employment. For example, the period after the global financial crises when deficits had been needed to avoid an even greater slump (though not put sufficiently high to maintain high employment rates). It would though follow that as economy recovers and moves to a lower budget deficit requirement the debt ratio will decline.

The relationship between the rate of growth and the rate of interest can be of considerable significance to sustainability. In Arestis and Sawyer (2004) it was argued that the two were often close, and particularly if the tax on government bonds were taken into account the rate of growth could often exceed the rate of interest. In recent times, there has been a range of authors arguing to a similar effect. For the long run, interest-growth differential for a sample of advanced economies, Barrett (2018) found that "point estimates are indeed negative, [but] a variety of statistical techniques cannot reject the possibility that this differential is small and positive". He concludes that to be conservative with respect to sustainable debt levels, "models of debt sustainability should feature interest-growth differentials which are small and positive" (p. 38). Blanchard (2018) also suggests that "the current situation in which, in the United States, safe interest rates are expected to remain below growth rates for a long time, is more the historical norm than the exception. If the future is like the past, this implies that debt rollovers, that is the

issuance of debt without a later increase in taxes may well be feasible" (p. 2). It could though be noted that rollover of debt could be subject to the credit rating of the government concerned not having changed.

Blanchard (2018) reports that for the USA over the period 1950–2018 the 1-year nominal interest rate on government debt averaged 4.7%, the 10-year rate averaged 5.6% while nominal GDP growth averaged 6.3%. In the three decades until the early 1980s, the 1-year and the 10-year rate were consistently below the growth rate. In the more recent decades, both nominal rates and nominal growth have declined with interest rates declining faster than growth. IMF (2018b) (Tables A23 to A25) provide forecasts for the interest rate-growth rate differentials over the period 2018–2030. For 34 advanced economies the average differential is −1.2%, for 38 emerging market and middle-income economies −3.9% and for 40 low-income countries −6.7%.

It has often been taken as a given that the rate of interest exceeds the rate of growth. A rate of return on wealth greater than the rate of growth forms an integral part of Piketty's thesis (Piketty 2014) on rising inequality. The figures just quoted suggest that treating the rate of interest on government borrowing to be less or equal to the rate of growth is to be treated as a serious possibility. In such a case, a primary budget deficit can be sustainable in the sense of leading to a stabilising debt to GDP ratio, albeit a relatively high one.

6 Political and Social Obstacles to Full Employment Budget Deficit

The idea of seeking to achieve high employment using macroeconomic policies, notably fiscal policy, would appear on the surface to be a highly attractive one. Why then is there such apparent resistance? A few remarks are offered here, as per below. There is the issue of public acceptance of the ideas of using fiscal policy to secure full employment with its implications for budget deficit and public debt. The issue was expressed by Keynes (1980): "I recently read an interesting article by Lerner on deficit budgeting, in which he shows that, in fact, this does not mean an infinite increase in the national debt, since in course of

time the interest on the previous debt takes the place of new debt which would otherwise be required. (He, of course, is thinking of a chronic deficiency of purchasing power rather than an intermittent one.) His argument is impeccable. But, heaven help anyone who tries to put it across the plain man at this stage of the evolution of our ideas" (p. 320: originally written in 1944).[8] Many of the responses to rising deficits after the global financial crisis may bear this out. The perceived necessity to reduce deficits was backed by arguments of 'credit card maxed out', 'burden of debt for the next generation', etc. Yet governments tend to run deficits (rather than surpluses) and have substantial public debts, which are, of course, the accumulation of deficits. There is something of a disjuncture between what governments often do (run budget deficits) and the political and social hostility to budget deficits.

In many respects, advocacy of the use of fiscal policy, particularly when it involves increasing budget deficits, has fallen outside what can be termed the Overton window that described the range of ideas tolerated in public discourse. For much of the time, budget deficits falls outside the Overton window and those seeking to stimulate the economy dismissed as 'deficit deniers'.

The difficulties of advocating the use of budget positions for securing full employment have been clear over the past decade in response to the recession following the global financial crisis (and of course before). When money is to be created to spend on increasing public expenditure, the cry often goes up that it will be inflationary. There were similar responses to quantitative easing. An open letter to Ben Bernanke, then Chair of the Federal Reserve in November 2010 signed by 24 economist, financiers and commentators[9] stated that "the Federal Reserve's large-scale asset purchase plan (so-called "quantitative easing") should be reconsidered and discontinued. We do not believe such a plan is necessary or advisable under current circumstances. The planned asset

[8]See Aspromourgos (2014) for extensive discussion on this point and more generally the relationship between Keynes and Lerner.

[9]Including Michael Boskin, John Cogan, Niall Ferguson, Ronald McKinnon, and John Taylor. Letter available at: https://economics21.org/html/open-letter-ben-bernanke-287.html.

purchases risk currency debasement and inflation, and we do not think they will achieve the Fed's objective of promoting employment".

It would seem more the case that often fears on deficit are played on as a smoke screen behind which austerity can be pursued. This is in line with the general thrust of the arguments of Kalecki (1943). He saw political motivations at play. "The entrepreneurs in the slump are longing for a boom; why do they not gladly accept the synthetic boom which the government is able to offer them?" (p. 324). Kalecki divided the reasons for "opposition of 'industrial leaders' to full employment by government spending" (p. 324) into three: "dislike of government interference in the problem of employment as such" (p. 324), "dislike of the direction of government spending (public investment and subsidizing consumption)", "dislike of the social and political changes resulting from the maintenance of full employment" (p. 324). "The social function of the doctrine of 'sound finance' is to make the level of employment dependent on the state of confidence" (p. 324). In addition, of course, it is the 'state of confidence' of a small group who make investment decisions, without regard to the 'state of confidence' among workers!

7 On Multipliers and Expansionary Austerity

The idea that the fiscal position should be geared to the achievement of high employment runs into practical difficulties of gauging and then achieving the appropriate budget deficit. From any existing economic situation, the question can always be posed what would be the required scale of fiscal expansion to achieve high employment. One way of approaching that is to think in terms of the effects that an expansion in public expenditure or reduction in tax rates would have on output; in other words what is often seen as the multiplier. In this section, estimates of the multiplier are reviewed including arguments that the multiplier can be negative (the case of so-called expansionary fiscal consolidation or austerity).

A multiplier relationship between government expenditure (or budget deficit) and output starts as a comparative static, ceteris paribus

relationship. The empirical relationship between government expenditure (budget deficit) and GDP depends on many factors. These include the purposes lying behind the change in public expenditure (e.g. was it what may be termed discretionary in response to economic conditions), the responses of private expenditure to government expenditure (e.g. was investment stimulated or discouraged by change in public expenditure) and what would have been happening to GDP otherwise (notably that capitalist economies fluctuate). These considerations suggest that the observed relationship between government expenditure and output will vary considerably and will depend on what factors are taken into account.

In Sawyer (2017b) it was noted that there is a wide range of estimates of the multiplier, and hence uncertainty over the size of the multiplier at a particular time and at a particular place. Gauging the scale of fiscal change, which is then relevant (to achieve a particular objective), is then particularly difficult. Further, any estimated multiplier is a mixture of causal relationship and association, and again the application of fiscal policy requires well-based forecasts of what would happen in the absence of fiscal changes. As Setterfield (2019) remarks there is "a growing empirical literature [that] demonstrates that the size of the expenditure multiplier varies over time, being both larger and consistently greater than one during periods of slow growth and/or recession" (p. 42). Qazizada and Stockhammer (2015) use a panel of 21 industrialised countries over the period 1979–2011. They find a spending multiplier of close to one during expansion, and values up to three during contractions. Further, their results did not indicate any difference of the spending multiplier during nominal interest zero lower bound periods.

Perotti (2011) examines four episodes of large fiscal consolidations in small open economies (Denmark, Finland, Ireland and Sweden).[10] Two of these episodes occurred immediately after pegging the exchange rate, while two occurred in the opposite circumstances, immediately after floating. He finds that "all four were associated with an expansion. But only in the Danish exchange rate based stabilization was domestic demand the initial driver of growth; and, as the effects of incomes

[10]See Arestis et al. (2007) for a similar exercise.

policies faded, after four years the gradual loss of competitiveness led to a slump that lasted six years". "These results cast doubt on some versions of the "expansionary fiscal consolidations" hypothesis, and on its applicability to many countries in the present circumstances". He does though argue that "even in the short run budget consolidations were probably a necessary condition for output expansion for at least three reasons: first, they were instrumental in reducing the nominal interest rate; second, they made wage moderation possible by signaling a regime change that reduced inflation expectations; third, for the same reason they were instrumental in preserving the benefits of nominal depreciation and thus in generating an export boom" (p. 42).

Alesina et al. (2019) define austerity (rather like fiscal consolidation) as sizeable reduction of budget deficit and stabilisation of public debt by combination of public expenditure cuts and tax increases. Note that they say that austerity would not be needed in situations where deficits during recession were offset by surpluses during a boom. They argue that austerity may be required because of past policy mistakes. In one sense I could agree with that since my approach here indicates that there is an upper limit on the appropriate scale of the budget deficit and that through misjudgement or deliberate policy actions a government may exceed that limit. It was also acknowledged that the calculation and implementation of the appropriate budget deficit were difficult and hence mistakes in both directions likely. They also argue (p. 4) that 'austerity' through expenditure cuts have different effects than through tax rises. They then go on to look at explanations for the differences. They argue that 'austerity' may be expansionary, but not always, and depends on accompanying changes in private demand. This is consistent with arguments (e.g. in Arestis and Sawyer 2014) that the apparent relationship between government expenditure (budget deficit) and levels of output and employment depends on the stage of business cycle and in responses to aggregate demand, which would have occurred anyway.

Arestis et al. (2018) use annual data over the period 1980–2014 for six countries (Portugal, Ireland, Italy, Greece, Great Britain and Spain). They use Boot-strap Granger causality analysis from Kónya (2006), which allows testing for causality on each individual country and accounting from cross country dependencies. Their "findings indicate

that in no country does fiscal consolidation promote growth. However, fiscal consolidation negatively affects employment in Portugal and Italy, whereas it positively influences employment in Great Britain" (p. 300).

Botta and Tori (2018) identify the three channels through which the proponents of 'expansionary austerity theory' (EAT) (i.e. 'expansionary fiscal consolidation') view reduced government expenditure and/or tax increases having a favourable effect on output and employment. These are (i) the 'expectation channel' through which economic agents develop optimistic expectations by anticipating future tax reductions, stimulating consumer expenditure; (ii) a 'financial channel' through which reduced budget deficit and public debt lower interest rates and (iii) 'external channel' through which exchange rate depreciates.

Botta and Tori (2018) note that the EAT literature has generally taken on board that the recorded budget deficit moves with the business cycle and use such measure of cyclically adjusted budget. As other authors (such as Guajardo et al. 2011; Baker and Rosnick 2014) have argued, the use of cyclically adjusted budget does not entirely remove the cyclical elements of the budget deficit. They find that "the theoretical fundamentals of EAT turn out to be extremely fragile and state- or institution-contingent, to say the least. Surely they cannot be taken as well-established and universal guidelines for conducting fiscal policy" (p. 367).

The empirical investigation of Botta and Tori (2018) uses annual data from a sample of 28 developed countries from 2007 to 2016, providing an unbalanced panel dataset of 216 annual observations. Through estimation of a set of six equations, they explore each of the three channels mentioned above (i.e. two specifications for each of the three channels) focusing on effects of budget deficit and debt on interest rates, exchange rate and private consumption and gross fixed capital formation. They find that "the results of our empirical exercise tell us thjat, from 2007 to 2016, austerity measures did not deliver the expected results. Most of the time, their effects were even contrary to the EAT's hypothesies" (p. 389).

A final note is that one objection to the use of fiscal policy and budget deficit to secure high employment is that in effect it is not required. This can be formalised in terms of Ricardian equivalence, namely that any proposals for changes in the government budget

position will be offset by matching changes in private expenditure, leaving the level of demand and thereby level of economic activity and employment unchanged. But from that perspective, it is difficult to understand why unemployment ever occurs as private demand would appear to be always sufficient to ensure full employment. At most, departures from full employment would arise from (unexplained) shocks and in the nature of such shocks, over full employment would match unemployment. The observation of substantial unemployment for most of the time should be sufficient to rule out that line of argument.

8 Structural Budgets

It has long been recognised that the actual budget outcome should vary with the business cycle, and that attempts to balance the budget during a downturn would worsen the recession. The pre-Keynesian view of seeking to balance the budget at all times has been replaced for many by notions of balancing the budget over a period of time (e.g. specified number of years, over the business cycle) and more significantly by the idea of a balanced structural budget. This can also be seen as a reformulation of old debates on whether budget deficits should be temporary during recessions or permanent.

The idea of structural budget position in terms of the budget position, which would result with present expenditure plans in place (if possible stripped of discretionary expenditure plans) and present tax rates if the economy were operating at 'potential output'. This can be critiqued along many lines; here focus on two. First, the measurement of 'potential output' is problematic, may not exist and its estimates tend to be path dependent. 'Potential output' is a theoretical construct, which is a property of a corresponding theoretical model, and the model may fail to correspond to the real world (or may apply at sometimes but not at others and not be a universal theory) (see Sawyer 2017b, Sect. 8 for further discussion). In its simplest form, the theory from which 'potential output' emerges is one summarised in the idea of the Phillips' curve in which inflation is based on output gap (actual output relative

to 'potential output') and expected inflation. The theory requires that the output gap has a positive effect on inflation, and the coefficient on expected rate of inflation is unity. However, what if that theory does not accord with reality? For example, what if the coefficient on expected inflation turns out to be different from unity?

A range of methods has been deployed for the estimation of 'potential output' that can be placed under two headings. The first comes from estimation of inflation—economic activity relationships including those between inflation, output and between inflation and unemployment (from which a non-accelerating inflation rate of unemployment, NAIRU, is calculated and then in turn a corresponding level of output). The second comes from treating potential output as some form of trend output. The estimation of 'potential output' is inevitably backward looking in the sense that it has to be estimated from previous data, which is often subject to revision.

A range of methods have been deployed for the estimation of 'potential output' (as indicated in Murray 2013), which can be placed under two headings. The first comes from estimation of inflation—economic activity relationships including those between inflation and output, and between inflation and unemployment (from which a non-accelerating inflation rate of unemployment, NAIRU, is calculated and then in turn a corresponding level of output). The second comes from treating potential output as some form of trend output.

The estimation of 'potential output' is inevitably backward looking in the sense that it has to be estimated from previous data, which is often subject to revision. These observations lead into two sets of issues. First, different ways of modelling 'potential output' can give different estimates (and thereby different estimates of the structural budget). Second, how far do estimates of 'potential output', for a specific period of time, change as further data becomes available?

Jarocinski and Lenza (2016) point to a range of analyses, which have suggested that the great recession resulted in a decline in growth of potential output, and that estimates of 'potential output' would be affected depending on the view taken on growth of 'potential output'. In their work, seven alternative modelling assumptions relating to real activity indicators and models of trend components of variables are

used. The resulting estimates of the output gap agree on the timing of peaks and troughs of the business cycle, but differ significantly on its level. For 2014–2015, for example, the estimates for the output gap lie in the range −2 to −6%; such a range of estimates could be expected to impact on estimates of structural budget position of around 2% of GDP.

The reliability of measures of 'potential output' and structural budget can also be gauged by seeing how the estimate of structural budget for a specific year changes over time as further data becomes available: see Sawyer (2017b), Fig. 1 for illustration.

Heimberger and Kapeller (2016) review how the estimates of potential output and structural budget position are formulated, and further show (for example their Table 2) the extent to which downward revisions of potential output have increased pressures for fiscal consolidation. Heimberger and Kapeller (2016) base their study on the performativity of economic models—that economic models "do not merely record a reality … but contribute powerfully to shaping, simply by measuring, the reality" (Callon 1998, p. 23). Heimberger and Kapeller (2016) "analyze the PO [potential output] model not primarily as a scientific device that allows economists to assess the position of an economy in the business cycle and to draw conclusions on the 'structural component' of the fiscal balance, but rather as a conceptual foundation for an authoritative political practice that structures the room for fiscal policy manoeuvring in EU countries" (p. 3). They note the pro-cyclicality of NAIRU and potential output estimates.

There is also the complicating factor of shifts in the assessment of 'potential output'. An example of this is that "essentially all of the convergence [between 2009 and 2014] between the economy's level output and its potential [i.e. output gap] has been achieved not through the economy's growth, but through downward revisions in its potential… Today, it is increasingly clear that the trend in growth can be adversely affected over the longer term by what happens in the business cycle" (Summers 2014, p. 66). Changes such as these would clearly affect the assessment of the fiscal stance.

Second, there is the implicit assumption that a balanced structural budget is feasible. Consider the equation:

$$S^p - I^p + FA^p = 0 \tag{9}$$

where superscript p indicates that the variable concerned refers to the desired (by economic agents) conditional on the level of economic activity being at potential output. Would that equation indeed hold, and hence the structural budget deficit would be zero? It may then be seen that an unbalanced budget may be required in the long term if high level of employment is to be secured.

9 On Interest Rates and Fiscal Policy

The alternative (or perhaps complement) to fiscal policy has long been monetary policy. In recent decades, monetary policy came to be the dominant arm of macroeconomic policies albeit to be used for inflation targeting through variations in the policy rate of interest. Within that framework, a policy (Taylor) rule is often invoked with the policy rate set according to a formulation such as:

$$i = i^* + a(p - p^T) + b(y - y_P) \tag{10}$$

where i is policy interest rate, i^* some form of 'natural rate of interest', p^T target rate of inflation and y_p potential output. In the background, there is a Phillips' curve type relationship in which inflation is related to expected inflation and output gap. Hence there is rate of interest i^* which is consistent with inflation at target and output at potential output. It is implicitly assumed that the economy is stable and can be guided through interest rate policy to reach constant inflation and potential output. Fiscal policy is deemed unnecessary as interest rates can do the job. Our perspective is rather different, and essentially challenges the notion of an equilibrium consistent with potential output (which may or may correspond to full employment of labour) achieved by the 'natural rate of interest'.

The 'natural rate of interest' is a concept derived within a particular theoretical framework, and doubts about the validity of the theoretical framework casts doubts on the validity of the notion of the 'natural rate of interest'.

Authors, notably Portes and Wren-Lewis (2015), have argued that fiscal policy comes into its own when monetary policy is at or tending towards the 'zero lower bound'—that is the lowest feasible policy rate of interest.[11] Hence, any further stimulus from lowering interest rates cannot take place. Two questions here (i) in terms of short-term influence on the economy, if some form of fine-tuning is to be attempted can debate the relative merits of interest rate and fiscal policy. Interest rates have arguments of flexibility in their favour, though doubts (Arestis and Sawyer 2004) on the impact of interest rates. Using interest rates to influence output and inflation ignores their effects on asset prices and thereby financial stability. (ii) the limits on the use of interest rates are derived from the (non) existence of a 'natural rate of interest' and its ability to secure full employment balance between savings and investment.

Angeriz and Arestis (2009) review empirical evidence (as well as theoretical arguments) from which they conclude that the results "point to a relatively weak effect of interest rate changes on inflation. Also, monetary policy can have long-run effects on real magnitudes" (p. 567).

10 Sustainability of Debt

An argument against running budget deficits over a number of years is that even if it does not involve unsustainable rise in public debt (relative to GDP), the resulting higher (than otherwise) debt ratio will be detrimental to growth. Authors such as Cecchetti et al. (2011), Reinhart and Rogoff (2011) have argued that a debt to GDP ratio of around 80 to 90% endangers, though serious doubts on the results of Reinhart and Rogoff have been cast by Hendon et al. (2014). However, authors such as Panizza and Presbitero (2012) do not confirm any causal relationship

[11]This approach has been adopted by the UK Labour Party (2017). Further, "when the Monetary Policy Committee decides that monetary policy cannot operate (the 'zero-lower bound'), the Rule as a whole is suspended so that fiscal policy can support the economy. Only the MPC can make this decision" (p. 2).

running from debt ratio to growth. In Arestis and Sawyer (2014), we illustrated how from a theoretical perspective a low growth (with a low investment to GDP ratio) could be anticipated to be associated with a high budget deficit requirement and resulting high debt to GDP ratio.

Rogoff (2019) is a remarkable about turn. In the context of discussing Brexit, he argued that "a hard Brexit would provide an overwhelming argument for using the government's strong balance sheet to cushion the transition. What's the point of saving for a rainy day if you don't use savings in an epic storm?" and argues for investment in physical and human capital rather than seeking to reduce debt ratio. "To be frank, it has never been remotely obvious to me why the UK should be worrying about reducing its debt–GDP burden, given modest growth, high inequality and the steady (and largely unexpected) decline in global real interest rates. It is one thing to have an exit plan for controlling the rate of debt increase after a deep financial crisis; it is entirely another thing to be in any rush to bring debt levels down".

In considering the sustainability of debt and its possible impact on growth, the role of other debts has to be considered. Carney (2019) notes that the globally the outstanding stock of debt almost doubled in the decade following the global financial crises, and that public debt had risen above 90% of GDP for the first time in the post-war era. He then argues that "public sector debt is important for intergentational equity" although it represents an intragenerational transfer. He also argues that "high levels of public indebtedness tend to result in lower growth over the long run", a result which has been disputed above as a general result though it would be recognised that a deficit larger than required to secure high level of employment could crowd out investment and lead to a higher debt than indicated above and a lower growth rate. Carney views high public debt as a "chronic not an acute problem". He does then cite research at the Bank of England and elsewhere to the effect that growth of the private sector provides one of the best early warning indicators of a downturn.[12] Further, over a half

[12]Carney (2019) cites Bridges et al. (2017), Borio et al. (2018), Taylor and Schularick (2012) and Aikman et al. (2018).

Table 3 Panel regression of per capita GDP growth

Variables			
HHD	0.051*	0.007	0.021
	(1.726)	(0.346)	(0.762)
HHD^2	−0.048**	−0.024	−0.051
	(−1.980)	(−1.494)	(−2.057)
Crisis		−0.017***	−0.015***
		(6.319)	(−4.688)
EMExHHD			−0.000
			(−0.015)
Education	0.028	0.018*	0.017
	(1.117)	(1.818)	(1.576)
Initial per capita GDP	−0.012**	−0.004	−0.000
	(−1.973)	(−1.227)	(0.078)
Constant	−0.035	−0.038	−0.066
	(−0.353)	(−0.933)	(−1.507)
Observations	278	278	278
Number of countries	73	73	73
AR^2	0.0186	0.137	0.185
Hansen	0.253	0.797	0.361
Instruments	55	73	68

Z-statistics in parenthesis
***$p<0.01$, **$p<0.05$, *$p<0.1$
Five-year average growth rates
HHD household debt to GDP
Crisis: dummy for the banking crisis
EME emerging market economy dummy
Source IMF (2017)

of recessions are preceded by booms of private sector credit and private credit booms often (to the extent of two-thirds) end in recession. IMF (2017) found "a trade-off between short-term boost to growth from higher household debt and a medium-term risk to macroeconomic and financial stability that may result in lower growth, consumption, and employment and a greater risk of banking crisis. This trade-off is stronger when household debt is higher can be attenuated by a combination of good policies, institutions, and regulations" (p. xii). This chapter provides a lengthy discussion on the financial and economic instabilities arising from household debt. In Table 3 regression results from IMF (2017) are reproduced to illustrate findings of an inverted U-shaped relationship between household debt and economic growth.

11 Fiscal Space

The degree of constraints on government expenditure has come to be discussed in terms of 'fiscal space', particularly within the international organisations. The IMF (2018b), for example, described fiscal space "as the room for undertaking discretionary fiscal policy relative to existing plans without endangering market access and debt sustainability" (p. 1). IMF continues by arguing that most countries have some fiscal space, reflecting low financing needs, and favourable interest rate-growth differentials (as indicated in the projections noted above). In terms of Eq. (8) above, fiscal space could be interpreted in terms of the degree to which the inequality applies, and the difference between the prevailing budget position and that, which would appertain under high level of employment. The notion of fiscal space places emphasis on issues of debt sustainability and ability to borrow rather than achieving high levels of employment.

IMF (2018b) among others indicate the difficulties of making assessments on the degree of fiscal space. For example, "fiscal space is a forward-looking and dynamic concept such that today's fiscal space depends on the future effect of policies given the particular conjuncture the economy faces. For instance, in the face of a severe negative shock, a large fiscal consolidation could actually reduce fiscal space by dampening growth. Alternatively, a temporary stimulus could create fiscal space and improve medium-term debt prospects, if it is used wisely, e.g. to fund investment in productive infrastructure, support structural reforms, or help repaid private balance sheets" (IMF 2018a, p. 2). IMF (2016) indicate a range of methods for assessing fiscal space. The significance of the range of methods is that it provides an indication of the difficulties in making the assessment. In terms of the central proposition of the use of budgetary position to secure high levels of employment, one interpretation would be that governments should seek to operate where there is no fiscal space left, and that the government has in effect pushed the budget position to its limit. However, the limiting factor on fiscal space is taken to be the public debt ratio, often pitched at 60% or less. IMF (2016) talk of the need for long-term adjustment to "reduce public debt to 60 and 40% of GDP (by 2030) respectively for

advanced and emerging economies while offsetting expected increases in age-related spending" (p. 21). There would seem little reason to accept a 60% (or 40%) of GDP as the limit on public debt. Doubt has been cast above on such a limit in terms of impact on economic growth and performance. It has also been argued that the desirable level of public debt should be related to the average budget deficit that is required to achieve high levels of employment. It was argued above that the implications for the current account position and for borrowing from overseas (particularly when denominated in a foreign currency) that could serve to limit the use of budget deficits to achieve high level of employment.

A specific and 'high' debt ratio does not preclude fiscal response to economic downturns for the simple reason that the characteristic of an economic downturn is a decline in investment and a rise in savings (which can only be realised if there is a corresponding budget deficit). In other words, the circumstances in which an increase in the budget deficit would be appropriate (whether arising from the operation of automatic stabilisers or through discretionary actions) are precisely those where the funding of the deficit would not create difficulties.

12 Summary and Conclusions

The central proposition on which this paper is based is that the prime purpose of budgetary policy should be to secure a high level of employment and not to produce a balanced budget. The purpose is to balance the economy rather than to balance the budget. The achievement of what may be regarded as full employment can be constrained by the quantity and location of productive capacity, and appropriate fiscal policy is a necessary but not sufficient requirement to achieve full employment. The basic arguments for this approach are set out in Sect. 5.

In Sect. 2, it has been pointed out that for government expenditure (and expansion thereof) can always be financed by the actions of the central bank. The first key question should be the social desirability of the expenditure proposed, and not 'where is the money coming from'. A budget deficit has to be funded through domestic and foreign

borrowing. This raises the question of the appropriate balance in funding between net central bank money creation and net bond sales, bearing in mind that the counterpart of budget deficit is private sector net savings (domestic private savings minus private investment plus borrowing from overseas). It is also relevant to consider the limitations on government expenditure and budget deficits, which come from open economy considerations, and the degree to which government expenditure on imports can be financed in the domestic currency and the degree to which the overall current account deficit can be funded.

Let us consider a proposal (say Green New Deal) for increased government expenditure and investment. The proposal is treated as socially beneficial. It would first be acknowledged that the expenditure would need to be financed by the use of central bank money. The proposal would need to be considered in terms of its resource requirements, whether resources appropriate for the proposal are available, and the degree to which resources will need to be drawn from other activities. We focus on the financing and funding elements. The degree to which the proposal would be matched by an increase in the budget deficit should depend on the state of economic activity. The degree to which it is funded by an increase in central bank money is governed by banks willingness to hold reserves (in the form of central bank money) and the public's willingness to hold bank deposits. For an increase in public expenditure, and associated increase in economic activity and in savings, the additional desire for banks to hold reserves and public to hold bank deposits may be expected to be rather small.

Section 3 argues that ideas such as people's quantitative easing do not contribute anything that is not available from traditional fiscal policy. Use of quantitative easing risks putting decisions on government spending (level and composition) in the hands of an unelected central bank. It also threatens to hypothecate funds via quantitative easing for specific projects.

Section 4 argues against ideas of a 'golden rule' under which borrowing for public investment is allowable but not for current expenditure. It is the overall budget position which is relevant here, and there are no persuasive reasons for the borrowing involved to be matched with the level of public investment. The extent and structure of public

investment should be judged, as other forms of public expenditure, by their contribution to economic and social benefit.

In Sect. 6, there is a brief reminder of what is perhaps obvious by observation of the world, namely that the obstacles to achieving high levels of employment through fiscal policy are social and political. The experiences of the last decade where the supposed urgent needs to eliminate budget deficits (described by the incoming UK coalition government as the most urgent economic problem facing the UK) has provided cover for austerity and attacks on the welfare state.

It is acknowledged that there are severe practical problems of achieving the right scale of budget deficit (or surplus) consistent with a high level of employment. There are well-known problems of seeking to fine-tuning a capitalist economy. The range of estimates of the multiplier are cited to indicate the difficulties—if the size of the multiplier is uncertain, how much change in public expenditure or tax rates would be required. In the operation of fiscal policy designed to achieve high levels of employment. However, it is argued in this section that the notion of expansionary fiscal consolidation can be dismissed though there can be fortuitous occasions when scaling back of public expenditure goes alongside a rise in economic activity generated by, for example, booming exports.

Much attention has been paid to macroeconomic policies involving a balanced structural budget, which contrasts with the approach to budget deficits adopted in this paper. It has, though, been argued here that the idea of a structural budget and the related notion of 'potential output' are problematic. The key point is that there is no reason to consider that the achievement of a balanced structural budget is feasible, and the pursuit of such a deficit situation could result in continuing austerity and damage to longer term growth prospects. This line of argument is reinforced in Sect. 9 where the idea of a 'natural rate of interest' capable of securing a high level of employment is dismissed. There is a line of argument, which portrays the use of budget deficits as leading to high and perhaps unsustainable levels of debt. In Sect.10, it is argued that budget deficits operated to secure high level of employment can firstly be funded. The appropriate public debt to GDP ratio would then be the one that would emerge from budget deficits applied

to secure high employment. This may be relatively large or relatively small depending on the scale of the required budget deficit and the nominal rate of growth. It is then argued that the notion that high levels of public debt undermine growth is theoretically and empirically weak. It is further argued that private debt levels pose much more of a threat to stability than do public debt levels. Ideas on fiscal space have been examined, and it is argued that in a number of respects the view of a country operating where it has no further fiscal space has correspondence with the 'functional finance' view followed in this paper. However, discussion of 'fiscal space' does not place sufficient emphasis on the achievement of high employment and places too much on constraints imposed by prevailing debt levels.

References

Aikman, D., Bridge, J., Kashyap, A., & Siegart, C. (2018). *Would Macroprudential Regulation Have Prevented the Last Crisis* (Bank of England Staff Working Paper No. 747).

Alesina, A., Favero, C., & Giavazzi, F. (2019). *Austerity: When It Works and When it Doesn't*. Princeton: Princeton University Press. ISBN: 9780691185019.

Angeriz, A., & Arestis, P. (2009). The Consensus View on Interest Rates and Fiscal Policy: Reality or Innocent Fraud? *Journal of Post Keynesian Economics, 31*(4), 567–586.

Arestis, P., & Flavio, M. (2015). Fiscal Policy and the Substitution Between National and Foreign Savings. *Journal of Post Keynesian Economics, 37*(3), 436–458. https://doi.org/10.1080/01603477.2015.1000168.

Arestis, P., Flávio Cunha Resende, M., Alencar, D., Barbosa, L., & Figueiredo Campolina Diniz, G. (2017). The Finance-Investment and Saving-Funding Circuit in the Closed and Open Economies with Government. *International Review of Applied Economics, 31*(6), 832–845.

Arestis, P., Goodwin, G., & Sawyer, M. (2007). "Fiscal Consolidation in Practice: Does It Work?": Appeared in Spanish translation as "Funciona en la Practica La Consolidacion Fiscal". In N. O. L. Orlik & G. M. de Anguiano (Eds.), *Políticas macroeconómicas para países en Desarrollo* (pp. 271–304). Mexico City: Amargura. ISBN: 978-970-701-917-1.

Arestis, P., Kaya, A., & Sen, H. (2018). Does Fiscal Consolidation Promote Economic Growth and Employment? Evidence from the PIIGS Countries. *European Journal of Economics and Economic Policies: Intervention, 15*(3), 289–312.

Arestis, P., & Sawyer, M. (2004). Fiscal Policy Matters. *Public Finance, 54,* 133–153.

Arestis, P., & Sawyer, M. (2014). On the Sustainability of Budget Deficits and Public Debts with Reference to the UK. In P. Arestis & M. Sawyer (Eds.), *Fiscal and Debt Policies for the Future* (pp. 38–75). Basingstoke: Palgrave Macmillan. ISBN: 978-1-137-26952-2.

Aspromourgos, T. (2014). Keynes, Lerner, and the Question of Public Debt. *History of Political Economy, 46*(3), 409–433.

Baker, D., & Rosnick, D. (2014). *Stimulus and Fiscal Consolidation: The Evidence and Implications* (IMK Working Paper No. 135).

Barrett, P. (2018). *Interest-Growth Differentials and Debt Limits in Advanced Economies* (IMF Working Paper WP/18/82).

Blanchard, O. (2018). Public Debt and Low Interest Rates. *American Economic Review, 109*(4), 1197–1229.

Borio, C., Drehmann, M., & Xia, D. (2018). The Financial Cycle and Recession Risk. *BIS Quarterly Review.*

Botta, A., & Tori, D. (2018). The Theoretical and Empirical Fragilities of the Expansionary Austerity Theory. *Journal of Post Keynesian Economics, 41*(3), 364–398. https://doi.org/10.1080/01603477.2018.1431789.

Bougrine, H., & Seccareccia, M. (2002). Money, Taxes, Public Spending and the State Within a Circuitist Approach. *International Journal of Political Economy, 32*(3), 58–79.

Bridges, J., Jackson, C., & McGregor, D. (2017). *Down in the Slumps: The Role of Credit in Five Decades of Recessions* (Bank of England Working Paper No. 659).

Callon, M. (1998). Introduction: The Embeddedness of Economic Markets in Economics. In M. Callon (Ed.), *The Law of Markets* (pp. 1–59). Oxford: Blackwell.

Carney, M. (2019). *The Global Outlook*. Speech given 12 February 2019 (downloaded from https://www.bankofengland.co.uk/speech/2019/mark-carney-speech).

Cecchetti, S., Mohanty, M., & Zampolli, F. (2011). *The Real Effects of Debt* (BIS Working Papers No. 352). Basel: Bank for International Settlements.

Cesaratto, S. (2016). The State Spends First: Logic, Facts, Fictions, Open Questions. *Journal of Post Keynesian Economics, 39*(1), 44–71. https://doi.org/10.1080/01603477.2016.1147333.

Coppola, F. (2018). The Myth of Monetary Sovereignty. *Coppola Comment*. http://www.coppolacomment.com/.

Domar, E. D. (1944). The 'Burden of the Debt' and the National Income. *American Economic Review, 34*(4), 798–827.

Graziani, A. (2003). *The Monetary Theory of Production*. Cambridge: Cambridge University Press.

Guajardo, J., Leigh, D., & Pescatori, A. (2011). *Expansionary Austerity: New Empirical Evidence* (IMF Working Paper No. 158).

Heimberger, P., & Kapeller, J. (2016). *The Performativity of Potential Output: Pro-cyclicality and Path Dependency in Coordinating European Fiscal Policies* (ICAE Working Paper Series No. 50).

Hendon, T. Ash, M., & Pollin, R. (2014, March 1). Does High Public Debt Consistently Stifle Economic Growth? A Critique of Reinhart and Rogoff. *Cambridge Journal of Economics, 38*(2), 257–279.

HM Treasury. (2002). *Reforming Britain's Economic and Financial Policy: Towards Greater Economic Stability* (E. Balls & G. O'Donnell, Eds.). Houndmills: Palgrave.

International Monetary Fund. (2016). *Assessing Fiscal Space: An Initial Consistent Set of Considerations.*

International Monetary Fund. (2017, October). *Global Financial Stability Report: Is Growth at Risk?* Washington, DC: IMF.

International Monetary Fund. (2018a). *Assessing Fiscal Space: An Update and Stocktaking*. Washington, DC: IMF.

International Monetary Fund. (2018b, October). *Managing Public Wealth, Fiscal Monitor.* Washington, DC: IMF.

Jarocinski, M., & Lenza, M. (2016). *An Inflation-Predicting Measure of the Output Gap in the Euro Area* (European Central Bank Working Paper No. 1966).

Kalecki, M. (1943). Political Aspects of Full Employment. *Political Quarterly, 14*, 322–331.

Kalecki, M. (1944a). The White Paper on Employment Policy. *Bulletin of the Oxford University Institute of Statistics, 6*(8), 137–144.

Kalecki, M. (1944b). Three Ways to Full Employment. In *The Economics of Full Employment*. Oxford University Institute of Statistics. Oxford: Blackwell.

Kalecki, M. (1997). *Studies in Applied Economics 1940–1967: Miscellanea, Collected Works* (Vol. 7, J. Osiatyński, Ed.). Oxford: Clarendon Press.

Keynes, J. M. (1980). *Activities 1940–1946 Shaping the Post-War World: Employment and Commodities, Collected Writings* (Vol. 27). London: Macmillan.

Kónya, L. (2006). Exports and Growth: Granger Causality Analysis on OECD Countries with a Panel Approach. *Economic Modelling, 23*(6), 978–992.

Labour Party. (2017). *Labour's Fiscal Credibility Rule.* London: Labour Party.
Lerner, A. (1943). Functional Finance and the Federal Debt. *Social Research, 10*, 38–51 (reprinted in W. Mueller (Ed.), *Readings in Macroeconomics* [pp. 353–360]: page numbers refer to the reprint).
Ministry of Reconstruction. (1944). *Employment Policy*, Cmnd. 6527. London: HMSO.
Murray, J. (2013). *Output Gap Measurement: Judgement and Uncertainty* (Office for Budget Responsibility, Working Paper No. 5). Available at: http://budgetresponsibility.org.uk/topics/forecast-methodology/#briefing.
Panizza, U., & Presbitero, A. F. (2012, April). *Public Debt and Economic Growth: Is There a Causal Effect?* (MoFiR Working Paper No. 65).
Perotti, R. (2011, November). *The 'Austerity Myth': Gain Without Pain?* (NBER Working Paper No. 17571).
Piketty, T. (2014). *Capital in the 21st Century* (Arthur Goldhammer, Trans.). Cambrdige, MA: Harvard University Press.
Portes, J., & Wren-Lewis, S. (2015). Issues in the Design of Fiscal Policy Rules. *Manchester School, 83*(S3), 56–86.
Qazizada, W., & Stockhammer, E. (2015). Government Spending Multipliers in Contractions and Expansions. *International Review of Applied Economics, 29*(2), 238–258.
Reinhart, C. M., & Rogoff, K. (2011). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton: Princeton University Press.
Rogoff, K. (2019, February 3). Never Mind the Debt: If There's a Hard Brexit Britain Will Have to Splash the Cash. *Sunday Times*.
Sawyer, M. (2009). Fiscal and Interest Rate Policies in the "New Consensus" Framework: A Different Perspective. *Journal of Post Keynesian Economics, 31*(4), 549–565.
Sawyer, M. (2014). Money and the State. In G. C. Harcourt & J. Pixley (Eds.), *Financial Crises and the Nature of Capitalist Money: Mutual Developments from the Work of Geoffrey Ingham* (pp. 162–177). Basingstoke: Palgrave Macmillan.
Sawyer, M. (2017a). Endogenous Money and the Tyranny of Demand and Supply. In L. P. Rochon & S. Rossi (Eds.), *Advances in Endogenous Money Analysis* (pp. 227–244). Chelthenham: Edeard Elgar.
Sawyer, M. (2017b). Lessons on Fiscal Policy After the Global Financial Crisis. In P. Arestis & M. Sawyer (Eds.), *Economic Policies Since the Global Financial Crisis* (pp. 41–84). Houndsmill, Basingstoke: Palgrave Macmillan.
Setterfield, M. (2019). Time Variation in the Size of the Multiplier: A Kaleckian Harrod Approach. *Review of Keynesian Economics, 7,* 28–42.

Summers, L. H. (2014). U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound. *Business Economics, 49,* 65–73. https://doi.org/10.1057/be.2014.13.

Taylor, A., & Schularick, M. (2012). Credit Booms Gone Bust: Monetary Policy, Leverage Cylces and Financial Crises, 1870–2008. *American Economic Review, 102*(2), 1029–1061.

van Lerven, F. (2016). *A Guide to Public Money Creation*: *Outlining the Alternatives to Quantitative Easing*. London: Positive Money.

3

Advances in the Post-Keynesian Analysis of Money and Finance

Marc Lavoie

1 Introduction[1]

This chapter deals with the advances that have been provided by post-Keynesian economists in the field of monetary economics. When speaking of advances, a question that immediately arises is how far back in time should we go to deal with those presumed advances. The choice made here is to focus on the various themes and claims that have been emphasized by post-Keynesians and that turned out to have been validated by the way central banks implement monetary policy and by the events that occurred during and after the Global Financial Crisis (GFC). This decision raises an immediate problem, as some of the

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apparently new assertions that have been endorsed recently by central bankers had been advocated a long time ago by post-Keynesian economists. Hence, despite the choice being made, some of the *advances* might go far back in the past.

Another issue is that there is a multitude of themes that could be addressed, and this creates the problem of how they could be selected and organized. It occurred to me that one way of organizing them would be to split them according to whether they corresponded to the *horizontalist* view of post-Keynesian monetary economics or whether they fitted more the concerns of the *structuralist* view. During the 1990s, an unending debate occurred between the advocates of these two views. As argued by Rochon (1999, p. 271), retrospectively there were a number of similarities between the views advocated by the structuralists and those of New Keynesians, for both of whom there could be a shortage of high-powered money provided by central banks. I have argued that besides this, most elements of this debate have been gradually settled, in particular thanks to the distinction between the short-term interest rate under the control of the central bank and the other interest rates (Lavoie 2014, pp. 230–232). As a consequence, Sect. 2 deals with horizontalist advances, Sect. 3 with unconventional monetary policies, Sect. 4 with three views of banking, and Sect. 5 with structuralist advances. Section 6 will summarize and briefly conclude.

Since another presentation is entirely devoted to features, limits and developments of the stock-flow consistent (SFC) approach, I will not deal with it in this chapter, except incidentally, despite my own contribution to it. Needless to say, I consider that the SFC approach is an important advance of post-Keynesian macroeconomics and monetary theory, if only by clarifying the role of liquidity preference. Similarly, there will be no discussion of the post-Keynesian critique of the New Neoclassical Synthesis, also, and better called, the New Consensus Macroeconomics, as this is also dealt with in another chapter.

2 Horizontalist Advances

2.1 Endogenous Money and Interest Rate Targeting

For a long time, post-Keynesian authors have been arguing that the supply of money is endogenous, and that the best that the central bank can do is to target the short-term rate of interest. The claim goes back to some of the earlier post-Keynesians, such as Nicholas Kaldor, Joan Robinson, Richard Kahn, Anthony Cramp and Jacques Le Bourva, and it was developed into a book by Basil Moore. The latter author coined the expression *Horizontalists versus Verticalists*, criticizing the notion that the supply of money was an exogenous variable, which could be described as a vertical line in the money/interest rate plane. Instead, both Kaldor (1982) and Moore (1988), as well as Le Bourva (1992) in an article published in 1959, argued that the supply of money could best be conceived as a horizontal line, at the target rate of interest of the central bank. Over the years, the notion of what an *endogenous supply of money* really meant and the reasons for which central banks could do no better than to attempt to control short-term rates of interest, rather than the stock of money or high-powered money, have been made more precise. More will be said about these reasons in subsections as per below.

In the meantime, it is worth pointing out that some central bankers—see Jakab and Kumhof (2015, p. 130) for a relevant list—have gone out of their way to explicate to their readers that the central bank can control neither the stock of broad money nor the stock of high-powered money; except for the latter under some circumstances that will be elicited in a later section. For instance, Ulrich Bindseil (2004), from the European Central Bank (ECB), and formerly from the Bundesbank, has written that "today's views and practice on monetary policy implementation and in particular on the choice of the operational target, have returned to what economists considered adequate 100 years ago, namely to target short-term interest rates; and much twentieth-century thinking, which regarded quantities as suitable operational targets, is today nearly unanimously rejected by the central bank

community" (p. 10). Thus, post-Keynesians, who had clearly rejected the quantity approach ever since Kaldor (1970), and perhaps even earlier, were much ahead of their time, and this was reflected by Moore's 1988 book.

Bindseil and König (2013), for instance, have recognized that "the last 25 years have vindicated the substance of his thinking [Moore's] in a surprising way that could hardly have been anticipated in 1988. Central bankers have by now largely buried 'verticalism', at least when it comes to monetary policy implementation" (p. 385). The post-Keynesian view has always been that, even when central bankers were officially announcing growth rate targets of money supply growth rates or of borrowed reserves, they were in fact dealing with estimates of money demand functions, assessing the interest rate that would be in line with the growth in the demand for money. This confusion was perhaps useful to central bankers, especially in the 1980s, as they could claim that the monetary authorities were not responsible for the high rates of interest. However, Moore (1988) and other post-Keynesians—mostly the horizontalist branch of post-Keynesian monetary theory—saw through this veil, and argued instead that the controlled variable was the rate of interest and not the money supply. As Bindseil and König (2013) conclude, regarding Moore's 1988 book, "the developments since then have corroborated his theory and his views in a remarkable way" (p. 389).

What have been these developments? In the 1990s, several central banks started doing inflation targeting. However, several of these central banks, as well as others, then announced their target interest rate, for instance the Treasury bill rate or the overnight rate (such as the Fed funds rate in the USA). In some cases, the target interest rate had always existed, but it was kept secret, as it was believed that it was best for financial markets to be uncertain about the exact policy being pursued by the central bank. However, with the move towards more transparency, central bankers thought that it would be more efficient to have an explicit rather than an implicit interest rate target. The implementation of this target was then reinforced by the adoption, in many central banks, of the so-called corridor or tunnel system, with the target rate being set in the middle of this corridor, delimited by a ceiling and a

floor. The ceiling is the rate of interest on credit facilities (which had always existed, as the Bank rate or the discount rate), while the floor is the rate of interest on deposit facilities, that is, the rate of interest paid on reserves held by commercial banks at the central bank. The latter was a new instrument, which was thought to facilitate the implementation of the target interest rate. This interest rate, although previously adopted by a number of central banks, was finally implemented by the Fed in the US, in 2008, as a consequence of the GFC.

The main consequence is that the interest rate is disconnected from the amount of reserves in the system, a feature that BIS economists Borio and Disyatat (2010) call the *decoupling principle*. With the same amount of reserves, the actual overnight rate will tend to oscillate around the target interest rate, whether it is high or low, because an overnight rate which is in middle of the corridor will generate an equal opportunity cost, whether the bank is borrowing or lending its reserves. This reinforces the notion that central banks accommodate the demand for reserves, at the interest rate of their choice, as was always argued by post-Keynesians. Several statements made by several bankers confirmed it: "For a central bank which manages interest rates, the volume of reserves is not an independent variable but is the result of banks' demand at a given interest rate" (Bundesbank 2017, p. 24). To substantiate this statement, it is perhaps worth reproducing in full the following statement arising from some members of the Bank of England:

> As with the relationship between deposits and loans, the relationship between reserves and loans typically operates in the reverse way to that described in some economics textbooks. Banks first decide how much to lend depending on the profitable lending opportunities available to them — which will, crucially, depend on the interest rate set by the Bank of England. It is these lending decisions that determine how many bank deposits are created by the banking system. The amount of bank deposits in turn influences how much central bank money banks want to hold in reserve (to meet withdrawals by the public, make payments to other banks, or meet regulatory liquidity requirements), which is then, in normal times, supplied on demand by the Bank of England. (McLeay et al. 2014, p. 14)

2.2 Reversed Causality and the Defensive Behaviour of the Central Bank

Why do central banks need to focus on interest rates rather than on monetary aggregates? The standard explanation is based on the macroeconomics of the IS/LM model. Before financial innovations became generalized, it was said that instability was induced by changes in the real economy, which could best be tamed by controlling monetary aggregates. By contrast, modern financial systems have been marred by the instability of the demand for money, and hence, so the argument goes, central banks have been forced to move to interest rate targeting to provide stability to the economy.

The post-Keynesian explanation is based instead on a microeconomic examination of the way the clearing and settlement system functions. In a nutshell, as expressed by Wray (1998), "regardless of the Fed's stated target, the Fed funds rate is the primary target; that is, even when the Fed claims to adopt a reserve aggregate as a target, it in fact targets the Fed funds rate. Most central bank actions are defensive in nature, and are mainly undertaken to offset Treasury operations" (p. 97). This view was well expressed a long time ago by some central bankers, in particular in a paper by Lombra and Torto (1973), whose title is quite evocative: "Defensive behavior and the reverse causation argument". Their paper underlines that the day-to-day operations of central banks are essentially defensive. A similar point was later to be made by Bindseil (2004), when he argued that *autonomous factors*—elements out of the control of the central bank—modify the composition and size of its balance sheet and hence impact liquidity in the overnight interbank market. By contrast, the textbook view is still that additional reserves, thanks to open market operations associated with either outright purchases of assets by the central bank or through the more modern repo operations, cause additional bank credits, with the money multiplier playing an important causal role. The reverse causation argument completely rejects this approach.

Advocates of endogenous money have from the start adopted the reversed causation argument, by claiming that new bank credits or new bank purchases of financial assets from non-financial agents lead at once

to the creation of new deposits and induce the emergence of additional reserves. As pointed out by Wray (1998, p. 107), "in the real world banks make loans independent of reserve positions, then borrow reserves to meet requirements…. Certainly, no loan officer ever checks the bank's reserve position before approving a loan". This is supported by Werner (2014, p. 14), who says that he asked loan officers whether they checked if the bank had enough deposits or reserves before signing on a new loan: they all confirmed that they did not. From the point of view of central banks, Lombra and Torto (1973) argued that "monetary authorities' open-market operations are predominantly defensive and that such operations are undertaken not only to offset those factors which will lead to a change in the monetary base but also to accommodate changes in the demand for deposits and the demand for currency" (p. 53).

This was made particularly clear by the empirical work pursued by Eichner (1986), who concluded that: "no matter what additional variables were included in the estimating equation, or how the equation was specified (e.g., first differences, growth rates, etc.), it proved impossible to obtain an R^2 greater than zero when regressing the changes in the commercial banking system's nonborrowed reserves against the change in the Federal Reserve System's holdings of government securities" (p. 111). Thus, open market operations were completely unrelated to the amount of new reserves held by the banking system. This meant that autonomous liquidity factors—mainly government expenditure and taxes as we shall see later, but also foreign exchange reserves, the issue of banknotes or the *float*, which occurs in several clearing and settlement systems—could cause large fluctuations for reserves in the monetary system. If the central bank does nothing, and as the demand for reserves is very much interest-inelastic, this will induce large fluctuations in overnight interest rates. In the absence of a rate of interest on bank reserves, the overnight rate could fall to zero in the case of an excessive amount of overnight liquidity; or the overnight rate would explode in the case of a lack of liquidity and if central banks refused to lend reserves. In order to avoid these possible large daily fluctuations in the overnight interest rate, and hence in other short-term interest rates, the central bank must pursue defensive operations, so as to counter-act, that is, neutralize the effects of these autonomous factors.

All of this has nothing to do with macroeconomic considerations: it has to do with the workings of the clearing and settlement system. Reserve requirements are not there to constrain the creation of credits and deposits. Their role is to mitigate the fluctuations in the overnight interest rate that arise as a consequence of the movements in the autonomous liquidity factors when central banks are unable to estimate appropriately changes in these autonomous factors, in the demand for reserves, and in the true amount that they are actually supplying. This has been explained in excruciating detail in a series of papers by Fullwiler (2003, 2006, 2017), an Institutionalist post-Keynesian who has contributed to Modern Money Theory (MMT).

2.3 Modern Money Theory (MMT) and the Relationship Between the Government and the Central Bank

A clear advance in post-Keynesian monetary theory is the contribution of advocates of the so-called MMT, also sometimes referred to as neo-chartalists. In the past, post-Keynesians had been mostly concerned with the relationship between non-financial firms and the banks, and between the banks and the central bank. The main focus of the analysis of MMT is the relationship between the government and its central bank. Their inquiries have allowed post-Keynesians to better understand the importance of the autonomous liquidity factors discussed in the previous subsection, in particular the impact of government expenditure or of collected taxes on the reserves of the banking system. While this analysis can be said to have been first formulated by Mosler (1994), it gained academic recognition in the book of Wray (1998), which was extended in Wray (2012).

In these books, Wray explains that whenever the government spends, it issues a cheque or an electronic payment that goes through the clearing and settlement system. This means that the recipient of the payment gets a deposit in some banking institution, while the bank sees its deposits (its reserves) at the central bank increase. There is thus an autonomous increase in the amount of liquidity in the overnight

interbank market. Symmetrically, when the government collects taxes from an agent, the payment goes through the clearing and settlement system, so that there is a decrease in the bank deposits of the agent while the agent's bank observes a decrease in its reserves at the central bank. This is another example of an autonomous factor. Note that the money is not destroyed: the government now has a larger amount of deposits at the central bank. A surprising feature, at least from the point of view of those that have been brought up in the tradition of the loanable funds approach or of the IS/LM model, is that a government deficit tends to lower the overnight interest rate, while a government surplus—a surplus of collected taxes over the payments made by the government—leads to an increase in the overnight interest rate. Therefore, as pointed out in the previous subsection, the central bank must intervene so as to bring back the level of reserves to the level being demanded by commercial banks or to the amount required by bank regulations.

Monetary systems where there are no compulsory reserve requirements are a perfect case for the argument that the purpose of reserves is not to constrain the creation of bank loans and that central banks act essentially in a defensive manner. Canada is a good illustration of this, as was first pointed out by Wray (1998), because "the Canadian system makes central bank operations more transparent – reserves are not a lever to be used to control the money supply" (p. 107). I have provided an analysis of the Canadian monetary and payment system in a number of papers, showing that the simplicity of the Canadian system, with its zero-reserve framework, perfectly illuminates the accuracy of the post-Keynesian approach (Lavoie 2005). An additional feature of the Canadian system is that clearing is not done on the books of the central bank, as happens in most financial systems. Clearing occurs on the books of a private clearinghouse, run by the Canadian Bankers Association; only the settlement of the payments that have not been compensated throughout the day at the clearinghouse or that have not been counterbalanced on the overnight market occurs on the books of the central bank (Lavoie 2019).

As long as transactions do not involve the central bank, on its own or as the financial agent of the government, the amount of reserves (now called settlement balances in Canada) will not change and will remain

at zero. *Thus, there is no relationship whatsoever between economic activity and the amount of bank deposits on one hand, and bank reserves on the other*. When payments involve the account of the central bank at the clearinghouse, the positive (negative) balances of the central bank at the clearinghouse will exactly balance the negative (positive) balances of the overall banking system. By the end of the day, if collected taxes exceed payments by the government out of its account at the central bank, the monetary authorities will need to remove its positive balances at the clearinghouse, and thus provide extra balances to the banking sector; this is to bring the deficit clearinghouse balances of the private sector back to zero.

MMT advocates have underlined, as is obvious in the preceding paragraph, that there must be coordination between the government (the Treasury) and the central bank. In the Canadian case, bringing back the negative clearinghouse balances of banks towards zero is achieved by auctioning government deposits, moving them from the central bank to accounts at commercial banks. If the central bank has negative balances, government deposits at banks will be withdrawn and brought back to the central bank. Thus, at the very end of the day, the banks which are in a negative position at the clearinghouse know that there are banks whose overall positive position matches theirs, so that the overnight market can clear at the interest rate targeted by the central bank, in the middle of the corridor. As Wray (1998) noted, "the Bank of Canada intervenes to keep net settlement balances at zero, an operation that by its very nature must be defensive" (p. 107).

In the case of the United States, until very recently, the coordination occurred through the existence of special *tax and loan accounts* at commercial banks, so that federal tax payments only involved payments between banks, with transfers of reserves occurring inside the private banking system. Symmetrically, whenever the government would spend, funds would be transferred from the *tax and loans* account of the Treasury towards its account at the Fed to minimize the impact on the overall amount of reserves. With quantitative easing and the consequent vast amount of excess reserves, this feature has been suspended, since there is no need to control the amount of reserves anymore.

2.4 The Compensation Thesis and Foreign Exchange Reserves

It was pointed out earlier that changes in foreign exchange reserves are an element of the autonomous factors. It follows that if the central bank intervenes in foreign exchange markets, either because the country is on a fixed exchange rate regime or because there is a managed floating regime, autonomous factors will kick in. Thus, as is the case for any other autonomous factor, an increase or a decrease in foreign reserves will necessitate a neutralization operation from the central bank, either to bring the amount of reserves back to zero, as would happen in the Canadian case, or back to the level of reserves demanded by the banking system at the target interest rate.

This is occasionally pointed out by central bankers. For instance, the Bank of Canada (2004) states that if it buys Canadian dollars on exchange markets, thus losing some of its foreign reserves, "to make sure that the Bank's purchases do not take money out of circulation and create a shortage of Canadian dollars, which could put upward pressure on Canadian interest rates, the Bank 'sterilizes' its purchases by redepositing the same amount of Canadian-dollar balances in the financial system". Conversely, when it purchases foreign currencies on exchange markets and thus increases its foreign exchange reserves, "to sterilize the effect of the Bank's sales of Canadian dollars (and prevent downward pressure on Canadian interest rates), the Bank withdraws the same amount of Canadian-dollar balances from the financial system". The same ascertainment is made at the Fed. As Craig and Humpage (2001) point out: "When a country's central bank maintains an unchanged interbank rate as the intermediate operating target for its monetary policy, it automatically offsets (or sterilizes) the impact of any exchange-market intervention on its monetary base" (p. 1).

Thus, sterilization is not a matter of choice; it is a necessity as long as the central bank wants to keep the interest rate at its target level. Post-Keynesians, however, have long argued that sterilization occurred in general and has occurred in the past. I, for one, have argued in a number of places that this automatic sterilization is the rule rather

than the exception, even in the case of currency boards (Lavoie 2001, 2014, Chapter 7). This is what some French central bankers have called the *compensation thesis* in the early 1970s. The argument is that an increase in credit to the rest of the world will usually be compensated by a decrease in credit to the domestic economy. In the case of an overdraft financial system, where banks are systematically indebted to the central bank, this compensation will be truly automatic, as banks use the acquired reserves to reduce their debt towards the central bank. This is just a version of Kaldor's (1982) reflux principle (Lavoie 1999). It has been shown to operate repeatedly when the Bundesbank was the counterpart of the speculative attacks against weak European currencies. Some researchers have shown that the compensation thesis ruled even in the heyday of the gold exchange standard, thus invalidating the so-called Rules of the game.

In financial systems where the central bank holds large quantities of government securities, the compensation can be done at the initiative of the central bank, by conducting open-market operations, that is, by selling government securities to banks. The latter will only be too happy to cooperate, since securities carry higher yields than reserves, especially when these were not remunerated. Alternative ways to compensate or to neutralize increases in foreign reserves can also involve elements of the liability side of the central bank: the monetary authorities can transfer government deposits towards banks, or they can sell central bank bills to the private sector.

There are at least two consequences to the compensation thesis. First, as argued by Serrano and Summa (2015), the Mundell-Fleming open-economy version of the IS/LM is not useful and ought to be dumped. Running a balance-of-payment surplus (deficit) in a fixed exchange regime does not lead to a decrease (increase) in (short-term) interest rates and to an increase (decrease) in high-powered money or in the money supply, as was already argued early on by Arestis and Eichner (1988). In the case of an external surplus, there is no economic force that will bring about a balanced current account, in contrast to the standard view that asserted that increases in money supply would generate price increases and hence a fall in net exports. Naturally, in the case of an external deficit, with foreign reserves gradually disappearing,

the central bank will need at some point to reconsider its interest-rate target. The second consequence, as emphasized by Angrick (2017), is that the compensation thesis questions the trilemma, familiar to students of international finance. The issue is not whether the economy is on a fixed or flexible exchange rate; the issue is whether the country is running an external deficit or surplus—something that begins to be recognized by other economists.

3 Unconventional Monetary Policies

3.1 Quantitative Easing

Quantitative easing, that is, the goal of raising and targeting the size of reserves held by commercial banks, had been earlier pursued by the Bank of Japan. The Japanese economy had stagnated since the crash of the stock market and of the real estate market in 1990. Despite the admonitions of such mainstream luminaries such as Krugman and Bernanke, Japanese officials had been reluctant to pursue quantitative easing, and hence only first tried it in 2001 (Koo 2009, p. 73). It was abandoned in 2006, as Japanese central bankers ended up doubting its capacity to get the real economy going and to raise the rate of consumer price inflation, although it was recently resurrected.

As argued by Lavoie and Fiebiger (2018), there are two views of quantitative easing: the monetarist or Friedmanian view on one hand, and the (post-) Keynesian view on the other hand. The Friedmanian view of quantitative easing, in its strongest incarnation, supposes the relevance of the standard money multiplier and of monetarism: more reserves will automatically be multiplied into a larger stock of broad money, which will generate a larger nominal GDP and possibly hyperinflation, as was first feared. Looked at from this angle, there is nothing new (or unconventional) with quantitative easing: it is monetarism in reverse gear. The strong Friedmanian view has been totally discredited, since huge increases in bank reserves only led to a weak growth in broad money supply and to barely any impact on inflation rates. The weaker variant of the Friedmanian view, based on the New Keynesian bank

lending channel, asserts that the increase in reserves provides banks with the loanable funds that they need to boost credit supply and economic activity. The lack of explanatory power of the money multiplier mechanism is blamed on banks, which are said to be hoarding excess reserves for fear of incurring losses on their loans. Needless to say, post-Keynesians reject both variants of the Friedmanian view.

The post-Keynesian view is similar to that of Keynes (1930) who did advocate quantitative easing in dire times in his *Treatise on Money*. Keynes (op. cit.) thought that persistent open-market operations destined to raise the size of the balance sheet of the central would bring down to zero the overnight interest rate and would manage to slash long-term interest rates. He thought that the fall in interest rates would also generate a rise in equity prices, and hence would get the economy out of the slump (Lavoie 2016). These are the two main mechanisms, with their possible effect on currency devaluation, that are envisaged by post-Keynesians today, although they very much doubt the efficacy of quantitative easing to raise real output, unless accompanied by an expansionary fiscal policy. As the saying goes, 'you can bring a horse to water, but you can't force it to drink'.

The post-Keynesian understanding of quantitative easing is consistent with its view of endogenous money alluded to earlier: banks do not need reserves to make loans; nor do they need deposits for that matter. Supplying more reserves will not induce banks to make more loans: they have already made all the loans they were willing to make to their creditworthy borrowers at the going rates of interest. Banks can only lend reserves to other banks or participants to the clearing system; they do not lend reserves to firms or households, a point made among others by Fullwiler (2013, 2017). As indicated by various central bankers (Martin et al. 2016; Keister and McAndrews 2009), the quantity of excess reserves is neither a measure of the unwillingness of banks to provide loans nor of the effectiveness of quantitative easing. Ábel et al. (2016) suggest that "the widespread criticism that commercial banks keep the money with the central bank rather than lending it the real economy is misguided" (p. 52). There is nothing that the banks can do to reduce the amount of reserves in the system as long as the central bank declines to engage in a transaction with them. For instance, banks

can purchase bonds until they are blue in the face, in no way will this reduce the overall size of bank reserves unless the central bank is the counterparty to the sale. Banks, taken as a group, cannot reduce the level of their reserves at the central bank, unless they operate within an overdraft financial system, as we shall see later.

A similar mechanism is involved when explaining why, in several instances, large increases in reserves have led to *smaller* increases in bank deposits, thus generating an apparent money multiplier smaller than unity. As illustrated with balance sheets in Lavoie (2014, p. 226), this is because the non-bank agents who have sold their financial assets to the central bank in exchange for bank deposits may decide to deleverage and use the acquired deposits to reduce their debt towards banks. Koo (2009), a financial advisor, has often insisted that financial crises were accompanied by balance-sheet recessions, meaning that private agents pursue debt-minimization and use any cash to reduce leverage. His analysis of the Japanese stagnation is consistent with the demand-led approach of post-Keynesian economics. While banks may decline to make loans because of the large capital losses that they suffered at the beginning of a bad crisis, in general, bank credit will be determined by the demand for loans of creditworthy borrowers, and when sales or revenues are stale, this demand will not be forthcoming. Borrowers, not lenders, become the bottleneck.

While the consequences of quantitative easing seem to vindicate post-Keynesian monetary theory, one inconsistency arises (Lavoie 2010). Post-Keynesians assert that the money supply and the supply of high-powered money are demand-determined. With quantitative easing, however, while this assertion remains true with respect to broad money and banknotes, it is no longer the case for bank reserves at the central bank. Post-Keynesians, at least those of the horizontalist camp, see the supply of high-powered money as being a horizontal line, set at the target overnight rate. This is meant to represent the claim that between meetings of the interest-setting committee of central banks, the latter will do their best to supply any amount of reserves which is exactly equal to the demand for reserves at the given target overnight interest rate. However, with quantitative easing, the supply of reserves can be considered as a vertical line, as the central bank can set the

supply of reserves without caring about the short-term interest rate. While this may fit the MMT distinction between the horizontal and vertical components of the money supply (Wray 1998, p. 111), more needs to be said.

Post-Keynesians usually reason that central banks have little control over the supply of reserves, first, as argued earlier, because the main focus of central banks is interest rates, but also because if the central bank were not to provide enough unborrowed reserves, the supply would still be demand-led: banks would acquire the missing reserves by borrowing them from the central bank at the discount window or at the credit facilities of the central bank. Furthermore, if the central bank were to provide an excessive amount of reserves, banks that had taken advances at the central bank would use these additional reserves to reduce their indebtedness vis-à-vis the central bank—the case of overdraft economies—thus getting the supply of reserves equal to the demand for reserves through a Kaldorian reflux mechanism.

There is an alternative to the corridor system and to the ceiling system, wherein the latter case banks have to borrow reserves from the central bank, and that is the floor system. In the floor system, the target overnight interest rate is the rate found at the bottom of the corridor—it is the rate of interest on reserves. The floor system was proposed by post-Keynesians (Fullwiler 2005) and central bankers alike (Keister et al. 2008). In fact, the Reserve Bank of New Zealand and the central bank of Norway both did adopt the floor system *before* the financial crisis actually occurred. In the case of the floor system, there is a total disconnect between the overnight interest rate and the amount of reserves. The link between short-term interest rates and the supply of reserves is completely severed—a full decoupling principle. With the floor system, it is possible for central banks to control the amount of reserves in the system, so that the supply of reserves far exceeds the amount of required or demanded reserves. In systems with no compulsory reserves, similarly, the central bank can have a supply of reserves that is way beyond zero. In the case of the floor system, which is a feature of quantitative easing, the supply of reserves is not demand-led—an amendment that must be made to post-Keynesian monetary theory (Lavoie 2010).

3.2 Other Alternative Monetary Policies

With the GFC came several unconventional or alternative monetary policies. I have already mentioned quantitative easing as it is usually understood, but as left-wing observers became frustrated with the rise in equity prices unaccompanied by increases in real output, they proposed to have QE for the (ordinary) people, sometimes called helicopter money. This is an *apparent* variant of the sort of QE that was pursued by the Bank of England, as a way to circumvent the banks, which are presumed to sit on their reserves, where financial assets are purchased from non-banks rather than from banks, thus raising the amount of deposits held by non-bank agents. In the case of QE for the people, households are provided by the central bank with additions to their bank deposits (or with currency). Thus everyone, not just asset holders, benefits from QE.

However, these two forms of quantitative easing are in fact quite dissimilar. In the case of the standard QE, just as in the case of credit easing, as defined by the Fed, what we have is a swap of financial assets, as the sellers of risky assets such as mortgage-based securities (MBS) acquire safe financial assets (credit easing) or bank deposits (standard QE). There is no increase in the net worth of the private sector. This is akin to a monetary operation. In the case of QE for the people, by contrast, their net worth increases by the amount of the helicopter drop. As Fullwiler (2013) says, "helicopter drops are fiscal deficit-spending operations, not monetary policy operations" (p. 188). Thus, as pointed out later by Lavoie and Fiebiger (2018), besides determining which institution—the central bank or the government—holds the negative net worth, "all the consequences of QE for the people are identical to those of a government deficit generated by a transfer of funds from the government to the population, with the government issuing securities that eventually end up on the balance sheet of the central bank" (p. 143). As long as the rate of interest on reserves is no different from the Treasury bill rate, the consequences for the net payment flows of the government are identical. As long as interest rates are positive, the government deficit will induce additional interest payments. With QE for the people, the central bank will have to pay interest on reserves, while

there is no counterpart asset, meaning that its profits will diminish, thus leading to a reduction in the dividends that the central bank can distribute to its government, the amount of which is identical to the additional interest payments arising from the deficit (Fullwiler 2015).

The same can be said about several other proposals designed to help the ecological transition or to get the economy out of stagnation: central banks providing funds for green projects at a zero interest rate; central banks purchasing green bonds issued by firms engaged in valid green projects at a zero interest rate (in both cases, *green QE*); or central banks providing funds at a zero rate of interest to some public investment bank. In all these cases, the central bank ends up with a liability, the amount of which correspond to the extra reserves held by banks the minute the created funds end in the bank account of some recipient. Again, as long as there is a rate of interest on reserves, these central bank liabilities will have to generate interest payments that will reduce the profits to be distributed to the government. As Lavoie and Fiebiger (2018) contend, the exact same result could have been achieved if the government had itself subsidized these projects by providing finance at a zero rate of interest or "if it had itself engaged in public infrastructure projects and had financed these expenditures by issuing its own securities at market rates" (p. 143). As pointed out by Nersisyan and Wray (2016), "debt-free money will not remain debt-free for long unless the central bank wants to offer a zero interest rate policy (ZIRP) forever" (p. 1312).

An alternative to avoid this pitfall would be for central banks to abandon the corridor and the floor systems, with a return to unremunerated reserves, so that central banks would avoid making interest payments on the reserves generated by these QE operations. Commercial banks would be left with a huge part of their assets yielding a zero rate of interest, as was the case with ZIRP. In all likelihood, this would induce banks to raise the interest rate charged on their other assets, as was observed with negative interest rates on reserves. Discarding the corridor or the floor systems however is unlikely, as they have proved to be so resourceful at controlling overnight interest rates. Indeed the Fed announced recently that it would continue with its floor system (Board of Governors 2019).

Other alternative monetary systems heavily upgrading the role of the central bank have been either resuscitated or newly proposed. Variants of these include narrow money, 100% reserves, full-reserve banking, positive money or sovereign money. These proposals, the purpose of which is to avoid the recklessness of banking as observed with the GFC and to limit the power of commercial banks, have substantial similitudes. They have been criticized rather harshly by post-Keynesian authors (Fontana and Sawyer 2016; Nersisyan and Wray 2017), especially concerning the true role of banks. The comments made in the previous paragraphs apply to some of these proposals as well. I will not say much more on the topic, except to point out that an SFC model of full-reserve banking, based on one of Godley and Lavoie's (2007) models, implicitly demonstrates the drawbacks of (at least one version) of full-reserve banking. This is so despite the optimistic viewpoint of its author (Laina 2018), who shows that things run quite smoothly when there is an increase in government expenditure financed by the central bank, or if there is a one-off helicopter drop.

However, as Laina (2018, pp. 21–22) concedes, if the government is pursuing austerity policies, reducing government expenditure or increasing tax rates, this could cause a credit crunch. Sales will be lower than expected, and as a consequence, inventories and their associated demand for loans will increase. Banks will be unable to supply additional loans because their time deposits (the *investment accounts* of Fontana and Sawyer [2016, p. 1341]), which have to be the counterpart of loans, will drop rather than rise. In general, if firms raise their target inventories-to-sales ratio, they could also face a credit crunch. Similarly, there could be another credit crunch if there is a brisk rise in the liquidity preference of agents, with agents swapping their time deposits for cash or demand deposits (or *transaction* accounts). Once again, time deposits will be insufficient to cover bank loans; in addition, the 100% bank liquidity ratio that goes with full-reserve banking may not be achieved any more, as the available reserves of banks might not cover the amount of demand deposits. Reading this literature and its post-Keynesian critique, there is a feeling that advocates of full-reserve banking and its variants have some way to understanding how the monetary system and banks work in practice.

4 Three Views of Banking

4.1 The Two Mainstream Views

This brings us to an important question, that is, whether banks are truly different from other financial institutions. That question came particularly to the fore in the social media, back in 2012, when Steve Keen and Paul Krugman entered into an argument on whether banks could create credit *out of thin air*. Keen forced Krugman to clarify his own views on banking. In denying the validity of the post-Keynesian story, Krugman (2012a) first took a loanable funds approach: "If I decide to cut back on my spending and stash the funds in a bank, which lends them out to someone else, this doesn't have to represent a net increase in demand", thus implying that banks could not create purchasing power. He then moved on to a money multiplier approach: "A key limiting factor in the size of bank balance sheets is the amount of monetary base the Fed creates" (Krugman 2012b). These debates have generated further reflections about the specificity of banks.

One can say that there are three views of banking, as argued by central bankers Jakab and Kumhof (2015) and Ábel et al. (2016), as well as Werner (2016)—a heterodox economist whose views are very close to those of post-Keynesians on money matters. The first one is what the latter two groups of authors call the *financial intermediation theory* of banking. This is Tobin's (1963) *new view* of banking, while Jakab and Kumhof (2015) call it *the intermediation of loanable funds* model of banking. In this view, new deposits allow banks to make new loans. There is no real difference between banks and other non-bank financial institutions: they are all intermediaries, getting funds from savers and allocating them to willing borrowers. Bertocco (2011) argues that this stance, which he also associates with Tobin (1963), sees real capital as being transformed into deposits, thus enhancing the portfolio choice offered to savers: thus, the bank is just a veil (Godley and Lavoie 2007, p. 497). Loans from banks do not increase purchasing power and have no effect on aggregate demand, as in the first quote of Krugman (2012a), unless there is a difference in the propensities to consume of

lenders and borrowers. The best caricature of this view of banking is provided by Jakab and Kumhof (2015). They picture savers bringing some goods to the bank, for which the bank issues a deposit on the liability side. In stories based on the advent of banks through goldsmiths, this would be gold, but here it is gravel. The bank then records on its asset side that it has a new inventory of gravel. When the gravel is provided to some entrepreneur, the bank logs a loan on the asset side of its balance sheet. Clearly then, deposits make loans, and banks are pure intermediaries. As Jakab and Kumhof (2015) conclude, models based on such an approach are "entirely fictitious representations of reality" (p. 11).

A close variant of the loanable approach to banking is the New Keynesian credit channel. This view of banking is associated with authors such as Bernanke, Gertler and Blinder. For these authors, because of their expertise to screen applicants, banks are financial intermediaries that can provide credit to borrowers who cannot get it on financial markets. Thus banks are special, but not fully so, since they are just another financial intermediary as noted by Rochon (1999, Chapter 7), Bianco and Sardoni (2018, p. 169) and Jakab and Kumhof (2015, p. 15). Loans are restricted by the deposits of savers. When extended, New Keynesians refer to the second theory of banking, contending that the ultimate source of loanable funds is the reserves provided by the central bank.

The second theory is the *money multiplier* theory of banking (Ábel et al. 2016), also called the *deposit multiplier* theory (Jakab and Kumhof 2015) or the *fractional-reserve* theory (Werner 2016). This is the theory that Krugman (2012b) seems to endorse in his second quote. Tobin (1963) called it the *old* view of banking. This theory is well-known as it figures in nearly all textbooks in economics. For this reason, I will not dwell on it. Suffice is to recall that the money multiplier, associated with Friedman, played an important role in justifying policies of quantitative easing by central banks (Fiebiger and Lavoie 2019), and that the money multiplier theory is no more able to represent the reality of a monetary economy than the loanable funds approach.

4.2 The Post-Keynesian Credit Creation View of Banking

Finally, there is the third view of banking, which post-Keynesians endorse and usually refer to as the *endogenous theory of money*, as do Ábel et al. (2016). Bianco and Sardoni (2018) prefer to speak of banks as *originators of inside* money. Werner (2016) calls it the *credit-creation* theory of banking, while Jakab and Kumhof (2015) refer to the *financing through money creation* view of banking. In a recent verbal presentation, Steve Keen spoke of a *bank-originated money and debt* view. The last three denominations may in fact better illustrate what post-Keynesians have in mind when they speak of endogenous money or endogenous credit-money. This third view of banking is closely related to what has already been said on reverse causation and central banks in previous subsections. The third view denies that banks are constrained by prior deposits or by the amount of reserves in the system, since the causal arrow goes from loans to deposits to reserves, if these are required. There is no money multiplier; at best one could speak of a *credit divisor*.

For advocates of the third view, banks are special for several reasons. First, as already pointed out, they are not only financial intermediaries—their main role is to create new credit, out of nothing, or rather more often than not, based on some collateral. Their main role is not to be an intermediary between savers and borrowers. Whereas other financial institutions can provide credit, the main feature of banks is that they can provide new credit without having earlier collected funds or without having to borrow from some other agent. As central bankers McLeay et al. (2014) point out, "rather than banks receiving deposits when households save and then lending them out, bank lending creates deposits.… Indeed, viewing banks simply as intermediaries ignores the fact that, in reality in the modern economy, commercial banks are the creators of deposit money" (p. 15). As Jakab and Kumhof (2015) add, "in the real world, the key function of banks is the provision of financing, or the creation of new monetary purchasing power through loans.… The bank therefore creates its own funding, deposits, in the act of lending" (p. 3).

The second specific feature of banks is that their deposits are part of the payment system. They are the means through which debts are irrevocably discharged. Non-banks ultimately have to transfer funds to some bank account for the final payment to go through. Payment is final, or settlement occurs, once the bank payment goes through the books of the central bank, or in some countries through the clearinghouse run by a bankers' association, as in Canada. As Michell (2017) states, this is not the case for non-banks, as they "fund themselves by issuing liabilities which cannot be used for settlement purposes" (p. 363). Because the payment system is under the overarching responsibility of the central bank, banks have access to central bank advances (the central bank credit facilities) to settle payments when banks in a deficit position in the clearinghouse get an insufficient amount of overnight loans from other banks in the interbank market. I would argue that these advances exist to protect the payment system and to allow settlement, not to protect banks as such, and hence are not a specific feature of banks (as the interventions of central banks during the GFC has demonstrated). Moreover, neither are the state-insured deposits of banks—a relatively new feature in several countries anyway.

A key feature of banks, as related to the payment system, is that "as long as banks create credit at the same rate as other banks, and as long as customers are similarly distributed, the mutual claims of banks on each other will be netted out and may well, on balance, cancel each other out. Then banks can increase credit creation without limit and without 'losing any money'" (Werner 2016, p. 373). For Unger (2016), from the Bundesbank, this implies that "credit expansion in the traditional banking system is not subject to the laws of supply and demand to the same extent as it is for other parts of the financial system" (p. 5). This was long ago recognized by Keynes (1930, p. 23), and then Le Bourva (1992), who argued that with the compensation occurring at the clearinghouse, there would be no limit to the amount of loans that banks could create, provided that these banks "are all moving in step, with no one bank getting ahead or lagging behind" (p. 461).

This is not the case of non-banks, since, as we shall see, if they wish to create more credit, they must first get either more deposits from the public or new loans from banks. One could argue that the situation

is similar for banks: if their depositors decide to transfer their bank deposits at accounts in non-banks, then the banks in their turn will need to borrow funds from non-banks. The difference, however, is that when non-banks borrow, they need *financing* to start with; when banks borrow, this occurs after the fact. This is the distinction made by post-Keynesian circuitists (Botta et al. 2015), inspired in particular by Graziani (1989). At the start of the circuit, the credit creation by banks is associated with *initial finance*; the funds that need to be recovered after the fact are *final finance*, and are mainly the consequences of the portfolio decisions of non-financial agents. They arise from the decision about where to assign the flow of saving and the reallocation of wealth. Davidson (1982) made the same distinction, with his use of *construction finance* and *investment funding* respectively. The same has been emphasized more recently by Jakab and Kumhof (2015, p. 3) as well as Borio and Disyatat (2011, p. 7) for whom financing (initial finance) is a cash-flow concept whereas saving (final finance or funding) is a national account concept.

Jakab and Kumhof (2015) note "the critical importance of double-entry bookkeeping in the analysis of banking and finance" (p. 10). This is precisely the point made by a number of post-Keynesians in recent years, such as Godley and Lavoie (2007), and Bezemer (2011). Indeed, since each financial transaction involves both assets and liabilities as well as at least two agents, this means that a quadruple-entry principle is required to properly understand banking and finance.

5 Structuralist Advances

5.1 Credit Creation Versus Liquidity Creation

While mainstream economists tend to believe that non-banks and banks alike are financial intermediaries, some post-Keynesian economists argue that banks and non-banks play a similar role because they are both entities that provide *liquidity*, that is, non-banks are more than being mere financial intermediaries. Nersisyan and Dantas (2017) have recently put this view forward. It is a development of the

idea of a hierarchy of money (also discussed by Michell 2017), where some sorts of assets are more liquid than others, or where there would be *true* liquidity, associated with central banks and commercial banks on the one hand, and *fictitious* liquidity—fictitious because of its elusive nature—associated with some non-bank financial institutions. These authors do not reject the post-Keynesian theory of endogenous money, they try to improve it (Nersisyan and Dantas 2018, p. 655). They believe that it would be a mistake to present non-bank financial institutions merely "as passive entities that intermediate between savers and lenders".

While both mainstream economists on the one hand, and Nersisyan and Dantas (2017) on the other hand, would argue that banks and non-banks show great similarities, the former because banks like non-banks are unable to have much of an impact on the economy, the latter argue by contrast that the similarity arises because non-banks, just like banks, have the power to change the level of economic activity. They resurrect a neglected point made before by Palley (1996, p. 128), under the guise of the *endogenous theory of finance*, when he contended that both versions of endogenous theory, the horizontalist and the structuralist ones, "are flawed because of their exclusive attention to the banking system" (p. 128). Palley (op. cit.) argued that insofar as "the activity of direct capital markets are pro-cyclical" (p. 133), non-bank financial institutions will also influence economic activity. In the words of Nersisyan and Dantas (2017), non-bank financial institutions are "liquidity creators", the activities of which "affect the real economy", and thus "they can be a source of instability" (p. 281). Thus, for these two authors, the specificity of banks that was described in the previous section relative to non-bank financial institutions "does not capture the elasticity of finance, or the financial fragility that may arise due to the activities of these institutions …. The ability of the financial sector to create liquidity is much more elastic than the endogenous money theory allows for" (Nersysian and Dantas 2017, pp. 297–298).

Nersysian and Dantas (2017) provide various statements by well-known post-Keynesian authors to show that post-Keynesians in general, used to pay little attention to the activism of non-bank financial intermediaries. While they do not mention him, perhaps the best illustration

of the lack of attention accorded in the past to the role of these non-banks can be found in the following statement by Eichner (1987): "It is only through a bank loan that the amount of funds circulating as checkable deposits can increase. If, instead, funds are borrowed from a non-bank financial intermediary, the latter will need to draw down its cash balance at some bank…. This is why the existence of nonbank financial intermediaries can usually be ignored and the flow of funds model simplified by eliminating the nonbank financial sector" (p. 825).

For most economists, the key characteristic of a financial institution is maturity transformation. On this account, one can argue that both banks and non-banks take short-term liabilities and hold longer-term assets. The advocates of liquidity creation as a hierarchical process add that banks and non-banks provide liquidity transformation, accepting to transform the less liquid debts of those institutions sitting at the bottom of the monetary hierarchy into liquid ones. As the following aphorism goes, "everyone can create money; the problem is to get it accepted" (Minsky 1986, p. 255).

The issue as I see it, taking note, however, of the power of non-bank financial institutions to affect the stability of the economy, is whether it is useful to consider banks as very special financial institutions, different from other financial institutions. As I pointed out myself, the variety of operations in which non-banks can engage in today "make murkier the distinction between *bona fide* banks and non-bank financial institutions" (Lavoie 2014, p. 259), the more so because non-bank financial institutions often have some kind of association with banks, even if legally they are entirely separate entities. However, in a comment on Nersysian and Dantas (2017), Bouguelli (2018) argues that "making a sharp distinction between commercial banks and other financial institutions" provides a "framework that has the advantage of clarity" (p. 653). To speak of *true* liquidity versus *fictitious* liquidity illustrates the fact that banks and non-banks face different constraints and play a different role in the overall financial system. Considering the case of traditional investment banks (if they still exist!) as presented by Nersysian and Dantas (2017), Bouguelli (2018) insists that "the commercial bank and the investment bank are fundamentally different: while the commercial bank can buy the asset with its own liability, the investment bank has

to borrow the liability of a commercial bank (a deposit) in order to get hold of the securities" (p. 649).

All this is closely tied to the issue of whether the so-called shadow banking system is, or could be, at the origin of the excesses that were observed in the financial system, especially in the US, and that led to the GFC. The term *shadow banking* may be a misnomer if the institutions figuring within the definition of the shadow banking system do not carry the major features of *bona fide* banks. We deal with this issue in the next subsection.

5.2 Shadow Banks and the Credit Boom

Post-Keynesians are sometimes accused of not realizing that non-banks can also provide credit (even trade credit), so that in a modern monetary economy, bank credit is in competition with other sources of financing. Edwin Le Heron (1986), himself a post-Keynesian, made this critique a long time ago. It is perhaps worthwhile to consider T-accounts to better understand how non-bank financial institutions (noted NBFI in the tables) can originate credit of their own accord. We will deal with three cases, two of which deal with securitization. In the first case, we assume that a non-bank issues money-market funds (MMF) deposits that are desired by some wealth holders (with some resemblance with the case presented in Bouguelli [2018, Table 2]).

Start with a bank that makes a loan to a non-financial agent who desires to acquire some liquid assets (bank deposits) for future use. This is the first line of Table 1. Assume now that the depositor transfers 20 units to a non-bank financial intermediary by purchasing shares in a MMF (we could have assumed just as well that the non-bank is a finance company that issues commercial paper bought by the non-financial agent). This implies that the non-bank now has 20 units of deposits at the commercial bank, which it may decide to transform into a certificate of deposit (CD). This occurs in line 2 of the table. The non-bank is now in a position to provide credit to some other non-financial agent, for instance by purchasing securities worth 15 units, but by thus reducing its CD at the bank by 15, as Eichner (1987) would

Table 1 Credit creation by non-bank financial institutions

	Banks		NBFI		Non-financial agents	
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
1	Loan 100	Deposit 100			Deposit 100	Loan 100
2	Loan 100	Deposit 80 CD 20	CD 20	MMF 20	Deposit 80 MMF 20	Loan 100
3	Loan 100	Deposit 95 CD 5	CD 5 Security 15	MMF 20	Deposit 95 MMF 20	Loan 100 Security 15

Source Own construction

have it. Line 3 shows the consequences of such a move. Whereas we started with bank loans of 100 units, we now have 115 units of credit: 100 units of bank loans and 15 units of sold securities. As to the non-financial sector, it now holds 95 units in bank deposits and 20 units as money-market shares for a total of 115 units of liquid assets, while the non-bank financial sector is left with 5 units of CDs.

To sum up: the overall amount of credit in the economy has risen; the amount of bank deposits has not; and the amount of liquid assets held by the non-financial sector has also risen. Thus, the non-bank financial system has contributed to the creation of liquidity, and has provided new credit, just as Le Heron, Palley or Nersysian and Dantas would have it. Note that the additional credit could have been provided just as well by the banking sector. Note further that the non-bank financial institutions would have been unable to provide any credit unless non-financial agents had previously transferred some of their bank deposits to the non-banks. Still, it is clear that in this first case the additional credit has originated from the non-bank financial institution, and not from a bank. A counterpoint, however, could be that the funds acquired by the non-banks have arisen initially from some previous bank loan.

We move on to the second case, tied to securitization, as described by Unger (2016). Here, start with a bank that grants a mortgage to some household; this is the first row of Table 2. In row 2, it is assumed that the real-estate builder is paid and acquires the deposits that were initially in the hands of the purchaser of the residence. A public institution or semi-public institution, such as a Government-sponsored enterprise

Table 2 Securitization with government-sponsored enterprises (GSE)

	Banks		NBFI (GSE)		Non-financial agents (NFA)	
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
1	Mortgage 100	Deposit 100			Deposit 100	Mortgage 100
2	Mortgage 100	NFA deposit 30 GSE deposit 70	Deposit 70	CP 70	Deposit 30 CP 70	Mortgage 100
3	Mortgage 30	NFA deposit 30	MBS 70	CP 70	Deposit 30 CP 70	Mortgage 100

Source Own construction

(GSE) in the United States or the Canadian Mortgage and Housing Corporation, issues commercial paper (CP) which is bought by real estate builders who swap part (say 70%) of their bank deposits for commercial paper. In row 3, with the proceeds, the GSE is now in a position to purchase the mortgage loans and ease the maturity position of the commercial banks. Finally, "the loans are bundled together to form an asset-based security (ABS) which are then retained on the GSE's balance sheet" (Unger 2016, p. 7). In Table 2, these are denoted as MBS.

In the case described by Table 2, loan origination—initial finance in the terms of Graziani (1989)—is performed by banks, not by non-banks. However, funding—final finance—as it will appear at the end of the process, is now partly in the realm of the *market financial system*. It seems that banks are losing out to non-banks: this is true from the standpoint of *stocks*, but it is not when considering *flows*: the flow of credit does indeed originate from banks.

We can look at another case of securitization, as described by Table 3. Start again with mortgage loans being granted by a bank to some households. The deposits so created end up in the bank account of the real-estate constructor. In the second step, shown in row 2, 70% of the mortgages are securitized and sold to a non-bank financial institution, this time a bank-sponsored conduit—a Structured Investment Vehicle (SIV). The SIV purchases the MBS by getting a temporary loan from its sponsoring bank. In addition, in the last step, shown in row 3, the conduit manages to sell 60 units of asset-backed commercial paper (ABCP) to real-estate builders, whose bank deposits then fall down to 40 units.

Table 3 Securitization with a conduit

	Banks		NBFI (SIV)		Non-financial agents (NFA)	
	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
1	Mortgage 100	Deposit 100			Deposit 100	Mortgage 100
2	Mortgage 30 Loan to SIV 70	NFA deposit 100	MBS 70	Loan 70	Deposit 100	Mortgage 100
3	Mortgage 30 Loan to SIV 10	NFA deposit 40	MBS 70	ABCP 60 Loan 10	Deposit 40 ABCP 60	Mortgage 100

Source Own construction

In this case of securitization, it is clear once again that the loan originates from the banks; furthermore, the conduit needs to have access to bank loans to handle discrepancies between its purchases of MBS and its sales of ABCP. The same could be said about investment banks, when they are financed through repos (Botta et al. 2015). As Michell (2017) concludes: "In this analysis, the shadow banking system is seen as a 'loan storage' facility in which money claims are crystallized into less liquid, yet short-term claims—claims which exhibit many features of money, yet are not—not yet, in any case—'money proper'. In the process of transferring credit claims onto the balance sheets of shadow banking institutions, the deposit created when the bank originally made the loan is destroyed, and the monetary circuit closed…" (p. 373). This is the *originate-and-distribute* model of banking, which makes the chain from the initial borrower to the ultimate fund holder longer, more complex and more opaque. It is also likely to make the system more fragile, as risk is being passed along by the originator to agents who may lack a proper understanding of the characteristics of the financial asset.

When omitting bonds and shares, Unger (2016) estimates that, in 2007, 88% of the stock of loan obligations held by the banking and shadow banking systems originated from banks. The remaining 12% correspond to the case described with the help of Table 1. But even

there, it could be argued that a loan would not have been possible without the non-bank getting access to funds that were initially arising from a bank loan. For Unger (2016), in agreement with what seems to be the consensus post-Keynesian position on this issue, "the largest part of the shadow banking system enters the credit intermediation process only after the loans to the ultimate borrowers and the means of payment to finance them have already been created" (p. 14).

5.3 Are There Limits to the Creation of Bank Credit?

There are two views about the systemic role of the shadow banking system as it has evolved. The first view has been defended by Lysandrou and Shabani (2018). They argue that its growth was generated by a search for higher yields, at a time when interest rates were relatively low: rich households or institutional investors have induced banks to issue more loans and to decrease their lending standards to produce the structured securities that the investors were longing for. A variant of this argument is that there was a scarcity of safe assets, and that this induced the financial system to create AAA short-term and long-term assets through securitization. Within that variant, one could argue that the GFC was a systemic response to this scarcity of safe assets, as it led to large government deficits and hence to the appearance of large quantities of new safe assets.

The second view, which will be discussed here, is tied to regulatory arbitrage. This was already the view of Palley (1996) when he underlined the role of endogenous finance. For Palley (op. cit.), "raising finance in capital markets … is more expansionary [than bank loans] because it by-passes the monetary constraint imposed by reserve requirements…. This feature is generic to fractional reserve banking systems, in which central banks seek to impose a monetary control over the supply of reserves…. By taking transactions out of the banking system, this reduces the need for bank services, and helps circumvent emerging liquidity shortage within the banking system" (p. 133).

The belief that non-bank finance and the shadow banking system are essential elements of our monetary system is entertained by a large

number of economists, including some heterodox ones. The argument is that without the shadow banking system there would not be enough liquidity or enough credit in the economy. This is what seems to come out from Palley's (1996) citation above. Thanks to endogenous finance, the private financial system can evade the constraints imposed by the monetary authorities. Thus, what we have here is an extension and modernization of the view associated with the earlier developments of the critique of monetarism and its concept of a stable velocity of money, whereby post-Keynesians such as Minsky (1986) emphasized the capacity of the financial system to avoid regulation and reserve constraints through innovations, rather than using arguments based on reverse causation. In this respect, it is interesting to note that Palley (1996), when introducing the notion of endogenous finance, refers to Minsky and securitization. He argues that securitized assets "have liquidity properties that are close to money, and enable agents to reduce their needs for currency and those bank liabilities carrying reserve requirements" (p. 134).

Today, the argument about the need for credit elasticity circumventing banking regulations cannot be based anymore on reserve requirements; it is now based on the capital adequacy requirements (CAR) imposed by the Bank for International Settlements (BIS). Descamps and Soichot (2003) picked up the arguments and the model of Palley (1996), superposing to it the CAR—the Cooke ratio as it was then called. They end up alleging that the post-Keynesian causality must be reversed: banks need equity in order to make loans. Thus CAR in their scheme plays a role which is similar to the one played by reserve requirements in mainstream models. Banks must first obtain additional equity if they wish to grant more loans. "The fundamental constraint on credit supply is capital. From the banks' perspective, the presence of regulatory capital requirements acts like a hard constraint on asset expansion" (Disyatat 2011, p. 716). The lesson to be drawn from this perspective is that banks will be forced to ration credit when they do not have access to enough equity. Bank credit is at the mercy of the financial markets as these markets may or may not accept to provide enough equity. Hence, there is a justification for the presence of the shadow banking system and the existence of securitization, as these features of the financial system help to provide sufficient elasticity to the monetary system.

While one can accept that securitization is associated with regulatory arbitrage, this does not mean that capital requirements restrict the creation of bank loans. As Michell (2017) says, the process of securitization once it is completed allows "banks to initiate the circuit once again by creating a new loan and a new deposit, without reducing their (on-balance sheet) liquidity or capital" (p. 373). Banks get their profits by a one-off fee. In addition, even if banks take back the asset-based securities on their balance sheet, overall capital requirements are diminished as, at least in Basel II, capital requirements on residential mortgages were 50% of the 8% Cooke ratio, whereas requirements on AAA MBS were only 20% of the Cooke ratio. The post-Keynesian perspective ought to be that securitization allows banks to have a lower overall capital to asset ratio, which increases the rate of return on equity, and not that it allows banks to make more loans. It allows "the originating banks, as well as those purchasing the securitized loans, to extend leverage beyond previously recognized safe ratios, thus improving their returns on equity, while simultaneously fully abiding by the terms of the Basel capital adequacy ratios" (Lavoie 2012–2013, p. 226).

What if some banks have an overly low level of own funds? The response is that banks can take one or several of the following actions. First they can increase the spread between their lending rates and their deposit rates, which empirically is what seems to be the case for banks with low realized capital adequacy ratios, as recalled by Disyatat (2011, p. 717) and in Godley and Lavoie (2007, p. 403), where this option is pursued in their SFC model of the banking system. Second, banks can distribute less dividends to their shareholders. Unger (2016, p. 16) points out that the additional equity needed for the loans that were sold to GSEs and conduits between 1984 and 2007 could have been obtained by reducing by 29% the amount of dividends paid out to shareowners during the same time period. Third, banks can issue new shares to obtain more equity, or they could reduce the size of the stock options given to their top managers, thus avoiding buy-backs.

However, what if the economy is in turmoil, with banks making no profits and being unable to convince investors to purchase their shares? Then, the government, or the central bank has to step in and purchase newly-issued shares, as was done during the GFC. An alternative was

apparently used by Crédit Suisse (and other banks) when its own funds were hit by huge defaults on its loan book. The bank grants a loan to an investor who is willing to purchase the newly-issued shares of the bank. Thus, in this case, both sides of the balance sheet of the bank are raised by the same amount, equal to the value of the new shares, thus allowing the bank to fulfill its capital adequacy ratio or to avoid bankruptcy. Werner (2016) concludes from this that "banks in this way created their own capital out of nothing, thus making nonsense of capital adequacy regulations. We learn from this that under the right circumstances it is possible even for an individual bank to show almost any amount of capital to regulators" (p. 375). This was also what an official at the Bank of Canada—Kevin Clinton—told me when I asked him whether the BIS regulations could constrain bank credit.

5.4 A Multiplicity of Interest Rates

I started this chapter by pointing out that some of the earlier disagreements between horizontalists and structuralists arose from the failure to consider an obvious fact—the existence of a multiplicity of interest rates. Thus, while horizontalists used to claim that liquidity preference was a red herring, structuralists would counter that liquidity preference and credit rationing are essential features of a monetary economy that were ignored by horizontalists. These two viewpoints can be reconciled by considering the presence of at least two rates of interest—a short-term rate which is essentially under the control of the central bank, and another rate, which is not. This other rate, depending on the aspects of the economy that need to be analyzed can be either the interest rate set by banks when making loans to their customers, or it could be some long-term interest rate (either the interest rate on government bonds or the interest rate on corporate bonds). About credit rationing, I believe the issue has long been settled: horizontalists have never denied the possibility of credit rationing, in fact they have always mentioned that banks only grant loans to creditworthy borrowers (although this claim became suspicious with the avalanche of subprime loans before the GFC). I have provided much evidence that the horizontalist view was

never extreme whatsoever in this regard (Lavoie 1996). Indeed, Wolfson (1996, 2012) has delivered an illuminating graphical framework that represents credit rationing within a horizontalist view of credit creation. He has a horizontal credit supply curve at a given lending rate for each class of borrowers. Credit rationing is taken into account by considering *two* credit demand curves: a notional demand curve, which reflects the expectations and optimism of borrowers, and an effective demand curve, also called the effective demand curve for credit or the creditworthy demand curve, which corresponds to the confidence of the bankers. The horizontal distance between the notional and effective demand curves at the ruling lending rate is a measure of credit rationing.

Another feature of Wolfson's apparatus is that he distinguishes between two interest rates, the target rate set by the central bank and the bank lending rate. When bankers lose confidence in the future prospects of the economy, and thus show greater liquidity preference, two effects are likely to happen. First, the effective demand curve for credit shifts inwards, thus inducing more credit rationing at a given interest rate. In addition, the bank lending rate rises relative to the target rate. The spread increases as banks impose higher profit margins so as to cover themselves from actual or potential higher default risks. This will induce both a further increase in credit rationing and a reduction in the demand for credit by borrowers. There is thus a possible disconnect between the evolution of the short-term target rate of the central bank and the interest rate which is relevant to non-bank economic agents, which for simplicity we can call *the market rate*, and which could be the bank lending rate or the long-term bond rate. This distinction is certainly useful when entertaining post-Keynesian amendments to the three-equation version of the New Consensus Macroeconomic model, as in Lavoie (2009).

There is a good deal of similarity between this kind of analysis and that of Stiglitz and Greenwald (2003), although they still seem to believe that raising reserve requirements will lead to reduced credit. Assuming that the target rate of central banks is the short-term treasury rate, they noted that "traditional monetary economics focused little on the spread between the T-bill rate and the lending rate" (p. 127). They insisted that "what firms care about is not the rate of interest that the

government pays on its loans, but the interest rates that *they pay*, and the relationship between the two may differ markedly" (p. 125), thus concluding that "because of the increase in spread, the T-bill rate had to be lowered *just to keep the lending rate from rising*" (p. 128). This was particularly evident at the start of the GFC, when interest rate spreads rose considerably, inducing central banks to quickly reduce their target overnight rate. By the way, in this case, standard tests of causality conducted for this period would show that market rates *cause* the overnight rate of the central bank, as advocates of theories based on the natural rate of interest would believe, but the relationship turns out to be negative instead of being positive as required by such theories.

6 Summary and Conclusion

This chapter has focused on ten themes that have been emphasized by post-Keynesian economists and that turned out to have been validated by the events that occurred during and after the subprime financial crisis. In several instances, the post-Keynesian views have been endorsed, implicitly or explicitly by some central bankers. The themes discussed include the theory of endogenous money as it relates to the determination of interest rates by central banks; the necessary defensive role of central banks; the relations between the government and the central bank, as developed by advocates of MMT; the compensation thesis as it applies to an open economy; unconventional monetary policies, mainly quantitative easing, but also some related recent proposals to avoid future financial crises; the question of whether banks are something more than a financial intermediary; the concepts of fictitious and true liquidity; whether the shadow banking sector is akin to the banking sector; the limits to credit creation; and the necessity to consider a range of interest rates.

My conclusion is that post-Keynesian monetary theory has been corroborated. Central bankers ought to be aware of post-Keynesian monetary theory to better understand what they ought to do, and vice versa, the research being carried out by some central bankers should inform post-Keynesians in better formulating their theories.

References

Ábel, I., Lehmann, K., & Tapaszti, A. (2016). The Controversial Treatment of Money and Banks in Macroeconomics. *Financial and Economic Review, 15*(2), 33–58.

Angrick, S. (2017). Global Liquidity and Monetary Policy Autonomy: An Examination of Open-Economy Constraints. *Cambridge Journal of Economics, 42*(1), 117–135.

Arestis, P., & Eichner, A. S. (1988). The Post-Keynesian and Institutionalist Theory of Money and Credit. *Journal of Economic Issues, 22*(4), 1003–1022.

Bank of Canada. (2004). *Intervention in the Foreign Exchange Market*. Available at: https://www.bankofcanada.ca/wp-content/uploads/2010/11/intervention_foreign_exchange.pdf.

Bertocco, G. (2011). Are Banks Special? Some Notes on Tobin's Theory of Financial Intermediation. *Journal of the Asia Pacific Economy, 16*(3), 331–353.

Bezemer, D. J. (2011). Understanding Financial Crisis Through Accounting Models. *Accounting, Organizations and Society, 35*(7), 676–688.

Bianco, A., & Sardoni, C. (2018). Banking Theories and Macroeconomics. *Journal of Post Keynesian Economics, 41*(2), 165–184.

Bindseil, U. (2004). *Monetary Policy Implementation: Theory, Past, and Present*. Oxford: Oxford University Press.

Bindseil, U., & König, P. J. (2013). Basil J. Moore's Horizontalists and Verticalists: An Appraisal 25 Years Later. *Review of Keynesian Economics, 1*(4), 383–390.

Board of Governors of the Federal Reserve System. (2019, January 30). *Statement Regarding Monetary Policy Implementation and Balance Sheet Normalization*. https://www.federalreserve.gov/newsevents/pressreleases/monetary20190130c.htm.

Borio, C., & Disyatat, P. (2010). Unconventional Monetary Policies: An Appraisal. *Manchester School, 78*(Suppl.), 53–89.

Borio, C., & Disyatat, P. (2011). *Global Imbalances and the Financial Crisis: Link or No Link?* (BIS Working Paper #346).

Botta, A., Caverzasi, E., & Tori, D. (2015). Financial-Real-Side Interactions in an Extended Circuit with Shadow Banking. *International Journal of Political Economy, 44,* 196–227.

Bouguelli, R. (2018). A Note on 'Rethinking Liquidity Creation: Banks, Shadow Banks and the Elasticity of Finance'. *Journal of Post Keynesian Economics, 41*(4), 648–653.

Bundesbank. (2017, April). The Role of Banks, Non-banks and the Central Bank in the Money Creation Process. *Deutsche Bundesbank Monthly Report*, pp. 13–33.

Craig, B., & Humpage, O. (2001). *Sterilized Intervention, Nonsterilized Intervention and Monetary Policy* (Working Paper 01-10). Federal Reserve Bank of Cleveland.

Davidson, P. (1982). *International Money and the Real World*. London: Macmillan.

Descamps, C., & Soichot, J. (2003). Monnaie endogène et réglementation prudentielle. In P. Piegay & L. P. Rochon (Eds.), *Théories monétaires post keynésiennes* (pp. 99–116). Paris: Économica.

Disyatat, P. (2011). The Bank Lending Channel Revisited. *Journal of Money, Credit and Banking, 43*(4), 711–734.

Eichner, A. S. (1986). *Toward a New Economics: Essays in Post-Keynesian and Institutionalist Theory*. London: Macmillan.

Eichner, A. S. (1987). *The Macrodynamics of Advanced Market Economies*. Armonk: M.E. Sharpe.

Fiebiger, B., & Lavoie, M. (2019, forthcoming). Helicopter Ben, Monetarism, the New Keynesian Credit View and Loanable Funds. *Journal of Economic Issues*.

Fontana, G., & Sawyer, M. (2016). Full Reserve Banking: More 'Cranks' Than 'Brave Heretics'. *Cambridge Journal of Economics, 40*(5), 1333–1350.

Fullwiler, S. T. (2003). Timeliness and the Fed's Daily Tactics. *Journal of Economic Issues, 37*(4), 851–880.

Fullwiler, S. T. (2005). Paying Interest on Reserve Balances: It's More Significant than You Think. *Journal of Economic Issues, 39*(2), 543–550.

Fullwiler, S. T. (2006). Setting Interest Rates in the Modern Money Era. *Journal of Post Keynesian Economics, 28*(3), 496–525.

Fullwiler, S. T. (2013). An Endogenous Money Perspective on the Post-crisis Monetary Policy Debate. *Review of Keynesian Economics, 1*(2), 171–194.

Fullwiler, S. T. (2015). *Corbynomics 101—It's the Deficit, Stupid!* http://neweconomicperspectives.org/2015/09/corbynomics-101-its-the-deficit-stupid.html.

Fullwiler, S. T. (2017). Modern Central Bank Operations: The General Principles. In L. P. Rochon & S. Rossi (Eds.), *Advances in Endogenous Money Analysis* (pp. 50–87). Cheltenham: Edward Elgar.

Godley, W., & Lavoie, M. (2007). *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*. Basingstoke: Palgrave Macmillan.

Graziani, A. (1989). The Theory of the Monetary Circuit. In *Thames Papers in Political Economy*, Spring.

Jakab, Z., & Kumhof, M. (2015). *Banks Are Not Intermediaries of Loanable Funds—And Why This Matters* (Working Paper 529). Bank of England.

Kaldor, N. (1970, July). The New Monetarism. *Lloyds Bank Review, 97,* 1–17.

Kaldor, N. (1982). *The Scourge of Monetarism*. Oxford: Oxford University Press.

Keister, T., Martin, A., & McAndrews, J. (2008, September). Divorcing Money from Monetary Policy. *FRBNY Economic Policy Review, 14,* 41–56.

Keister, T., & McAndrews, J. (2009). Why Are Banks Holding so Many Excess Reserves? *Federal Reserve Bank of New York Current Issues in Economics and Finance, 15*(8), 1–10.

Keynes, J. M. (1930). *A Treatise on Money*. London: Macmillan.

Koo, R. C. (2009). *The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession*. Singapore: Wiley.

Krugman, P. (2012a). *Minsky and Methodology (Wonkish)*. https://krugman.blogs.nytimes.com/2012/03/27/minksy-and-methodology-wonkish/?_r=0.

Krugman, P. (2012b). *Banking Mysticism, Continued*. https://krugman.blogs.nytimes.com/2012/03/30/banking-mysticism-continued/.

Laina, P. (2018). Money Creation Under Full-Reserve Banking: A Stock-Flow Consistent Model. *Cambridge Journal of Economics*. Advanced access: https://doi.org/10.1093/cje/bey034.

Lavoie, M. (1996). Horizontalism, Structuralism, Liquidity Preference and the Principle of Increasing Risk. *Scottish Journal of Political Economy, 43*(3), 275–301.

Lavoie, M. (1999). The Credit-Led Supply of Deposits and the Demand for Money: Kaldor's Reflux Mechanism as Previously Endorsed by Joan Robinson. *Cambridge Journal of Economics, 23*(1), 103–113.

Lavoie, M. (2001). The Reflux Mechanism in the Open Economy. In L. P. Rochon & M. Vernengo (Eds.), *Credit, Growth and the Open Economy: Essays in the Horizontalist Tradition* (pp. 215–242). Cheltenham: Edward Elgar.

Lavoie, M. (2005). Monetary Base Endogeneity and the New Procedures of the Asset-Based Canadian and American Monetary Systems. *Journal of Post Keynesian Economics, 27*(4), 689–709.

Lavoie, M. (2009). Taming the New Consensus: Hysteresis and Some Other Post Keynesian Amendments. In G. Fontana & M. Setterfield (Eds.), *Macroeconomic Theory and Macroeconomic Pedagogy* (pp. 191–213). Basingstoke: Palgrave Macmillan.

Lavoie, M. (2010). Changes in Central Bank Procedures During the Subprime Crisis and Their Repercussions on Monetary Theory. *International Journal of Political Economy, 39*(3), 3–23.
Lavoie, M. (2012–2013). Financialization, Neo-liberalism, and Securitization. *Journal of Post Keynesian Economics, 35*(2), 211–229.
Lavoie, M. (2014). *Post-Keynesian Economics: New Foundations*. Cheltenham: Edward Elgar.
Lavoie, M. (2016). Rethinking Monetary Theory in Light of Keynes and the Crisis. *Brazilian Keynesian Review, 2*(2), 174–188.
Lavoie, M. (2019). A System with Zero Reserves and with Clearing Outside of the Central Bank: The Canadian Case. *Review of Political Economy*. https://doi.org/10.1080/09538259.2019.1616922.
Lavoie, M., & Fiebiger, B. (2018). Unconventional Monetary Policies, with a Focus on Quantitative Easing. *European Journal of Economics and Economic Policies: Intervention, 15*(2), 139–146.
Le Bourva, J. (1992). Money Creation and Credit Multipliers. *Review of Political Economy, 4*(4), 447–466.
Le Heron, E. (1986). Généralisation de la préférence pour la liquidité et financement des banques. *Économies et Sociétés, 20*(8–9), 67–93.
Lombra, R. E., & Torto, R. G. (1973). Federal Reserve Defensive Behavior and the Reverse Causation Argument. *Southern Economic Journal, 40*(1), 47–55.
Lysandrou, P., & Shabani, M. (2018). The Explosive Growth of the ABCP Market Between 2004 and 2007: A 'Search for Yield' Story. *Journal of Post Keynesian Economics, 41*(4), 526–546.
Martin, A., McAndrews, J., & Skeie, D. (2016). Bank Lending in Times of Large Bank Reserves. *International Journal of Central Banking, 12*(4), 193–222.
McLeay, M., Radia, A., & Thomas, R. (2014). Money Creation in the Modern Economy. *Bank of England Quarterly Bulletin, 54*(1), 14–27.
Michell, J. (2017). Do Shadow Banks Create Money? Financialisation and the Monetary Circuit. *Metroeconomica, 68*(2), 354–377.
Minsky, H. P. (1986). *Stabilizing an Unstable Economy*. New York: McGraw-Hill.
Moore, B. J. (1988). *Horizontalists Versus Verticalists: The Macroeconomics of Credit Money*. Cambridge: Cambridge University Press.
Mosler, W. (1994). *Soft Currency Economics*. West Palm Beach, FL: AVM.
Nersisyan, Y., & Dantas, F. (2017). Rethinking Liquidity Creation: Banks, Shadow Banks and the Elasticity of Finance. *Journal of Post Keynesian Economics, 40*(3), 279–299.

Nersisyan, Y., & Dantas, F. (2018). Response to 'A Note on Rethinking Liquidity Creation: Banks, Shadow Banks and the Elasticity of Finance'. *Journal of Post Keynesian Economics, 41*(4), 654–659.

Nersisyan, Y., & Wray, L. R. (2016). Modern Money Theory and the Facts of Experience. *Cambridge Journal of Economics, 40*(6), 1297–1316.

Nersisyan, Y., & Wray, L. R. (2017). Cranks and Heretics: The Importance of an Analytical Framework. *Cambridge Journal of Economics, 41*(6), 1749–1760.

Palley, T. I. (1996). *Post Keynesian Economics*. London: Macmillan.

Rochon, L. P. (1999). *Credit, Money and Production: An Alternative Post-Keynesian Approach*. Cheltenham: Edward Elgar.

Serrano, F., & Summa, R. (2015). Mundell-Fleming Without the LM Curve: The Exogenous Interest Rate in an Open Economy. *Review of Keynesian Economics, 3*(2), 248–268.

Stiglitz, J. E., & Greenwald, B. (2003). *Towards a New Paradigm in Monetary Economics*. Cambridge: Cambridge University Press.

Tobin, J. (1963). Commercial Banks as Creators of Money. In D. Carson (Ed.), *Banking and Monetary Studies* (pp. 408–419). Homeward, IL: Richard D. Irwin.

Unger, R. (2016). *Traditional Banks, Shadow Banks and the US Credit Boom—Credit Origination Versus Financing* (Discussion Paper 11/2016). Deutsche Bundesbank.

Werner, R. (2014). Can Banks Individually Create Money Out of Nothing? The Theories and the Empirical Evidence. *International Review of Financial Analysis, 36,* 1–19.

Werner, R. (2016). A Lost Century in Economics: Three Theories of Banking and the Conclusive Evidence. *International Review of Financial Analysis, 46,* 361–379.

Wolfson, M. H. (1996). A Post Keynesian Theory of Credit Rationing. *Journal of Post Keynesian Economics, 18*(3), 443–470.

Wolfson, M. H. (2012). Credit Rationing. In J. King (Ed.), *The Elgar Companion to Post Keynesian Economics* (2nd ed., pp. 115–121). Cheltenham: Edward Elgar.

Wray, L. R. (1998). *Understanding Modern Money: The Key to Full Employment and Price Stability*. Cheltenham: Edward Elgar.

Wray, L. R. (2012). *Modern Money Theory*. Basingstoke: Palgrave Macmillan.

4

Why the Subprime Financial Crash Should Have Been Prevented and Implications for Current Macroeconomic and Regulatory Policy

J. S. L. McCombie and M. R. M. Spreafico

1 Introduction

It is now over a decade since the subprime crisis (or the Great Financial Crisis, as it is sometimes called) occurred. It is usually taken as beginning in August 2007, when the large French Bank BNP Paribas prevented its investors from redeeming funds that contained subprime mortgages. The crisis was the worst since the Great Depression and dwarfed the Asian financial crisis of 1997 and the six other postwar banking crises in the advanced countries. These were the UK secondary banking crisis of 1973–1975, and the banking crises of Spain (1977), Norway (1987), Sweden (1991) and Japan (1992) (see Reinhart and Rogoff 2011). The ramifications of the Great Financial Crisis,

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in the form of low productivity growth and irretrievably lost output, are still present today.

What is remarkable is the degree to which even in the months in the immediate run-up to the crisis, few economists and no regulatory bodies, including the central banks, the IMF and the OECD, had any idea that a crisis of the size that occurred was remotely possible. Bezemer (2009) identifies only ten economists who were concerned about a potential crisis, but even these did not provide a detailed explanation of the likely precise causes. One exception was the IMF Chief Economist Ray's (2005) prescient warning about the perverse incentives facing bankers, dismissed by former U.S. Treasury Secretary Summers as "slightly luddite" and "largely misguided" (Wallace 2015, p. 4). Shiller (2007) correctly identified the increase in US house prices as a bubble, but did not identify the severity of the consequences when it burst. Another exception was Borio and White (2004) of the Bank for International Settlements.

Hindmoor and McConnell (2015) confirm this lack of foresight for the UK by a detailed examination of such evidence, inter alia, as the official reports by the Bank of England, the Treasury and the Financial Services Authority. Golub et al. (2015) looked at the case of the US. They analyse the number of times that the terms subprime mortgages and collateralised debt obligations (CDOs) and credit default swaps (CDS) appear in the minutes of Federal Open Market Committee (FOMC). It was not until 2007 that they are first mentioned. The Financial Crisis Inquiry Commission (FCIC 2011) that was set up by Congress to examine the subprime crisis, notes that in the US, "Even among those who worried that the housing bubble might burst few - if any - foresaw the magnitude of the crisis that would ensue" (p. 3).

In this chapter, we analyse two major warnings that should have alerted policymakers to the possibility of a financial crash, but did not. These are the failure of the hedge fund Long-Term Capital Management (LTCM) in 1998 and the Savings and Loans (S&L) debacle during the 1980s. The former was too financially interconnected with other banks to be allowed to fail and the latter demonstrated the effect of weak regulation and banking malfeasance in a banking crisis. Moreover, there was also increasing evidence of the problems with over-the-counter

(OTC) derivatives during the 1990s that went unheeded by Greenspan and other influential regulators. Convinced of the efficiency of unregulated financial markets, these regulators, in 1998, actually blocked the Commodities and Futures Trading Commission from instigating a public discussion as to whether OTC derivatives should be regulated after it had issued a concept release. After this intervention occurred, the subprime crisis became inevitable.

In the light of these events, we also assess the current regulatory reform including the Dodd-Frank Wall Reform and Consumer Protection Act (which is similar in many ways to Basle III) as to whether or not the lessons have now been learned. There are worrying indications that they may not have been.

2 Securitisation and the Failure to Regulate Derivatives

The causes of the subprime crisis have been exhaustively analysed (see, for example, Arestis et al. 2011; Buckley 2011; FCIC 2011; and Lo's 2012 review of 21 books about the subprime crisis). Consequently, we will not deal with these in any detail.

A major development in structured finance was the increasing securitisation from 1986 onwards of mortgages into residential mortgage-backed securities (RMBSs) (Coval et al. 2009). These securities were sold for a capital sum, with the mortgage payments paying the interest earned by the security. This had the great advantage of raising further funds for new mortgages, especially for non-bank mortgage originators that could not take deposits. From the late 1990s, these financial institutions began increasingly to originate subprime mortgage loans to low-income households and the loans were then securitised by the various investment banks.

The RMBSs were divided into, say, three tranches. (In practice, there could be more than just three.) The junior tranche would take the first loss from any default on the mortgage payments and, hence, would pay the highest interest rate. Next, there was the mezzanine tranche,

less risky but receiving commensurately less interest. The senior tranche paid the lowest interest rate, but was considered to be almost as safe as US Treasury Bonds. These tranches had the advantage of catering for the different risk preferences of investors and, supposedly, allowed for a more efficient allocation of capital.

A problem was the junior tranche had a low rating (say triple B) from the rating agencies (discussed below) and was difficult to sell. To overcome this, it was bundled together with other junior tranches into a CDO. The rating agencies were persuaded to rate this as, say, a triple A, because the CDO was seen as being more diversified, and hence less risky, than the underlying RMBSs. In fact, this was not the case because if there was a downturn in the national, as opposed to the regional, housing market, which did occur, the value of all the RBMSs in a CDO would fall simultaneously.

The move from originate and hold to originate and distribute caused by securitisation meant that the risk was transferred to the purchaser of an RBMS or CDO. This removed the need for the originator to undertake detailed due diligence. The subprime mortgages were accompanied by extensive fraud on the part of the mortgage loan originators who, working on commission, encouraged liar loans and misled low-income borrowers as to the true cost of their mortgages—often persuading them to take out more expensive mortgages than they could afford.

The assessment of the riskiness of the CDOs was relegated to the three government approved rating agencies and these relied entirely on statistical methods and flawed computer models. Their methodology had no allowance for a fall in house prices (it was not in their data). There were also the consequences of the serious conflict of interest arising from the fact that the banks paid the rating agencies for their services (White 2009). "The crisis could not have happened without the rating agencies" (FCIC 2011, p. xxv).

At the end of the day, the collapse of the banking system was due to the eventual fall in house prices after the bubble burst. One implication of this was the mortgages of, especially, the low-income households could no longer be refinanced. This, together with the end of the many initial two-year teaser rates with low, or zero, mortgage rates and

their subsequent sharp rise, led to a marked increase in mortgage default rates. This precipitated a collapse in the value of the previously AAA-rated CDOs. However, this was not the sole cause of the collapse in the banking system. After all, it is sometimes overlooked that over the period 2000–2002, eight of the ten largest mortgage originators went bankrupt. This did not then precipitate a banking crisis. So what was the reason for the 2008 crisis?

An important factor in the subprime crisis was the rapid growth of CDSs. These have been likened to a form of insurance. If it was considered that the CDO was likely to default, it would be possible to insure against this by paying a recurring premium. In the event of a default (a credit event) the insurer would pay the cost of the default. The CDSs were unregulated and, consequently, the insurer did not have to set aside reserves in case the default actually occurred. Moreover, unlike other more conventional insurance policies, CDSs did not require any insurable interest. This meant that any number of CDSs could be taken out on a single CDO. Consequently, they could be seen more as financial instruments for speculation, or gambling, than for insurance. Furthermore, CDSs could be, and were, bundled into synthetic CDOs and traded. These did not include any RBMS and did not make any direct contribution to financing house purchases.

With the rapid growth of CDOs and on a closer examination of the underlying loan documentation, financial institutions such as hedge funds, and some investment banks, considered that there was a substantial risk of subprime mortgage defaults and hence a collapse in the value of the RBMSs underlying the CDOs. These financial institutions began to take out CDSs to short the CDOs and found a willing counterparty in, especially, the insurance giant AIG-FP. This financial institution, drastically underestimating the degree of risk involved, saw the premiums as money for (almost) nothing.

In 2007, the total value of CDSs reached just over $60 trillion compared with the value of subprime mortgages of $1.3 trillion. With the downturn in house prices and the increase in defaults, the true value of the CDOs (the so-called toxic assets) became unknown. This resulted in the almost overnight downgrading in their ratings by the credit rating agencies and the interbank (repo) market froze. It was the large volume

of CDSs that made the banking collapse so severe (Greenberger 2018). According to Buckley (2011), "If the problem created by subprime debt is rated ten, that created by credit default swaps justifies … a rating of 100 or more" (p. 74). The rest is history.

2.1 Early Warnings That Were Ignored

Long before the subprime crisis, there had been increasing concerns about the rapid increase in OTC derivatives and their lack of regulation. A derivative is a financial security whose value depends upon that of an underlying asset, or group of assets. RBMSs, CDOs and CDSs are all derivatives. Derivatives were first used in the mid-nineteenth century for hedging commodity prices and were sold on regulated exchanges such as the Chicago Board of Trade. The development of the unregulated OTC derivatives consisted of largely interest swaps and exchange-rate swaps and options. They were contracts between individual parties and were not sold on the exchanges. The breakdown in the Bretton Woods agreement in 1971, which led to greater volatility in exchange rates and interest rates, was the catalyst for their development. By the 1980s, as we shall see, the independent regulatory body, the Commodities Futures Trading Commission (CFTC) became increasingly worried by the rapid growth of the unregulated OTC derivatives that in 1987 the CFTC moved to regulate these financial instruments.

To the investment banks, and indeed the financial system as a whole, any regulation was an anathema, as, almost by definition, it restricted how they traded and, hence, reduced their profitability. To counter the threat of regulation a powerful industry association was set up in 1985, namely the International Swaps and Derivatives Association (ISDA).

By the 1990s, the warning lights were already flashing about the dangers of OTC derivatives. In 1994, the County Treasurer of Orange County (a large municipality in California) bought with public money inverse floater derivatives. He was advised by Merrill Lynch that interest rates would be bound to fall and the value of the derivatives would rise. The bonds had been rated AA by both Moody's and S&P. However, Greenspan, at this time, unexpectedly raised the Federal Funds Rate.

The consequent fall in the value of the derivatives (which were immediately downgraded to CCC) bankrupted the municipality. Merrill Lynch eventually agreed to pay Orange County $400 million, by way of damages, of the $1.7 billion that had been lost. There were other well-publicised dramatic losses by relatively unsophisticated buyers from the purchase of derivatives. Most notable were Proctor and Gamble and Gibson's Greeting Cards, badly advised by Bankers Trust, at the time one of the US's largest banks. The subsequent court case showed the substantial degree to which Bankers Trust fraudulently traded on the ignorance of the firms about the complexity of derivatives.

The legal action was the only reason that the CFTC found out about the fraud. As there were no reporting requirements, the government did not even have information about the size of the OTC derivatives markets. As a result, *Fortune Magazine*, for example, published a long analytical piece about the dangers of derivatives (Loomis et al. 1995) and there was increasingly widespread concern about the use of derivatives.

At about this time, the U.S. General Accounting Office (GAO) (1994) issued a highly critical report of unregulated derivatives, exposing what it saw as their serious limitations. The Report was concerned that the largest five banks and top seven security companies accounted for about 90% of the total value of OTC derivatives. The report warned that the sudden failure, or withdrawal from trading, of these dealers could cause severe liquidity problems "that could pose risks to others, including federally insured banks *and the financial system as a whole*" (p. 7, italics added). Indeed, the GAO report stated explicitly that any crisis could be global. The report also noted presciently that the government may have to intervene to avert a systemic crisis and that "the Federal Reserve may be required to serve as lender of last resort to any major U.S. OTC derivatives dealer, whether regulated or unregulated" (p. 12). A set of four bills of derivative regulations were submitted to Congress in 1994.

So what happened? The industry association, the ISDA, alarmed by what it saw as an attempt to reduce the profitability of the derivatives market, mounted a vociferous lobbying campaign to prevent it. In 1993, the Group of Thirty (G30), an influential independent organisation of economists, academics and bankers, had published a detailed set of guidelines for derivatives. These were less stringent than those of

the GAO and did not have regulatory force. The ISDA campaign was successful. The four bills that had been brought before Congress were dropped. Self-regulation, using the G30 voluntary guidelines, was seen as sufficient (Tett 2010, pp. 43–47).

Three years later, in 1997, the small CFTC, under the chairmanship of Brooksley Born, made another attempt to open discussion about the desirability of the regulation of OTC derivatives. Born (1998) was particularly concerned about swaps (Roig-Franzia 2009; Schmitt 2009), which we have seen were to play such a destructive role in the subprime crisis. The CFTC decided merely to issue a concept release, or a consultative paper, to solicit views on the regulation of OTC derivatives.

Federal Reserve Chairman, Alan Greenspan, Treasury Secretary Robert Rubin and his deputy Lawrence Summers and former Securities and Exchange Commission chairman Arthur Levitt (who, after the subprime crisis, admitted he had been wrong) vehemently opposed even this modest proposal. However, the CFTC went ahead anyway. Greenspan et al. successfully persuaded Congress to block any attempt even to consider regulation (McLean and Nocera 2010, Chapter 7). Congressional action was required because the CFTC was an independent regulatory body outside the jurisdiction of any other regulatory authority, such as the Federal Reserve.

The reasoning behind this action was, as Greenspan (1997), in a review of the history of the derivatives market, stated "no market is ever truly unregulated. The self-interest of market participants generates private market regulation". In the case of off-exchange OTC derivatives, he further stated that "private market regulation is quite effectively and efficiently achieving what have been identified as the public policy objectives of government regulation". Consequently, Greenspan, in 1997, considered that there was no need for regulation because the "derivatives market involved Wall Street professionals, who could patrol themselves" (Schmitt 2009). Greenspan (1997) went so far as to suggest that there could be parallel markets (one regulated and one unregulated) and institutional investors should choose which they considered to be more effective.

The upshot was that in 1998 legislation was passed temporarily barring the CFTC from taking any action on derivatives, and, in 2000,

the Commodities Futures Modernisation Act effectively permanently prevented the CFTC from regulating OTC derivatives. The market grew unchecked. This was probably the last opportunity to have prevented the subprime crisis.

Born left the CFTC in April 1999 (McLean and Nocera 2010, pp. 101–105; Roig-Franzia 2009; Schmitt 2009). A year after the CFTC was effectively emasculated, in 1998 the hedge fund LTCM collapsed, confirming Born's (1998) worse fears about OTC derivatives. However, as we shall see, even after the demise of LTCM still nothing serious was done about regulating derivatives.

3 The Collapse of Long-Term Capital Management: The Canary in the Mine

More than any crisis, the collapse of LTCM (Born 1998; Edward 1999; Lowenstein 2001; Allington et al. 2012) should have led to a serious reappraisal of the lack of regulation, not just of hedge funds, but of the whole banking system and, especially, OTC derivatives. The extent of potential damage that the collapse of LTCM could have caused is best illustrated by Greenspan's (1998) testimony in the aftermath of the collapse to House of Representatives in 1998. Here Greenspan (op. cit.) was justifying the actions of the Federal Reserve Bank of New York in organising a rescue, which we shall discuss further below. Greenspan (1998) commented that:

> Had the failure of LTCM triggered the seizing up of markets, substantial damage could have been inflicted on many market participants, including some not directly involved with the firm, and could have potentially impaired the economies of many nations, including our own. ….
>
> What is remarkable is not this episode, but the relative absence of such examples over the past five years. Dynamic markets periodically engender large defaults.

What is remarkable, rather, is that a non-bank financial institution with only about 180 employees in 1996 could, according to Greenspan (1998), nearly have caused the entirety of the US banking system to collapse. The collapse of LTCM should have highlighted the serious problem of substantial systemic risk that derivatives, combined with high levels of leverage, could cause to the overall financial stability. It should also have drawn attention to the misleading impressions of low risk that the standard Value-at-Risk (VaR) methods could cause. Importantly, the implications of the collapse were not just confined to hedge funds, but extended to the banking system.

LTCM was set up in 1994 with a small amount of equity for a hedge fund of around $1.3 billion. It had an impressive management team and also directors that included the Nobel Prize winners Merton and Scholes. Its methodology was to use the latest computer algorithms from modern finance and to undertake quantitative analysis of millions of data points. One of its approaches was to bet on the reduction in international bond prices (or, equivalently, spreads) in thousands of trades as the world financial markets became more integrated. Thus, an underlying assumption was that this would occur because of the efficient market hypothesis. These pairwise trades were hedged, so it did not matter whether the relevant bond market, as a whole, rose or fell. All that mattered was the spreads would narrow. Combining both its extensive off-balance sheet exposures and its on-balance sheet holdings, LTCM had $1.4 trillion exposures with only $5 billion of equity—a huge leverage ratio.

VaR was by now a standard method of calculating the maximum value that a portfolio could lose, say, 95% of the time. It assumed that the volatility of prices followed a fixed Gaussian distribution, but was only based on data for a relatively short time period, often only five years. For example, in the first LTCM shareholders' report the probability that the fund would lose 5% of its value, or less, in a typical year was given precisely as 12%; losses of 10% and 15% or more, were given a correspondingly smaller probability. The modellers, of course, knew of the existence of fat tails, but the latter were ignored as they could not be statistically modelled for day-to-day trading.

What caused its downfall was that while behind LTCM's strategy of thousands of trades was the prediction of convergence in sovereign bonds prices and yield spreads; in 1998 precisely the opposite occurred. The Asian Financial Crisis occurred in 1997 (completely unforeseen by such international institutions as the IMF). This was closely followed by Russia devaluing the rouble and declaring a moratorium on repaying its Treasury debt. Russian banks, which had provided hedging against this event, failed to honour their contracts (as they were entitled to do in the face of a systemic failure).

Given this unexpected crisis, there was a flight to quality and to liquidity, as investors unloaded high-risk assets, or junk bonds, in all the national financial markets with the result that the market for these quickly became illiquid. This panic caused spreads to *widen*, which was the converse of LTCM's expectations and the basis of their trades.

The markets panicked and risk premia in all emerging markets rose rapidly, including those that had little connection with the Russian crisis. The share price of LTCM fell dramatically and bankruptcy loomed.

As we have seen, the potential bankruptcy was viewed with alarm by the Fed. This was not because it was too big to fail, but because it was too interconnected to fail. In other words, it was involved in so many trades with other financial institutions that there was the danger of a chain reaction and a systemic crisis occurring. Most of the counterparties with LTCM were unaware of the existence of the many other counterparties. As McDonough, Chairman of the New York Fed, stated, it was not just the adverse effects on LTCM counterparties that was cause for concern, but the fact that there was the distinct probability of a general drying up of credit, in much the same way as occurred later in the subprime crisis.

The Federal Reserve Bank of New York brokered a rescue of LTCM, with a great deal of persuasion, by 14 banks (with two refusing). The Fed, mindful of the charge that it was increasing the problem of moral hazard, repeatedly stressed that this could not occur as no public money or guarantees had been involved. However, many commentators remained unconvinced (see Dowd 1999).

The fact that LTCM had, by the admission of Greenspan, nearly brought down the US banking system, remarkably did not change his perception that the level of regulation was still satisfactory. In fact, quite the opposite occurred. There was the inevitable post-mortem, notably the hearing on Hedge Funds Operations held before the U.S. House of Representatives (1998). Here, Greenspan justified the fateful strategy taken by LTCM in terms that bordered on hyperbole: "But many of the things which [hedge funds] do … tend to refine the pricing system in the United States and elsewhere, and it is that really exceptionally and increasingly sophisticated pricing system which is one of the reasons why the use of capital in this country is so efficient. It is why productivity is the highest in the world, why our standards of living, without question, are the highest in the world. I am not saying that the cause of all of this great prosperity is the consequence of hedge funds… What I am saying is that there is an economic value here which we should not merely dismiss" (U.S. House of Representatives 1998, pp. 93–94). Thus, according to Greenspan, LTCM was caught out by an extreme financial event that he dismissed as unlikely to occur again (Greenspan 1998). This ignored the fact that financial crises regularly occurred in the US and the rest of the world (Reinhart and Rogoff 2011).

In 2005, Greenspan further commented that "The data seem to have resolved the debate. In the United States, the Commodity Futures Modernization Act of 2000 [which prevented the regulation of OTC derivatives] has permitted healthy competition between the exchanges and the OTC markets and both sets of markets are reaping the benefits" (2005, p. 1). Yes, this was only three years before the very same OTC derivatives brought about the worse banking crisis since the Great Depression.

Greenspan (2004) stated that, "these increasingly complex financial instruments have contributed, especially over the recent stressful period, to the development of a far more flexible, efficient and hence resilient financial system than the one that existed just a quarter-century ago". But this view was also shared by others who had been lulled into a sense of false security by the years of the Great Moderation.

Consequently, having had a nasty scare in 1998, the financial authorities in the US and the financial institutions promptly forgot the lessons of LTCM, only to be forcefully reminded of them a decade later. In fact, it was only one year later (in 1999) that the Glass-Steagall Act of

1933 was finally repealed, having been progressively watered down over the previous two decades.

What were the lessons not learned from the collapse of LTCM? The first is that the failure of even a relatively large financial institution, per se, is not the main danger. It is the problem of *systemic* risk that looms large. Even with strong and objective risk management and the use of VaRs, it is almost certain that the contagion effects will not be fully accounted for. It was a failure to take this into account, and to let Lehman Brothers fail, that exacerbated the subprime crisis. The problem was that VaRs were calculated using short-run data and were based on the normal distribution. As such they grossly underestimated the probability of extreme events, such as the Asian Financial Crisis (1997) and Black Monday, 19 October 1987, when the stock exchanges fell between 20% and 40% the world over for no apparent reason. VaRs seemed to work most of the time, except when they were most needed (Mandelbrot and Hudson 2004; Taleb 2008; Allington et al. 2012). What is remarkable is that in 2004 the SEC, after pressure from the investment banks, allowed these banks to use VaRs for the risk assessment of securities in markets that were liquid, which included CDOs (Lowenstein 2010, p. 63). At the same time, Basle II's preferred measure for measuring risk was again the discredited VaR.

At the same time the rise of New Classical Economics, rational expectations, real business cycle theory and the theory of rational expectations came to dominate macroeconomics. Indeed, in the year before the crash, there was a remarkable degree of complacency among neoclassical macroeconomists. All the major issues in macroeconomic policy had been solved (see, for example, Goodfriend 2007). However, this merely confirmed the more pragmatic ideological approach of Greenspan (the master of economic detail) concerning the need for little regulation. In fact, dynamic stochastic general equilibrium (DSGE) models played little direct role in the setting of macroeconomic policy in the UK (King 2016; Farmer 2018, p. 1105). In the US, the philosophy of the libertine Ayn Rand had more influence on Greenspan than any DSGE model. As the Governor of the Bank of England, Mark Carney (2018, p. 2) put it "markets always clear" is *Lie II* (Carney's *Lie I* is "this time is different").

Views about the need for little regulation were further confirmed by the development of mathematical finance and efficient market hypothesis. Both financial traders and most financial economists uncritically accepted the assumptions underlying the valuation of derivatives. The assumption that risk is simply measured by past volatility, together with the fact that no account is taken of uncertainty, lead to a serious underestimation of systemic dangers. It results in excess confidence and the illusion of control. Capelle-Blancard (2010, p. 79) cites a survey in 2004 conducted by the financial industry's trade association, ISDA, of finance professors in the top 50 business schools. Only 1% of the respondents considered that derivatives could have a negative impact on the global financial system. Any problems with derivatives were seen as being simply due to the practioners' lack of knowledge of the financial models and how to use them correctly. "This is nothing less than a simplistic view", as Capelle-Blancard (2010, p. 79) put it. It was only much later that Greenspan (2013) came to appreciate the important role that uncertainty and animal spirits played in financial markets, together with fat tails.

Derivatives, while they might not increase market volatility, substantially increase financial systemic risk, as we have seen. There had been a few warnings about uncritically relying on the mathematical financial models. Merton ironically, just before LTCM crashed, is reported to have said that risk cannot be eliminated just because it can be measured (Capelle-Blancard 2010, p. 79). In the case of LTCM, it was the very mathematical strategies designed to reduce risk that nearly brought down the US financial system, not a failure theoretically to understand the structure of the models per se. The problem was the failure fully to appreciate the implications of the models' limitations.

We next turn another lesson not learned from an earlier financial crisis, namely the S&L debacle and *Lie III*, "markets are moral" (Carney 2018, p. 5)—another lesson not learnt.

4 The Forgotten Banking Crisis: The Savings and Loans Debacle, 1980–1989

Second only to the subprime crisis, the worst US banking crisis since the Great Depression is what has come to be known as the S&L debacle. This commenced in 1980 and lasted until about 1989, costing in

total about $US 160 billion, the majority of which was picked up by the US taxpayer. The debacle should have been instructive because it clearly showed not only the dangers of financial deregulation, but also the problems caused by the weak, or indeed lack of, enforcement of existing regulations.

Moreover, importantly, it showed that financial fraud or control fraud, as it is sometimes known, while not the cause of the S&L crisis, greatly magnified its severity. The banking system, by its very nature, is more prone to fraud than any other industry, a fact that seemed to have been forgotten in the run-up to the subprime crisis. Malfeasance was widespread in the subprime crisis and is still widespread today in the banking system. So, what was the cause of the S&L crisis and why did it become so serious, given the previous good track record of the S&Ls until 1980?

4.1 The Early Years of the S&Ls

Savings and Loan associations (S&Ls) (or Build and Loans, as they were initially known) were first established in 1831. S&Ls are also known as thrifts. They were similar to the British building societies and took deposits, largely from working-class households, and issued long-term mortgages to them. Like other banks, they were severely hit by the Great Depression and became subject to greater government oversight.

Consequently, two main reforms were brought in during the 1930s. The first was the formation of the Federal Home Loan Bank Board (henceforth the Bank Board) to grant charters to some of the S&L institutions (there were also 12 regional Federal Home Loan Banks). A number of other S&Ls were state-chartered, but their regulatory conditions were very similar to the Federal-chartered institutions. The second reform was the creation of the Federal Savings and Loans Insurance Corporation (FSLIC), which guaranteed the S&L deposits and was financed by a levy on the thrifts. By 1980, the S&Ls were responsible for about one-half of all US mortgages and, until that date, there had been very few cases of financial mismanagement.

The S&Ls, in providing mortgages, were subject to the inherent problem of maturity mismatch that faces any bank. In 1966, Regulation Q was applied to the S&Ls. This restricted the limit of the level of interest rates payable on the various types of deposit accounts, but it had previously only applied to commercial banks. The S&Ls were given a small, but important, interest rate differential over the commercial banks to give them a competitive advantage. At this time, it was difficult for individual savers to move their funds to other higher interest-rate paying financial institutions and they were, in fact, cross-subsidising the mortgage holders.

The crisis occurred almost overnight. The main reason was the rapid increase in interest rates. To fight inflation, Volker, the then Chairman of the Fed, suddenly raised interest rates, from 10% in 1979 to peaking at just over 19% in 1981.

Because of Regulation Q, in 1979, the S&Ls could only offer a deposit rate of 5.5%, which says it all. Financial developments by now meant that there were other financial institutions paying higher interest rates on deposits that were now accessible to the S&L traditional savers. Although Regulation Q for the S&Ls was phased out from 1980, there was still the problem that even when the thrifts raised their deposit rate, they still received the interest payments from the original mortgage loans at a low fixed rate. This led to a huge interest rate mismatch. The market value of the mortgages held by the S&Ls plummeted, although under Generally Accepted Accounting Principles (GAAP) they were still valued at their historic cost.

By 1982, 414 out of 3287 S&Ls insured by the FSLIC were bankrupt and many more were technically insolvent. Their net income in 1981 and 1982 was minus $4.6 billion and minus $4.1 billion respectively and the tangible net worth of the entire S&L industry was virtually zero. In 1983, it was estimated that it would cost roughly $25 billion to compensate fully the insured depositors of the failed S&Ls, but the S&L insurance fund (the FSLIC) had only about $6 billion in its coffers (Federal Deposit Insurance Corporation [FDIC] 1997, p. 169). The Reagan administration, with its aim of balancing the budget and cutting taxes, was not prepared to bail out the FSLIC. Moreover, there was, at that time, concern about alarming the public and causing runs on the S&Ls if their financial distress became known.

Consequently, there was an immediate twofold reaction on the part of the administration and the Bank Board to the crisis. The first was to pretend that there was no serious crisis and the second was rapidly to introduce de-regulation that actually accentuated the problem.

4.2 Reactions to the Immediate Crisis

There were two major reactions to the S&L crisis by the regulatory authorities, namely, forbearance and deregulation.

(i) ***Forbearance***

The first strategy was based on the assumption that losses of the thrifts would be only temporary and would be automatically corrected as interest rates fell. If the insolvent thrifts could be allowed to continue operating until this happened, then their financial problems would resolve themselves. Consequently, the view was taken that these S&Ls should be granted regulatory forbearance until interest rates had returned to levels that were more normal. Other regulatory requirements were actually weakened; such as reducing the net asset requirements and allowing losses from the high-interest rates to be deferred.

One of the more remarkable incidents of creative accounting that was permitted was the treatment of goodwill that allowed many S&Ls to avoid insolvency. If an insolvent S&L was taken over by a solvent S&L, then, so the argument went, it could not therefore be insolvent. Why would a solvent S&L takeover an insolvent S&L? Consequently, the deficit on the balance sheets of the latter was covered by an offsetting credit due to the value of goodwill, even though the latter was, in practice, negligible.

At one stage, the S&L industry even suggested that *all* the S&Ls should mark-to-market their assets and the difference between this figure and the original value of the mortgages be offset by the value of goodwill. This would remove the need for any mergers, but was a step too far. Nevertheless, it can be seen how this method of accounting led to a plethora of takeovers among the S&Ls. “Both the buyer and the

S&L it was about to acquire would, in 1979–1982, have reported losing money. The merger would occur, and, miraculously, the combined entity would almost immediately be profitable – extremely profitable. It is very difficult to take supervisory action against a firm that is profitable" (Black 2013, p. 27).

(ii) ***Deregulation***

Legislation was also introduced in 1980 and 1982 that actually increased the final cost of the crisis. The main Acts were the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA) and the Garn-St Germain Depository Institutions Act of 1982 (Garn-St Germain). These acts reduced the net worth requirements of the S&Ls and gave a legal basis for capital forbearance. A long overdue move was the introduction of adjustable-rate mortgages (ARM) mortgages. As we have noted above, Regulation Q was phased out, which, after 1981, made the S&Ls more competitive in the money markets.

These Acts effectively deregulated the thrifts, but without tightening supervision. In fact, the existing supervision was woefully inadequate. There were the examiners, who scrutinised the S&L accounts and the supervisors who were the only people who could issue directives and compliance orders to the S&Ls. The examiners reported to the Bank Board and the supervisors to the regional FHLBs, which lead to a serious lack of communication and a degree of mistrust. "Even the most diligent S&L examiner faced considerable difficulties in reporting negative findings and seeing those findings acted upon" (FDIC 1997, p. 172). The result was that the regulators would normally pursue only cease-and-desist orders negotiated with the S&Ls, rather than undertake legal action and would avoid cases where there was a lack of precedent. "Unfortunately, these policies undermined the effectiveness of both contemporary and future enforcement actions" (FDIC 1997, p. 172). Moreover, the problem was compounded by the Republican administration pursuing its deregulation agenda. It imposed a freeze of the hiring of regulators in 1980–1981, even though the posts were funded by the S&L industry.

Importantly, deregulation allowed the thrifts to make acquisition, development and construction (ADC) loans, i.e., real estate loans. Although it allowed the S&Ls to diversify their portfolio, it led the way wide open for fraud. Also, the legislation made it possible for one individual to own an S&L. Previously, no one person could own more than 15% of the stock and there had to be at least 400 shareholders. The conflict of interest rules were rewritten so that management of the S&Ls could benefit from their positions in the S&L. The rules for capital requirements were relaxed and, remarkably, the consequence was that the faster an S&L grew, the lower was the effective percentage capital requirement (Black 2013, p. 31). Consequently, a rapidly growing S&L had, in practice, literally a thousand-to-one leverage ratio (Black 2013, p. 32).

Whatever the degree of insolvency, it was impossible for the regulators to take a fast-growing S&L into receivership. The S&Ls were now also allowed to loan up to 40% of their assets to the construction industry and this gave the remarkable opportunity for accounting fraud. As the title of Black's (2013) book put it: *The Best Way to Rob a Bank Is to Own One*.

The S&L crisis was ended with the Financial Institutions Reform, Recovery and Enforcement Act of 1989. The FSLIC was declared insolvent in 1986 and its role eventually taken over by the fully funded Resolution Trust Corporation in 1989. The total cost of the rescue was, as we have noted, about $160 billion. It could have been only $25 billion if action had been taken earlier.

4.3 How Did Control Fraud, or Looting, Occur and How Widespread Was It?

Akerlof and Romer (1993) convincingly challenged the prevailing, and continuing, orthodoxy that market forces would always prevent control fraud. "The typical economic analysis [for the insolvency of a bank] is based on moral hazard, excessive risk taking and the absence of sensitivity in the premiums charged for deposit insurance" (p. 4). The last is that the same levy rate for deposit insurance is charged regardless of the risk inherent in a bank.

If a bank is in financial trouble, then, in the standard economic model, gambling for resurrection may occur. In other words, excessive risks may rationally be taken on the basis there is nothing to lose if the bank would otherwise fail. Nevertheless, an owner of a bank engaged in gambling for resurrection would never have operated a thrift in a way that many owners did. They had a complete disregard for any form of due diligence on the loans. Everything points to widespread fraud. Control fraud is where the owner of a financial institution uses that organisation to embezzle funds, even to the extent that it almost certainly will bankrupt the bank. In other words, it occurred when the amount an owner could extract from the S&L was greater than the S&L's net worth, which, as we have seen, was typically a very small fraction of the S&L's assets.

What are the conditions for accounting fraud to flourish? The first is the government needs to guarantee the S&L's deposits through some form of federal insurance. This enables the S&L to achieve substantial deposits by raising its interest rates. In an extreme case, non-recourse loans are then made for highly speculative ventures that look like having a high value, but in the knowledge that eventually the contracts will not be honoured. Construction projects were popular and subject to land flips. This is the repeated selling of a piece of land (often at the same meeting), thereby inflating its value for loan purposes. The real estate building was often never completed and the loan was usually defaulted. Nevertheless, the S&L made 100% loans on the project, which included the commission fees from which huge bonuses were paid. The developer did not put any of his own money in and would pay the thrift substantial interest rate payments from the loan. The loan would invariably default and the developer would pocket his fees. If the loan was for genuine purposes, then reputational risk would ensure the S&L took care to ensure the developer was capable and the project carefully risk-assessed. However, with control fraud, quite the opposite occurred. The S&Ls also bought high interest, but commensurately high-risk, junk bonds. However, no provision was made for their high propensity to default. In fact, the loans with the greatest returns but with the highest propensity to default were the best for control fraud (Akerlof and Romer 1993; Calavita et al. 1997).

While fraud did not cause the S&L debacle, it greatly exacerbated it. Calavita et al. (1997) came to the conclusion that "if we assume that thrift managers are rational economic actors, deliberate insider abuse is the only viable explanation for the behaviour of insiders at the worst failures" (p. 44).

Much later, in 1997, Alan Greenspan, then Chairman of the Federal Reserve Bank,[1] remarkably reputedly commented to Brooksley Born (1998) as follows: "Well, you probably will always believe there should be laws against fraud, and I don't think there is any need for a law against fraud" (Schmitt 2009). Greenspan, according to Born (1998), believed the market would take care of itself. Fraud would not occur because of the danger of reputational damage to the perpetrator. This view is very common in the literature on corporate governance theory. For example, Easterbrook and Fischel (1991), in a leading textbook, state that "a rule against fraud is not essential or even necessarily an important ingredient of securities markets" (p. 283). Any significant financial scandal is simply due to mismanagement, incompetence, or unwarranted interference by regulators, but not to wrongdoing.

Akerlof and Romer (1993) consider that the cost of the fraud was about $60 billion out of a total cost of $140 billion. Eventually, over one thousand S&L people were convicted in "major" (so termed by the U.S. Department of Justice [DoJ]) fraud cases.

5 Fraud and Malfeasance in the Banking Industry

The S&L crisis demonstrated that fraud can be endemic in the banking system, perhaps more so than in any other industry, *pace* Greenspan. Ferguson (2012) has argued that since the 1980s, what are criminal actions, rather than just recklessness, have become widespread in the US

[1]The S&L crisis largely occurred when Volker was Chairman of the Fed (August 1979–August 1987). Greenspan was Chairman from August 1987 to January 2006. However, Greenspan had been an economic advisor to Keating, who was convicted for fraud while running Lincoln S&L. Consequently, *ex post*, although not at the time, Greenspan must have been aware of widespread fraud in the S&Ls.

financial system. Indeed, he goes so far as to term this cultural change as financial criminalization, which also reflects the views of Black (2013). This lack of ethics seems to be acceptable by some financial employees, including senior managers, partly because the gains accrue directly to the bank and only indirectly to the employee though higher bonuses. Moreover, they are seen as victimless crimes (if crimes at all) generally affecting other sophisticated financial traders—it is simply justified as a case of caveat emptor.

Cohn et al. (2014) provide some interesting experimental behavioural evidence. They took two groups of bank employees and the experiment consisted of tossing a coin ten times, where, say a head earned them $20 and a tail nothing. These tosses were unobserved and so provided an opportunity for cheating. One group, prior to the tossing, were asked questions directly related to their banking activities, reinforcing their identity as bankers. For the control group, the questions were unrelated to the profession. Adjusting the results using controls, the first group with the bankers' identity displayed statistically significantly more cheating than the control group. This led Cohn et al. (2014) to conclude that "the prevailing business culture in the banking industry favours dishonest behaviour and thus has contributed to the loss of the industry's reputation" (p. 88).

The risky and fraudulent actions of the banks in the run-up to the subprime crisis has resulted in fines against the banks, rating agencies and other financial institution by 2017 of $150 billion (*Financial Times* 2017). The Bank of America accounts for about one-third of these fines, through its acquisition of Countrywide and Merrill Lynch. These fines almost all relate to the mis-selling of mortgage-backed securities and related financial instruments. In the US, prosecutors have insisted on guilty pleas for other offences including money laundering (notably by HSBC) in violation of US sanctions. When all these are added up, the banks have paid $321 billion in fines from 2007 to 2016, with more expected to be levied by European and Asian regulators.

There is evidence of widespread fraud in the origination of mortgage loans in the 2000s, largely on the part of the originators (Hendron 2018). Furthermore, there were plenty of warnings that were ignored. If

the regulators had stepped into prevent the fraudulent granting of mortgages at this stage, it would undoubtedly have lessened the impact of the subprime crisis.

The FCIC (2011), for example, reports that the Greenlining Institute, a major not-for-profit housing group, met with Greenspan annually from 1999, yes 1999, and warned him of the "growth of predatory lending practices" (p. 9). Similarly, Federal Governor Gramlich listened sympathetically to similar complaints during the 2000s, but was unable to persuade the Fed to act. The fraudulent mortgage practices began in the mid-1990s. However, it was only from 2004 when the loans were packaged in CDOs and billions of dollar bets taken on their failure, through CDS and synthetic-CDOs, that they became capable of bringing down the financial system.

Unsuccessful attempts were made by Cleveland, Ohio, in 2000, where liar loans were rife, to persuade the Fed to use its 1994 powers, under the Home Ownership and Equity Protection Act (HOEPA). In the same year, community leaders in several states approached the Office of Thrift Supervision (OTS) to crack down on exploitative practices. What was worse was not just the indifference of the Fed, but the fact that the Office of the Comptroller of the Currency (OCC) and the OTS acted to prevent the states from enforcing rules against national banks and thrifts that were nationally regulated. The fraud continued to grow, despite the opinion of one Assistant Director of FBI that the problem "could have as much impact as the S&L crisis" (FCIC 2011, p. 15). The red lights were flashing.

The U.S. Permanent Subcommittee on Investigations (PSI), which reported in 2011, undertook some very detailed case studies. It looked in detail at Washington Mutual (WaMu), the US's largest S&L bank, together with its subsidiary Long Beach Mortgage Company, and its regulator, the OTS. WaMu was one of the US's largest issuers of subprime mortgages and mortgage backed securities. The PSI concluded that WaMu and its subprime lender Long Beach Mortgage, "engaged in a host of shoddy lending practices that produced billions of dollars in high risk, poor quality mortgages and mortgage-backed securities …. They also designed compensation incentives that rewarded loan

personnel for issuing a large volume of higher risk loans, valuing speed and volume over loan quality" (PSI 2011, p. 3).

Moreover, the WaMu management had "compelling evidence of deficient lending practices in internal emails, audit reports and reviews" (PSI, op. cit., p. 3). This included evidence of "extensive fraud" that the senior management did nothing about. The OTS was also aware of these fraudulent practices, but was content to allow the bank to sort it out itself. This has strong parallels with the S&L debacle, where, as we have seen, cease and desist orders were regularly issued by the regulators, rather than prosecutions undertaken for which the regulators had insufficient resources.

The conclusions of the PSI (2011) could have been written about many of the thrifts.

> Hindered by a culture of deference to management, demoralized examiners, and agency infighting, OTS officials allowed the bank's short term profits to excuse its risky practices and failed to evaluate the bank's actions in the context of the U.S. financial system as a whole. (p. 5)

See also Fligstein and Roehrkasse (2016) for further details of fraud in the subprime crisis.

5.1 Too Big to Jail and Moral Hazard

As of 2018, only 47 bankers worldwide have been jailed for the part they played in the financial crisis (the number excludes rogue traders who were not directly related to the crisis and associated bank collapses). Of the 47 convictions, 21 were convictions for the Icelandic Banking Crisis; there were 11 convictions in Spain, 7 in Ireland and one each in Cyprus, Germany, Italy and the US.

To the extent that fraud and malfeasance was a fundamental cause of the crisis, the question arises as to why there were no criminal prosecutions of either individuals or the banks. This is even though some banks were given fines of several billion US dollars. The penalties, consequently, fell entirely on the shareholders who, because of the divorce

of ownership from control, had no say in any of the disastrous decisions made by the banks. Given the statute of limitations in the US of five years, it is likely there will now be no prosecutions with respect to the subprime crisis.

Attorney General Holder, in testimony before the Senate Judiciary Committee on 6 March 2013 opined that some financial institutions have become "so large that it makes it difficult for us to prosecute them". Because of the widespread concern, to say the least, that his statement invoked, Holder backtracked on 15 March 2013, again before the Senate Judiciary Committee. However, as we shall see, his comments arose in respect of the failure of the DoJ to prosecute the US arm of HSBC. This essentially contradicts the Attorney General's recantation.

The fact that there were no criminal prosecutions raises a new type of moral hazard. If bankers believe that they can act fraudulently and keep their bonuses without fear of criminal action, then what is to prevent similar future actions occurring in the context of complex banking decisions? Moreover, the US criminal justice system had success in prosecuting those involved in the junk-bond crisis (Michael Milken), Enron and other large corporate frauds (e.g., Jeffrey Skilling, Bernie Ebbers) and over 1000 bankers were indicted after the S&L debacle. So why were there no prosecutions for the more serious subprime crisis?

Rakoff (2014), a US District Judge in New York, has analysed this problem and provides some compelling insights. To prove fraud on the part of high-level management, the DoJ must prove intent, which is difficult when considering senior management, who operate several tiers above the trading floor. But given the widespread evidence of fraud within the banks (including suspicious activity reports) the failure of top management to make inquiries is what is legally known as wilful blindness or conscious disregard and has been sufficient in the past to prove intent.

A second excuse made by the DoJ is that the buyers of these eventually worthless financial instruments were sophisticated bank traders and were not relying on the assurances of the sellers as to their worth. As such, they were fair game. This was the view of Breuer, then head of the DoJ's Criminal Division. However, as Rakoff (2014) points out, this

is a surprising misreading of the law, where reliance is never required to be proved. If it were, a seller could lie with impunity if the buyer was a sophisticated buyer.

5.2 The Case of HSBC and Fraud Post-2008: What Needs to Be Done?

Finally, the argument has been made that bringing prosecutions against the large banks may actually materially harm the US, and possibly, the world economy. This too big to jail argument, of course, violates the notion of the equality of the law and prosecuting the high-level executives is highly unlikely to bring down a financial institution. The fact that a policy of too big to jail is still sometimes followed is evidenced by the case of HSBC.

HSBC was found in 2012 by the DoJ to have undertaken "blatant" (DoJ) criminal behaviour (laundering, both inadvertently and deliberately, hundreds of millions of US dollars of drug cartel money and processing financial transactions on behalf of Cuba, Iran, Libya, Sudan and Myanmar). This had occurred for several years until 2010.

> The conduct occurred within HSBC locations around the world, with the knowledge, approval and encouragement of senior corporate managers and legal and compliance departments. (U.S. Treasury Press Release 2012)

"The record of dysfunction that prevailed at HSBC for many years was astonishing" reported Assistant U.S. Attorney General Breuer (*Financial Times* 2012).

The bank agreed to pay a fine of about $1.9 billion. However, remarkably this was under a deferred prosecution, which avoids a criminal charge being brought against the bank or bank employees. This is offered on condition that a bank agrees to take measures that prevent it from happening again.

A report was subsequently published by the Republican Staff of the Congress Committee of Financial Services, entitled *Too Big to Fail* (2016).

It found that the DoJ's Asset Forfeiture and Money Laundering Section had internally recommended that the DoJ should prosecute HSBC for criminal violations in September 2012. However, before a decision could be made, the UK's Financial Services Authority (FSA) and the then Chancellor of the Exchequer, Osborne, intervened, with the latter writing to Chairman Bernanke and Secretary Geithner. Osborne contended that prosecuting a "systematically important financial institution" such as HSBC "could lead to [financial] contagion" and pose "very serious implications for financial and economic stability, particularly in Europe and Asia" (U.S. Committee on Financial Services 2016, p. 14).

One of the concerns of the UK government was that if a criminal prosecution was successful, as the DoJ internally conceded was very likely, the US would consider revoking HSBC's charter to operate in the US. This would have undermined the UK's competitive position in banking. Moreover, the decision confirms that even after the Dodd-Frank Act, in practice if not in theory, some banks were deemed by the US and UK governments still too big to fail, whatever the cause.

The argument is that while senior managers of the banks were complicit in fraudulent activity, for various reasons it was easier, or perhaps only possible, to pursue civil action against the large banks. While more of the FBI were transferred from counter-terrorism duties to fight fraud after 2008, much experience of dealing with fraud had been lost. Moreover, given the complex nature of the frauds, it would be difficult successfully to prosecute the senior managers who could use the bank's resources to hire the best attorneys to represent them.

A study by Garrett (2016) found that the number of prosecutions of banks in the US had reached record numbers in 2015. But as he points out, the fines, although often seeming large in absolute terms, are tiny compared with the banks' capitalisation and banks receive no greater fines for recurring convictions. "The outcomes suggest that the 'too big to jail' argument … retains currency and applies to banks that commit crimes repeatedly" (Garrett, op. cit., p. 43). The danger is that fines on banks simply become to be regarded as part of the costs of doing business, so long as CEO and other senior managers escape prosecution. The few convictions of bank employees tend to be of relatively junior members.

What is worrying is the number of fraudulent activities of the banks that have come to light and which post-date the subprime crisis. A notable case is JP Morgan where one of its traders, Bruno Iksil (the so-called London Whale), lost $6.2 billion from using CDS in 2012. Ironically, this occurred in the bank's Chief Investment Office, whose remit was to hold down the Bank's risk level. A Senate report concluded that JP Morgan mislead both investors and JP Morgan's audit committee. The U.S. PSI stated that risk limits were breached more than 300 times before the bank switched to a more lenient risk-evaluation criterion. Attempts were made to hide the losses from senior management and the regulators. JP Morgan ultimately paid more than $1 billion and admitted wrongdoing to settle related US and British investigations. The CEO, Dimon, took a 50% pay cut, after previously dismissing the episode as a "storm in a teacup".

Other notable fraudulent activities include the rigging of LIBOR (London Inter-bank Offered Rate), which started as long ago as 1991. LIBOR is the interest rate that banks report that they charge each other and underpins a multitude of other rates. Significant reforms were introduced and LIBOR is now regulated by the Financial Conduct Authority. It is proposed that LIBOR will be based on actual transaction rates by the end of 2021.

The resolution of the misselling of ineffective and inappropriate Personal Protection Insurance by the UK banks ended in August 2019, having been started by the Financial Services Authority in 2005. The repayment of the premiums will run into several billion pounds. The Lloyds Banking Group alone has already paid out £18 billion. The above are only a few examples of post-2008 banking scandals. For a more comprehensive list see the RepRisk (2016) report of ten years of global banking scandals, 2006–2016.

A potential powerful legal weapon that US regulators have is the Sarbanes-Oxley Act of 2002, which makes it a criminal offence for corporate executives to knowingly certify inaccurate financial reports. Furthermore, the Act requires public companies to have internal controls such that investors can have reasonable assurance about the companies' financial positions. Senior management is required to share key information with important decision makers, such as the board of

directors. The Act was brought in because of the fraudulent activity at Enron. However, as in the case of JP Morgan, the regulators have surprisingly never used the Sarbines-Oxley Act in a criminal prosecution, only in civil actions.

In the UK, the Governor of the Bank of England, Carney (2018), emphasised the similar regulatory role of the UK Senior Managers Regime, which came into force in 2016. This gives firms a requirement to re-establish clear links between a senior manager and the post's responsibilities and accountability. Firms must annually certify that the senior managers are fit and proper to fulfil their role. However, as this is merely the encapsulation of a voluntary code, it is a moot point whether its existence at the time of the subprime crisis would have made any significant difference.

Nevertheless, this is an important issue. As Lagarde (2018), the then Managing Director of the IMF, put it: "There is one other important area that has not changed much—the area of culture, values, and ethics. … The financial sector still puts profit now over long-range prudence, short-termism over sustainability. Just think of the many financial scandals since Lehman". Yet the banking culture is likely to be hard to change. The S&L crisis did little to change it in the US.

6 The Aftermath of the Subprime Crisis: The New Regulatory Environment

6.1 The Dodd-Frank Act

The severity of the subprime crisis led to major financial regulatory reforms that were the most radical since the Great Depression. In 2010, the Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act, which introduced sweeping reforms (however, at the time of writing, February 2019, still not all have been fully implemented. Moreover, President Trump has said many times he would like to repeal this act). These rolled back much of the financial deregulation that had steadily occurred over the post-war period,

culminating in 1999 with the repeal of the Glass-Steagall Act of 1933. The new US legislation was extensive, with 225 new rules encompassing 11 agencies. The Act directed the Federal Reserve Bank to put in place enhanced regulatory requirements for banks with assets more than $50 billion, namely the Systemically Important Financial Institutions (SIFIs). The Fed introduced three categories of SIFIs. These are banks with (1) assets of more than $50 billion, (2) assets of more than $250 billion or foreign exposures of more than $10 billion, and (3) G-SIBs (Globally-Systemically Important Banks). The last were the banks deemed too big to fail and were categorised on the basis of a number of factors including their asset size and degree of interconnectedness in the banking system.

It has been suggested that smaller banks by asset size should be subject to the interconnectedness criterion (Office of Financial Research 2017). The case for this, as we have noted above, is strongly supported by the collapse of LTCM, where it was its degree of interconnectedness, rather than its asset size, that caused turmoil in the US banking system.

The Act was heavily partisan, supported by the Democrats and opposed by the Republicans. In 2018, parts of the Dodd-Frank Act were repealed under the Trump admission, putatively to reduce the heavy cost of regulation on the regional banks. Notably, it increased the size of the assets of the SIFIs from $50 billion to $250 billion, leaving only 10 banks to strict Fed oversight. The Fed has the right to designate any bank over $100 billion as a SIFI. To date, it is fair to say, there has been only minor weakening of the Act.

In this section we briefly review the effect of these new US regulations and assess their likely efficacy. There have been numerous studies undertaking this (see, for example, Acharya et al. 2010, 2011; Baily et al. 2017; Krainer 2012). In a sense, the Act closes the stable door after the horse has bolted, but may prevent other horses bolting.

The Dodd-Frank Act may best be considered as falling in two areas. The first is the creation of the Consumer Financial Protection Bureau (CFPB) that was set up specifically to prevent predatory mortgage lending, especially subprime mortgages. Mortgage terms now must be easier to understand. The Act prevents mortgage brokers originating loans with a higher interest rate or fees than otherwise available

or issuing mortgages that give the highest return to the originator. The CFPB also regulates other types of consumer lending, such as debit cards. Largely, this reflects the failure of the various Federal agencies, in the years immediately before the subprime crisis, to act on information about fraudulent loans. The Fed had all the necessary powers under the HOEPA to take action, which it did not implement. As we have seen in the last section, the Fed deliberately thwarted the actions of the state authorities in much the same way as had occurred in the S&L debacle. There is now a belated requirement for greater due diligence on the part of the lenders to ensure borrowers have reasonable ability to repay a loan. This, for example, has led to a fall in credit cards being issued to those with non-prime credit scores from 29% of the total in 2007 to less than 20% in 2015. Ironically, this is seen by as a criticism of the Act by some and a reason to repeal it (McLannahan 2017).

The second major effect of the Dodd-Frank Act is the establishment of the Financial Stability Oversight Council and the Orderly Liquidation Authority. The former monitors, especially, the financial stability of financial institutions deemed too big to fail (i.e. those that generate systemic risk). There is also the politically contentious power for the Fed to break up banks that are deemed too large. However, one of the paradoxes of the subprime crisis is that because of the necessary bank mergers, the concentration and size of the too-big-to-fail banks have actually increased.

The regulators can also increase the capital-adequacy ratio (CAR) and undertake other prudential regularity control. Importantly, there is provision for the orderly winding down of failing financial institutions so that taxpayers' money is not used. SIFIs have to provide living wills. Any costs of bank failure will be levied *ex post* on the rest of the banking system. However, as critics have pointed out, this may lead to further moral hazard problems, as the penalty is not levied on the failed bank. One of the problems encountered in dealing with the subprime crisis is that the Fed had no authority to deal directly with the bank holding companies, each of which may consist of several bank subsidiaries. This posed serious problems for the Fed in terms of the dealing with some failing banks. This has now been rectified by the single-point-of-entry

(SPOE) strategy. Overall, the Fed has more powers than before, but rather less discretion. This may not be advantageous. For example, the Fed cannot offer assistance to a particular financial institution, without offering it to all others in the same category.

The Act also introduced the so-called Volker rule which, to a certain extent, reintroduces conditions of the Glass-Steagall Act and bans commercial banks from engaging in proprietary trading (i.e. using customers' deposits to trade on the bank's behalf). This is a key factor in separating commercial and investment banking and preventing the former from using deposits in speculative trading. However, in the view of Baily et al. (2017) "there is little evidence that proprietary trading was a direct and major contribution to the most recent crisis" (p. 25). The cause was primarily a combination of the failure to accurately price the risk of the CDOs, the gambling using CDS on the default of CDOs, particularly by hedge funds and later by the banks, and the collapse of the repo and asset-backed paper debts market (Krishnamurthy 2010). This largely occurred in the unregulated shadow banking system (Gorton and Merick 2012). In the US and worldwide the shadow banking system is now, and at the time of the crisis was, about half the size of the commercial banking system. One criticism of the rule is that in practice it may be difficult to identify propriety trading. Suppose a bank buys assets on behalf of a client who does not take them up. The assets therefore remain on the banks' books—is this classified as propriety trading?

As we have seen, one of the major problems of the subprime crisis was the moral hazard problem caused by the problem of too big to fail of the larger banks. The implicit guarantee that the government would need to bail out these banks goes a long way to explain the risky behaviour of the investment banks. It reduces market discipline and imposes a negative externality as their failure has greater financial costs than those of the failed bank, per se. The refusal of the government to bail out Lehman Brothers and the immediate consequences of massive bail outs to the other large banks or arranged mergers merely reinforced this problem.

6.2 Stress Testing: How Effective Is It?

A major change under the Dodd-Frank Act and Basle III has been a greater emphasis on bank stress testing by the regulators, with a view to seeing whether or not a bank's CAR, namely the ratio of a bank's capital to its risk-adjusted assets, and the leverage ratio are at a satisfactory prudential level. In other words, the issue is whether, in the face of the simulated shock, they fall below a designated minimum acceptable level. A stress test is the use of a model designed to simulate the effect of an assumed macroeconomic and/or financial shock (e.g., a steep fall in GDP followed by a recovery) on the banks' profitability and balance sheets. Congruent stress tests can be run on several banks simultaneously in an attempt to capture the effect of systemic risk.

Before the subprime crisis, beginning in the early 1990s, stress tests were largely undertaken by the banks themselves for internal bank purposes and to supplement their VaR calculations. It was not until the early 2000s that the central banks and regulatory bodies began to undertake their own independent stress models but, of course, none of them picked up the rapidly emerging problems of CDOs and CDSs.

Initially under Basle I the risk weights were set internationally, but there was lack of granularity. Subsequently, the banks used their own internal models to determine the riskiness of their asset. However, and as Haldane pointed out (2013), "for a large, complex bank, the numbers of calculated risk weights rose from five hundred to thousands, perhaps millions" (p. 2). They did not have any direct effect on central bank regulatory policy and Haldane notes that risk assessment became self-regularity determined by the banks themselves.

The other measure of the ability of the banks to deal with an adverse shock is the size of the leverage ratio. This ratio is particularly important as the subprime crisis was leverage led. However, the use of the leverage ratio gave contradictory results when compared with the CAR. The average risk weights nearly halved from 1993 to 2011, while bank leverage ratios rose steadily over this period. The correlation between the two indicators was minus 0.6. "While the risk traffic lights were flashing bright red for leverage, for risk weights they were signalling ever-deeper

green" (Haldane 2013, p. 2). It seems almost certain that the banks had manipulated the risk weights in their internal models to their advantage on a significant scale. Haldane (2013) goes so far as to suggest it might be optimal given the uncertainty about the weights to simply assign equal weights to all the assets.

Hypothetical portfolio exercises (HPE) take a common set of portfolios and determine how much capital the banks models should set against them. These have shown the existence of extremely wide interbank ranges of default probabilities and risk weights—often by 5–10 times and 3–5 times respectively. Haldane (2013) documents the extremely wide variation in the various banks' estimates of the values of the risk indicators. The extent of this can be seen in Haldane's (2013) observation that "one bank's models suggesting $1 of capital, another over $1000, for an identical [portfolio's] exposure" (p. 3). There is also the problem of model risk or model noise, which can be very serious and makes the cruder (but model free) leverage ratio a better guide to the overall degree of risk. Haldane (2013) concludes that a necessary regulatory reform is "to make greater use of simple, prudent metrics" (p. 10) and this is being undertaken.

There have been several criticisms of stress testing. Dowd (2014, 2017) notes that, first, they are not carried out by independent authorities, but by the central banks. But the latter have as one of their remits promoting confidence in the banking system. Therefore, they have a vested interest in designing the stress test so that there is a low bar for success. Secondly, with reference to the Fed, Dowd (op. cit.) is concerned that the scenarios tested are very limited and major shocks such as the collapse of the Chinese or Eurozone banking systems or major trade wars should be stressed tested. Finally, and related to this, he finds the losses of the banks under the tests were only about half those of the subprime crisis. He goes so far as to argue that stress tests are so misleading that they should be scrapped.

Dowd (op. cit.) makes two further points. One effect of stress tests is to lead to a standardisation of the banks' risk management practices. This means that in the face of adverse shock they are likely to act in a similar fashion, further exacerbating the crisis. He further argues that the good outcome of the banks with respect to the stress tests is that

they have learned how to game them. Goldstein (2017) has argued that the stress tests do not place enough emphasis on fat tails, understates the importance of non-linearities and feedback effects. They also underestimate the impact of the adverse effects in the financial sector on the real sector and vice versa.

Nevertheless, the importance and influence of stress tests should not be underestimated. The successful results of the 2009 US stress test (the Supervisory Capital Assessment Program) are credited with being a turning point in restoring investors' confidence in the US banking system immediately after the crash (Bernanke 2015, p. 397). More recently, the Bank of England's (2018) modelling of a no deal Brexit found that all the largest seven banks passed the stress test. This involved, inter alia, a 4.7 percentage point fall in UK GDP and a 27% drop in the value of the pound. This provides a certain amount of confidence in the UK banking system. Stress tests are likely to continue to remain an important tool of macroeconomic regulatory policy.

6.3 Credit Default Swaps and the Dodd-Frank Act: A Phoenix Rising from the Ashes?

We have seen that the widespread use of OTC CDSs was a prime cause for the subprime crisis. The Dodd-Frank Act included an attempt to remedy this by ensuring that the US swaps market was subject to a battery of regulatory controls, specified in detail by the CFTC. The Act expressly stated that this was also to cover any overseas swaps undertaken by the guaranteed foreign subsidiaries of the US banks, if they could adversely affect the US economy. However, in 2013, ISDA advised its members effectively to deguarantee their foreign subsidiaries. The effect of this was that even if all the financial work in creating swaps was done in the US, so long as the completed contracts were assigned to its deguaranteed foreign subsidiary, the banks would no longer be subject to the Dodd-Frank Act. Not surprisingly, the big four swaps dealers, Citibank, JPMorgan Chase, Goldman Sachs and Bank of America, who undertake about 90% of the US swaps trades, took full advantage of this loophole. However, the swaps still remain on the

balance sheets of these banks. As these banks are systemically important, it means that they would be eligible to be bailed out by the US, if necessary, in another severe financial crisis.

An attempt by the CFTC in October 2016 to close this loophole may well not be finalized by the Trump administration, which is committed to its repeal. In fact, there is no need for the administration to roll back this section of the Dodd-Frank Act relating to swaps because of its ineffectiveness. Given that the CDSs were the major reason for the subprime crisis, this paves the way for the possibility of a second serious crisis. However, the second time around, this is more likely to involve defaults in the US on student loans, car loans and credit card debt, rather than subprime mortgages. However, Greenberger (2018) notes that the relevant statutory framework affords a state Attorney General the right to bring a so-called *parens patriae* action in federal district court to enforce, inter alia, the Dodd-Frank Act on behalf of the state's citizens. Greenberger considers that this kind of litigation is now badly needed to enforce the Act's extraterritorial provisions. Nevertheless, the present situation with regard to CDS and a possible financial crisis is still potentially serious.

7 Summary and Conclusions

The Chief Financial Officer of Goldman Sachs, David Viniar, famously noted in 2007 that "we are seeing things that were 25-standard deviation moves, several days in a row" (cited by Haldane 2009, p. 1). As Haldane (2009) pointed out "a 25-sigma event would be expected to occur once every $6 \times 10{,}124$ lives of the universe" (p. 1).

Of course, even with the danger of hindsight bias, it is clear that while the exact timing and nature of the subprime crisis could not have been foreseen, there was ample evidence over the preceding forty years or that the financial system is dangerously fragile. Certainly, there was plenty of empirical evidence that contradicted Greenspan's view that the financial markets were efficient and needed no regulation.

The problems concerning the opaque nature of derivatives were becoming well known in the 1990s with the financial disasters of Orange County, inter alia. The implications were well known from such

magazines as *Fortune*. What was remarkable was the blocking of the CFTC's attempt even to start a discussion of the possible dangers of derivatives in 1998.

The collapse of LTCM, ironically, led Greenspan to emphasise the dangers of financial interlinkages in leading to serious systemic risk. Moreover, the collapse showed the dangers of the use of the widely used VaR models and the dangers of ignoring fat tails. Basle III and the Dodd-Frank Act have belatedly gone a long way to ensuring the stability of the banking system, but what still needs to be ensured is that regulators have a detailed knowledge of financial innovations in structured finance and their possible contagion effects in the financial system.

The S&L debacle clearly demonstrated the costs of weak regulation and the failure to give the regulators sufficient resources. We have seen that there was widespread fraud on the part of thrift owners that the deregulation facilitated. This makes Greenspan's view that reputational damage is sufficient to prevent fraud seem naïve. What is worrying, as we have seen, is the degree of fraud that continues to be perpetuated by some of the largest banks long after the end of the subprime crisis. This reflects an ethical problem endemic in the culture of the banking system, which is difficult to resolve.

The subprime crisis and its severe output effects, although precipitated by the fall in house prices, largely arose sui generis from developments within structured finance. Whether current bank stress tests are effective in picking up future developments, and possible resulting problems, is a matter of controversy.

To conclude with an aphorism: "Those who don't study history are doomed to repeat it, while those who *do* study history are doomed to stand by while everyone else repeats it". However, it is to be hoped that the lessons of the past have finally been learnt.

References

Acharya, V., Cooley, T., Richardson, M., & Walter, I. (Eds.). (2010). *Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance*. Hoboken, NJ: Wiley.

Acharya, V., Cooley, T., Richardson, M., & Walter, I. (2011). *Dodd-Frank: One Year On*. VoxEU.org.ebook.

Akerlof, G. A., & Romer, P. M. (1993). Looting: The Economic Underworld of Bankruptcy for Profit. *Brookings Papers on Economic Activity, 2,* 1–73.

Allington, N. F., McCombie, J. S. L., & Pike, M. (2012). Lessons Not Learned: From the Collapse of Long-Term Capital Management to the Subprime Crisis. *Journal of Post Keynesian Economics, 34*(4), 555–582.

Arestis, P., Soberer, R., & Orebro, J. L. (Eds.). (2011). *The Financial Crisis: Origins and Implications*. Basingstoke: Palgrave Macmillan.

Baily, M. N., Klein, A., & Schardin, J. (2017). The Impact of the Dodd-Frank Act on Financial Stability and Economic Growth. *Russell Sage Foundation Journal of the Social Sciences, 3,* 20–47.

Bank of England. (2018). *Financial Stability Report*, Issue No. 44.

Bernanke, B. S. (2015). *The Courage to Act: A Memoir of a Crisis and Its Aftermath*. New York: W. W. Norton.

Bezemer, D. J. (2009, June). *No One Saw This Coming: Understanding Financial Crisis Through Accounting Models* (Munich Personal RePEc Archive MPRA, Paper No. 15892).

Black, W. (2013). *The Best Way to Rob a Bank Is to Own One: How Corporate Executives and Politicians Looted the S&L Industry*. University of Texas at Austin Press (updated edition).

Borio, C., & White, W. (2004). *Wither Monetary and Financial Stability? The Implications of Evolving Policy Regimes* (Bank for International Settlements, Working Papers, No. 147).

Born, B. (1998). *The Lessons of Long-Term Capital Management L.P.* Remarks at Chicago Kent-IIT Commodities Law Institute, Chicago.

Buckley, A. (2011). *Financial Crisis: Causes, Context and Consequences*. Harlow: Financial Times, Pearson.

Calavita, K., Tillman, R., & Pontell, H. N. (1997). *Big Money Crime: Fraud and Politics in the Savings and Loan Crisis*. Berkeley: University of California Press.

Capelle-Blancard, G. (2010). Are Derivatives Dangerous? A Literature Survey. *International Economics, 123,* 67–90.

Carney, M. (2018, October 19). *True Finance—Ten Years After the Financial Crisis*. Speech given at the Economic Club of New York. Available at: https://www.bankofengland.co.uk/speech/2018/mark-carney-economic-club-of-new-york.

Cohn, A., Fehr, E., & Maréchal, M. A. (2014). Business Culture and Dishonesty in the Banking Industry. *Nature, 516*(7529), 86–89.

Coval, J., Jurek, J., & Stafford, E. (2009). The Economics of Structured Finance. *Journal of Economic Perspectives, 23*(1), 3–25.

Dowd, K. (1999). *Too Big to Fail? Long-Term Capital Management and the Federal Reserve*. Washington D.C.: Cato Institute Briefing Paper, 52.

Dowd, K. (2014). Math Gone Made: Regulatory Risk Modeling by the Federal Reserve. *Policy Analysis*. Cato Institute, no. 754.

Dowd, K. (2017). *No Stress III: The Flaws in the Bank of England's 2016 Stress Test*. London: Adam Smith Institute.

Edward, F. R. (1999). Hedge Funds and the Collapse of Long-Term Capital Management. *Journal of Economic Perspectives, 13*(2), 189–210.

Easterbrook, F. H., & Fischel, D. R. (1991). *The Economic Structure of Corporate Law*. Cambridge: Harvard University Press.

Farmer, R. E. (2018). The End of Alchemy by Mervyn King: A Review Essay. *Journal of Economic Literature, 56*(3), 1102–1118.

Federal Deposit Insurance Corporation (FDIC). (1997). *History of the Eighties: Lessons for the Future: Vol. 1: An Examination of the Banking Crises of the 1980s and Early 1990s.* Washington, DC: FDIC.

Ferguson, C. (2012). *Inside Job: The Financiers Who Pulled Off the Heist of the Century*. London: Oneworld Publications.

Financial Crisis Inquiry Commission. (2011). *The Financial Crisis Inquiry Report: The Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States, Including Dissenting Views*. Washington DC: U.S. Government Printing Office.

Financial Times. (2012, December 11). *DoJ Holds 'Sword of Damocles' Over HSBC*. Available at: https://www.ft.com/content/dc80fcf2-43cc-11e2-844c-00144feabdc0.

Financial Times. (2017, August 7). *US Haul from Credit Crisis Bank Fines Hits $150bn*. Available at: https://www.ft.com/content/71cee844-7863-11e7-a3e8-60495fe6ca71.

Fligstein, N., & Roehrkasse, A. F. (2016). The Causes of Fraud in the Financial Crisis of 2007 to 2009: Evidence from the Mortgage-Backed Securities Industry. *American Sociological Review, 81*(4), 617–643.

Garrett, B. L. (2016, May). The Rise of Bank Prosecutions. *The Yale Law Journal Forum, 126,* 33–56.

Goldstein, M. (2017). *Banking's Final Exam: Stress Testing and Bank-Capital Reform*. Washington, DC: Peterson Institute for International Economics.

Golub, S., Kaya, A., & Reay, M. (2015). What Were They Thinking? The Federal Reserve in the Run-Up to the 2008 Financial Crisis. *Review of International Political Economy, 22*(4), 657–692.

Goodfriend, M. (2007). How the World Achieved Consensus on Monetary Policy. *Journal of Economic Perspectives, 21*(4), 47–68.

Gorton, G. B., & Merick, A. (2012). Securitized Banking and the Run on the Repo. *Journal of Financial Economics, 104*(3), 425–451.

Greenberger, M. (2018). *Too Big to Fail U.S. Banks' Regulatory Alchemy: Converting an Obscure Agency Footnote into "At Will" Nullification of Dodd-Frank's Regulation of the Multi-Trillion Dollar Financial Swaps Market* (Institute for New Economic Thinking, Working Paper No. 74).

Greenspan, A. (1997, February 21). Remarks by Chairman Alan Greenspan. *Government Regulation and Derivative Contracts*. At the Financial Markets Conference of the Federal Reserve Bank of Atlanta, Coral Gables.

Greenspan, A. (1998). Testimony of Chairman Alan Greenspan, *Private-Sector Refinancing of the Large Hedge Fund, Long-Term Capital Management.* Before the Committee on Banking and Financial Services, U.S. House of Representatives.

Greenspan, A. (2004). Remarks by Chairman Alan Greenspan, *Economic Flexibility*. Before the HM Treasury Enterprise Conference, The Federal Reserve Board, London, England (via satellite).

Greenspan, A. (2005). Remarks by Chairman Alan Greenspan, *Risk Transfer and Financial Stability*. To the Federal Reserve Bank of Chicago's Forty-first Annual Conference on Bank Structure, The Federal Reserve Board, Chicago, IL.

Greenspan, A. (2013, November/December). Never Saw It Coming: Why the Financial Crisis Took Economists by Surprise. *Foreign Affairs, 92,* 88–96.

Haldane, A. G. (2009, February 9–10). *Why Banks Fail the Stress Test*. Speech given at the Marcus-Evans Conference on Stress-Testing. Available at: https://www.bis.org/review/r090219d.pdf.

Haldane, A. G. (2013, April 9). *Constraining Discretion in Bank Regulation*. Paper given at the Federal Reserve Bank of Atlanta Conference, Managing Financial Stability: Holding a Tiger by the Tail(s). Available at: https://www.bankofengland.co.uk/.../2013/constraining-discretion-in-bank-regulation.

Hendron, T. (2018, September 7). *Mortgage Fraud Fueled the Financial Crisis—And Could Again*. Institute for New Economic Thinking. Commentary Blog. Avaiable at: https://www.ineteconomics.org/perspectives/blog/mortgage-fraud-fueled-the-financial-crisis-and-could-again.

Hindmoor, A., & McConnell, A. (2015). Who Saw It Coming? The UK's Great Financial Crisis. *Journal of Public Policy, 35*(1), 63–96.

King, M. (2016). *The End of Alchemy: Money, Banking and the Future of the Global Economy*. London: Little Brown.

Krainer, R. E. (2012). Regulating Wall Street: The Dodd-Frank act and the New Architecture of Global Finance: A Review. *Journal of Financial Stability, 8*(2), 121–133.

Krishnamurthy, A. (2010). How Debt Markets Have Malfunctioned in the Crisis. *Journal of Economic Perspectives, 24*(1), 3–28.

Lagarde, C. (2018). *Ten Years After Lehman—Lessons Learned and Challenges Ahead*. IMFBlog. Available at: https://blogs.imf.org/2018/09/05/ten-years-after-lehman-lessons-learned-and-challenges-ahead/.

Lo, A. W. (2012). Reading About the Financial Crisis: A Twenty-One-Book Review. *Journal of Economic Literature, 50*(1), 151–178.

Loomis, C. J., Barlyn, S., & Ballen, K. (1995). Untangling the Derivatives Mess. *Fortune Magazine*. Available at: http://archive.fortune.com/magazines/fortune/fortune_archive/1995/03/20/201945/index.htm.

Lowenstein, R. (2001). *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. London: Fourth Estate.

Lowenstein, R. (2010). *The End of Wall Street*. London: Penguin Press.

Mandelbrot, B., & Hudson, R. L. (2004). *The (Mis)behavior of Markets: A Fractal View of Financial Turbulence*. New York: Basic Books.

McLannahan B. (2017, February 13). Did Dodd-Frank Really Hurt the US Economy? *The Financial Times*.

McLean, B., & Nocera, J. (2010). *All the Devils Are Here*. London: Penguin Books.

Office of Financial Research. (2017, October 26). *Size Alone Is Not Sufficient to Identify Systemically Important Banks*. Office of Financial Research Viewpoint.

Rakoff, J. S. (2014, January 8). The Financial Crisis: Why Have No High-Level Executives Been Prosecuted? *The New York Review of Books*.

Ray, R. (2005). *Has Financial Development Made the World Riskier?* Paper presented at The Greenspan Era: Lessons for the Future Federal Reserve Bank of Kansas Symposium, Jackson Hole, WY.

Reinhart, C. M., & Rogoff, K. S. (2011). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton: Princeton University Press.

RepRisk. (2016). *RePrisk Report 2006–2016: Ten Years of Global Banking Scandals*. Available at: https://www.reprisk.com/content/5-publications/1-special-reports/51-ten-years-of-global-banking-scandals/repriskreport-banking.pdf.

Roig-Franzia, M. (2009, May). Brooksley Born, the Cassandra of the Derivatives Crisis. *The Washington Post*. Available at: http://www.washingtonpost.com/wp-dyn/content/article/2009/05/25/AR2009052502108.html?sid=ST2009052502127.

Schmitt, R. (2009, March/April). Prophet and Loss. *Stanford Magazine*. Available at: https://stanfordmag.org/contents/prophet-and-loss.

Shiller, R. J. (2007). *Understanding Recent Trends in House Prices and Home Ownership* (National Bureau of Economic Research, Working Paper 135523).

Taleb, N. M. (2008). *The Black Swan: The Impact of the Highly Improbable*. London: Penguin Books.

Tett, G. (2010). *Fool's Gold. How Unrestrained Greed Corrupted a Dream, Shattered Global Markets and Unleashed a Catastrophe*. London: Abacus.

U.S. Committee on Financial Services. (2016, July 11). *Too Big to Jail: Inside the Obama Justice Department's Decision Not to Hold Wall Street Accountable*. Report Prepared by the Republican Staff of the Committee on Financial Services, U.S. House of Representatives, 114th Congress, Second Session.

U.S. General Accounting Office. (1994, May). *Financial Derivatives: Actions Needed to Protect the Financial System*. Washington, DC: General Accounting Office.

U.S. House of Representatives, Committee on Banking and Financial Services. (1998, October 1). *Hedge Fund Operations*. Available at: http://commdocs.house.gov/committees/bank/hba51526.000/hba51526_0f.htm.

U.S. Senate Permanent Subcommittee on Investigations (PSI). (2011, April 13). *Wall Street and the Financial Crisis: Anatomy of a Financial Collapse*. United States Senate.

U.S. Treasury Press Release. (2012, December 11). *Treasury Department Reaches Land Mark Settlement with HSBC*. Available at: https://www.treasury.gov/press-center/press-releases/Pages/tg1799.aspx.

Wallace, L. (2015). Finder of Financial Fault Lines. *Finance and Development, 52*(1), 2–5.

White, L. J. (2009). Markets: The Credit Rating Agencies. *Journal of Economic Perspectives, 24*(2), 211–226.

5

Inflation: Failures of Inflation Targeting—A European Perspective

Elisabeth Springler

1 Introduction

Since the end of the 1980s, when New Zealand first introduced inflation targeting as the objective of monetary policy, the number of countries using inflation targeting has constantly increased. While until the early 2000s only advanced economies joined the club of inflation targeters, it is mainly emerging economies which have become inflation targeters since then. Following Niedźwiedzińska (2018), who analysed the period until mid-2018 for the structure and development of economies and included within the spectrum of 42 economies explicit and implicit—or as Mishkin (2000a) calls it—hybrid inflation targeters (see Table 1).

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Within the latter group, for example the Euro Area,[1] as well as Japan, Switzerland and the United States can be found. Although many empirical studies focus in their analyses only on explicit targeters, this chapter follows the broader approach of inflation targeting and includes explicit and implicit targeting economies, with a focus on the Euro Area. Apart from a distinction between economies that explicitly or implicitly follow inflation targeting, countries can also be classified according to four different modes of inflation targeting, following a band target, a band target with midpoint, a point target or a point target with tolerance level. While the most important mode for emerging markets who account now for almost 70% of all inflation targeters clearly is a point target with tolerance level, advanced economies mostly follow two different modes, a point target and a band target. Similar to the different reasons for economies to join the club of inflation targeters also explanations for introducing the one or other mode, or switching over time from one to another mode vary substantially according to the individual institutional setting and historical background. No matter which mode of inflation targeting is implemented by developed or emerging economies, the underlying theoretical background stemming from a modern orthodox macroeconomic concept prioritizes the fight against inflation over the macroeconomic goals of full employment and economic growth.

New facets of inflation targeting were implemented after the global financial crisis of 2008/2009, as modes of unconventional monetary policy were introduced worldwide. In the case of the Euro Area the term unconventional monetary policy covers two different areas. On the one hand open market operations, called *main refinancing operations*, which are an important tool of conventional monetary instruments, were structurally redesigned. On the other hand, *additional monetary tools* were added to the system. Changes were designed to deal with the challenges—e.g. lack of liquidity due to disruptions in the interbank market and the fear of systemic financial instability—the ECB was confronted with the aftermath of the global financial crisis. The structural

[1]Especially in empirical studies Member States of the Euro Area are also addressed as non-targeting economies, when no distinction between explicit and implicit targeters is applied (see among others Ismailov et al. 2016; Johnson 2002).

changes within main refinancing operations can be highlighted with the full accommodation of commercial banks' needs within fixed rate tenders and the enlargement of assets accepted within the tender system. These structural changes, which aim to ease the refinancing options for commercial banks together with the overall decrease in interest rates, are also referred to as *easy money*.[2] The *covered bond purchasing program* can be quoted as the most influential *additional monetary tool* implemented after the financial crisis (see for more details Beirne et al. 2011).

The Euro Area has experienced now almost a decade of easy money and ultra-low inflation policy and despite increases in economic growth in recent years in some member states, the inflation target of 2% has still not been reached. In the last decade under the umbrella of inflation targeting, monetary policy had to serve multiple goals, strengthen financial stability, promote investment and raise confidence in the existing economic system. Increasing asymmetries among Member States of the Euro Area became visible also as interest rate spreads for long-term government bonds increased sharply on the early 2010s and peaked to yields for Greece long-term government bonds of 22.5% in 2012 while German long-term government bonds reached only 1.5% in the same year (see Fig. 5). The aim of the central bank was to increase not only monetary stability but to boost fiscal stability.

Additionally the effects of easy money, like the increase of asset prices and the boost of *financialization*, which led to a further asymmetric distribution of wealth among and within Euro Area member states (see among others, Fessler and Schürz 2018), are widely neglected under the current monetary policy structure. The term *financialization* not only means the general importance of financial markets for non-financial enterprises and households, which seems to infuse everyday life and businesses, but also a structural and institutional shift in asset markets, e.g. the housing sector. This means that despite the discussion on the potential effectiveness of inflation targeting for macroeconomic goals, the mode of capitalism is affected.

[2]By defining *easy money* as period of expansionary monetary policy after the financial crisis of 2008, this chapter follows the distinction of periods of monetary policy of Vítor Constâncio former Vice president of the ECB (2018). This period is replaced by *ultra-low inflation and Quantitative Easing* from 2014 to 2018.

This chapter proceeds with an overview over the historical settings of monetary policy and the macroeconomic implications set up by orthodox economists. Critique regarding the theoretical background, the institutional and structural set-up, as well as the implementation of the Taylor rule as monetary policy from a Post-Keynesian perspective is presented. Building on these arguments the focus is laid on the impacts of monetary policy after the global financial crisis in the Euro Area and detects further weaknesses of the focus on a European inflation target of 2%, which became visible in the last decade.

2 Monetary Policy: Historical Settings and Macroeconomic Implications

Not only is the effectiveness of monetary policy to shape real activities in the short and/or in the long run discussed in macroeconomic schools of thought, but also the causal mechanisms and monetary instruments derived from the opposing theoretical backgrounds. This means the core questions are: Is money neutral? Which intermediate target works best to achieve the goals of monetary policy, money stock versus interest rates? How should monetary policy be implemented, rules-based versus discretionary monetary policy?

2.1 Framing the Historical Setting: When Inflation Got into the Centre of Macroeconomics Analysis

As output increased after World War II, economists started to worry about the negative effects of creeping inflation by the end of the 1960s. Assuming that inflation is determined as demand push factor in a boom phase, a decade, which in Europe is synonymous with a strong catching up process in economic growth and development. Only in the 1960s growth policy became a goal for economic policy makers, before the main focus was an anti-inflationary policy (Kienzl 1970, p. 30). Worries increased that households would live beyond their financial means and

drive up inflation as they aim to become winners of the redistribution effects of inflation (Ausch 1970, pp. 5f.).

Given this empirical background central bankers and monetary economists of countries witnessing strong economic growth throughout the 1960s and had a history of hyperinflation after World War I and the interwar period, like Austria (hyperinflation accumulated to an almost 14,000% increase in prices from 1914 to 1924; see Beer et al. 2016, p. 15), started to focus more strongly on low inflation rates to account for economic stability.

Apart from a classification of inflation into cost-push and demand-pull factors, the phenomenon of creeping inflation was discussed within the categories of state inflation—as category of demand inflation, income inflation, credit inflation and imported inflation. According to Ausch (1970) especially the two categories could be controlled via direct central bank intervention on commercial banks discount rates and open market operations, which should be accompanied in the case of imported inflation with 'adequate' trade tools. Income and state inflation are reflections of a change in society due to the shift towards an individual-based mass consumption society. Private households aim to increase their wealth, while state budgets are supposed to follow an anti-cyclical budget policy leading public infrastructure to erode.

Solutions to these structural changes in society are quite diverse and lead from necessary shifts in thinking of 'opinion leaders' (Ausch 1970, p. 25) towards concrete shifts in monetary policy. Among others Pech (1970) and Liskar (1970) reflected already on the necessity to focus on the monetary stock or another closely related monetary aggregate to determine the amount of money and in its impact on inflation; whereas interest rates were said to have a minor impact as the central bank would have only control over interest rates. This is already in line with Friedman's view on the power of monetary tools:

> The more important problem is these monetary powers of the Reserve System. As you know, they consist primarily of three items: (1) the power to change reserve requirements of member banks; (2) the power to rediscount for member banks; and (3) the power to engage in open-market operations. Of these three powers, the first two are, I think, inefficient and poorly designed tools of monetary management. In making

> this judgment, I am assuming that our present system is in all respects unchanged, that the institutional organization of the banking system is what it is and that the criteria for controlling the stock of money are whatever they now are. My purpose in doing this is to separate issues: whatever the criteria are, there remains the question whether present powers are efficient tools for achieving them. (Friedman 1965, p. 13)

Furthermore, the general impact of monetary policy on real activities was questioned and regarded as complicated, while too great liquidity seems to be the reason for price increases and the given competitive structure (Vieweger 1970, pp. 152ff.).

The slowdown of inflation that holds for all economies presented in Fig. 1 seems to be the effect of this policy shift. Furthermore, this effect seems to hold regardless of the level of inflation during the 1970s. While some economies were affected more severely by the increase of inflation in the 1970s, they converged towards a level of 2%. An important feature that is not addressed in Fig. 1 is the type of measurement of inflation rate. Even within the Euro Area member states, which are presented in Fig. 1 by France, Austria and Germany, distortions in the measurement cannot be neglected. As Erber and Hagemann (2010) point out, the introduction of the so-called harmonized consumer price

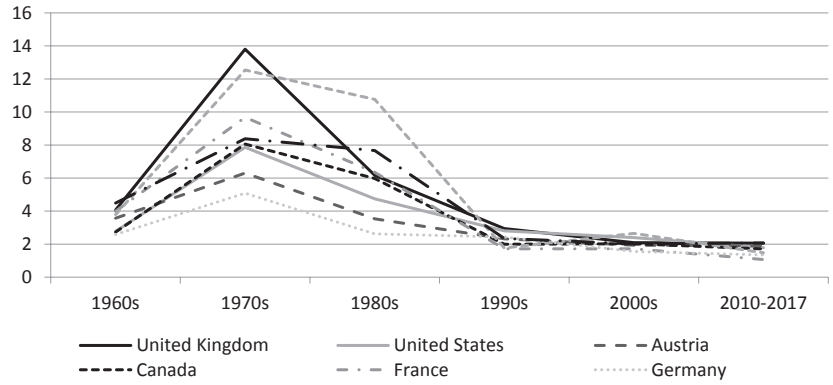

Fig. 1 Consumer price index of selected advanced inflation targeting economies, 10 year average (*Source* OECD [n.d.-a]; Own calculations)

index, which represents a unified measurement with identical weights for goods' categories, does not lead to a convergence of inflation per se. Therefore, a shift from a harmonized consumer price index approach towards the focus on purchasing power parities between member states is proposed. Although such critique regarding the measurement process is fundamental for the assessment of the inflation targeting scheme, it is put aside in this chapter as focus is laid upon the causal relations and effects on real activities, not on the level of inflation rates per se.

The power to establish this seemingly international convergence of inflation rates can be traced back to monetarists and the analysis of Friedman and Schwartz in their work *A Monetary History of the United States 1867 to 1960* (referred to as AMH) according to Bordo and Rockoff (2013), as the following statement shows. But also the public and the fear of households of an increase in inflation is said to have pushed the Federal Reserve to change monetary policy. The term *Great Moderation* refers to the period from the mid-1980s till the mid-2000s. Although Great Moderation refers primarily to the development in the United States, a similar trend can also be observed in OECD economies (see for more detail González Cabanillas and Ruscher 2008).

> Slower monetary growth per unit of output during the Great Moderation appears to have contributed to the slowing of inflation from about 6 per cent per year from 1965 to 1982 to about 2.5 percent per year from 1982 to 2008. The monetary regime changed because the Fed was persuaded to put greater emphasis on price stability. The main reason was that the public was frightened by inflation and demanded action to stop it. But some of the credit for the change in the policy regime must go to the monetarists and to AMH. (Bordo and Rockoff 2013, p. 6)

The immediate question arises, whether this power of the public and the household sector is integrated in the underlying monetary theory. Furthermore, whether or not economies had suffered in the past from high inflation rates or hyperinflation, they converged towards lower inflation rates from the 1990s and onwards (as Fig. 1 shows). It cannot be explained why some economies had experienced a strong increase in inflation the decades before, while others—although they were sharing

similar geographical and industrial background like Germany, UK, France and Austria—experienced only minor increases with high growth rates. Inflation perception and the power of the public to determine monetary policy seem to be of lesser explanatory value. The inclusion of the institutional setting and financial structure is of importance for monetary policy; this was also concluded by Taylor (1999) when comparing the effectiveness of different monetary policy rules for the United States. He claims that 'hence, the historical approach to monetary policy evaluation is a necessary complement to the model-based approach. By focusing on particular episodes or case studies one may get a better sense about how a policy rule might work in practice' (Taylor 1999, p. 320). For the United States, the underlying historical analysis, which also earmarked the shift in monetary theory, is the work of Friedman and Schwartz, as mentioned above. It can be concluded that inflation targeting as model derived from the theoretical analysis of the Monetarists and New Classical Macroeconomics is historically and institutionally determined by the experiences of the United States; also, and although historical reflections are perceived as important, model-based structures for monetary policy seem to be implemented in the course of time in many developed and emerging economies.

2.2 Monetary Theory: Paving the Way for Inflation Targeting

Competing economic analyses and modelling challenge economic policy makers with opposing views, within the so-called mainstream economics on the impact of monetary theory on the real world. Flexible price models of new classical macroeconomics and of real business cycle analysis, oppose sticky price models of New Consensus Macroeconomics (NCM) economists, which are understood as long-term equilibrium models. Whereas the former see monetary policy as unimportant for real economic activity, the latter do the opposite in the short run (Goodfriend and King 1997, p. 231). Numerous fundamental critiques have been articulated, since formulation of this model. Only some of these fundamental inconsistencies are mentioned here briefly.

The three equations relationship: money supply (1), the quantity Eq. (2) and the Cambridge cash-balance Eq. (3) had determined the monetary view of the neoclassical synthesis model (ISLM model) (Papademos and Stark 2010, pp. 22ff.):

$$M = mB \tag{1}$$

$$Mv = Py \tag{2}$$

$$M = kPy \tag{3}$$

- The money supply function (1), shows that the amount of money (M) available equals the monetary base—also called *high powered money*—(B), the most narrow definition of money resulting from the money in circulation and the reserves of commercial banks at the central bank, multiplied by the money multiplier (m). The money multiplier indicates the ability of commercial banks to create liquidity and therefore enlarge the volume of money available and is a function of the ratio of deposits to bank reserves and cash holdings to deposits.
- The quantity theory (2) suggests, money would be neutral as increases in money stock (M) would lead in the short run only to a rise in the price level (P), due to a constant velocity of money (v) and constant number of transaction (y) in the short run.
- Equation (3) can be derived from Eq. (2). M in Eq. (3) is seen as money demand, as it equals k, the inverse of income velocity v in Eq. (2), multiplied with the price level (P) and the number of transactions (y) (see Papademos and Stark 2010, p. 28). The model implemented by Hicks (1937, p. 148ff), using the Cambridge cash-balance Eq. (3) as money demand function, for the discussion of the marginal-efficiency of capital in Keynes' work leads to direct effects of monetary policy on the aggregate income/output level.

The central bank can exogenously determine the supply of money and neglect actors' behaviour within the financial structure. These assumptions are not only perceived as misleading in the real world by heterodox economists, especially Post-Keynesians, but lead also to critique within central banks (see among others Papademos and Stark 2010, p. 22).

While in the 1950s and early 1960s the followers of the neoclassical synthesis saw the need for an active approach to alter aggregate demand and therefore also acknowledged monetary policy as an important and supportive instrument to reach higher aggregate demand, the framework changed with the monetarist counter-revolution in the late 1960s. In the following decades, fiscal policy was viewed ineffective (Liskar 1970, p. 231) and the neoclassical synthesis was challenged. While macroeconomic understanding turned its back towards the neoclassical synthesis, monetarists brought back the view of the quantity theory. This had implications for the causal relation between money and inflation as well as between inflation and the transmission mechanisms (Goodfriend and King 1997, pp. 237ff.). As Friedman (1968) points out in his paper, 'The role of monetary policy', it is the real quantity of money which is important not monetary policy in terms of changes in interest rates, see quotation below. Haberler (1946), who had critically discussed the impact of fiscal multipliers, pointing especially at the potential time lags and leakages of the induced circulation process (Haberler 1946, pp. 459ff.), already in the 1930s and similarly as Pigou (Haberler 1946, pp. 499ff.; 1952) focused on the importance of wealth effects to overcome consumptions slumps out of a potentially arising liquidity trap in a Keynesian view, determined also the shift towards monetary policy (see also, Friedman 1968, pp. 2ff.).

> Inflation, stimulated by cheap money policies, not the widely heralded postwar depression, turned out to be the order of the day. The result was the beginning of a revival of belief in the potency of monetary policy. This revival was strongly fostered among economists by the theoretical developments initiated by Haberler but named for Pigou that pointed out a channel-namely, changes in wealth-whereby changes in the real quantity of money can affect aggregate demand even if they do not alter interest rates. (Friedman 1968, p. 2)

Based on this Friedman sees three major impacts in monetary policy:

> The first and most important lesson that history teaches about what monetary policy can do - and it is a lesson of the most profound importance - is

> that monetary policy can prevent money itself from being a major source of economic disturbance. (Friedman 1968, p. 12)

This means that the underlying institution—the central bank—has to aim for financial stability and needs to embody necessary and transparent tools to fulfil this task. In the second task, Friedman turns to the importance of stable inflation and the confidence connected with monetary stability:

> Our economic system will work best when producers and consumers, employers and employees, can proceed with full confidence that the average level of prices will behave in a known way in the future-preferably that it will be highly stable. (Friedman 1968, p. 13)

In the third impact of monetary policy Friedman reflects on the mode of monetary policy, and it becomes clear, that first of all the focus should be on money stock in the determination of the money growth rate and the underlying mechanism should affect money growth rather than the interest rate.

> If there is an independent secular exhilaration - as the postwar expansion was described by the proponents of secular stagnation - monetary policy can in principle help to hold it in check by a slower rate of monetary growth than would otherwise be desirable. If, as now, an explosive federal budget threatens unprecedented deficits, monetary policy can hold any inflationary dangers in check by a slower rate of monetary growth than would otherwise be desirable. (Friedman 1968, p. 14)

This means that within these three impacts, monetary policy should have the underlying causal mechanisms as well as the key prerequisites—confidence in the monetary system, financial stability and a strong (independent) monetary authority—of inflation targeting were unfolded. The theoretical modelling was not incorporated yet into the theoretical paradigm, but was shaped by further challenges the neoclassical synthesis had to face: the Lucas critique of macroeconomic policy, which introduced and formalized the concept of rational expectations.

When rational expectations were integrated into the modelling, as by early new classical economists, the view on monetary policy changed again. In general, the incorporation of rational expectations would lead to neutrality of economic policy for real economic activity. Nevertheless, monetary policy could lead to real economic fluctuations within this model, as price changes would result from the aim to offset real effects perceived in changes of monetary policy; in the long run this also leads to an absence of the tradeoff between inflation and unemployment (see among others Papademos and Stark 2010, pp. 41f.). As these changes would target money stock, the aim of the central bank should be to avoid fluctuations in money growth and aim for an annual increase in the monetary base—monetary base concept (see among others Pech 1970, p. 358; Goodfriend and King 1997, p. 24) of approximately 4% (see among others Liskar 1970, p. 237).

In the early 1980s, the first wave of NCM models incorporated insights from monetarist approaches and rational expectations into a model of sticky wages, which was in the following turned into sticky price models. From these strands in economic theory New Neoclassical Synthesis was formed, joining New Classical macroeconomics and rational expectations into dynamic modelling on the one hand and NCM in terms of sticky price models and imperfect competition on the other hand (Goodfriend and King 1997, p. 255; Papademos and Stark 2010, pp. 41ff.). Within this concept the effectiveness of monetary policy, conversely to fiscal policy was, as Snowdon and Vane (2005, p. 409) put it, 'at least in principle, re-established'. The question that arises, when monetary policy gains effectiveness is, how inflation can be controlled as it is agreed that inflation had a damaging effect on economic growth and development. All together four different monetary regimes can be distinguished (exchange rate targeting, monetary targeting, explicit and implicit inflation rate targeting) according to the nominal anchor, which is implemented to diminish the time-inconsistency problem that arises of discretionary policy (Snowdon and Vane 2005, pp. 413f.).

Summing up, the view on neutrality of money and the question of the impact of transmission of monetary policy on real activities changes throughout economic theoretical discussion. The main aim was to argue against the postwar discretionary monetary policy. The inability of

discretionary monetary policy to cope with current phenomena of the real world those days cumulated in the 1970s, a period with increasing inflation rates and persisting unemployment rates.

2.3 The Set-Up of Inflation Targeting

When introducing inflation targeting as monetary mode, which means the inflation measured by changes in the consumer price index is the nominal anchor, first focus has to be laid on an accurate measurement of consumer price changes. Debelle (1997, p. 12) points in this respect to the importance of the accuracy of the index and as mentioned above Erber and Hagemann (2010) criticized the harmonized consumer price index in the Euro Area as insufficient.

Furthermore, mainstream economists point at various 'structural institutional prerequisites', that have to be embedded, followed by a step-by-step 'action plan' to enable an effective implementation of inflation targeting. The main prerequisites are: creditability of monetary policy, sound financial system and central bank independence (Snowdon and Vane 2005, p. 414).

As a theoretical basis a model is presented as an optimization problem (Green 1996, pp. 5f.). Monetary policy aims to minimize a social loss function, which is faced by a supply constraint—the short-run Philips curve—as well as the inflationary expectations of private households driven by rational expectations. The general formulation of the monetary policy rule enables to minimize the social loss function. The approach can be summed up to a three equation model, as presented by Tsoulfidis (2010, pp. 375f.), referring to Fontana (2009) (cited in Tsoulfidis 2010, p. 375) (see also among others Arestis and Sawyer 2008, p. 631), the output gap (4), the Philipps curve (5) and the Taylor rule (6), which symbolizes the interest rate policy.

Output gap:

$$(y - y^*)_t = a_0 + a_1(y - y^*)_{t-1} + a_2 E(y - y^*)_{t+1} + a_3\left(i_t - E(\pi)_{t+1}\right) + u_1 \quad (4)$$

Phillips curve:

$$\pi_t = b_1\pi_{t-1} + b_2 E(\pi_{t+1}) + b_3(y - y^*)_t + u_2 \quad (5)$$

Taylor rule

$$i_t = i^* + a_1(\pi - \pi^*) + c_2(y - y^*)_{t-1} + u_3 \tag{6}$$

The output gap function (4) shows that the deviation of current output (y) from potential output (y^*) is affected by the output gap of the previous period $(y - y^*)_{t-1}$ as well as the expectations (E) of future deviations of real output from potential output $E(y - y^*)_{t+1}$ and interest rate (i) that is related to rational expectations about the future inflation rate $(i_t - E(\pi)_{t+1})$ (Tsoulfidis 2010, p. 376). The Phillips curve (5) determines the inflation rate π_t at a specific time t by the output gap in this respective period $(y - y^*)_t$ and the inflation rate of the past and expected future inflation rate $E(\pi_{t+1})$. The Taylor rule (6) implements the interest rate attached to the output gap $(\gamma - y^*)_{t-1}$ and inflation rate gap—deviation of the current inflation rate from the target $(\pi - \pi^*)$—and the equilibrium interest rate (for more details see Tsoulfidis [2010, pp. 375f.]).

In setting up this three equation model, a mechanistic structure is established, in which monetary policy determines the accurate interest rate to reach the ex-ante established target. Other sectors as well as the institutional and structural setting of these sectors are left apart (e.g. wage bargaining modes to impact the development of wages).

2.3.1 Prerequisites for Implementing Inflation Targeting and Additional Effects of the System

In the inflation targeting framework, postulated prerequisites for the system are also seen as positive incentives, like financial stability or fiscal discipline as discussed below, for other macroeconomic effects in the view of mainstream economists. Central bank independence is also said to increase fiscal discipline, while the prerequisite of financial soundness leads as self-fulfilling prophesy to even higher global financial stability in the future. Furthermore, expectations about future price stability should be guided by high credibility of monetary policy.

Central Bank Independence

Credibility can be achieved via a transparent monetary policy. To implement these policies, the central bank, as an authority with data and knowledge about monetary development, is supposed to work independently. Friedman points in the following citation at the three main actors for financial means of households, firms and the state. In case the public sector (treasury) uses the monetary authority to finance public debt, inflation is increased and the control over the stock of money is lost.

> That brings me to the problems of monetary reform. These can be classified under three headings: institutional organization of the private banking system; monetary powers of the Federal Reserve and the Treasury; and criteria for controlling the stock of money. (Friedman 1965, p. 10)

Despite the recommendation of Central Bank independence, not all inflation targeters implemented a high degree of broadly speaking central bank independence; in the UK or Canada, as Bernanke and Mishkin (1997, p. 102) put it, 'the government rather than the central bank retains the final control over monetary policy'. Nevertheless, inflation targeting was implemented. As Sawyer (2006, pp. 640, 649) points out, monetary arrangements were changed towards an independent central bank in the UK in 1997 and enacted with the Bank of England Act of 1998, fulfilling the prerequisites some years after the implementation of inflation targeting in 1992. In this case, a causal relation between fiscal discipline and inflation targeting is said to hold, as Minea and Tapsoba (2014) show in their empirical investigation of developed and emerging economies. They conclude that targeting economies both in developed and less developed economies improved their inflation performance compared to non-targeters. Although other empirical studies suggest (e.g. Ismailov et al. 2016) that especially developing economies with high public debts, have no incentive to implement inflation targeting, as they aim to reduce the real value of public debt through inflation, a positive effect also for the soundness of the financial system is derived by Minea and Tapsoba (2014, pp. 198).

Overall the term independence of the central bank creates confusion, as not every kind of dependence is as harmful as another. One clearly has to distinguish between 'goal independence and instrument independence' (Conti-Brown 2015), while the government might have an impact on the implementation of the underlying method of monetary policy, the general agreement on the enforcement of inflation targeting for example, the set-up of the respective measurements to achieve the goal has to rely on the monetary authority. As Conti-Brown (2015, p. 270) points out, in empirical observations of central banks independence, economists refer to the existence of such laws, but personalities of administrators and personal relationships are mostly forgotten.

When such a broad definition of independence is applied it has to be concluded, that neither the implementation of a specific monetary regime, nor the statement of legal independence as a prerequisite for the implementation of a monetary mode can serve as a sufficient condition to evaluate the independence of a national monetary authority.

Sound Financial System

When it comes to the soundness of the financial system, circular causation is at the centre of the argument. On the one hand financial stability serves as a prerequisite to enfold the functioning of monetary policy. As the following quotation from Friedman (1968) shows, financial instability is even argued to cause monetary malfunctioning. Monetary policy cannot serve as stabilization policy in case of institutional and/or structural failures; therefore, also the question whether monetary policy could have reacted in a different way and might have had another option to avoid further instability becomes obsolete.

> The main lesson I want to drive home is that the 1929–1933 period was not one in which the economic depression forced a decline in the stock of money. The decline in the stock of money was a direct consequence of the sequence of bank failures. The banking failures were not important primarily because they involved the failures of financial institutions. They were important because they forced a decline in the stock of money. (Friedman 1965, p. 9)

On the other hand, many economists argue that simply the implementation of a monetary policy like inflation targeting, which is based on a forward-looking rule-based agenda, leads to an increase in financial soundness. This argument especially becomes a research agenda after the global financial crisis of 2008/2009. Comparing inflation targeting countries with non-targeting economies, the presented empirical results show (see among others the comparison of 71 countries from 1998 to 2012 by Fazio et al. 2014) that targeting economies have less fragile banks irrespectively of their size of the banking sector and classification of national financial system. However, the question of circular causation and the impact of numerous other measures not directly related to the goal of price stability and potential monetary policies to achieve this goal, like the implementation of Basel III requirements in many economies with large banking sectors or the implementation of the banking union after the global financial crises, are not addressed.

Credibility of Monetary Policy

In order to achieve and maintain credibility of monetary policy, the central bank has to minimize the moment of surprise for economic actors, as suggested by NCM. In this respect, among others, McCallum (1984, pp. 12, 28) argued for a monetary rule, which might be also an activist one, that enables rational actors to foresee measures of monetary policy and act accordingly. The economic results of low credibility due to a discretionary monetary policy would be higher inflation rate 'and no less unemployment'. This means that credibility as a prerequisite can be enhanced by the monetary policy proposed. Additionally, the mode the monetary policy regime as presented—in a transparent way—enhances effectiveness and credibility further (Green 1996, pp. 14f.).

2.3.2 The 'Action Plan' of Inflation Targeting Within the New Consensus Framework

On the basis of the three-equation model presented above and the prerequisites, the action plan of inflation targeting involves the following main

elements (summed up after Snowdon and Vane 2005, pp. 413–414; see also, Arestis and Sawyer 2008, pp. 633ff. for more details):

- public announcement of medium term numerical target for inflation;
- institutional commitment to price stability as a primary goal of monetary policy;
- information and communication of the monetary policy;
- implementation of inflation forecasts.

Build on this broad framework, central banks set up an individual legal background of inflation targeting procedures, which leads to different schemes.

Even the target itself can be made explicit beforehand or be implemented as implicit target. Although meeting the inflation target is the primary goal of a central bank and the monetary authority is accountable to meet this target, other (secondary) goals might be at least mentioned in the reserve banks' acts. Furthermore, when the inflation target is not met, the question arises how the central bank is formally held accountable; are explicit sanctions in place for this case? Therefore, the time horizon over which to meet the target is important. Following the theoretical background of inflation targeting, the effect of monetary policy on real activities is not only minor, but if existing it is only relevant in the short run. This means the alternative secondary goals are also only relevant in the short run and the implementation of inflation targets is to be seen within the scope of a medium or longer run policy. Some possible aspects of the inflation target scheme are used only rarely. The Law of New Zealand for example includes direct accountability of central bankers, and the tenure of the governor is linked to the achieving of the respective target (Bernanke and Mishkin 1997, p. 100; Debelle 1997, p. 18). No other economies seem to have implemented such a legal accountability. Central banks present their accountability sometimes via publications, like the inflation reports or monetary policy reports (e.g. Debelle et al. 1998, p. 8).

3 Dead Ones Live Longer: Empirical Evidences and Challenges After the Financial Crisis

Numerous empirical studies on the effectiveness of inflation targeting for developed and emerging markets have been undertaken in recent decades. They vary in empirical method, countries included—with the main question whether to include or exclude so-called implicit inflation targeting economies—and time setting—before or after the global financial crisis—but have one striking feature in common: no clear evidence for the positive impact of inflation targeting in reducing rate of inflation. As for example Angeriz and Arestis (2006, p. 566) point out, inflation started to decrease in many of targeting economies even before inflation targeting as monetary policy was put in place. This clearly opposes some earlier individual case study analysis on the national level. National success stories were delivered not only by New Zealand and Canada (see Debelle 1997), as the early adopters of inflation targeting, but also by the UK. In these studies, policy variations according to the national institutional setting and the historical experiences are clearly stated. The UK for example had adopted an inflation target in 1992 after other money supply targets had failed. The system was revised, also with the independence of the Bank of England 1997 to increase the accountability of the Bank of England (Lane and Van Den Heuvel 1998, p. 4). In their empirical analysis Lane and Van Den Heuvel (1998) conclude that the performance of the first period of inflation targeting—between 1992 and 1997—was positive, leading to moderate inflation, close to its target. It has to be noted that the introduction of the new monetary framework coincides with the British withdrawal from the European Exchange Rate Mechanism.

A reason for cross country studies failing to provide evidence whether monetary schemes managed to achieve what was promised, might be the neglect of the individual institutional setting and historical background in each of the economies. Nevertheless, some of the main results are presented as follows, selected to give an overview over the causal argumentation of inflation targeting in the prerequisites and the set-up

of the monetary scheme as presented above. Mishkin (2000a) focuses on developed economies and concludes that inflation targeting in general provides a good framework to achieve better economic performance. The necessity for countries to design their individual monetary policy also within this framework accurately according to their specific needs is explained by using case studies and country-specific historical and institutional settings. Conversely to that empirical studies are not that positive. Mishkin (2000a, p. 25) claims that the operational design of inflation targeting enables economies to construct an adequate framework for their national needs—above all it is 'far from a rigid rule'. This also means that most of the arguments brought up against inflation targeting should be solvable with the correct design, only potentially rising financial instability due to the required exchange rate flexibility and the fact that the importance of fiscal policy is still existing, serve as fundamental disadvantages according to mainstream economists (see Mishkin 2000b, p. 4). Conversely to that, empirical studies using different time periods and country samples are generally less optimistic regarding the positive effects of inflation targeting and agree that the effects of inflation targeting even on the fundamental aim, which is the decrease of the inflation level, cannot be directly linked empirically. Similarly expected inflation and forecast errors cannot be minimized or are not significant (see Johnson 2002; Ardakani et al. 2018). Ball and Sheridan (2003) conclude in their pre-crisis survey of 7 OECD inflation targeters and 13 non-targeters that no evidence for the positive impact of inflation targeting for stable prices and interest rates can be found. For the analysis, the pre-targeting period was set from 1960 to 1985, while the post targeting period ends in 1998 or 2001 depending on whether targeting economies entered the Euro Area. Based on this analysis, economists conclude that the institutional aspects and prerequisites for implementing inflation targeting as presented above (e.g. central bank independence) are not important. On the other hand the authors conclude that no evidence could be found that inflating targeting 'does any harm' (Ball and Sheridan 2003, p. 17) in the investigated pre-crisis time period.

Studies which cover not only the pre-crises period but extend the analysis of the effects of inflation targeting to the changed macroeconomic

situation after the global meltdown of 2008/2009, conclude a more diverse picture of the effects of inflation targeting. In Kose et al. (2018), inflation targeting is not viewed as not harmful per se anymore, but seems to have increased real exchange rate volatility in inflation targeting economies. Therefore, the development of an inflation targeting scheme towards a hybrid version, which should incorporate measures of macroprudential regulation to decrease exchange rate volatility, is proposed. Compared to this, Ardakani et al. (2018) focus more strongly on the different effects between developed and less-developed economies. The fiscal stance in terms of debt to GDP ratios improves in all targeters, although as mentioned above, developing economies with high debt to GDP ratios have no incentive to introduce inflation targeting. The results are again dispersed in regard to exchange rate volatility. Developed economies face an increase in exchange rate volatility, while the situation improves in developing economies. Aizenman et al. (2011) come to similar results when focusing on less developed inflation targeters only.

Summing up, it can be stated that besides of the mixed picture on the success in empirical studies, case studies suggest that inflation targeting as a monetary scheme even if it is not a framework that can be implemented in similar modes but requests a national specific modelling, holds what it promises and the theoretical background of inflation targeting per se is not questioned. Furthermore, the global financial meltdown shed light on the structural deficits of the system of inflation targeting, which led to the demand for reshaping the structure even within the orthodox thinking. Two major conclusions are drawn from a mainstream perspective after the financial crisis (Reichlin and Baldwin 2013):

- Inflation targeting is an adequate monetary structure to ensure price stability and enables economic development that needed a revision after the crisis—"fix it don't scrap it" (p. 28).
- The macroeconomic environment after the global crisis request a stronger focus on credibility to determine expectations to cope with a more fragile banking sector and heavily indebted national states.

Consequently, numerous proposals for revision were brought forward, which aim to maintain the core setting of the model within the New

Synthesis framework, but adapt it to the changed environment after the financial crisis. These can be grouped according to two broad lines:

- Reshaping: measures to enlarge the goals and specifications of inflation targeting;
- Add ons: measures to enlarge the scope of inflation targeting—using additional objectives and applying additional instruments. While the goal remains unchanged these broader sets of objectives aim to grasp the interrelations between economic actors and monetary policy more accurately.

3.1 Forms of Reshaping

Numerous central banks have introduced already a second (minor) goal besides inflation. In the course of the financial crisis, inflation forecasts and forward guidance were less effective. Therefore, secondary goals could be implemented via thresholds. Woodford (2013) introduces in this respect the possibility of an 'unemployment threshold', which should help maintain low interest rates, when the economic upswing starts. The underlying assumption is that interest rates tend to rise too early and an unemployment threshold would help to maintain low interest rates for a longer period. The threshold is supposed to be reached before interest rates are allowed to rise. Similarly, the inflation target could be enlarged by a 'nominal-GDP target' (Woodford 2013; Frankel 2013), which aims to maintain low interest rates, when the economy starts to boom. A nominal-GDP target can directly be linked to an inflation target and complement the system. Frankel (2013) points out, that in Europe a nominal-GDP target of 4–5% can be linked to the inflation target. The idea of higher nominal-GDP rates together with low interest rates should accelerate GDP growth further and the inflation target, which is still in place, is reached after a recession. This means that inflation target in the long run maintains its preset level, but in the short run the nominal-GDP target is put in place instead of the Taylor rule (Frankel 2013, p. 93).

3.1.1 Add-Ons to the System of Inflation Targeting

The question on how important monitoring of asset price developments by central banks to conduct monetary policy should be is discussed after the financial crisis. While some proposals argue in line with a 'flexible inflation targeting' mechanism (Woodford 2012), others aim to introduce additional measures to enlarge the scope of inflation targeting and already derived macroprudential proposals. The latter aim to figure out, whether in the respective national banking sector bottlenecks can be detected, which might lead to low interest rates that are not spread beyond the banking sector. This means that the monetary authority has to 'think beyond a simple Taylor rule' (Brunnermeier and Sannikov 2013, p. 98). Similar to forms of reshaping goals of inflation targeting schemes, also an increase of the focus to prudential measures increase the 'flexibility of the system' of inflation targeting and aim to respond in the short term with a broader set of instruments (Banerjee et al. 2013, p. 117). It was also noted that this additional claim for greater financial stability, which is beyond a traditional view of a sound financial system but aims to provide a tool against financial crisis, implies that there might arise a gap in the medium-run to the respective target (inflation and/or nominal-GDP target).

All in all the developments after the financial crisis ask for minor changes in the modelling but do not aim to reframe its fundamentals. Concrete proposals to incorporate higher flexibility in the implementation of inflation targeting economies are not given.

4 Post-Keynesian Critique and Alternatives

To discuss monetary policy Post-Keynesian economists have grouped the most important features of an optimal monetary policy along three broad lines.[3] Leaving aside for a moment the fact that optimal

[3]Palley (2007, p. 62), articulates in this respect, five critical factors affecting the determination of monetary policy, taking a closer look at the definition of uncertainty and the distribution of information. Both factors are subsumed within the broad definition of the institutional and structural set-up, which covers, for example, the demand for credibility and accountability of the monetary policy.

monetary policy also depends on the structure of the economy that is built for: 'the specification of the underlying theoretical paradigm', that includes the determination of the assumed causal relation between money/monetary policy and other economic activities, the 'institutional and structural set up' to maximize the effectiveness of monetary policy within the underlying paradigm and the derived 'instruments of monetary policy'. Apart from these fundamental elements of critique, further problems of inflation targeting in the European perspective, resulting from the period of easy money and quantitative easing (QE) after the global financial crisis, are discussed below separately.

4.1 Reframing the Underlying Paradigm

While in New Classical approaches in the short-run Phillips curve inflation is determined by the difference of unemployment from the natural rate of unemployment (NAIRU) and the expected inflation rate, the NCM model focus is on a permanent tradeoff between inflation and unemployment with the long-run Philips curve being vertical at the NAIRU (determined by the supply side of the economy). Post-Keynesian approaches replace the NCM Phillips curve by a dynamic disequilibrium function, allowing for cost-push and demand-pull inflation scenarios. Real effects (unemployment, wages growth) of monetary policy are at the centre of the analysis, and might allow due to the shape of the wage, profit rate and growth function a backward bending Phillips curve (Palley 2003, pp. 58f.; 2007, pp. 70–74). Applying a backward bending Philips curve, leads to the effect that an increase in inflation leads first to a decrease in unemployment till a turning point is reached and implies a counterproductive effect on unemployment when inflation increases further after the turning point is reached.

Other Post-Keynesian economists (see among others Setterfield 2006; Lima and Setterfield 2008; Mota dos Santos 2011) reformulate the Phillips curve to evaluate inflation targeting. A so-called Post-Keynesian Phillips curve refrains from a natural level of output and introduces a

new variable that incorporates the 'conflicting claims' over nominal income as a source of inflationary pressure (Setterfield 2006, pp. 662, 665). Inflation targeting becomes compatible with Post-Keynesian economics, insofar as also a new monetary rule is established, which shall determine the optimum interest rate level, without applying the conventional Taylor rule. The term optimum in this case refers to an interest rate level, which accounts for the conflicting claims as mentioned above and aims to re-establish the Keynesian demand for boosting employment. Monetary policy becomes a tool to serve an employment goal rather than an inflation goal. This challenges the mainstream assumption of path dependency of the NAIRU as 'pre-existing route for the economy to follow around which the actual path followed will oscillate' (Arestis and Sawyer 2009, p. 2). When incorporating institutional set-ups and admit that history matters, an individual development path is determined. This in turn impacts the importance of monetary policy to determine the development of a geographical area of diverse institutional frameworks as the Euro Area. Furthermore, studies (see among others Onaran and Galanis 2013) show the importance of the underlying wage bargaining process, which manifest the 'conflicting claims' over nominal income as mentioned above to explain strategies to overcome an economic crisis—wage led vs. profit led systems—leading to different distributional policies (Lavoie and Stockhammer 2013, Table 1.1; Stockhammer 2013). Stockhammer and Onaran (2011) argue that the Euro Area's demand regime is wage led. This impacts on the inflation target, as bargaining structures aim to promote an increase in wages, which leads to an economic upswing and enforces an upward revision of the inflation target.

4.2 Institutional and Structural Set-Up

Taking a closer look at the institutional and structural set-up, in terms of prerequisites to achieve the assumed best outcome of inflation targeting, a checkup with real economic policy procedures presents a gap between theory and economic policy evidence.

Wray's (2007, pp. 120ff.) analysis of central bank's independence in terms of institutional and personnel independence, presented as a prerequisite by proponents of inflation targeting, can be summed up as 'non-existing'. The request of independence of monetary policy authorities from public sector financing demands to control against hyperinflation is obsolete, as sovereign governments can use the national banking sector for refinancing, while the banking sector itself enlarges its assets with treasury bonds and therefore bank reserves (see for more details Bell and Wray 2002, pp. 265f.). Apart from the fact that also political (in)dependence is determined by the institutional set-up of the central bank, as visible when comparing, for example, the Federal Reserve System of the United States with the European Central Bank System. While in the United States, the Board of Governors are politically appointed and therefore their opinions are part of their monetary policy decisions, the Governors of the National Central Banks of the Euro member states are supposed to be independent and have to refrain from direct political positions; they are also appointed in their positions by the respective national governments. Again their opinions are transmitted into the monetary decision-making process. Apart from this, Wray (2007) points to another implicitly assumed independence within the mainstream approach; the independence of a central bank to conduct whatever monetary policy is aimed to be implemented and the possibility to select any tools wanted. Referring to the concept of endogenous money, this fact only holds, when the structure of the banking sector and the importance of other financial institutions to serve as refinance options are put aside. Only within the accommodating-approach of endogenous money such an assumption holds.

Linking the question of independence to use the tools of monetary policy freely by a monetary authority to the global financial crisis it becomes evident that an accommodating approach is more likely in the situation of a non-existing interbank market than a structuralist approach; in which commercial banks receive a major part of refinancing from the interbank sector and do not need to use the central bank for refinancing options. In this respect QE policies in the Euro Area deserve attention. As Gaffard et al. (2018, p. 136) note, QE policies might also have an impact on the determination of credit supply

in times without financial crisis. Although the authors see little impact of this monetary policy on stabilization within Europe, data of the last years (since 2015) show a rise in output growth (see Fig. 2) and investment in terms of changes in industrial production (Fig. 3). As Fig. 2 depicts economic development measure with changes in the real GDP within the Euro Area is by far not homogenous. Ireland especially outlines the picture and is plotted on the right scale in Fig. 2. The reason given for these changes in real GDP is the favourable tax scheme for international companies, which led to the massive reallocation of investment to Ireland.[4] The selected southern European Economies (Greece, Italy) are well below Euro-zone average, while e.g. Estonia as a 'newcomer' performs very well. Figure 3 shows the development of industrial production from 2014 to 2018. It becomes evident, that changes in industrial production fluctuate on an annual basis strongly on country level, while these fluctuations do not become visible in the Euro Area perspective. Again, Ireland serves as an outliner and is presented on the right scale, as industrial production seems to be determined only by relocation of enterprises at a point in time. Overall, from these developments in economic growth and the Fig. 1 on inflation presented above, inflation targeting for the Euro Area with the aim to promote economic development cannot be interpreted as success.

An important feature that is noted by Gaffard et al. (2018) when discussing the effectiveness of QE to boost real activities is the increase of financialization. The term financialization is used in this chapter to describe not only the use of financial instruments as financing or speculative tool, that increases the instability of global financial systems e.g. due to an increase in securitization, but also the importance of financial markets in 'everyday life' of households; for example, due to a rise in household debt as described below in Sect. 5.1.

This rise in the importance of financial markets over real economic production in terms of return led to a decrease in the effectiveness of monetary policies such as QE after the global financial slump, but also

[4]As OECD data shows (n.d.-b) tax to GDP ratio decreased sharply in 2015—from 28.4 to 23.1%—compared to an OECD average of above 30%.

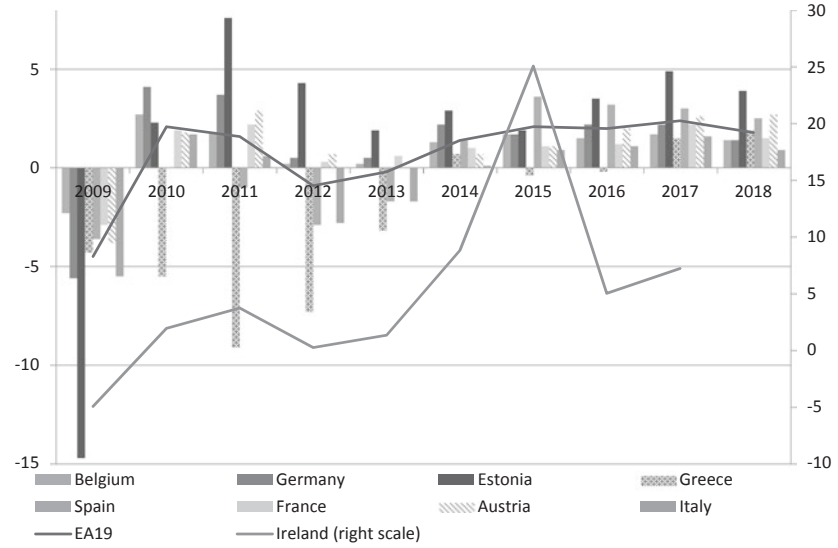

Fig. 2 Real GDP changes in % (*Source* OeNB [n.d.-a])

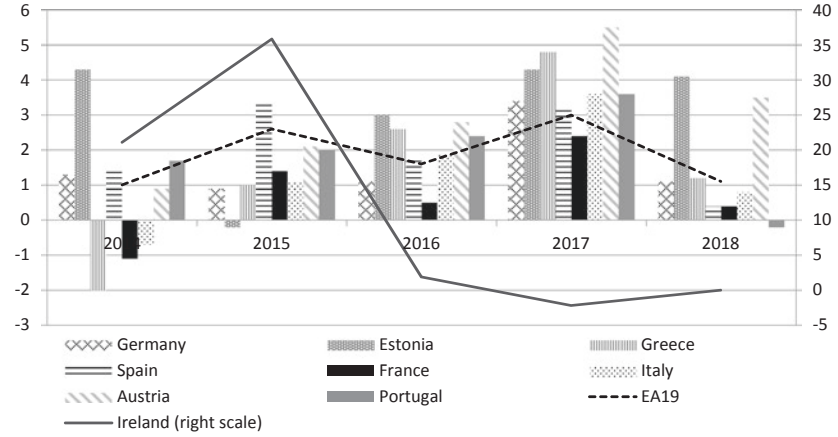

Fig. 3 Industrial production excluding construction, selected countries Euro Area (*Source* OeNB [n.d.-b])

manifested the upward price trend of assets. So far this leads directly to one of the main elements of criticism of inflation targeting, the rise of asset prices as a result of cheap money policies in times of economies downturn.

4.3 Stepping Back from the Taylor Rule

As a consequence of the shortcomings in the theoretical background and the resulting revisions of the slope of the Phillips curve, the question of how to set the optimum interest rate to achieve the optimum outcome has also to be revised.

The aim is to link monetary policy to the short-term nominal interest rate, while expected inflation is not influenced directly. This seems more promising than anchoring expected inflation and not setting the nominal interest rate, as direct monetary policy too; for example, the European main refinancing operations and the overnight interest rates can be directly determined by the central bank. Both might serve as a corridor targeting the interbank short-nominal interest rate. Two solutions are given of how to set the interest rate in an adequate way: the activist versus the parking rules (see Asensio and Hayes 2009, pp. 69ff.).

Within the 'activist rule', the Post-Keynesian approach seeks to achieve a more accurate interest rate determination that includes the real effects of monetary policy on employment and growth by acting flexible when the inflation rate ranges between a predetermined upper and lower bound. This means that the actual inflation rate does not only find a reference to a target rate but also to the respective upper and lower bound. In case the actual rate inflation rate is above the target but below the predetermined lower bound, monetary policy should still decrease interest rates moderately to profit from an increase in output. While in the short run a rise in output has positive stabilization effects, price stability will be achieved in the long run, with possible positive effects in the output level. This in turn decreases the upward pressure on prices. This approach immediately traces back to the shape of a backward bending Phillips curve, in which also a minimum unemployment rate can be detected. Palley (2003, 2007) introduces

MURI—minimum unemployment rate of inflation—to manifest the turning point in the backward bending Phillips curve. Only when monetary authorities reduce interest rates beyond the point where the minimum unemployment rate is achieved, increases in inflation cannot be offset by increases in output and employment.

While the immediate impact of short-run interest rates on the real economy is unquestioned, the ability to impact long-run interest rates via setting short-run nominal interest rates by monetary authorities remains questionable. Confidence in the future development in the economy and liquidity preference might counteract short-run interest rate policies by monetary authorities (Asensio and Hayes 2009). In this case interest rates should not be changed actively, but rather be held constant, 'be parked', at a certain level. Three versions of the parking, its rule can be observed within Post-Keynesian theory. When holding the nominal interest rate close to (Smithin Rule) or at zero (The Kansas City Rule), the aim is to focus on the distributional effects of monetary policy. Low interest rates enable the redistribution of income away from rentiers and follow Keynes' claim of a 'Euthanasia of the Rentier' (Wray 2007, pp. 136f.). As Wray (op. cit.) puts it, financial markets might be affected by a change in monetary policy, similarly as the orthodox economics claim, but the proposed rule follows as mentioned above the wish to redistribute income.

> The truth about monetary policy is rather simple: it usually does not matter much. Unexpected rate change can affect financial markets, and, as the new classicals say, random policy has larger effects, but there is not much to recommend it. …a monetary policy rule is preferred: set the overnight rate to zero, and keep it there. A properly programmed 'thin man' robot ought to do the trick. (Wray 2007, p. 138)

Compared to this, Smithin (2007, p. 114) argues that the interest rate should rather be low but not zero to maintain the 'social order' and the existing 'social contract' within the capitalist system. As presented above the theoretical frame for this monetary policy rule is set up by implementing an adapted version of the Philipps curve (Setterfield 2006). The third approach follows the 'fair interest rate' (Pasinetti's rule). Also

here capitalists are supposed to receive a reward, but not according to a certain set low or even zero interest rate, but according to the growth rate of labour productivity (Rochon and Setterfield 2012, p. 501). Within this approach, the labour market and an implicit way of wage coordination (reward for productivity) would be integrated into the mode of monetary policy.

Derived from the focus on the re-distributional effects monetary policy rules might have, also approaches to enrich Post-Keynesian economics more strongly with class conflicts over income by introducing three classes into the model (rentiers, firms and workers), reaches fruitful results (Hein and Stockhammer 2010). The crucial factor in this model is not the mode of interest rate setting but macroeconomic coordination between monetary authorities, fiscal policy and wage bargaining parties. While monetary authorities target the distribution between the classes introduced—therefore the model follows the demand for low interest rates—fiscal policy aims to reach stabilization. The triangle of targets is completed with the results of wage bargaining processes, which target inflation (Hein and Stockhammer 2010, pp. 349f.). The argument of macroeconomic coordination is central when applying inflation targeting to the European experience after the global financial downturn of 2008/2009.

5 Inflation Targeting After the Global Financial Crisis: Are Low Interest Rates What the Post-Keynesian Approach Demanded?

While the theoretical appraisal of inflation targeting within Post-Keynesian economies led to a systemic reformulation before the global financial crisis and discussions of how low to set the interest rate, the focus shifted after a decade of low interest rates and easy money to the mostly untold distribution effect of increasing asset prices; and questions of financial stability aside of the claimed financial soundness when introducing inflation targeting within the NCM model. The visible increasing European asymmetries in terms of financial stability,

economic growth, asset price development (especially house prices) and fiscal performance demand a discussion beyond the claim for macroeconomic coordination. But ask for a look at the so far hidden mechanisms of inflation targeting. The focus will be on the effects for the Euro Area.

5.1 Asset Prices Developments: Housing and Its Immediate Effects for Redistribution

Figure 4 presents the developments of house prices in selected European economies. Especially since 2015 house prices show a sharp upward trend in the European Union, which is also reflected in the Euro Area. Having a look at the national trends of economies with different institutional structures and experiences with house price developments, it becomes evident, that, independent of past experiences sharp increases are visible in almost all economies. Italy represents in this respect one of the few exceptions, similarly to Greece (not shown in Fig. 4). The surprising development in the data presented in Fig. 4 is given by

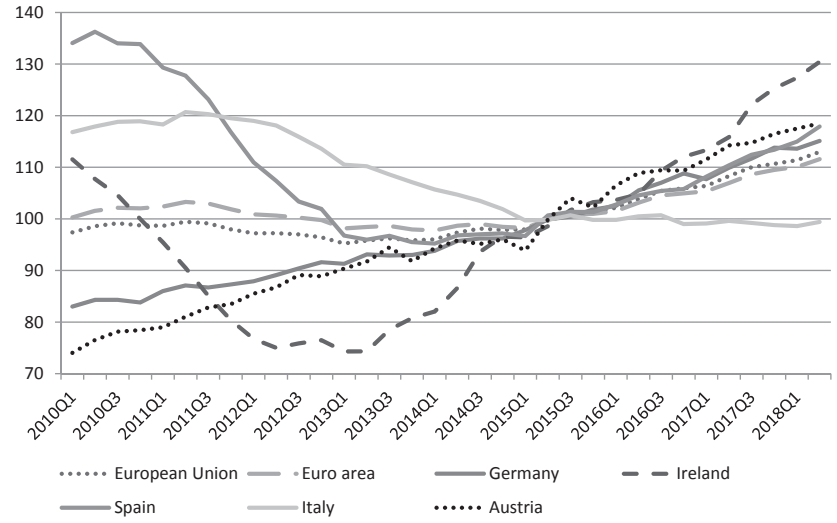

Fig. 4 House price index (2015 = 100) selected European economies (*Source* Eurostat [n.d.])

Germany and Austria. Both economies are characterized by stable house prices in the past and had not experienced a sharp increase before the global financial crisis or a decrease after. Nevertheless, house prices are increasing strongly since 2015.

The effects of the aim to spur inflation in the Euro Area towards its 'near but below' 2% target and the decade of easy money, led to derived demand for housing. 'Derived' stands for 'speculative' demand in this case and symbolizes the fact that housing is not used for the primary need for shelter but is financialized and serves the goal of yield increases in days of low interest rates. All in all, two stages of financialization can be distinguished. In stage one a shift from a renters' society is encouraged. In stage two, housing as a shelter is of minor importance and speculation gains momentum (Springler 2018). Housing becomes increasingly commodified. The tenure structure of housing as well as the respective national financial system impacts the speed of change towards the second stage of financialization. Figure 6 gives an overview of the differences in tenure status across European economies. Although it has to be noted that national definitions regarding volume and structure of the so-called social sector, inducing reduced rents, vary substantially, overall observations can be made. Countries with comparatively high fractions of tenants living at reduced price flats show only moderate price increases. As regards national financial systems, economies with a rigid mortgage market, focusing on modes bank-based financial structure experience a less dynamic house prices (Springler and Wöhl 2019). The rigidity of the mortgage market refers to the use of financial instruments, such as mortgage-backed securities for housing finance.

While international comparisons show that price to income ratios experienced a downward adjustment after the crisis of 2008/2009 and would now experience the closing of the gap with the long-run average. Affordability seems not to be tackled negatively in these studies (see Philiponnet and Turrini 2017, pp. 10ff.). However, other approaches show the increasing gap between homeowners and renters on the one hand and shrinking affordability ratios (Hypostat 2017, p. 13). European capitals face markups leading to even stronger increases in house prices. Again large differences between Euro Area Member States are visible.

To be aware of potential housing bubble, which might have negative effects on the stability of European financial markets and especially the banking sector, the Austrian Central Bank for example started to conduct a fundamental price indicator (see for more details Springler 2018). This indicator shows that prices are increasingly overvalued compared to the fundamentals driving supply and demand for housing as shelter, but financial fragility is not increased due to low interest rates and the high capability of households to bear the burden of a mortgage. This means that house prices are driven by income, the aim to financialize—at least in stage one from a mere renters' to a homeowners' society is in the focus. The second stage is promoted by low yields on best rated government bonds. This means that returns on investment in housing are comparatively high, given the low risk of the investment. This vicious cycle of increasing disparities between renters and homeowners, the constant increase in financialization and rising house prices is determined by shrinking yields on other best rated asset—government bonds. Inflation targeting and the means to overcome the financial crisis, within this monetary scheme, made it necessary to introduce measures as the Public Sector Purchasing Programme (PSPP). This programme aims to diminish interest rate spreads of government bonds within the European Monetary Union, as confidence is increased due to a predetermined monthly purchase of government bonds of European Area member states by the European Central Bank. The programme and effects are discussed below.

Apart from this interrelation of increasing house prices with monetary tools within the system of inflation targeting after the financial crisis, also another aspect enters the stage in recent years: households' debt ratios and the impact on financial stability. The awareness that households' debt increase due to ultra-loose monetary policy might increase financial instability raises, as latest reports by the European Central Bank show (Lo Duca et al. 2019). Similarly, to the fundamental price indicator in Austria, indicators to compare the state of cross country housing market stability are applied, focusing on the households' ability to bear a potentially higher debt burden when the period of low interest rates and easy money might end in the European Union. So far the policy measures derived, focus only on the potential tools of

macroprudential regulatory frame, which was put in place as part of the Banking Union in the Euro Area after the financial crisis.

As discussed above, mainstream economists proposed an added component to inflation targeting to ensure financial stability. In recent years numerous measures have been implemented to increase financial soundness. The question arises, do they follow the Post-Keynesian critique and claim for stronger financial regulation?

5.2 How Sound Is the New Buffer Regime of the European Banking Union?

Although economists demand, as presented above, a sound financial system as a precondition for the implementation of the system of inflation targeting and assume simultaneously that financial soundness is increased, the global financial crisis showed that also the Euro Area has a fragile financial structure.

The plea for an increase in financial regulation to overcome increased speculation and to diminish economic fragility was among others a main claim of Hyman Minsky. The restructuring of the neoliberal order, in which inflation targeting serves as stabilization momentum to seemingly increase confidence in the market mechanism by supporting rational expectations, asks for stronger regulations of the financial sector. Boom phases on the one hand increase financial fragility, but on the other hand weak financial regulation deepens the recession, as Palley (2011) argues when presenting the super cycle, following Minsky's Instability hypothesis over a longer period of upswings and downturns. Financial regulation with the aim to macroeconomic coordination is therefore strongly argued by Post-Keynesian economists (see among others Arestis 2017, pp. 30ff.)

In the case of the Euro Area, the Banking Union was established to serve as a main guidance against financial fragility of the banking sector and to help to shed light on the interrelations between financial sector and globally acting banks. The first pillar, the Single Supervisory Mechanism (SSM), of this three pillar concept of the Banking Union serves the objective to promote a more united supervisory mechanism

within the Euro Area. While the second pillar, the Single Resolution Mechanism (SRM), which should be in place once a bank needs to be liquidated or recapitalized and the third pillar, the Harmonized Deposit Insurance System (HDIS), is lagging behind schedule in implementation, the main focus to gain financial stability is laid upon the SSM. The European Central Bank took over the regulation of systemically important banks to track potential weaknesses resulting from their global presence more easily. Additionally, macroprudential schemes with the aim to guide also on national level the interrelations between banks and the environment of their activities were established and resulted in a wide range of buffer. These buffers' add-ons to the core capital ratios, established by Basel III, have to be implemented into national law of the respective member states. Each member state has to establish these additional buffers according to the respective needs and potential threats the national banking system has to deal with (see in this respect, for example, the national strategy to improve stability of the Austrian Financial Stability Board 2017).

In this sense, the implemented mechanism to increase stability does not follow the analysis of Post-Keynesian Economies, which argues for a restructuring of the Basel framework, towards asset-based reserve requirements instead of a focus on the probability of default of a borrower (Palley 2003). Due to its complexity, the system is in danger to lose transparency and accountability (Springler 2016).

Referring directly to the working of the inflation targeting system in place it has to be noted that to overcome the trend to increase house price bubbles and a deterioration of lending ratios, leading to potential high loan to value ratios in times of rising house prices, the system of macroprudential regulation offers instruments to put ceilings after detecting internationally valid ratios to control for house price bubbles in place. While the control of house price bubbles is an important and valid task for a regulatory authority, it has to be noted that in times of increasing financialization, induced by inflation targeting, that leads to speculatively increase house prices; such measure, in the end, hamper households demand to provide for their basic needs of housing, once no alternative to rent affordable housing is given in a specific national structure. International comparisons show a wide divide between

ownership ratios and different form of rental housing (free and subsidized housing). However, economies with strong subsidized rental sectors show less strong house price developments and fluctuations in historical perspective—for example, Austria (see Fig. 6).

All in all, the combination of induced system changes due to the focus to reach an inflation target together with the aim to satisfy the need to financial stability leads to further negative distribution effects as speculators would hardly be tackled by mortgage ceilings. Furthermore, the tools applied in financial regulation do not follow the claims made by Post-Keynesian economists, as mentioned above, to reframe the structure of banking regulation towards a stronger asset-based approach but add further elements to the existing system.

5.3 Monetary Policy and Government Bonds

The period of easy money (see Footnote 2) in the Euro Area was topped in 2015 with the implementation of QE, in which the scope of cheap money (easy money) for commercial banks was enlarged by further scopes. First of all, sterilization measures to maintain a stable exchange rate were abandoned to improve the effectiveness of the easy money policy implemented so far. Further scopes were addressed by the three pillars of QE under the heading of 'expanded asset purchase program' (see Springler 2015):

- The 'covered bond purchase program' (CBPP3)—the third implementation, as well as the 'asset-backed securities purchase program' (ABSPP) aimed to further promote stability and confidence of the inter-bank sector. The fact that financial products as asset backed securities were also the main drivers for the financial crisis of 2008 was not considered dangerous for financial stability in the Euro Area. New modes of financial regulation were implemented simultaneously and should control for macro-prudential risks. Additionally banking stress tests were conducted.
- An additional scope was addressed by the implementation of the corporate sector purchase program (CSPP). The aim was to affect

long-term interest rates and promote especially infrastructure projects, which in turn might impact long-run development processes.

The third pillar of inflation targeting focused directly on the public sector. The PSPP,[5] which was meant to decrease interest rate spreads on government bonds, is also criticized for its further downward pressure on interest rates and shall be the centre of the argumentation in this chapter.

This means that all in all the QE in the Euro Area aimed to increase and improve banks' reserves, promote long-term private investments and diminish speculative pressures on national public budgets. While inflation-targeting regimes state that fiscal discipline is not only the imperative for implementation but it is also enforced directly through the system. The QE programme of the Euro Area took separate measures to ease the situation in the member states but seem to have rather counteracted the initial aim.

The public sector purchase programme, which was put in place in March 2015, could only be used by best ranked government bonds. This excluded Greece and Cyprus from participation. All in all, and in each month 60 billion Euro were bought under the PSPP in 2015, later the monthly amount of purchases increased and then gradually phased out by the end of 2018. Currently, only reinvestments take place. This means that the aim to diminish spreads on yields on long-term government bonds could not fully develop. Furthermore, the PSPP is set up to allow only purchases with yields above or exactly the deposit facility, which was at the time of the implementation at −0.20%, fell to −0.30% in December 2015 and to −0.40% in March 2016 (past key interest rates according to ECB website[6]). Simultaneously, purchases should follow the key for shares of member states of the Euro Area, meaning that the ECB should buy from economies with large shares in the European Central Bank System. These technical circumstances pointed at Germany for large shares of PSPP; but also meant that when

[5]For more detail regarding the PSPP see Znidar (2015).

[6]Available at: www.ecb.int.

government bonds from economies with low necessity to issue new bonds; when these get dried up in the market, yields decrease. Taking the set-up of the PSPP into account, one can conclude that the aim initially stated—to diminish yield spreads and encouraging investments to finally meet the inflation target—lost its goal and promoted economies already ahead in economic prosperity in comparison to other member states of the Euro Area. Asymmetries within Europe did not decrease, the inflation target was not reached homogenously but meant that some economies got closer to the target while others were lagging behind.

6 Summary and Conclusions

Recent developments in the Euro Area, as an implicit inflation targeting zone, show the fault lines of this monetary mode for economic prosperity and even distribution. Tracing the historic roots of inflation targeting and the proposals of monetarists and proponents of rational expectations and New Classical economists, one becomes aware, that despite the constant inconsistencies regarding the proposed effects of monetary policy on real activities and the potential transmission mechanisms, inflation targeting has gained momentum ever since its first implementation. It seemed that in absence of another policy tool that one could agree upon, the mode, that at least had no *harmful impact* for economic development—as some empirical observations show—was implemented in many nations, ignoring that inflation had decreased in most economies even before leading to the misinterpretation of convergence between economies. Subsequently the mainstream paradigm of NCM seemingly fitted the empirical observations, ignoring the fundamental national differences in the structural and institutional set-up—for example, in the wage bargaining process.

By taking a closer look at the demanded prerequisites of inflation targeting, the weaknesses of the system become evident, as Post-Keynesian economists presented in their analyses of numerous shortages of the system. While the main arguments circle around the missing integration of other markets into the model and the revision of the Phillips curve, which lead to opposing views on the rationality of interest rules

compared to mainstream economics, the misperformance of inflation targeting becomes even more obvious when focusing on the last decade. Despite loose monetary policy, which was topped up with a multipillar QE structure within the Euro Area, inflation rates have not hit the target.

The weak add-ons to the existing system and proposals of flexibility of mainstream economists do not tackle the multilevel problems inflation targeting introduced in developing economies as the Member States of the Euro Area. Increasing asymmetries in economic development but also household wealth between Member States could not be diminished by the claim to reach a harmonized inflation rate of 2%. When the monetary policy was confronted by multiple problems to be solved after the crisis the result was to enforce inflation targeting with the help of a broader frame of macroprudential regulation and the help of asset purchase programmes. The result was a rise in uneven distribution, increasing asset prices—especially house prices—and erosion of government bond yields in best rated economies. The underlying structural changes in terms of increasing financialization and shifts from renters' societies to homeowners' societies, resulting in deeper class conflicts have strong impact on the capitalist structure of European Economies. In this sense, the NCM has promoted the neoliberal paradigm also after the global financial crisis. The measures implemented so far seem to be 'more of the same' regarding the underlying economic imperative they apply. Although financial regulation was enforced as proposed by numerous heterodox economists, as discussed in this chapter, the mode of regulation does not lead to a change of the existing system.

Appendix

See Table 1, Figs. 5 and 6.

Table 1 Inflations targeting countries

Albania	Hungary	the Philippines
Argentina	Iceland	Poland
Armenia	India	Romania
Australia	Indonesia	Russia
Brazil	Israel	Serbia
Canada	Japan	South Africa
Chile	Kazakhstan	Sweden
Colombia	Korea	Switzerland
Czech Republic	Mexico	Thailand
Dominican Republic	Moldova	Turkey
Euro Area	New Zealand	Uganda
Georgia	Norway	Ukraine
Ghana	Paraguay	United Kingdom
Guatemala	Peru	United States

Source Niedźwiedzińska (2018, p. 9)

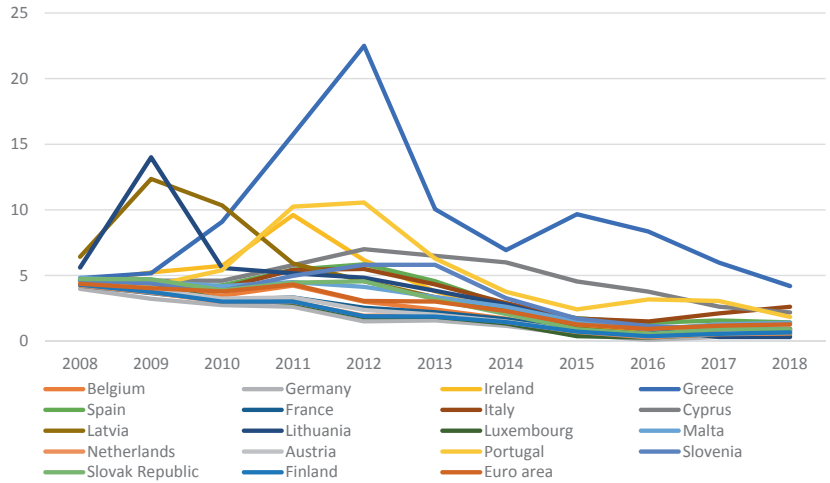

Fig. 5 Long-term government bond yields (*Source* OeNB [n.d.-c])

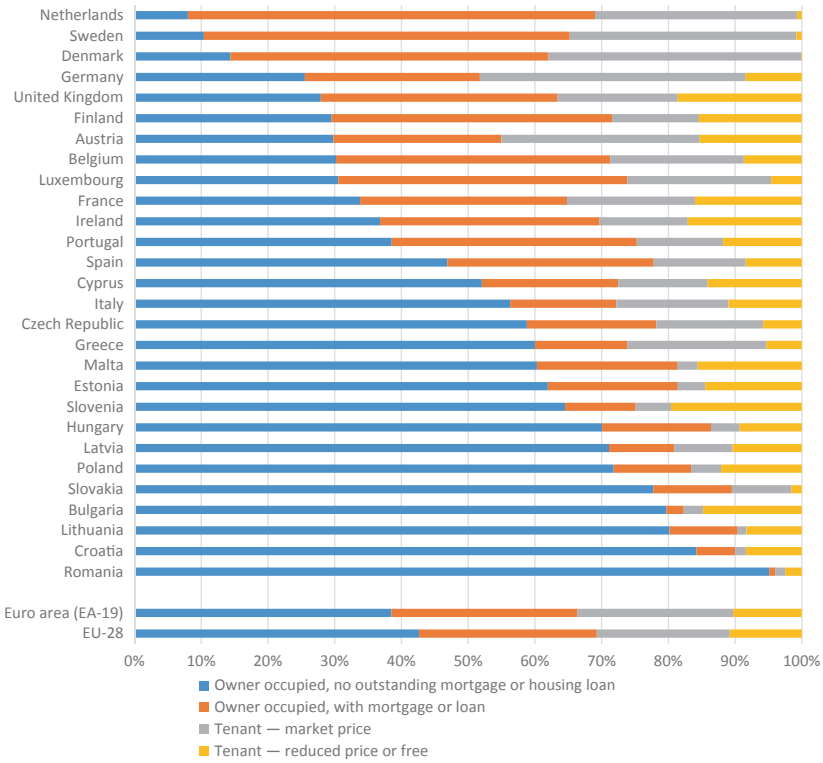

Fig. 6 Distribution of population by tenure status—2016 (*Source* Eurostat 2016)

References

Aizenman, J., Hutchison, M., & Noy, I. (2011). Inflation Targeting and Real Exchange Rates in Emerging Markets. *World Development, 39*(5), 712–724.

Angeriz, A., & Arestis, P. (2006). Has Inflation Targeting Had Any Impact on Inflation? *Journal of Post Keynesian Economics, 28*(4), 559–571.

Ardakani, O. M., Kishor, K. N., & Song, S. (2018). Re-evaluation the Effectiveness of Inflation Targeting. *Journal of Economic Dynamics and Control, 90,* 76–97.

Arestis, P. (2017). Monetary Policy Since the Global Financial Crisis. In P. Arestis & M. Sawyer (Eds.), *Economic Policies Since the Global Financial Crisis, International Papers in Political Economy* (pp. 1–41). Houndmills: Palgrave Macmillan.

Arestis, P., & Sawyer, M. (2008). New Consensus Macroeconomics and inflation Targeting: Keynesian Critique. *Economia e Sociedale*, Campinas, *17,* 629–653.

Arestis, P., & Sawyer, M. (2009). Path Dependency and Demand-Supply Interactions in Macroeconomic Analysis. In P. Arestis & M. Sawyer (Eds.), *Path Dependency and Macroeconomics* (pp. 1–36). Houdmills: Palgrave Macmillan.

Asensio, A., & Hayes, M. (2009). The Post Keynesian Alternative to Inflation Targeting. *Intervention, 6*(1), 65–79.

Ausch, K. (1970). Inflation und Konsumgesellschaft. In W. Schmitz (Ed.), *Geldwertstabilität und Wirtschaftswachstum, Währungspolitik im Spannungsfeld des Konjunkturverlaufs, Festschrift für Andreas Korp* (pp. 3–26). Wien and New York: Springer.

Austrian Financial Stability Board. (2017). *The Macroprudential Policy Strategy for Austria*. Vienna: FMSG. Available at: https://www.fmsg.at/dam/jcr:40b1594d-626d-465c-9b3e-dcdd98a15683/20171228_Mmacroprudential-policy-strategy.pdf. Accessed 1 Oct 2018.

Ball, L., & Sheridan, N. (2003). *Does Inflation Targeting Matter?* (IMF Working Paper WP/03/129). International Monetary Fund.

Banerjee, R., Cecchetti, S., & Hofmann, B. (2013). Flexible Inflation Targeting: Performance and Challenges. In L. Reichlin & R. Baldwin (Eds.), *Is Inflation Targeting Dead? Central Banking After the Crisis* (pp. 113–119). London: CEPR.

Beer, C., Gnan, E., & Valderrama, M. T. (2016). Die wechselvolle Geschichte der Inflation in Österreich. *Monetary Policy and the Economy, 16*(3–4), 6–35.

Bell, S., & Wray, R. (2002). Fiscal Effects on Reserves and the Independence of the Fed. *Journal of Post Keynesian Economies, 25*(2), 263–271.

Bernanke, B. S., & Mishkin, F. S. (1997). A New Framework for Monetary Policy? *The Journal of Economic Perspectives, 11*(2), 97–116.

Bordo, M. D., & Rockoff, H. (2013). *Not Just the Great Contraction: Friedman and Schwartz's a Monetary History of the United States 1867 to 1960* (NBER Working Paper 18828). Cambridge: National Bureau of Economic Research.

Beirne, J., Dalitz, L., Ejsing, J., Grothe, M., Manganelli, S., Monar, F., et al. (2011). *The Impact of the Eurosystem's Covered Bond Purchase Programme on the Primary and Secondary Markets* (ECB Occasional Paper Series No. 122). Frankfurt am Main: ECB.

Brunnermeier, M., & Sannikov, Y. (2013). Reviving "Money and Banking". In L. Reichlin & R. Baldwin (Eds.), *Is Inflation Targeting Dead? Central Banking After the Crisis* (pp. 95–103). London: CEPR.

Constâncio V. (2018, May 4). *Past and Future of the ECB Monetary Policy*. Speech of Vítor Constâncio Vice president of the ECB at the Conference on "Central Banks in Historical Perspective: What Changed After the Financial Crisis?". Available at: https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180504.en.html. Accessed 4 Apr 2019.

Conti-Brown, P. (2015). The Institutions of Federal Reserve Independence. *Yale Journal in Regulation, 32*(2), 267–310.

Debelle, G. (1997). *Inflation Targeting in Practice* (IMF Working Paper WP/97/35). Washington, DC: International Monetary Fund.

Debelle, G., Masson, P., Savastano, M., & Sharma, S. (1998). *Inflation Targeting as a Framework for Monetary Policy*. Washington, DC: International Monetary Fund.

EMF. (2017). *Hypostat 2017: A Review of Europe's Mortgage and Housing Markets*. EMF. Available at: https://hypo.org/app/uploads/sites/3/2017/09/HYPOSTAT-2017.pdf. Accessed 2 Feb 2019.

Erber, G., & Hagemann, H. (2010). Monetary Policy Challenges of the ECB Facing a Divergent Inflationary Process in the EMU Area. In G. Fontana, J. McCombie, & M. Sawyer (Eds.), *Macroeconomics, Finance and Money, Essays in Honour of Philip Arestis* (pp. 54–74). Houndmills: Palgrave Macmillan.

Eurostat. (n.d.). *House Price Index*. Dataset. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_hpi_q&lang=en. Accessed 1 Feb 2019.

Eurostat. (2016). *Living Conditions Housing*. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK_DS-057102_QID_69CEE79E_UID_-3F171EB0&layout=TIME,C,X,0;TENURE,L,X,1;GEO,L,Y,0;INCGRP,L,Z,0;HHTYP,L,Z,1;INDICATORS,C,Z,2;&zSelection=DS-057102INCGRP,TOTAL;DS-057102HHTYP,TOTAL;DS-057102INDICATORS,OBS_FLAG;&rankName1=HHTYP_1_2_-1_2&rankName2=INDICATORS_1_2_-1_2&rankName3=INCGRP_1_2_-1_2&rankName4=TIME_1_0_0_0&rankName5=TENURE_1_2_1_0&rankName6=GEO_1_2_0_1&sortC=ASC_-1_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&waifalse&time_mode=ROLLING&time_most_recent=true&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23. Accessed 15 Nov 2018.

Fazio, D. M., Tabak, B. M., & Cajueiro, D. O. (2014). *Inflation Targeting and Banking System Soundness: A Comprehensive Analysis* (Banco Central do Brasil Working Paper 347). Available at: https://www.bcb.gov.br/pec/wps/ingl/wps347.pdf. Accessed 7 Jan 2019.

Fessler, P., & Schürz, M. (2018). *The Functions of Wealth: Renters, Owners and Capitalists Across Europe and the United States* (Austrian Central Bank Working Paper 223). Vienna: Austrian Central Bank.

Fontana, G. (2009). *Whither New Consensus Macroeconomics? The Role of Government in Fiscal Policy in Modern Macroeconomics* (The Levy Economics Institute, Working Paper No. 563).

Frankel, J. (2013). Nominal-GDP Targets, Without Losing the Inflation Anchor. In L. Reichlin & R. Baldwin (Eds.), *Is Inflation Targeting Dead? Central Banking After the Crisis* (pp. 90–94). London: CEPR.

Friedman, M. (1965). A Program for Monetary Stability. In M. D. Ketchum & L. T. Kendall (Eds.), *Readings in Financial Institutions* (pp. 1–16, 189–209). Boston: Houghton Mifflin. Available at: https://miltonfriedman.hoover.org/friedman_images/Collections/2016c21/Houghton_1965.pdf. Accessed 10 Jan 2019.

Friedman, M. (1968). The Role of Monetary Policy. *The American Economic Review, 58*(1), 1–17.

Gaffard, J.-L., Napoletano, M., & Battiston, S. (2018). Some Reflections of Inflation Targeting, Monetary-Fiscal Policy Interactions, and Unconventional Monetary Policies. *European Journal of Economics and Economic Policies: Intervention, 15*(2), 132–138.

González Cabanillas, L., & Ruscher, E. (2008). *The Great Moderation in the Euro Area: What Role Have Macroeconomic Policies Played?* (European Economy Economic Papers 331). Brussels: European Communities. Available at: http://ec.europa.eu/economy_finance/publications/pages/publication12753_en.pdf. Accessed 4 Apr 2019.

Goodfriend, M., & King, R. (1997). The New Neoclassical Synthesis and the Role of Monetary Policy. In B. S. Bernanke & J. Rotemberg (Eds.), *NBER Macroeconomics Annual 1997* (Vol. 12, pp. 231–296). Cambridge, MA: MIT Press.

Green, J. H. (1996). *Inflation Targeting: Theory and Policy Implications* (IMF Working Paper WP/96/65). Washington, DC: International Monetary Fund.

Haberler, G. (1946). *Prosperity and Depression: A Theoretical Analysis of Cyclical Movements*. Lake Success, NY: United Nations.

Haberler, G. (1952). The Pigou Effect Once More. *Journal of Political Economy, 60*(3), 240–246.

Hein, E., & Stockhammer, E. (2010). Macroeconomic Policy Mix, Employment and Inflation in a Post-Keynesian Alternative to the New Consensus Macroeconomics Model. *Review of Political Economy, 22*(3), 317–354.

Hicks, J. R. (1937). Mr. Keynes and the 'Classics': A Suggested Interpretation. *Econometrica, 5*(2), 147–159.

Ismailov, S., Kakinaka, M., & Miyamoto, H. (2016). Choice of Inflation Targeting: Some International Evidence. *North American Journal of Economics and Finance, 36,* 350–369.

Johnson, D. R. (2002). The Effect of Inflation Targeting on the Behaviour of Expected Inflation: Evidence from an 11 Country Panel. *Journal of Monetary Economics, 49,* 1521–1538.

Kienzl, H. (1970). Wirtschaftspartner, Stabilität und Wachstum. In W. Schmitz (Ed.), *Geldwertstabilität und Wirtschaftswachstum, Währungspolitik im Spannungsfeld des Konjunkturverlaufs, Festschrift für Andreas Korp* (pp. 27–57). Wien and New York: Springer.

Kose, N., Yalcin, Y., & Yucal, E. (2018). Performance of Inflation Targeting in Retrospect. *Empirica, 45,* 197–213.

Lane, T., & Van Den Heuvel, S. (1998). *The United Kingdom's Experiences with Inflation Targeting* (IMF Working Paper WP/98/87). Washington, DC: International Monetary Fund.

Lavoie, M., & Stockhammer, E. (2013). Wage-Led Growth: Concept, Theories and Policies. In M. Lavoie & E. Stockhammer (Eds.), *Wage-Led Growth: An Equitable Strategy of Economic Recovery* (pp. 13–39). Houndmills: Palgrave Macmillan.

Lima, G. T., & Setterfield, M. (2008). Inflation Targeting and Macroeconomic Stability in a Post Keynesian Economy. *Journal of Post Keynesian Economies, 30*(3), 435–461.

Liskar, B. (1970). Der monetäre Steuerungsprozess in jüngster Sicht. In W. Schmitz (Ed.), *Geldwertstabilität und Wirtschaftswachstum, Währungspolitik im Spannungsfeld des Konjunkturverlaufs, Festschrift für Andreas Korp* (pp. 223–240). Wien and New York: Springer.

Lo Duca, M., Pirovano, M., Rusnák, M., & Tereanu, E. (2019). Macroprudential Analysis of Residential Real Estate Markets. *Macroprudential Bulletin, 7*. ECB. Available at: https://www.ecb.europa.eu/pub/financial-stability/macroprudential-bulletin/html/ecb.mpbu201903_03~16f6101896.en.html#toc1. Accessed 29 Mar 2019.

McCallum B. T. (1984). *Credibility and Monetary Policy* (NBER Working Paper Series 1490). Cambridge: NBER.

Minea, A., & Tapsoba, R. (2014). Does Inflation Targeting Improve Fiscal Discipline? *Journal of International Money and Finance, 40,* 185–203.

Mishkin, F. S. (2000a). *From Monetary Targeting to Inflation Targeting: Lessons from the Industrialized Countries* (World Bank Policy Research Working Paper No. 2684). Washington, DC: The World Bank.

Mishkin, F. S. (2000b). *Inflation Targeting in Emerging Market Countries* (NBER Working Paper 7618). Cambridge: NBER.

Mota dos Santos, A. L. (2011). Inflation Targeting in a Post Keynesian Economy. *Journal of Post Keynesian Economics, 34*(2), 295–318.

Niedźwiedzińska, J. (2018). *Inflation Targeting Institutional Features of the Strategy in Practice* (NBP Working Paper No. 299). Warsaw: Narodowy Bank Polski.

OECD. (n.d.-a). *Consumer Price*. Dataset. Available at: https://stats.oecd.org/viewhtml.aspx?datasetcode=PRICES_CPI&lang=en. Accessed 15 Jan 2019.

OECD. (n.d.-b). *Revenue Statistics: Key Findings for Ireland*. Available at: http://www.oecd.org/ireland/revenue-statistics-ireland.pdf. Accessed 29 Jan 2019.

OeNB. (n.d.-a). *Internationale Vergleiche Konjunkturindikatoren*. Available at: https://www.oenb.at/Statistik/Standardisierte-Tabellen/Internationale-Vergleiche/Konjunkturindikatoren.html. Accessed 29 Jan 2019.

OeNB. (n.d.-b). *Industrial Production Excluding Construction.* Available at: https://www.oenb.at/isaweb/report.do?report=10.12. Accessed 29 Jan 2019.

OeNB. (n.d.-c). *Long Term Government Bond Yields*. Available at: https://www.oenb.at/isaweb/report.do?report=10.6. Accessed 19 Oct 2018.

Onaran, Ö., & Galanis, G. (2013). Is Aggregate Demand Wage-Led or Profit-Led? A Global Model. In M. Lavoie & E. Stockhammer (Eds.), *Wage-Led Growth: An Equitable Strategy of Economic Recovery* (pp. 71–99). Houndmills: Palgrave Macmillan.

Palley, T. (2003). Asset Price Bubbles and the Case for Asset-Based Reserve Requirements. *Challenge, 46*(3), 53–72.

Palley, T. (2007). Macroeconomics and Monetary Policy: Competing Theoretical Frameworks. *Journal of Post Keynesian Economics, 30*(1), 61–78.

Palley, T. (2011). A Theory of Minsky Super-Cycles and Financial Crises. *Contributions to Political Economy, 30*(1), 31–46.

Papademos, L. D., & Stark, J. (2010). *Enhancing Monetary Analysis*. Frankfurt am Main: European Central Bank.

Pech, H. (1970). Die moderne Geltheorie im Lichte der Geldpolitik. In W. Schmitz (Ed.), *Geldwertstabilität und Wirtschaftswachstum, Währungspolitik im Spannungsfeld des Konjunkturverlaufs, Festschrift für Andreas Korp* (pp. 337–366). Wien and New York: Springer.

Philiponnet, N., & Turrini, A. (2017). *Assessing House Price Developments in the EU* (European Commission Discussion Paper 048). Luxembourg: Publications Office of the European Union. Available at: https://ec.europa.eu/info/sites/info/files/dp048_en.pdf. Accessed 15 Mar 2019.

Reichlin, L., & Baldwin, R. (2013). Introduction. In L. Reichlin & R. Baldwin (Eds.), *Is Inflation Targeting Dead? Central Banking After the Crisis* (pp. 10–30). London: CEPR.

Rochon, L.-P., & Setterfield, M. (2012). A Kaleckian Model of Growth and Distribution with Conflict-Inflation and Post Keynesian Nominal Interest Rate Rules. *Journal of Post Keynesian Economics, 34*(3), 497–520.

Sawyer, M. (2006). Inflation Targeting and Central Bank Independence: We Are All Keynesians Now! Or Are We? *Journal of Post Keynesian Economics, 28*(4), 639–652.

Setterfield, M. (2006). Is Inflation Targeting Compatible with Post Keynesian Economics? *Journal of Post Keynesian Economics, 28*(4), 653–671.

Smithin, J. (2007). A Real Interest Rate Rule for Monetary Policy? *Journal of Post Keynesian Economics, 30*(1), 101–118.

Snowdon, B., & Vane, H. R. (2005). *Modern Macroeconomics, Its Origins, Development and Current State*. Cheltenham: Edward Elgar.

Springler, E. (2015). Quantitative Easing als Chance der Geldpolitik? *ÖGZ, 10*(2015), 23–33.

Springler, E. (2016). Banking Union: Lost in Complexity? *101-Complexity in Business: Insights and Solution, Working Paper presented at the Fachhochschule Konferenz 2016*. Forschungsforum der österreichischen Fachhochschulen. Available at: http://ffhoarep.fh-ooe.at/bitstream/123456789/572/1/101_329_Springler_FullPaper_dt_Final.pdf. Accessed 10 Dec 2018.

Springler, E. (2018). Die Rückkehr der Wohnungsfrag Soziale Bruchlinien in Österreich nach der Krise. *Kurswechsel, 4*(2018), 47–56.

Springler, E., & Wöhl, S. (2019). Financialization of the Housing Market in Austria and Ireland. In S. Wöhl, E. Springler, M. Pachel, & B. Zeilinger (Eds.), *The State of the European Union Fault Lines in European Integration* (pp. 155–174). Wiesbaden: Springer Fachmedien.

Stockhammer, E. (2013). Why Have Wage Shares Fallen? An Analysis of the Determinants of Functional Income Distribution. In M. Lavoie & E. Stockhammer (Eds.), *Wage-Led Growth: An Equitable Strategy of Economic Recovery* (pp. 40–70). Houndmills: Palgrave Macmillan.

Stockhammer, E., & Onaran, Ö. (2011). *Rethinking Wage Policy in the Face of the Euro Crisis: Implications of the Wage Led Demand Regime* (Economics Discussion Papers 2011-2). Kingston University London. Available at: https://eprints.kingston.ac.uk/22984/1/Stockhammer-E-22984.pdf. Accessed 4 Apr 2019.

Taylor, J. B. (1999). A Historical Analysis of Monetary Policy Rules. In J. B. Taylor (Ed.), *Monetary Policy Rules: Implications* (pp. 319–347). Chicago: University of Chicago Press.

Tsoulfidis, L. (2010). *Competing Schools of Economic Thought*. Heidelberg: Springer.

Vieweger, W. (1970). Welchen Beitrag leisten monetäre Maßnahmen zur Stabilisierung des Geldwertes? In W. Schmitz (Ed.), *Geldwertstabilität und Wirtschaftswachstum, Währungspolitik im Spannungsfeld des Konjunkturverlaufs, Festschrift für Andreas Korp* (pp. 151–166). Wien and New York: Springer.

Woodford, M. (2012). *Inflation Targeting and Financial Stability* (NBER Working Paper 17967). Cambridge: NBER.

Woodford, M. (2013). Inflation Targeting: Fix It, Don't Scrap It. In L. Reichlin & R. Baldwin (Eds.), *Is Inflation Targeting Dead? Central Banking After the Crisis* (pp. 74–89). London: CEPR.

Wray, R. (2007). A Post Keynesian View of Central Bank Independence, Policy Targets, and the Rules Versus Discretion Debate. *Journal of Post Keynesian Economics, 30*(1), 119–141.

Znidar, M. (2015). *ECB's Public Sector Purchase Programme*. Presentation. Available at: https://www.ecb.europa.eu/paym/groups/pdf/omg/2015/20150317/Presentation_PSPP_OMCG.pdf?f3555bdfd512ffeba1707e7b41a43650. Accessed 15 Jan 2019.

6

Stock-Flow Consistent Dynamic Models: Features, Limitations and Developments

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1 Introduction

The stock-flow consistent (SFC) approach to macroeconomic dynamic modelling was developed in the 2000s by Godley and Lavoie (2007a, b), who paved the way for the flourishing of SFC models. These models are based on four accounting principles (flow consistency, stock consistency, stock-flow consistency and quadruple book-keeping), which allow inferring a set of accounting identities. The latter are then coupled with a set of equations defining the equilibrium conditions. Finally, difference (or differential)

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stochastic equations are added to define the behaviour of each macro-sector (or agent) of the economy. SFC models' coefficients can be calibrated to obtain a theoretical baseline scenario and/or estimated through standard econometric techniques. Baseline results are then compared with a variety of 'possible worlds' or shocks. This theoretical and analytical flexibility is the reason why SFC models are used by economists with different theoretical backgrounds. While SFC models are affected by some limitations, due to both their 'heavy' structure and the ex-post book-keeping they are based on, we believe that advantages outdo weaknesses. In this chapter, we provide a survey of SFC models' literature and we discuss a possible new research strand, presenting an experimental two-country SFC ecological model.

The rest of the chapter is organised as follows. Section two outlines the origin of the SFC approach. Section three presents and defines the main features of modern SFC models, which are compared to standard DSGE models in section four. Specifically, we focus on model linearity issues, parameter estimation methods, types of microfoundations and the intelligibleness of model outcomes, respectively. Section five deals with recent developments in SFC modelling. While many successful attempts at cross-breeding the basic model with other approaches (e.g. agent-based and input–output models) have been made in the last decade, we focus on two promising 'internal developments': multi-country SFC models and ecological SFC models. In section six, we present an ecological two-country model prototype. We show that, if household consumption plans are sensitive to climate change (and/or other natural phenomena), balances of payments and government budgets of less ecologically efficient countries or areas are affected. This, in turn, can trigger a reaction (either

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in the form of austerity measures or protectionist policies) that ends up reducing the international volume of trade and world output. While green innovation slows down, the fall in world output can bring about beneficial effects for the environment. However, in principle, a 'high road' to ecological sustainability would be also possible if a coordinated macroeconomic plan, aiming at fostering green innovation, was negotiated by the two parties. Concluding remarks are provided in section seven.

2 Origins of the SFC Approach

Arguably, the early theoretical roots of the SFC approach trace back to the works of Keynes (1936) and Kalecki (1972). However, it is the pioneering work of Copeland (1949) that provided the methodological cornerstone SFC models are built upon (e.g. Caverzasi and Godin 2015; Nikiforos and Zezza 2017). Copeland (1949) integrated the standard national income identity with the flow of funds through the quadruple accounting principle, thus establishing a simple and sound method to link economic and financial flows with stocks. The bridge between the Keynesian macroeconomic theory and Copeland's (op. cit.) methodology was later provided by Tobin and his research group, based at the Yale University in the New Haven (hence the name 'New Haven School' attributed to it). In his Nobel Memorial Lecture, Tobin (1982) stressed that the task of the economists is 'to bring the columns [of the flow of funds account] to life by functions relating sectorial portfolio and saving decisions to relevant variables, and to bring the rows to life as a set of simultaneous market-clearing equations' (p. 16). To bring the columns to life means, for instance, to link households' wealth-allocation decisions across different financial assets to their relative return rates, market price expectations and agents' liquidity preference. The use of Tobinesque principles to define portfolio equations is one of the key features of SFC models. Tobin's adding-up (or vertical) constraints for portfolio coefficients (Tobin 1969) have been integrated with additional horizontal constraints (Godley 1996) to make financial assets' demand functions fully consistent. Similarly, to bring flow of funds matrix's rows to life means specifying the mechanism that allows matching the

demand for financial assets with their supply. This also enables assuring the system-wide equality between financial assets and financial liabilities. While market-clearing prices are usually used for the equity and shares market and other securities, SFC modellers are reluctant to extend price adjustment mechanisms to other markets.

Tobin's (1982) influence on the SFC community is not confined to the use of portfolio equations. In fact, his Memorial Lecture has become a sort of 'manifesto' for SFC modellers. The main points can be summarised as follows:

a. *Precision regarding time*. Models must be dynamic, meaning they must evolve through non-ergodic (discrete) time, in which the economy's state at a certain time depends on the previous periods' states.
b. *Tracking of stocks*. Stocks change over time by virtue of flows, and the whole system is affected by their feedback on transactions-flows (e.g. consumption, investment and production decisions).
c. *Plurality of assets (liabilities) and return rates*. There are many different financial assets (liabilities) in the system, each of which is possibly characterised by a different interest rate.
d. *Integration of real and financial sides*. Not only is the financial sector made up of a plurality of financial assets in addition to cash money, but there is no long-run neutrality of money.
e. *Adding-up constraints and Walras' law*. As mentioned, portfolio equations must be subject to algebraic constraints to meet the stock-flow consistency criteria. In addition, for the Walrasian principle one equation of the model is logically implied by all the others and must be dropped to avoid over-determination. In fact, it can be used as a test to check the consistency of the model.

While Tobin's speech did not have a major impact on the Neo-Keynesian School (which was struggling with the 'rational expectations' revolution), his theoretical baton was taken over by the Cambridge Economic Policy Group (henceforth, CEPG), led by Wynne Godley. In his *Background memories*, Godley explains this point as follows:

> I remember the damascene moment when, in early 1974 (after playing round with concepts devised in conversation with Nicky Kaldor and Robert Neild), I first apprehended the strategic importance of the accounting identity which says that, measured at current prices, the government's budget deficit less the current account deficit is equal, by definition, to private saving net of investment. Having always thought of the balance of trade as something which could only be analysed in terms of income and price elasticities together with real output movements at home and abroad, it came as a shock to discover that if only one knows what the budget deficit and private net saving are, it follows from that information alone, without any qualification whatever, exactly what the balance of payment must be. (Godley and Lavoie 2007a, pp. xxxvi–xxxvii)

The line of research pursued by the CEPG (e.g. Godley and Cripps 1983; Coutts et al. 1985) shows clear resemblance to the one pursued by Tobin and his group (e.g. Backus et al. 1980). This methodological resemblance took the form of a direct collaboration in 1984, when the CEPG invited Tobin to Cambridge to present his portfolio asset allocation approach. The latter has been incorporated in SFC models ever since. The major difference between the New Haven school and the SFC one is theoretical, as SFC theorists have incorporated Tobin's portfolio approach 'into a monetary production economy where the supply of money is endogenous and where behavioural equations respond to Kaleckian or Keynesian precepts rather than neoclassical ones' (Lavoie 2014, p. 264). More precisely, SFC models recognise both the long-run impact of changes in aggregate demand on real variables and the independence of investment plans from saving decisions.

In the 1990s Godley joined the *Levy Economics Institute of Bard College*, where he kept refining his approach. Several empirical models for short- and medium-run forecasting were developed, based on SFC principles (e.g. Godley and Zezza 1992; Godley 1999). These efforts culminated in the development of an empirical model for the US economy named the 'Levy model' (see Caverzasi and Godin 2015; Nikiforos and Zezza 2017, for a thorough description of it). The Levy model

allowed Godley and his group to forewarn about the Dot-Com Crisis of 2000–2002 and the Global Financial Crisis of 2007–2009. The predictive power of the model was recognised by the press and earned Godley's approach an increasing popularity among the practitioners. Arguably, the impact on the academia, particularly on the current mainstream in macroeconomics, was less dramatic. However, the SFC approach has been increasingly considered a 'way of unifying all heterodox macroeconomists' (Lavoie 2014, p. 264). In a sense, an 'alternative consensus' in non-neoclassical macroeconomics has been established, based on the SFC approach, as opposed to the so-called 'new consensus' in mainstream macroeconomics, based on its rendition of the 'dynamic stochastic general equilibrium' (DSGE) class of models. In fact, the stock-flow consistency of models is now regarded as a *conditio sine qua non* for publication by many heterodox economics journals.

3 SFC Models: Definition and Main Features

The use of the label 'stock-flow consistent' is quite controversial. It was popularised and became a sort of 'brand' after the publication of Dos Santos (2006)'s definitory work (e.g. Nikiforos and Zezza 2017). Nonetheless, it is still regarded as misleading by some SFC theorists. Significantly enough, it is never mentioned in the 'Bible' of SFC modellers, namely, by Godley and Lavoie (2007a). The fact is that, while some standard macroeconomic models are not SFC (think of the traditional IS-LM-AS model), others are (e.g. most DSGE models). As a result, the label 'stock-flow consistent' does not allow to separate models based on the 'neoclassical dichotomy' from models based on a thorough integration of real and monetary aspects. Since the SFC community explicitly rejects the neoclassical dichotomy, a different label is sometimes invoked to avoid confusion. However, a new label could possibly foster controversies and misunderstandings, rather than smoothing them out. Consequently, we stick to the standard definition hereafter.

Narrowly defined SFC models are based on four accounting principles (e.g. Nikiforos and Zezza 2017; Deleidi et al. 2018):

a. *flow consistency*, meaning that every transaction-flow must come from somewhere and go somewhere;
b. stock consistency, meaning that the financial liability issued by an economic unit (be it a firm, a household, a bank, a financial intermediary or the State) must be held as a financial asset by another economic unit;
c. *stock-flow consistency*, meaning that flows affect stocks and this impact must be accurately registered (including capital gains and losses);
d. *quadruple book-keeping*, meaning that every transaction requires filling in four different entries.[1]

These four principles are incorporated in the Balance-Sheet (BS) and the Transactions-Flow Matrix (TFM) of the economy, providing the accounting framework SFC models' identities are derived from. The BS encompasses sectoral assets and liabilities. Assets are usually recorded using a positive sign, while liabilities (and net worth) have negative sign. The TFM is obtained by combining the national income equation with the sectoral flow of funds accounting. Receipts or sources of funds are usually recorded using a positive sign, whereas payments or uses of funds are given a negative sign. The latter displays the changes in the stocks at time t due to purchases of new assets (issues of new liabilities). Notice that changes in stocks' values due to changes in assets' prices are not included here. They are sometimes recorded as revaluation effects in a third matrix, named the Full-Integration Matrix (FIM), where each sector's net wealth at time t is calculated by adding capital gains (subtracting capital losses) to net wealth at time $t - 1$.

SFC matrices, particularly the TFM, allow inferring the first set of model equations in the form of accounting identities (e.g. national income, net wealth, etc.). The latter are then coupled with a second set of equations defining the equilibrium conditions (e.g. labour supply equals labour demand). Finally, difference (or differential) stochastic

[1]More specifically, there must be always an inflow in favour of a unit, call it A, that matches the outflow faced by another unit, call it B, along with a reduction in assets held by (or an increase in liabilities of) unit A that matches the increase in assets held by (or the reduction in liabilities of) unit B.

equations are added, to define the behaviour of the macro-sectors of the economy under observation (e.g. consumption, investment and import functions). The inclusion of behavioural equations, which are usually borrowed from the post-Keynesian tradition in economics, differentiates SFC models from purely 'hydraulic' models, which just rely on accounting principles. Identities only provide a general set of constraints, which enable reducing the 'degrees of freedom' of models. In fact, early SFC modellers thought that building models upon a sound accounting structure would have reduced significantly the range of possible long-run findings (e.g. Godley and Cripps 1983). Unlike Solow-type models, SFC models do not have their medium-run dynamics constrained by any supply-side exogenous attractor (e.g. the 'natural output' and/or the 'natural unemployment level'). Production and employment are always demand-led.[2] Full employment is not guaranteed by price flexibility. The economy's medium-run dynamics is constrained by the accounting structure of the model. If a sector or a national economy is running a surplus, there must be another sector or national economy that is facing a deficit, after all. A policy corollary follows that fiscal policies and/or other types of intervention of the government sector are necessary to achieve and maintain full employment and financial stability, while traditional monetary policies are usually less effective. This is not to say that stochastic equations are uninfluential in the modelling. On the contrary, behavioural hypotheses are still crucial, 'as has been confirmed when new SFC models, with assumptions slightly different from those of the earlier ones, produced different trajectories' (Lavoie 2014, pp. 273–274).

Focusing on one-country SFC models, four sectors are usually considered, notably, households, firms, banks and the government. However, SFC models can be further extended to include additional

[2]However, the accumulation of (unsold) inventories is possible when actual demand falls short of expected demand and hence firms' production plans turn up to be too optimistic. In addition, credit rationing is considered, and supply-side constraints may well arise from the ecosystem (e.g. climate change and the depletion of natural reserves of matter and energy). The central role played by aggregate demand is the reason some authors refer to these models as 'post-Keynesian stock-flow consistent' models (e.g. Caverzasi and Godin 2015).

sub-sectors (e.g. wage-earners as opposed to rentiers and capitalists, non-bank financial institutions as opposed to commercial banks, etc.), national economies and other social and ecological variables. Once their theoretical structure is set up, SFC models are usually solved through computer numerical simulations.[3] For this purpose, models' coefficients can be:

a. calibrated, based on stylised facts or rules of thumb;
b. estimated through standard econometric techniques;
c. fine-tuned in such a way to obtain a specific baseline scenario.

Arguably, option (a) is still the most popular. In this case, the robustness of the results is usually checked through sensitivity tests. However, option (b) has gained momentum in the last decade, as empirically estimated models are more suited to policy purposes. Method (c) is employed to set coefficient values that cannot be estimated or to obtain a specific baseline. These values are often calculated using model equations along with observed initial values for stocks and lagged endogenous variables. Finally, auto- and cross-correlation structures of simulated data (or out-of-sample predictions) are sometimes compared with the observed ones. The aim is to verify whether observed and simulated series share the same statistical properties.

Whatever the calibration method chosen, baseline results are usually compared with a variety of scenarios or shocks. SFC models' analytical flexibility is the reason they are used by economists with different theoretical backgrounds. In fact, SFC models have been crossbred with other non-neoclassical approaches, including 'interacting heterogeneous agents'-based models, input-output analyses, supermultiplier mechanisms, ecological flow-fund models, etc. Despite this heterogeneity, narrowly defined SFC models are all based on a sound macroeconomic accounting, which allows for a complete integration of the real and the financial side of the economy. Money is not a veil laid over real

[3]Algebraic or analytical solutions are sometimes provided for the simplest models but cannot be calculated for the most sophisticated models.

variables. On the contrary, real variables are affected by the way credit money is created, circulated and destroyed in the economy. The money creation process, in turn, is affected by real variables (for instance, an increase in the expected growth rate of output raises the level of investment that can be financed by bank loans). Government money (or high-potential money) is also considered, along with a variety of financial assets and liabilities (including loans, mortgages, deposits, bonds, shares and equities, other securities and derivatives). For SFC models are not just stock-flow *consistent*, but also stock-flow *relevant*, meaning that are built upon a 'realistic' description of how a financially sophisticated capitalist economy works.

4 SFC vs. DSGE Models: A Comparison

DSGE models have dominated mainstream macroeconomics in the last three decades. Focusing on the basic (closed economy) reduced-form model, there are usually three theoretical building blocks, which define an IS-like curve (demand side), a Phillips curve (supply side) and a monetary rule, respectively.[4] Each block is micro-founded, meaning that each equation of the reduced-form macroeconomic model is obtained by solving a problem of intertemporal maximisation subject to constraints. More precisely, to obtain the IS-like curve, it is assumed that the representative household maximises its lifetime utility function (including consumption, real money balances and hours worked, plus the discount factor, labour supply elasticity and other 'deep' parameters) subject to a budget constraint. To obtain the Phillips curve, it is assumed that the representative firm maximises its profit subject to the technical constraints (production function) and/or price constraints (e.g. menu costs). To derive the monetary rule, it is usually assumed that the central banker steers the money market interest rate in such a

[4]Also the simpler, benchmark 3-equation model, also known as the New Consensus Model, is built upon an IS curve, a Phillips curve and some sort of a monetary rule. See for example Lavoie (2015).

way to minimise its loss function (whose arguments are the deviation of inflation from the target level and the deviation of current output gap from the natural level) subject to the Phillips curve. DSGE models can be regarded as a particular class of Real Business Cycle (RBC) models (e.g. Kydland and Prescott 1982; Long and Plosser 1983). Therefore, it is no surprise that early RBC-DSGE models were based on the assumption of perfect markets, entailing price and wage flexibility. Since the mid-1990s, these models have been gradually displaced by a new generation of DSGE models, named New Consensus Macroeconomics (NCM) DSGE models. Like the original RBC-DSGE models, NCM-DSGE models usually rely on rational expectations. However, NCM-DSGE models account explicitly for market imperfections (rigidities, frictions and asymmetries) in the short term, which can temporarily keep current output from adjusting to its natural or long-run equilibrium level. However, price stickiness and other imperfections also allow the central bank to influence the real interest rate (and so current output and inflation) in the short run, while steering the nominal rate. Besides, NCM-DSGE models can include non-microfounded parts (e.g. the backward-looking component of inflation in the so-called NCM Phillips Curve), based on empirical evidence, to improve their fit of observed time series.[5] The models are then calibrated or estimated (using Bayesian techniques) in such a way to trace the behaviour of macroeconomic variables back to 'deep structural parameters' defining agents' preferences and technical and institutional constraints.

Despite the relatively higher degree of 'realism' (compared to the early DSGE models), NCM-DSGE models have been harshly criticised in the aftermath of the Global Financial Crisis. In fact, their use is still highly contentious (e.g. Mankiw 2006; Romer 2016; Stiglitz 2018; Krugman 2018). Unsurprisingly, SFC models are frequently mentioned as possible alternatives (e.g. Burgess et al. 2016; Caiani et al. 2016). However, are SFC models exempt from the flaws attributed to NCM-DSGE models? To address this question, we focus on four standard

[5]Allegedly, the most famous DSGE model is the so-called Smets–Wouters model, developed by the European central bank (Smets and Wouters 2003; see also, Lindé et al. 2016).

criticisms directed at mainstream models, which concern model linearity, parameter estimation methods, types of microfoundations and the intelligibleness of model outcomes, respectively.

As mentioned, DSGE models (be they RBC or NCM) usually assume rational expectations, that is, economic agents use all available information and know the model underlying the economy. As a result, agents never make systematic errors. Predictions are correct on average, meaning that they do not differ predictably from equilibrium results. The use of rational expectations allows inter alia justifying the stability of models, thereby making the linearisation of nonlinear economic systems possible. Typically, DSGE models' solutions are all unstable except one, that is, the 'saddle path solution' (e.g. Rankin 2011). The existence of a unique and stable equilibrium is guaranteed by the so-called 'transversality condition', which, in turn, is based on the rational behaviour hypothesis.[6] If the latter were abandoned, the former would be hardly met. Notice that linearity, as an assumption, is what allows the models to extrapolate existing trends from time series to predict future values. While this may sound controversial, SFC models are usually based on linear equations too. However, they can be amended to incorporate non-linearities. Besides, while DSGE models are specifically used to extrapolate existing trends into the future, SFC models are generally used to ask whether existing trends can be sustained (Keen 2016).

A second alleged flaw of DSGE models concerns the estimation of model coefficients. Both calibration and Bayesian estimation techniques have been criticised. The problem with the former is that 'the choice to rely on a "standard set of parameters" is simply a way of shifting blame for the choice of parameters to previous researchers' (Blanchard 2018, p. 45). As for the latter, 'the justification for the tight priors is weak at best, and what is estimated reflects more the prior of the researcher than the likelihood function' (Ibidem). Once again, SFC models are possibly affected by the same problem. An accurate estimation of

[6]The transversality condition rules out explosive paths or bubbles, when the current value of a certain variable, say the inflation rate, depends on its expected future value. It holds that the increase in expected inflation is not 'too fast'. As a result, the path of inflation is convergent.

parameter values can improve models' fit. However, it is hard to understand whether the model is actually capturing any 'causal trend' or it is just reproducing the noise in the data instead. To reduce the risk of pure data-fitting exercises, SFC modellers usually opt for equation-by-equation estimation techniques (sometimes based on cointegration). In addition, the inclusion of financial assets (liabilities) stocks and flows, along with the accurate modelling of different sectors (including the financial sector), make SFC models more realistic and, arguably, less likely to blunder. It is sometimes counter-argued that DSGE models have incorporated some financial variables, and even some agent heterogeneity, since the mid-2000s. However, DSGE models simply treat these features as additional sources of frictions, which can only slow down the process of convergence to a predetermined, natural, equilibrium. Unlike IS-LM-AS models, DSGE models are usually SFC, as money is defined residually. However, they are not stock-flow relevant, as financial stocks and flows are like sand in the machine, rather than a crucial gear of it.

A third issue with DSGE models concerns the type of microfoundations they are based on: a representative agent maximising her utility or profit function subject to constraints.[7] This is said to address the Lucas critique about the sensitivity of macroeconometric models' parameters to changes in the policy stance. For calibrating or estimating deep structural parameters (preferences, technical constraints, etc.) would allow anchoring the model to invariant magnitudes. However, three major counter-arguments can be raised here. First, the empirical relevance of the Lucas critique has been questioned. Second, deep structural parameters are not as invariant as they are assumed to be (e.g. Altissimo et al. 2002). Third, linking the dynamics of a macroeconomic system to the behaviour of a representative agent is a smart *escamotage* to address the well-known flaws of early Walrasian

[7]As mentioned, some agent heterogeneity has been allowed for in the last decade. For instance, Ricardian households (who can borrow and lend to smooth their consumption over time) are now sometimes coupled with non-Ricardian households (who cannot rely on the credit market). However, this is just a different type of friction, which in no way affects the qualitative behaviour of the model in the long run.

general equilibrium models (concerning the uniqueness and stability of the equilibrium). However, capitalist economies are complex systems. The latter show emergent properties that their individual parts do not possess, and which result from the interaction of the individual parts. This means that the behaviour of aggregate variables must be studied either from a macroeconomic perspective (i.e. macrofoundations) or from a bottom-up generative approach (i.e. interacting agents-based microfoundations). SFC models are suitable for both options, whereas DSGE are stuck in a theoretical limbo.

The main advantage of DSGE models, compared to SFC models, seem to be the simplicity of the narrative brought about by the former. Technically speaking, DSGE models are highly sophisticated models. Their developers are required to master both dynamic optimisation techniques and Bayesian statistics. Nonetheless, once a model is set up, it produces '(at least when linearised) a VAR representation of the endogenous variables that should, in theory, be straightforward to take to the data' (Burgess et al. 2016, p. 3). In addition, reduced-form three-equation DSGE models are very useful to tell the students, the practitioners and the policy-makers, a simple story about the way our economies work. The implied causality is simple and intuitive: the central bank steers the nominal interest rate, thus affecting the real cost of money (because prices are sticky in the short run) and hence current output; the latter, in turn, determines the inflation rate, in the long run, which is also influenced by price expectations. This is the reason why central banks must be credible (mainly inflation-targeting) institutions, independent from the control of governments and parliaments. By contrast, the interpretation of SFC models' outcomes is not always straightforward. On the one hand, the TFM includes a variety of flow variables, whose interactions (and the interaction with stock variables) determine model dynamics. The latter is not trivial, as there is no long-run attractor that predetermines it. As a result, multiple equilibria are possible. On the other hand, the System of National Account (SNA) is far more detailed than any 'tractable' SFC model could possibly be. For instance, the ONS Blue Book contains around 6500 time series referred to transactions and other flow variables, while an SFC model usually includes less than 200 series. Unfortunately, there is still no standard method to

match the usual SFC matrices with the information provided by the SNA, even though a few attempts have been made in recent times (e.g. Burgess et al. 2016; Veronese Passarella 2019).

5 Recent Developments in SFC Modelling

The SFC approach has been developed in a period marked by two major economic and financial crises of advanced countries. SFC models are naturally fit for the analysis of the interaction between the real and financial sector. So, it is no surprise that the so-called 'financialisation' process has been one of the most popular topics in the SFC literature since its inception (e.g. Skott and Ryoo 2008; Lavoie 2008; Van Treeck 2008; Hein and Van Treeck 2010; Michell and Toporowski 2012; Morris and Juniper 2012; Veronese Passarella 2012; Reyes and Mazier 2014; Botta et al. 2015; Sawyer and Veronese Passarella 2017). The increasing importance of financial motives, tools and agents is not the only subject covered by SFC theorists. Income distribution, credit rationing, growth determinants, economic policies and ecological issues have been covered as well (for a detailed rendition, see Caverzasi and Godin 2015; Nikiforos and Zezza 2017). In addition, there have been at least two types of 'external' development, or cross-fertilisations, and three types of 'internal' development of SFC models.

The former aim at cross-breeding the original model with other analytical tools and/or modelling techniques. Successful cross-fertilisations include agent-based SFC models (AB-SFC) and input–output SFC models (IO-SFC), providing the basic model with micro- and meso-foundations, respectively. AB-SFC models are usually employed to detect the emergent properties of the economic system resulting from the interaction of a variety of heterogeneous agents, in which the use of a generative or bottom-up approach is required. These models are particularly fruitful in the study of financial diseases, such as bankruptcy chains, financial contagion phenomena, etc. (e.g. Caiani et al. 2016). Besides, they have been employed to detect the effects of distributive inequality and credit constraints on consumption, investment and output (e.g. Cardaci and Saraceno 2016; Botta et al. 2018). IO-AB,

in contrast, allow analysing the process of dynamic structural change that characterises capitalist economies, which a standard aggregate SFC model would not be able to capture (e.g. Berg et al. 2015).

The three main types of internal developments are: empirical SFC models (E-SFC), open economy or multi-country SFC models (MC-SFC) and ecological SFC models (Eco-SFC).

5.1 E-SFC Models

While the majority of SFC works are still purely numerical-simulation models, there is an increasing interest for empirical applications of the SFC approach. We can name E-SFC models those in which (most) unknown parameters are estimated from available data through econometric procedures. The most popular estimation methods are equation-by-equation ordinary-least squares (OLS) and vector-error correction models (VECM). Unlike DSGE modellers, SFC modellers rarely opt for system estimation techniques instead. Although the latter may allow for an excellent fit of past data, equation-by-equation methods enable attributing clear economic meaning to behavioural equations' coefficients, thereby helping the modeller to extrapolate and detect the economy's laws of motion. Initial values of stocks and lagged endogenous variables are also set in line with available data.

Focusing on the main characteristics, we can distinguish early E-SFC models, including the Levy model, from those developed in the last decade. Early models are usually developed starting from available data, rather than an already-made theoretical model. In addition, the information they rely on (e.g. data, code, program files) is usually not freely accessible. An example of early E-SFC model is the one used by Godley and Zezza (1992), who applied it to the Danish economy. The Levy model underpins the analyses released by the Levy Institute for the US economy (e.g. Godley 1999; Godley and Zezza 2006; Godley et al. 2007, 2008; Papadimitriou 2009; Papadimitriou et al. 2011), and the Greek economy (e.g. Papadimitriou et al. 2013a, b, 2015). Most recently, SFC modellers have stressed the need for making all the information available to the public, thus assuring

the reproducibility of results. There are also some methodological differences between the Levy approach and other E-SFC models. For instance, in the so-called 'Limerick model' for the Irish economy, most coefficients are not estimated as fixed parameters, but calibrated to fit available time series (e.g. Kinsella and Aliti 2012a, b, 2013; Godin et al. 2012; see also, Caverzasi and Godin 2015 on this point). The rationale is to use the model to ask 'as if' questions about alternative policies implemented in the past, rather than to forecast future trends. An analogue approach was used by Miess and Schmelzer (2016a, b) for the Austrian economy. E-SFC models have been also applied to developing countries, e.g. Colombia (see Escobar-Espinoza 2016).

The increasing popularity of the SFC approach has led the Bank of England to develop an E-SFC prototype aimed at providing scenario analyses for the British economy (see Burgess et al. 2016). On the same line, a simple empirical model using Eurostat data for Italy has been also proposed (see Veronese Passarella 2019). In a sense, E-SFC models can be considered a middle-ground between, on the one hand, numerical SFC and other theoretical models and, on the other hand, vector auto-regression (VAR) models.

5.2 MC-SFC Models

The analysis of the open economy has been one of most interesting applications of the SFC approach since its launch. The main reference for the 'first generation' of MC-SFC models is Chapter 12 of Godley and Lavoie (2007a), where a complete two-country model is developed. It must be noticed that SFC methodology

> differs from the usual textbook approach, according to which models of individual closed economies are eventually 'opened', but which give no consideration to what other countries must be held to be doing and how a full set of interactions between all countries might be characterized. […] We shall discuss open economy macro-economics using models of an economic system which, taken as a whole, is closed, with all flows and all stocks fully accounted for wherever they arise. (p. 171)

The model can be run under four different monetary regimes, notably, a flexible exchange regime system, a fixed exchange rate system with foreign reserves, a fixed exchange rate system with an endogenous interest rate and a fixed exchange rate system with endogenous government spending. The model of Chapter 12, particularly its flexible exchange rate version, has represented the main reference for the subsequent generation of MC-SFC models. When a two-country economy is considered, portfolio equations can take into account the expected change in the exchange rate as one of the factors that drive households' demand for financial assets. This point is developed by Lavoie and Daigle (2011), who integrate the SFC approach with some recent contributions from behavioural finance. More precisely, two different attitudes or behavioural profiles of economic agents (or traders) are considered: (a) the 'conventionalists' are those whose expectations are anchored to a conventional long-term value of the exchange rate; (b) the 'chartists', in contrast, base their expectations on the previous value of the exchange rate. Main findings can be summarised as follows. First, while expectations are shown not to affect (qualitatively) the trajectories of consumption and investment, they do affect both the long-run level of the actual exchange rate and the trade balance. Second, economic and financial instability increases as the share of 'chartists' to total traders increases. Third, the model exhibits weak hysteresis proprieties, meaning that shocks' effects are more persistent when expectations are considered.

As mentioned, Godley and Lavoie's (2007a) 2-country model has paved the way for the subsequent generation of MC-SFC models. The latter have extended the scope of SFC models beyond their original boundaries. For instance, Ioannou (2018) uses a MC-SFC model to study the impact of credit rating agencies' activity on a two-country monetary union. The model shows that sovereign rating boosts the business cycle, thus accentuating recessionary shocks. As one would expect, the weakest country is particularly affected. In addition, credit rating agencies' 'perception of what constitutes a sustainable debt to GDP ratio have self-fulfilling proprieties and may generate additional instability into the system' (Ioannou 2018, p. 153).

Nonetheless, the analysis of international imbalances is by far the most popular topic covered by MC-SFC models. In the wake of

Lequain (2003), Godley and Lavoie (2007b) developed a three-country model where two of the countries share a currency (i.e. the Euro). Although simulations are purely numerical, the model explicitly mimics the relationship between the US economy and the Euro Area, and the one between peripheral (or deficit) and core (or surplus) members of the monetary union. In hindsight, the model provides some accurate (conditional) forecasts about the effects that the Global Financial Crisis has had on the Euro Area. Using a flexible exchange rate between the US dollar and the Euro, Godley and Lavoie (2007b) show that, when a peripheral Euro Area's member-state faces a current account deficit (following a negative shock to the economy, such as an increase in the propensity to import), there is no automatic readjustment mechanism. For the devaluation of the Euro (with respect to the US dollar) benefits the core member-states, while the periphery keeps running a current account deficit along with a government budget deficit. This means that the policy-makers have three options to rebalance the current account (and government budget) imbalances within the monetary union: (a) to push the deficit country to cut government spending and/or increase taxes (i.e. austerity measures); (b) to persuade the surplus country to adopt expansionary fiscal policies; (c) to mutualise the government debt of the Euro Area. Compared to options (b) and (c), option (a) is less effective and entails a remarkable loss in terms of production and employment levels, which seems to be coherent with the historical evidence. In principle, wage cuts in peripheral countries (and/or a wage rise in core countries) can also support the rebalancing process. However, we use a fixed price model that rules out this option.

On the same line, Duwicquet and Mazier (2012) use a MC-SFC model to test the effect of Euro Bonds and other forms of money transfers from surplus to deficit Euro Area's member-states. The aim is to offset the hidden transfer that runs in the opposite direction because of the exchange rates' misalignment within the Euro Area. Their simulations show that these policies are effective in addressing asymmetrical shocks and rebalancing national current account and government balances. Using a four-country model, Mazier and Valdecantos (2015) analyse four different scenarios. These are: (a) the status quo, marked by a single currency and floating exchange rates of two Euro Area members

(or blocks) with the US and the rest of the world; (b) a Eurozone with three 'euros'; (c) a return to the European Monetary System, where a 'global euro' is used as an international currency and unit of account; (d) a Euro Area without (current) surplus countries. The last scenario is shown to be the most stable. In fact, this solution can be 'beneficial for all' (Mazier and Valdecantos 2015, p. 108). Similarly, Mazier and Aliti (2012) develop a three-country model (including the US, the Euro Area and China) that highlights the negative impact on the Euro Area deriving from a reserves' diversification strategy undertaken by the People's Bank of China (in favour of assets denominated in euros). This confirms the early findings by Lavoie and Zhao (2010). The paper shows also that balance of payments' imbalances are linked with the semi-fixed US Dollar-Yuan parity system. A 'real' floating exchange rate between the US Dollar and the Yuan would help reduce the US current account deficit (and hence the Chinese surplus). Although this scenario is regarded as unrealistic, Chinese authorities could achieve similar results by allowing for a gradual appreciation of the exchange rate in real terms.[8] Finally, using a four-country model, Valdecantos and Zezza (2015) compare a 'US dollar-based' or 'post-Bretton Woods' model with an ideal 'Bancor' model, inspired by the well-known Keynes' plan for the international monetary system. They show that the adoption of a common international currency (i.e. the Bancor) and the establishment of a supranational clearing union would reduce cross-country imbalances, thus helping to achieve economic prosperity and financial stability. The rebalancing effect would result from surplus countries being forced to contribute to the adjustment, as they would be accruing negative interests on their reserve holdings. These payments would be then used to promote investment and innovation in deficit countries.

The main features of a simple two-country model (2C-SFC) are summarised by Tables 1 and 2, defining the BS and the TFM, respectively. All the variables relevant to the first country or area, named Ecoland, have a *g* superscript (which stands for 'green'), while all the variables relevant to the other country, named Carbonl and, are marked by a

[8]The IMF defines China's regime of exchange rate as 'stabilized arrangements' (IMF 2017).

Table 1 Balance-sheet of a simplified two-country economy

	Ecoland (*g*)			Carbonland (*c*)			
	Households	Government	Central bank	Households	Government	Central bank	Σ
Money	$+H_{gh}$		$-H_{gh}$	$+H_{ch}$		$-H_{ch}$	*0*
Bills	$+B_{gh}$	$-B_g$	$+B_{gcb}$	$-B_{ch}$	$-B_c$	$+B_{ccb}$	*0*
Gold reserves			$+OR_g \cdot p_{org} \cdot E$			$+OR_c \cdot p_{orc}$	$OR_g \cdot p_{org} \cdot E + OR_c \cdot p_{orc}$
Balance (net worth)	$-V_{gh}$	$+V_{gG}$		$+V_{ch}$	$+V_{cG}$		$-(OR_g \cdot p_{org} \cdot E + OR_c \cdot p_{orc})$
Σ	0	0	0	0	0	0	0

Notes: E is the exchange rate. A '+' before a magnitude denotes an asset, whereas '–' denotes a liability (except for Balance's entries, where signs are reversed). Fixed exchange rates are assumed. No private transactions in foreign assets are allowed. Central banks held all their foreign exchange reserves in the form of gold

Table 2 Transactions-flow matrix of a simplified two-country economy

	Ecoland (*g*)					Carbonland (*c*)				
	Households	Firms	Government	Central bank		Households	Firms	Government	Central bank	Σ
Consumption	$-C_g$	$+C_g$				$-C_c$	$+C_c$			0
Gov. spending		$+G_g$	$-G_g$				$+G_c$	$-G_c$		0
Ecoland export to Carbonland		$+X_g$			$\cdot E$		$-IM_c$			0
Carbonland export to Ecoland		$-IM_g$			$\cdot E$		$+X_c$			0
GDP	$+Y_g$	$-Y_g$				$+Y_c$	$-Y_c$			0
Interests	$+r_{g,-1} \cdot B_{gh,-1}$		$-r_{g,-1} \cdot B_{g',-1}$	$+r_{g,-1} \cdot B_{gcb',-1}$		$+r_{c,-1} \cdot B_{ch,-1}$		$-r_{c,-1} \cdot B_{c',-1}$	$+r_{c,-1} \cdot B_{ccb',-1}$	0
CB profits			$+r_{g,-1} \cdot B_{g',-1}$	$-r_{g,-1} \cdot B_{gcb',-1}$				$+r_{c,-1} \cdot B_{c',-1}$	$-r_{c,-1} \cdot B_{ccb',-1}$	0
Taxes	$-T_g$		$+T_g$			$-T_c$		$+T_c$		0
Change in cash	$-\Delta H_{gh}$			$+\Delta H_{gh}$		$-\Delta H_{ch}$			$+\Delta H_{ch}$	0
Change in bills	$-\Delta B_{gh}$		$+\Delta B_g$	$-\Delta B_{gcb}$		$-\Delta B_{ch}$		$+\Delta B_c$	$-\Delta B_{ccb}$	0
Change in gold				$-\Delta OR_g \cdot p_{org}$	$\cdot E$				$-\Delta OR_c \cdot p_{orc}$	0
Σ	0	0	0	0		0	0	0	0	0

Notes: *E* is the exchange rate. A '+' before a magnitude denotes a receipt or a source of funds, whereas '–' denotes a payment or a use of funds. Fixed exchange rates are assumed. No private transactions in foreign assets are allowed. Central banks held all their foreign exchange reserves in the form of gold

c superscript.[9] For the sake of simplicity, it is assumed that the private residents of each country do not hold foreign assets.[10] The exchange rate, E, is fixed.[11] As a result, any discrepancy between sales and purchases on the exchange market are made good by transactions of the two national central banks. The latter held all their foreign exchange reserves in the form of gold.[12] The shaded column dividing Table 2 shows that all transactions between the two countries require conversion, because each country has a central bank that issues its own currency. This is accounted for by the BS (Table 1), which also shows that each country has its own government. The latter issues domestic-currency denominated bills. The third row of Table 1 show that each central bank owns a stock of gold reserves. These reserves are physical (not financial) assets. Like fixed capital, they have no liability as their counterpart. As a result, the value of the gold reserves appearing in the last column is not zero, although central banks have zero net worth.

It is assumed that the residents of neither country hold the currency of the other. When they are paid for the products they sell abroad, they exchange their foreign-currency-denominated proceeds into their own currency. Similarly, when they purchase imported products, they must first obtain the foreign currency from the central bank. This means that any 'excess of (private sector) payments for imports over receipts from exports must therefore have an identical counterpart in transactions involving the two central banks, using […] sales or purchases of gold bars valued at some fixed rate in terms of its own currency. With a fixed exchange rate and no restrictions on trade, each central bank must be willing to buy or sell gold on any scale at that fixed rate' (Godley and

[9]The meaning of country names is clarified in Sect. 5.

[10]Consequently, one needs not to worry about the exchange rate when summing the elements of each row, except for the stock of gold reserves in the BS, the export (import) entries, and the change in gold reserves in the TFM.

[11]It is here defined as the quantity of Brownland currency in exchange for one unit of Ecoland currency.

[12]These are the key hypotheses underpinning the so-called Model OPEN, i.e. the simplest 2C-SFC model presented in sections 6.6–6.9 of Godley and Lavoie (2007a).

Lavoie 2007a, p. 189).[13] Finally, an interesting feature of 2C-SFC models' TFMs is that there is no column displaying the balances of payment of the two countries. However, cross-country trade flows can be derived from the two rows describing exports. This is the current account of the balance of payment. Its financial counterpart is given by the changes in (or transfers of) gold reserves, which are a zero-sum game for the economy as a whole.

5.3 Eco-SFC Models

An increasing number of either aggregative or agent-based Eco-SFC models have been developed in the last decade, which aim at:

a. detecting sustainable growth conditions and questioning the growth imperative (e.g. Jackson and Victor 2015; Richters and Siemoneit 2017);
b. studying the energy sector (e.g. Naqvi 2015; Berg et al. 2015);
c. investigating the trajectories of key environmental, macroeconomic and financial variables (e.g. Dafermos et al. 2017, 2018);
d. analysing the impact of green fiscal policies and 'green sovereign bonds' (e.g. Monasterolo and Raberto 2018; Bovari et al. 2018);
e. examining the interaction between climate change and financial stability (e.g. Dafermos et al. 2018);
f. or between natural resources' depletion and State-led innovation policies (e.g. Deleidi et al. 2018).

More precisely, Jackson and Victor (2015) raise the question whether growth is necessary for capitalist economies to survive. In other words, they check whether a 'growth imperative' exists, which is determined by the need for the borrowers to pay back the interests due on the stock of outstanding debt. For this purpose, they use a SFC dynamic

[13]This is just a useful modelling simplification. It is well known that gold bars are no longer traded, and reserves of central banks are mainly made up of foreign currencies (US dollars, Euros and other key currencies).

macro-economic model accounting for the credit creation process led by banks and private equity in a closed economy. They find no evidence of a 'growth imperative'. In addition, they show how an economy can move from a growth to a stationary (or no growing) path. They argue that the countercyclical spending carried out by governments can promote such a transition by smoothing and dampening the oscillations associated with it.

Similarly, Richters and Siemoneit (2017) analyse several SFC post-Keynesian models and question the idea of positive interest rates as the main responsible for the 'growth imperative'. Particularly, a stationary state economy—characterised by zero net saving and investment—is compatible with positive interest rates. The chapter confirms the idea of a debt-based monetary system that does not cause any growth imperative. A stationary state is generated by positive net saving and net investment decisions, which are permanently above zero, and not by a systemic and inevitable necessity.

Naqvi (2015) proposes a multisectoral SFC model for a closed economy. Production is demand-led and the economy is made up of several institutional sectors (firms, energy, households, government and financial institutions), which interplay with the environment. The model is calibrated on the European economy and aims at evaluating the effect of five alternative environmental economic policies (i.e. a de-growth scenario, a capital stock damage function, a carbon tax, a higher share of low-emissions renewable energy and an investment in technical innovation) on three main challenges (trilemma): (i) boosting output growth; (ii) fostering employment growth with a more equal distribution; or (iii) improving environmental sustainability. The study is motivated by a trilemma that European policy-makers are currently facing. Naqvic's (op. cit.) findings show that four out of five policies cannot solve the three challenges simultaneously. Only the investment in innovative technologies can increase output, foster employment (and wage growth), while reduce CO_2 emissions.

Berg et al. (2015) develop a multisectoral ecological SFC model by integrating the flow and stock analysis with the input–output methodology. This allows to model to detect the interaction among three types of flow variables: (i) monetary flows in the financial system; (ii) flows of

goods and services produced by the real economy; and (iii) the flow of physical materials related to the natural environment. These models are more flexible than standard aggregate SFC models, for they allow modelling a variety of sectors. The model developed by Berg et al. (2015) considers an economy made up of five sectors: the government sector, the banking system, the household sectors and two industrial sectors that produce energy and goods. The main findings of the paper can be summarised as follows: (i) a no growing economy can be associated with positive interest rates; (ii) an increase in energy prices can negatively affect the economic system by lowering real wages and aggregate demand, thus triggering a recession. Overall, the model shows hot to integrate heat emissions due to economic activities and climate change modelling.

Dafermos et al. (2017) develop a stock-flow-fund ecological macroeconomic model calibrated on global data, which combines a standard SFC framework with the flow-fund approach developed by Georgescu-Roegen (1979). In the model, the output is demand-led and finance is non-neutral. This allows considering the channels through which the monetary system, the real economy and the ecosystem, interact and affect each other. The two laws of thermodynamics are explicitly modelled. Supply constraints are determined by the exhaustion of natural resources as well as by environmental damages. Furthermore, climate change is included in the analysis and affects aggregate demand through the influence of catastrophes, global warming, and health issues, on the desired level of investment, savings, consumption and potential output. The paper focuses on two types of green finance policy: (i) a reduction in interest rates and the relaxing of credit rationing criteria on green loans, coupled with unchanged conditions on the remaining types of loans; (ii) a reduction in interest rates and the relaxing of credit rationing criteria on green loans, coupled with tighter conditions on conventional types of loans. The second policy generates better environmental results than the first policy, because of the lower economic growth rate. Particularly, a lower output level combined with a larger share of green investment created gives rise to lower CO_2 emissions and therefore a lower atmospheric temperature. Finally, the leverage ratio of firms is lower under the second green finance policy, despite the lower economic

growth rate. These results are due to the fact that damages derived by global warming are lower when the share of green loans increases.

Dafermos et al. (2018) aim at assessing and investigating the existing links between climate change and financial (in) stability. Using a stock-flow-fund macro model, the authors argue that an increase in the average temperature can be detrimental for firms' profitability and financial stability, possibly leading to a higher default rate and increasing the risk of systemic bank losses. The authors focus on the physical risks implied by climate change. They maintain that 'climate-induced financial instability reinforces the adverse effects of climate change on economic activity' (Dafermos et al. 2018, p. 220). In addition, they consider the impact of global warming on households' portfolio choices. The latter tend to be diverted towards 'safer' and more liquid assets (because of the impact on economic agents' confidence), such as deposits and government bonds, causing in this way a decrease in corporate bonds' prices. To tackle the financial instability triggered by climate change, a green quantitative easing programme, regarded as a long-term industrial policy, is proposed and discussed. The authors analyse a hypothetical scenario where central banks decide to buy a quarter of total green bonds worldwide. The policy's effectiveness is shown to vary according to the parameters of the model. More precisely, a crucial role is played by the sensitivity of investment in green capital assets to the differential between green bonds' and conventional bonds' yields. However, green QE policies usually help counter financial instability. Investment financing turns out to be less dependent on bank credit, and hence less subject to credit crunch risks. Moreover, slower climate change implies a reduced degree of economic damages. Therefore, firms' profitability is restored, liquidity problems are dampened and the default ratio decreases.

The model developed by Deleidi et al. (2018) is based on four different theoretical approaches: (i) the Sraffian supermultiplier model; (ii) the Neo-Schumpeterian framework which emphasises the entrepreneurial role of the State; (iii) the SFC approach to macro-economic modelling; (iv) and recent developments in ecological economics literature aiming at extending post-Keynesian theories and models to deal with environmental issues. The paper aims at developing a simple

analytical tool that can help examine: (i) the impact of innovation on economic growth and the ecosystem; and (ii) the impact of ecological feedbacks on economic growth and government spending effectiveness. The authors find that, in principle, the government can be successful in supporting innovation and growth while slowing down natural reserves' depletion rates and tackling climate change. This requires targeting green innovations policies characterised by the highest ecological efficiency gains. More precisely, the State can actively promote green innovation, thus driving a change in the overall economic structure. However, ecological feedbacks affect government policy effectiveness. In addition, it is argued that the policy-makers are likely to be facing a conundrum in the next decade: green innovation allows for lower matter-, energy- and CO_2-intensity coefficients, but the higher investment and production levels may well frustrate these efficiency gains.

Bovari et al. (2018) combine a SFC approach with a dynamic predator–prey of the Lotka–Volterra model.[14] They analyse the challenges posed by climate change in conjunction with private indebtedness. The starting point of the analysis is as follows: climate change mitigation is an expensive process and, given the multiple constraints imposed on public finances, the private sector is expected to carry out most of the burden. However, this can lead to a further explosion of private debt and trigger financial instability. The latter is co-caused by global warming and private indebtedness. The proposed policy approach consists of pricing carbon emissions through a carbon tax, which should incentivise firms to devote part of their production to the abatement of emissions. The authors conclude that, in spite of the +2 °C target being plausibly already out of reach, an adequate carbon tax can be conducive to a reduction in carbon emissions and to the achievement of the +2.5 °C objective. This result can be obtained without affecting economic growth, as long as adequate policies aiming at increasing the wage share and fostering the employment rate are also set in motion.

Finally, Monasterolo and Raberto (2018) propose a mix of fiscal and monetary policies (green sovereign bonds) that aim at tackling climate

[14]See for example Goodwin (1967).

change. The analytical tool used to conduct the analysis is the so-called EIRIN model. The latter is a SFC model with neo-Schumpeterian insights, where the supply side is defined through a Leontief production function. In addition, the economy is made up of 'heterogeneous economic sectors and subsectors characterized by adaptive behaviours and expectations (households, firms), heterogeneous capital goods characterized by different resource intensity, a credit sector characterized by endogenous money creation, and a foreign sector' (Monasterolo and Raberto, op. cit., p. 229). The simulations show that green sovereign bonds can significantly contribute to green investment and help reduce the import of raw materials. However, the implementation of this monetary policy can imply a short-run trade-off between positive effects in terms of green transition and the risk of wealth concentration. Focusing on green fiscal policies, incentives and taxes, climate change mitigation can come at the cost of negative feedbacks on the economy (for instance, in terms of an increase in the unemployment rate).

Notice that, unlike open economy topics, ecological aspects were not initially covered by Godley and Lavoie (2007a) and the early SFC community. For this reason, they represent one of the most significant internal developments in SFC literature. The standard way to account for the impact on the ecosystem and ecological feedbacks is to couple the TFM and the BS with two additional matrices: the physical flow matrix, displayed by Table 3a, and the physical stock-flow matrix, shown by Table 3b. The physical flow matrix can be regarded as an 'extension of the matrix that Georgescu-Roegen used in his flow of fund model' (Dafermos et al. 2017, p. 192; see also, Georgescu-Roegen 1971, 1979, 1984). It is meant to capture the First and Second Laws of Thermodynamics. The former entails that matter and energy cannot be crated out of, or vanish into, thin air. The latter entails that production transforms low-entropy energy into high-entropy dissipated energy. For instance, fossil fuels are turned into thermal energy.

The physical stock-flow matrix displayed by Table 3b accounts for the changes that take place in physical stocks of material reserves, renewable and non-renewable energy reserves, atmospheric CO_2 concentration, the socio-economic stock (meaning the stock of capital goods and housing) and other things which affect human life and well-being.

Table 3 Physical matrices of the economy

(a) Physical flow matrix			(b) Physical stock-flow matrix				
	Material balance	Energy balance		Material reserves	Non-renewable energy reserves	Atmospheric CO_2 concentration	Socio-economic stock
Inputs			**Initial stock**	$k_{m,-1}$	$k_{en,-1}$	$co2_{AT,-1}$	$k_{se,-1}$
Extracted matter	$+mat$		Resources converted into reserves	$+conv_m$	$+conv_e$		
Renewable energy		$+er$	Emissions			$+emis$	
Non-renewable energy	$+cen$	$+en$	Production of material goods				$+y_{mat}$
Oxygen	$+O2$		Extraction/use of matter/energy	$-mat$	$-en$		
Outputs			Net transfer to oceans/biosphere			$+(\phi_{11}-1)\cdot co2_{AT,-1}+\phi_{21}\cdot co2_{UP,-1}$	
Industrial CO_2 emissions	$-(emis-emis_l)$		Destruction of socio-economic stock				$-des$
Waste	$-wa$						
Dissipated energy		$-ed$					

(continued)

Table 3 (continued)

(a) Physical flow matrix			(b) Physical stock-flow matrix				
	Material balance	Energy balance		Material reserves	Non-renewable energy reserves	Atmospheric CO_2 concentration	Socio-economic stock
Change in socio-economic stock	$-\Delta k_{se}$						
Σ	0	0	**Final stock**	k_m	k_e	$co2_{AT}$	k_{se}

Notes: Matter is measured in Gt while energy is measure in EJ. A '+' sign denotes inputs in the socio-economic system (a) or additions to the opening stock (b), whereas '–' denotes outputs (a) or reductions (b). Hazardous waste not included

The first row displays the stocks available at the beginning of each period, while the last row shows the same stocks at the end of the current period, that is, after additions and deductions have been considered. These additional tables highlight the three-fold role played by the Laws of Thermodynamics in Eco-SCF models.

> First, the First Law of Thermodynamics allows us to incorporate explicitly the harmful by-products of energy and matter transformation (CO2 emissions and hazardous material waste). […] these by-products cause the degradation of ecosystem services with feedback effects on the economy. Second, the Second Law of Thermodynamics implies that in the very long run the economic processes cannot rely on the energy produced from fossil fuels. Since the fossil fuel resources are finite and the economic processes transform the low-entropy energy embodied in these resources into high-entropy energy, sustainability requires the reliance of economic processes on renewable energy sources (even if there was no climate change). Third, by combining the laws of thermodynamics with Georgesu-Roegen's analysis of material degradation, it turns out that recycling might not be sufficient to ensure the availability of the material resources that are necessary for the economic processes. Hence, the depletion of matter needs to be checked separately. (Dafermos et al. 2017, p. 193)

In the next section, we extend a basic Eco-SFC model to the open economy. More precisely, we consider a two-country economy under a fixed exchange rate regime.

6 An Eco-2C-SFC Model Prototype

Eco-SFC models usually focus on a single-area economy. However, local impacts of climate change (and natural resources depletion) are likely to be uneven across countries. Besides, ecological shocks hitting one country or area can bring about indirect effects for other countries or areas, because of the interconnections of the balance of payments. To shed light on this yet-unexplored aspect, we developed a simplified ecological two-country SFC model (Eco-2C-SFC hereafter). The model is made up of 109 endogenous variables *plus* 66 exogenous variables and

parameters. The full set of identities, equilibrium conditions and behavioural equations is displayed in Appendix. There are three main blocks of equations. The first block is about the open economy. It defines national income, import, export, consumption, tax payments, disposable income, wealth, financial assets (liabilities), the exchange rate and interest rates, in each country or area. The second block defines their balance of payment components and government budgets. The third block of equations are about the ecosystem. It is made up of five sub-blocks. The first sub-block defines the evolution of matter resources and reserves over time. It also determines the socio-economic stock of each area. The second sub-block deals with (both renewable and non-renewable) energy resources and reserves. Non-renewable energy consumption is used by the third sub-block to determine CO_2 atmospheric concentration and the (predicted) average change in atmospheric temperature. The improvement of ecological efficiency (i.e. matter-, energy- and CO_2-intensity coefficients) due to technical progress is accounted for in the fourth sub-block. The last sub-block defines matter and energy depletion ratios. Besides, it calculates the proportion of gross damages due to climate change (in line with Dafermos et al. 2017, 2018) and endogenises each propensities to import. This allows the model to consider the impact of both global warming and government (green) spending on household consumption plans.

Eco-2C-SFC key features can be summarised as follows:

a. The world economy is subdivided in two main areas, named Ecoland and Carbonland respectively.
b. Initial or baseline values of narrowly defined economic variables and parameters (e.g. GDP, wealth stocks, propensities to consume, return rates, etc.) are identical across the two areas.
c. Natural resources endowments (matter and energy resources) are also identical across areas. For the sake of simplicity, we assume that firms located in each area can only access their domestic resources.
d. Both government budgets and balances of payments (current accounts) are perfectly balanced in the baseline scenario.
e. No production function is used to determine potential output. Neither labour force nor natural resources availability constrain

output in the period considered. The economy is demand-led both in the short- and long-run. This two-fold hypothesis allows us to focus on the effects of global warming.

f. Unit prices are fixed and all economic variables are expressed in real terms (namely, at constant prices).
g. Techniques of production are different across areas, as Ecoland has lower energy- and matter-intensity coefficients (on average) compared to Carbonland.[15]
h. Similarly, Ecoland's share of renewable energy to total energy is higher, and the sensitivity of atmospheric temperature to CO_2 emissions is lower, compared to that of Carbonland.
i. Investment in fixed capital is assumed away. Hence total output is only made up of consumption, government expenditure and net export.
j. Equity, corporate bonds, bank deposits and private foreign investments are neglected. As a result, households hold their savings in form of (domestic) Treasury bills and/or cash.
k. Each central bank (or group of central banks) owns a stock of gold reserves (or US dollars), which are used to settle international payments.
l. One unit of Ecoland's currency, call it Green Dollar, is conventionally set equal to one unit of USD.
m. Carbonland's currency, the Brown Dollar, is pegged to the Green Dollar. In other words, the exchange rate is fixed.[16]

Narrowly defined economic variables are calibrated in such a way to obtain a gross world output equal to 80 trillion USD ca in the baseline scenario.[17] As a result, the baseline output of a single block, say Ecoland, roughly amounts to the combined GDP of the two

[15]For the sake of clarity, when simulating the model, we assume that CO_2-intensity coefficients do not vary across areas.

[16]Assumptions (e), (f), (i), (j) and (m) have been relaxed in a more advanced version of our model.

[17]Table 4 shows coefficients and initial values of stocks at http://models.sfc-models.net/. We are happy to provide the program file of our model upon request.

biggest economic areas worldwide, namely, the US and the EU. Correspondingly, Carbonland's output amounts to the rest of the world's GDP. Economic parameters are usually taken from Chapter 6 of Godley and Lavoie (2007a), while the ecological part of the model is calibrated based on Dafermos et al. (2017) and IPCC (2018).[18] The model has been run from 1960 to 2100, on an annual basis. Baseline values have been obtained based on the assumption of zero growth at worldwide level. A slow decline in matter- and energy-intensity coefficients (0.5 and 1%, respectively) has been assumed in line with available data. As a result, the change in the average atmospheric temperature relative to the 1950s is expected to be 1.5C ca in 2030, heading to 2.9C ca in 2100. A sharp decline in CO_2-intensity coefficients after 2020 (at 3% rate, in line with Paris Climate Pact of 2015) has been also considered to set baseline values. This would keep climate change below 2.5C, under a zero-growth scenario.

Model Eco-2C-SFC can now be used to check the behaviour of main endogenous variables under alternative scenarios. More precisely, we test here the effects of two changes or shocks in 2020. First, we simulate the impact generated by the decision of Ecoland's households to reduce their consumption of goods and services made in Carbonland (first scenario). This can be the effect of a higher ecological awareness of Ecoland's consumers (who turn to low-impact products, consume *zero kilometre* food, etc.). It can also result from hoarding behaviours associated with the increase in natural catastrophes' frequency, which increases uncertainty about the future. Second, we test the effects triggered by Carbonland's government decision to cut green spending—for instance, to repeal green incentives to buy photovoltaic solar panels or other green products 'made in Ecoland' (second scenario). The reason is that green incentives end up increasing imports, thus affecting Carbonland's current account balance.[19] Hence, the decision of Carbonland's government to cancel the incentives plan. These two scenarios can be regarded as two phases of

[18]See the fifth column of Table 4 for information about the source of data.

[19]In our model, this effect is considered by assuming that Brownland's propensity to import is positively associated with changes in government green spending. Ecoland's propensity to import, in contrast, is a decreasing function of government green spending, as most green products are made in Ecoland. See Eqs. (108) and (109) in Appendix 'Depletion Ratios, Damages and Feedbacks' and Table 4.

the same sequence of events: climate change affects Ecoland's import of non-green products, which affects Carbonland's trade balance, which, in turn, leads Carbonland's policy-makers to reduce green spending, thus rebalancing both net export and government budget. For the sake of clarity, we analyse each scenario separately.

Figure 1 displays domestic GDPs, balances of payments, climate change, CO_2 emissions, depletion ratios and reserves of matter and energy under the first scenario or experiment, that is, when global warming affects Ecoland consumers' propensity to import from Carbonland. As expected, the fall in Ecoland's propensity to import is associated with a fall in Carbonland's GDP—Fig. 1a. The latter is exactly matched by an increase in Ecoland's GDP, which leaves the world output (quantitatively) unchanged. Carbonland now records a budget deficit, which mirrors its current account deficit—Fig. 1b. This is no surprise. Since the private sector tends to balance the budget in the medium run, a persistent deficit in the current account entails the government sector issuing more bonds. This happens because Carbonland's GDP declines, and so do tax revenues. Hence, a budget deficit shows up (unless the government revises its spending plans downwards and/or increases tax rates, but this depresses further the economy!). In a specular manner, Ecoland records a twin surplus. Figure 1c shows that the temperature reduces relative to its baseline value, due to the higher ecological efficiency of Ecolands' techniques of production relative to Carbonland's. Two aspects are worth being stressed here. First, the drop in Carbonland's CO_2 emissions outstrips the increase in Ecoland's emissions—see Fig. 1d. Second, the higher share of renewable energy sources allows Ecoland's to reduce worldwide energy depletion relative to the baseline—Fig. 1e.[20]

[20]In principle, above effects can be further strengthened by a lower CO_2-intensity coefficient of Ecoland compared with Brownland. As mentioned, we assume away this additional effect in our simulations.

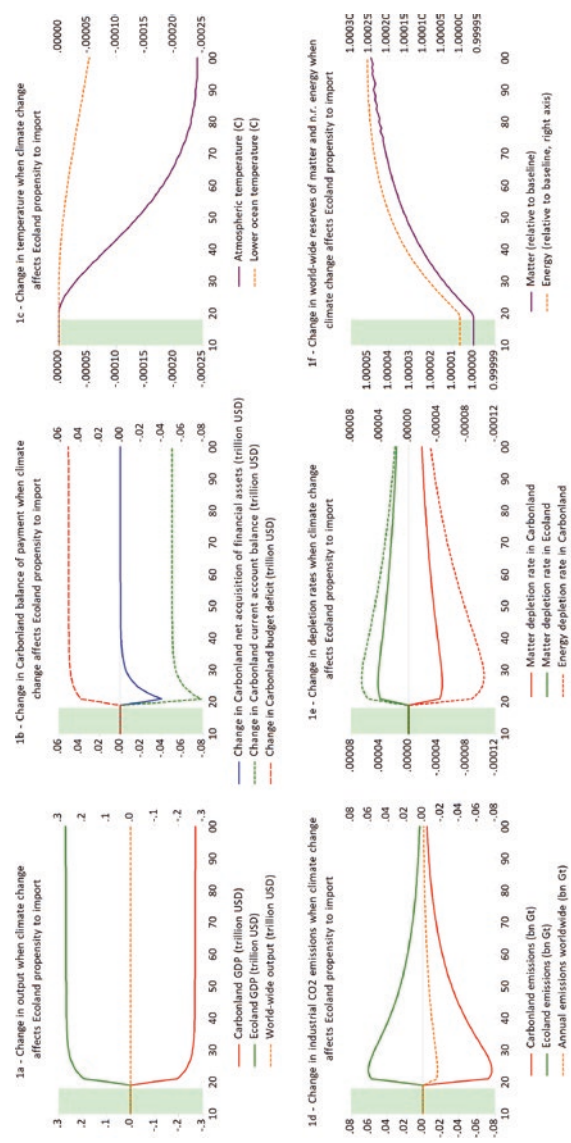

Fig. 1 Simulations: first experiment

Figure 1f shows that higher matter and energy reserves are available as well, thus postponing the *redde rationem* with natural resources' scarcity. To sum up, if global warming triggers a radical change in consumption habits favouring green products, this brings about a beneficial effect on the ecosystem, while leaving unchanged worldwide output and wealth. However, non-green economies are negatively affected, because of the fall in export. Paradoxically, their governments can be forced to adopt austerity measures (to cope with their twin deficit) exactly when more spending would be necessary to foster the transition to green technologies!

Turning to the second scenario, our findings are displayed in Fig. 2. The decision of Carbonland's government to withdraw green incentives affects heavily Ecoland and the world economy. Despite the austerity, Carbonland's GDP is not necessarily affected. In fact, the new equilibrium level for the GDP can be even higher *if* the fall in the propensity to import outstrips the reduction in domestic demand. This is the case portrayed by Fig. 2a. However, the overall effect on the world economy is *always* negative. Now Carbonland records a twin surplus (Fig. 2b), while Ecoland faces a twin deficit. Once again, the deficit is due to the fall in tax revenues (given government spending), due to the contraction of Ecoland's GDP. The atmospheric temperature reduces, due to the sharp fall in world output—Fig. 2c. More generally, the ecosystem benefits from Carbonland's government decision—see Figs. 2d–f. However, this is not due to a higher ecological efficiency of production processes. On the contrary, it is due to the collapse of international trade and the world economy. In a sense, this can be regarded as the 'low road' to ecological sustainability, as opposed to the 'high road' described by the first experiment. They both entail international imbalances that can only be addressed by means of a coordinated macroeconomic plan negotiated and adopted by the two areas.

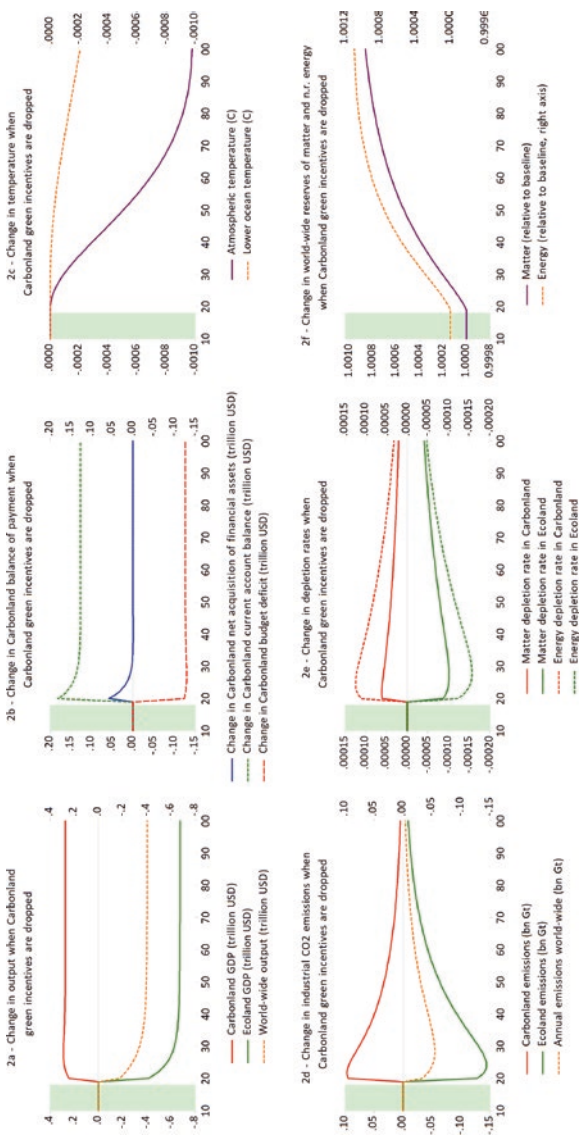

Fig. 2 Simulations: second experiment

7 Concluding Remarks

The SFC approach to macroeconomic dynamic modelling was developed in the 2000s by Godley and Lavoie (2007a, b), who paved the way for the flourishing of SFC models. These models are based on sound accounting principles, which inter alia allow constraining models' dynamics without anchoring them to any preordained long-run supply-side equilibrium. In addition, SFC models enable accounting for the process of money creation (and destruction), while including a variety of financial assets, motives and agents. In previous sections, we provided a survey of SFC models' literature and we discussed recent developments. More precisely, we identified two types of 'external' development, or cross-fertilisations, and three types of 'internal' development of SFC models. The former aim at cross-breeding benchmark SFC models with other analytical tools and/or modelling techniques. Successful cross-fertilisations include agent-based SFC models and input–output SFC models, providing the basic macroeconomic structure with micro- and meso-foundations, respectively. By contrast, the three main types of internal developments are empirical SFC models, open economy or multi-country SFC model and ecological SFC models. Building upon this taxonomy, we identified a gap in current literature on SFC models, as ecological models usually focus on a single country or the world economy. For this reason, we presented an ecological 2-area SFC model prototype. Despite its simplified structure, the model enables testing a variety of shocks and comparing different scenarios. For instance, we showed that the uneven technical progress, coupled with rising ecological awareness of the 'consumers', can force governments of less ecologically-efficient areas to adopt austerity measures and/or implement protectionist policies, thus moving further away from green technologies. While the environment can benefit from these changes (in terms of a lower average temperature compared to the baseline value), this happens because both the volume of international trade and world output collapse. Arguably, these issues can be addressed by means of an internationally coordinated macroeconomic plan, aimed at supporting green transition of 'brown' economies. Notice that the

advantages of the methodology we have just presented go well beyond the specific findings of our experiment. SFC models are effective tools to assess the impact of alternative policy options in a multi-country environment, where economic and financial variables interact with the broader ecosystem.

Disclaimer Responsibility for the information and views expressed in the paper lies entirely with the author.

Appendix: Eco-2C-SFC Model Equations

The model is made up of 109 equations. Exogenous variables and parameters are 66. The model is split in four blocks of equations: basic equations of the open economy model; equations for government budgets and balances of payment of the two areas; and equations for the ecosystem (including matter reserves, energy reserves, CO_2 emissions and climate change, ecological efficiency, depletion ratios and damages). The latter are based on Dafermos et al. (2017, 2018). The redundant equation of the system is the amount of gold bars (or USD reserves) exchanged by the central banks. All coefficient values and initial values of stocks are shown by Table 4 at http://models.sfc-models.net/.

Basic Equations of the Open Economy Model

$Y_c = C_c + G_c + X_c - IM_c$	(1) National income of Carbonland
$Y_g = C_g + G_g + X_g - IM_g$	(2) National income of Ecoland
$IM_c = m_c \cdot Y_c \cdot \left(1 - \delta^c_{T,-1}\right)$	(3) Import of Carbonland
$IM_g = m_g \cdot Y_g \cdot \left(1 - \delta^g_{T,-1}\right)$	(4) Import of Ecoland
$X_c = IM_g / E$	(5) Export of Carbonland
$X_g = IM_c \cdot E$	(6) Export of Ecoland
$YD_c = Y_c - T_c + r_{c,-1} \cdot B_{hc,-1}$	(7) Disposable income in Carbonland

$$YD_g = Y_g - T_g + r_{g,-1} \cdot B_{hg,-1}$$ (8) Disposable income in Ecoland

$$T_c = \theta_c \cdot (Y_c + r_{c,-1} \cdot B_{hc,-1})$$ (9) Tax payments in Carbonland

$$T_g = \theta_g \cdot (Y_g + r_{g,-1} \cdot B_{hg,-1})$$ (10) Tax payments in Ecoland

$$V_c = V_{c,-1} + YD_c - C_c$$ (11) Wealth accumulation in Carbonland

$$V_g = V_{g,-1} + YD_g - C_g$$ (12) Wealth accumulation in Ecoland

$$C_c = (\alpha_{c1} \cdot YD_c + \alpha_{c2} \cdot V_{c,-1}) \cdot \left(1 - \delta^c_{T,-1}\right)$$ (13) Domestic consumption in Carbonland

$$C_g = (\alpha_{g1} \cdot YD_g + \alpha_{g2} \cdot V_{g,-1}) \cdot \left(1 - \delta^g_{T,-1}\right)$$ (14) Domestic consumption in Ecoland

$$H_{hc} = V_c - B_{hc}$$ (15) Cash money held in Carbonland

$$H_{hg} = V_g - B_{hg}$$ (16) Cash money held in Ecoland

$$B_{hc} = V_c \cdot \lambda_{c0} + V_c \cdot \lambda_{c1} \cdot r_c - \lambda_{c2} \cdot YD_c$$ (17) Demand for government bills in Carbonland

$$B_{hg} = V_g \cdot \lambda_{g0} + V_g \cdot \lambda_{g1} \cdot r_g - \lambda_{g2} \cdot YD_g$$ (18) Demand for government bills in Ecoland

$$B_{sc} = B_{gc,-1} + \left(G_c + r_{c,-1} \cdot B_{gc,-1}\right) - \left(T_c + r_{c,-1} \cdot B^{cb}_{c,-1}\right)$$ (19) Supply of government bills in Carbonland

$$B_{sg} = B_{gg,-1} + \left(G_g + r_{g,-1} \cdot B_{gg,-1}\right) - \left(T_g + r_{g,-1} \cdot B^{cb}_{g,-1}\right)$$ (20) Supply of government bills in Ecoland

$$B^{cb}_c = B_{gc} - B_{hc}$$ (21) Bills held by central bank in Carbonland

$$B^{cb}_g = B_{gg} - B_{hg}$$ (22) Bills held by central bank in Ecoland

$$OR_c = OR_{c,-1} + \left(H_{gc} - H_{gc,-1} - \left(B^{cb}_c - B^{cb}_{c,-1}\right)\right)/p_{or,c}$$ (23) Gold held by central bank in Carbonland

$$OR_g = OR_{b,-1} + \left(H_{gg} - H_{gg,-1} - \left(B^{cb}_g - B^{cb}_{g,-1}\right)\right)/p_{or,g}$$ (24) Gold held by central bank in Ecoland

$$H_{gc} = H_{hc}$$ (25) Supply of cash money in Carbonland

$$H_{gg} = H_{hg}$$ (26) Supply of cash money in Ecoland

$p_{or,c} = \bar{p}_{or}$	(27) Unit price of gold in Carbonland
$p_{or,g} = p_{or,b} \cdot E$	(28) Unit price of gold in Ecoland
$E = \bar{E}$	(29) Exchange rate (fixed)
$r_c = \bar{r}_c$	(30) Interest rate in Carbonland
$r_g = \bar{r}_g$	(31) Interest rate in Ecoland

Notes: m_c and m_g are the propensities to import of Carbonland and Ecoland, respectively; E is the nominal exchange rate; θ_c and θ_g are the average tax rates; α_{c1} and α_{g1} are the propensities to consume out of income; α_{c2} and α_{g2} are the propensities to consume out of wealth; λ_{c0}, λ_{c1}, λ_{c2}, λ_{g0}, λ_{g1} and λ_{g2} are parameters of household portfolio equations.

Additional Equations for Government Budgets and Balances of Payment

$B_s = B_{sc} + B_{sg}$	(32) Worldwide supply of government bills
$DEF_c = G_c + r_{c,-1} \cdot B_{sc,-1} - T_c - r_{c,-1} \cdot B^{cb}_{c,-1}$	(33) Government deficit of Carbonland
$DEF_g = G_g + r_{g,-1} \cdot B_{sg,-1} - T_g - r_{g,-1} \cdot B^{cb}_{g,-1}$	(34) Government deficit of Ecoland
$NAFA_c = DEF_c + CAB_c$	(35) Net accumulation of financial assets in Carbonland
$NAFA_g = DEF_g + CAB_g$	(36) Net accumulation of financial assets in Ecoland
$CAB_c = TB_c$	(37) Current account balance in Carbonland
$CAB_g = TB_g$	(38) Current account balance in Ecoland
$KABP_c = d(OR_c) \cdot p_{orc}$	(39) Financial account balance in Carbonland
$KABP_g = d(OR_g) \cdot p_{org}$	(40) Financial account balance in Ecoland
$TB_c = X_c - IM_c$	(41) Trade balance of Carbonland
$TB_g = X_g - IM_g$	(42) Trade balance of Ecoland

$BP_c = CAB_c$	(43) Balance of payments of Carbonland
$BP_g = CAB_g$	(44) Balance of payments of Ecoland

Equations for the Ecosystem

Material Resources and Reserves

$y_{matc} = \mu_c \cdot Y_c$	(45) Production of material goods in Carbonland
$y_{matg} = \mu_g \cdot Y_g$	(46) Production of material goods in Ecoland
$mat_c = y_{matc} - rec_c$	(47) Extraction of matter in Carbonland
$mat_g = y_{matg} - rec_g$	(48) Extraction of matter in Ecoland
$rec_c = \rho_c \cdot dis_c$	(49) Recycled socio-economic stock in Carbonland
$rec_g = \rho_g \cdot dis_g$	(50) Recycled socio-economic stock in Ecoland
$dis_c = \mu_c \cdot (C_c - TB_c)$	(51) Discarded socio-economic stock in Carbonland
$dis_g = \mu_g \cdot (C_g - TB_g)$	(52) Discarded socio-economic stock in Ecoland
$k_{sec} = k_{sec,-1} + y_{matc} - \mu_c \cdot TB_c - dis_c$	(53) Socio-economic stock in Carbonland
$k_{seg} = k_{seg,-1} + y_{matg} - \mu_g \cdot TB_g - dis_g$	(54) Socio-economic stock in Ecoland
$wa_c = mat_c - d(k_{sec})$	(55) Waste generated in Carbonland
$wa_g = mat_g - d(k_{seg})$	(56) Waste generated in Ecoland
$k_{mc} = k_{mc,-1} + conv_{mc} - mat_c$	(57) Stock of material reserves in Carbonland
$k_{mg} = k_{mg,-1} + conv_{mg} - mat_g$	(58) Stock of material reserves in Ecoland
$k_m = k_{mc} + k_{mg}$	(59) Worldwide stock of material reserves
$conv_{mc} = \sigma_{mc} \cdot res_{mc}$	(60) Material resources converted to reserves in Carbonland
$conv_{mg} = \sigma_{mg} \cdot res_{mg}$	(61) Material resources converted to reserves in Ecoland
$res_{mc} = res_{mc,-1} - conv_{mc}$	(62) Stock of material resources in Carbonland
$res_{mg} = res_{mg,-1} - conv_{mg}$	(63) Stock of material resources in Ecoland

$res_m = res_{mc} + res_{mg}$	(64) Worldwide stock of material resources
$cen_c = emis_c/car$	(65) Carbon mass of non-renewable energy in Carbonland
$cen_g = emis_g/car$	(66) Carbon mass of non-renewable energy in Ecoland
$o2_c = emis_c - cen_c$	(67) Mass of oxygen issued by Carbonland
$o2_g = emis_g - cen_g$	(68) Mass of oxygen issued by Ecoland

Notes: μ_c and μ_g are the matter-intensity coefficients in Carbonland and Ecoland, respectively; ρ_c and ρ_g are recycling rates; σ_{mc} and σ_{mg} are rates of conversion of material resources into reserves; *car* is the coefficient converting *Gt* of carbon into *Gt* of CO_2.

Energy Resources and Reserves

$e_c = \epsilon_c \cdot Y_c$	(69) Energy required for production in Carbonland
$e_g = \epsilon_g \cdot Y_g$	(70) Energy required for production in Ecoland
$er_c = \eta_c \cdot e_c$	(71) Renewable energy in Carbonland
$er_g = \eta_g \cdot e_g$	(72) Renewable energy in Ecoland
$en_c = e_c - er_c$	(73) Non-renewable energy in Carbonland
$en_g = e_g - er_g$	(74) Non-renewable energy in Ecoland
$ed_c = er_c + en_c$	(75) Dissipated energy in Carbonland (end of period)
$ed_g = er_g + en_g$	(76) Dissipated energy in Ecoland (end of period)
$k_{ec} = k_{ec,-1} + conv_{ec} - en_c$	(77) Stock of energy reserves in Carbonland
$k_{eg} = k_{eg,-1} + conv_{eg} - en_g$	(78) Stock of energy reserves in Ecoland
$k_e = k_{ec} + k_{eg}$	(79) Worldwide stock of energy reserves
$conv_{ec} = \sigma_{ec} \cdot res_{ec}$	(80) Energy resources converted to reserves in Carbonland
$conv_{eg} = \sigma_{eg} \cdot res_{eg}$	(81) Energy resources converted to reserves in Ecoland
$res_{ec} = res_{ec,-1} - conv_{ec}$	(82) Stock of non-renewable energy resources in Carbonland
$res_{eg} = res_{eg,-1} - conv_{eg}$	(83) Stock of non-renewable energy resources in Ecoland
$res_e = res_{ec} + res_{eg}$	(84) Worldwide stock of energy resources

Notes: ϵ_c and ϵ_g are the energy-intensity coefficients in Carbonland and Ecoland, respectively; η_c and η_g are the shares of renewable energy to total energy; σ_{ec} and σ_{eg} are the rates of conversion of non-renewable energy resources into reserves.

Emissions and Climate Change

$emis_c = \beta_c \cdot en_c$	(85) Industrial emissions of CO_2 in Carbonland
$emis_g = \beta_g \cdot en_g$	(86) Industrial emissions of CO_2 in Ecoland
$emis_l = emis_{l,-1} \cdot (1 - g_l)$	(87) Land emissions of CO_2
$emis = emis_c + emis_g + emis_l$	(88) Total emissions of CO_2 worldwide
$co2_{AT} = emis + \phi_{11} \cdot co2_{AT,-1} + \phi_{21} \cdot co2_{UP,-1}$	(89) Atmospheric CO_2 concentration
$co2_{UP} = \phi_{12} \cdot co2_{AT,-1} + \phi_{22} \cdot co2_{UP,-1} + \phi_{32} \cdot co2_{LO,-1}$	(90) Upper ocean/ biosphere CO_2 concentration
$co2_{LO} = \phi_{23} \cdot co2_{UP,-1} + \phi_{33} \cdot co2_{LO,-1}$	(91) Lower ocean CO_2 concentration
$F = F_2 \cdot \log_2 \left(\frac{co2_{AT}}{co2_{AT}^{PRE}} \right) + F_{EX}$	(92) Radiative forcing over pre-industrial levels (W/m^2)
$F_{EX} = F_{EX,-1} + fex$	(93) Radiative forcing due to non-CO_2 greenhouse gases (W/m^2)
$T_{AT} = T_{AT,-1} + \tau_1 \cdot \left[F - \frac{F_2}{s} \cdot T_{AT,-1} - \tau_2 \cdot (T_{AT,-1} - T_{LO,-1}) \right]$	(94) (Change in) atmospheric temperature
$T_{LO} = T_{LO,-1} + \tau_3 \cdot (T_{AT,-1} - T_{LO,-1})$	(95) (Change in) lower ocean temperature

Notes: β_c and β_g are the CO_2-intensity coefficients of production processes in Carbonland and Ecoland, respectively; g_l is the rate of decline of land-use CO_2 emissions; ϕ_{ij} are CO_2 transfer coefficients;

F_2 is the increase in radiative forcing (due to doubling of CO_2 concentration) since pre-industrial levels; $co2_{AT}^{PRE}$ is the pre-industrial CO_2 concentration; *fex* is the annual increase in radiative forcing due to non-CO_2 greenhouse gas emissions; τ_1 is the speed of adjustment of atmospheric temperature; τ_2 and τ_3 are coefficients of heat loss; and s is the equilibrium climate sensitivity

Ecological Efficiency

$\mu_c = \mu_{c0} \cdot (1 + g_{\mu c})^{-t}$	(96) Matter-intensity coefficient in Carbonland
$\mu_g = \mu_{g0} \cdot (1 + g_{\mu g})^{-t}$	(97) Matter-intensity coefficient in Ecoland
$\epsilon_c = \epsilon_{c0} \cdot (1 + g_{\epsilon c})^{-t}$	(98) Energy-intensity coefficient in Carbonland
$\epsilon_g = \epsilon_{g0} \cdot (1 + g_{\epsilon g})^{-t}$	(99) Energy-intensity coefficient in Ecoland
$\beta_c = \beta_{c0} \cdot (1 + g_{\beta c})^{-t}$	(100) CO_2-intensity coefficient in Carbonland
$\beta_g = \beta_{g0} \cdot (1 + g_{\beta g})^{-t}$	(101) CO_2-intensity coefficient in Ecoland

Notes: g_{ic} and g_{ig} (with $i = \mu, \epsilon, \beta$) define the rates of reduction over time of matter-, energy- and CO_2-intensity coefficients of Carbonland and Ecoland, respectively; subscript '0' refers to initial values of variables.

Depletion Ratios, Damages and Feedbacks

$\delta_{mc} = mat_c / k_{mc}$	(102) Matter depletion ratio in Carbonland
$\delta_{mg} = mat_g / k_{mg}$	(103) Matter depletion ratio in Ecoland
$\delta_{ec} = en_c / k_{ec}$	(104) Energy depletion ratio in Carbonland
$\delta_{eg} = en_g / k_{eg}$	(105) Energy depletion ratio in Ecoland
$\delta_T^c = 1 - \left(1 + d_1^c \cdot T_{AT} + d_2^c \cdot T_{AT}^2 + d_3^c \cdot T_{AT}^{x_c}\right)^{-1}$	(106) Proportion of gross damage in Carbonland due to changes in temperature
$\delta_T^g = 1 - \left(1 + d_1^g \cdot T_{AT} + d_2^g \cdot T_{AT}^2 + d_3^g \cdot T_{AT}^{x_g}\right)^{-1}$	(107) Proportion of gross damage in Ecoland due to changes in temperature
$m_c = m_{c,-1} + m_0^c + m_1^c \cdot (G_c - G_{c,-1})$	(108) Carbonland propensity to import

$m_g = m_{g,-1} + m_0^g - m_1^g \cdot (G_g - G_{g,-1})$	(109) Ecoland propensity to import

Notes: d_i^j and x_j (with $i = 1, 2, 3$ and $j = c, g$) are positive coefficients such that: $0 < \delta_T^j < 1$ and $T_{AT} = 6 \rightarrow \frac{\delta_T^c + \delta_T^g}{2} = 0.5$; m_i^j (with $i = 0, 1$ and $j = c, g$) are positive coefficients.

Redundant Equations

$\Delta OR_c = -\Delta OR_g$	Zero reserve gains (losses) across areas

References

Altissimo, F., Siviero, S., & Terlizzese, D. (2002, July–December). How Deep Are the Deep Parameters? *Annales d'Economie et de Statistique* 67/68: 207–226.

Backus, D., Brainard, W. C., Smith, G., & Tobin, J. (1980). A Model of U.S. Financial and Nonfinancial Economic Behavior. *Journal of Money, Credit and Banking, 12*(2), 259–293.

Berg, M., Hartley, B., & Richters, O. (2015). A Stock-Flow Consistent Input–Output Model with Applications to Energy Price Shocks, Interest Rates, and Heat Emissions. *New Journal of Physics, 17*(1), 1–21.

Blanchard, O. (2018). On the Future of Macroeconomic Models. *Oxford Review of Economic Policy, 34*(1–2), 43–54.

Botta, A., Caverzasi, E., & Tori, D. (2015). Financial–Real-Side Interactions in an Extended Monetary Circuit with Shadow Banking: Loving or Dangerous Hugs? *International Journal of Political Economy, 44*(3), 196–227.

Botta, A., Caverzasi, E., Russo, A., Gallegati, M., & Stiglitz, J. E. (2018). *Inequality and Finance in a Rent Economy* (Greenwich Papers in Political Economy, No. 20377).

Bovari, E., Giraud, G., & Mc Isaac, F. (2018, May). Coping with Collapse: A Stock-Flow Consistent Monetary Macrodynamics of Global Warming. *Ecological Economics, 147,* 383–398.

Burgess, S., Burrows, O., Godin, A., Kinsella, S., & Millard, S. (2016). *A Dynamic Model of Financial Balances for the United Kingdom* (Working Paper No. 614). Bank of England.

Caiani, A., Godin, A., Caverzasi, E., Gallegati, M., Kinsella, S., & Stiglitz, J. E. (2016). Agent Based-Stock Flow Consistent Macroeconomics: Towards a Benchmark Model. *Journal of Economic Dynamics and Control, 69,* 375–408.

Cardaci, A., & Saraceno, F. (2016). *Inequality, Financialisation and Credit Booms: A Model of Two Crises* (SEP Working Papers, No. 2016/2). LUISS School of European Political Economy.

Caverzasi, E., & Godin, A. (2015). Post-Keynesian Stock-Flow-Consistent Modelling: A Survey. *Cambridge Journal of Economics, 39*(1), 157–187.

Copeland, M. A. (1949). *Social Accounting for Moneyflows*. The Accounting Review 24 (July), pp. 254–264. Reproduced in Dawson, J. C. (Ed.). (1996). *Flow-of-Funds Analysis: A Handbook for Practioners*. Armonk, New York, USA: M.E. Sharpe.

Coutts, K. J., Godley, W., & Gudgin, G. D. (1985). Inflation Accounting of Whole Economic Systems. *Studies in Banking and Finance, 9*(2), 93–114. Supplement to Journal of Banking and Finance, Amsterdam: North Holland.

Dafermos, Y., Nikolaidi, M., & Galanis, G. (2017, January). A Stock-Flow-Fund Ecological Macroeconomic Model. *Ecological Economics, 131*, 191–207.

Dafermos, Y., Nikolaidi, M., & Galanis, G. (2018, October). Climate Change, Financial Stability and Monetary Policy. *Ecological Economics, 152*, 219–234.

Deleidi, M., Pariboni, R., & Veronese Passarella, M. (2018). *Supermultiplier, Innovation and the Ecosystem: A Stock-Flow Dynamic Model* (Working Paper 2019-01). UCL Institute for Innovation and Public Purpose.

Dos Santos, C. H. (2006). Keynesian Theorising During Hard Times: Stock-Flow Consistent Models as an Unexplored 'Frontier' of Keynesian Macroeconomics. *Cambridge Journal of Economics, 30*(4), 541–565.

Duwicquet, V., & Mazier, J. (2012). Financial Integration and Stabilization in a Monetary Union Without or with Bank Rationing. In D. B. Papadimitriou & G. Zezza (Eds.), *Contributions in Stock-Flow Modeling* (pp. 197–234). London: Palgrave Macmillan.

Escobar-Espinoza, A. (2016). *Stock-Flow Consistent Models for Developing Countries: The Case of Colombia* (Unpublished Working Paper). Available at: https://www.gtap.agecon.purdue.edu/resources/download/8168.pdf.

Georgescu-Roegen, N. (1971). *The Entropy Law and the Economic Process*. Cambridge: Harvard University Press.

Georgescu-Roegen, N. (1979). Energy Analysis and Economic Valuation. *Southern Economic Journal, 45*(4), 1023–1058.

Georgescu-Roegen, N. (1984). Feasible Recipes Versus Viable Technologies. *Atlantic Economic Journal, 12*(1), 21–31.

Godin, A., Tiou-Tagba Aliti, G., & Kinsella, S. (2012). *Method to Simultaneously Determine Stock, Flow, and Parameter Values in Large Stock Flow Consistent Models* (Unpublished Working Paper). Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id+2094996.

Godley, W. (1996). *Money, Finance and National Income Determination: An Integrated Approach* (Levy Institute Working Paper No. 167). Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College.

Godley, W. (1999). *Seven Unsustainable Processes: Medium-Term Prospects and Policies for the United States and the World*. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College.

Godley, W., & Cripps, F. (1983). *Macroeconomics*. Oxford, UK: Oxford University Press.

Godley, W., & Lavoie, M. (2007a). *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*. New York: Palgrave.

Godley, W., & Lavoie, M. (2007b). A Simple Model of Three Economies with Two Currencies: The Eurozone and the USA. *Cambridge Journal of Economics, 31*(1), 1–23.

Godley, W., & Zezza, G. (1992). A Simple Stock Flow Model of the Danish Economy. In H. Brink (Ed.), *Themes in Modern Macroeconomics*. London: Palgrave Macmillan.

Godley, W., & Zezza, G. (2006). *Debt and Lending: A Cri de Coeur*. Levy Institute Policy Note. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levy.org/pubs/pn_4_06.pdf.

Godley, W., Papadimitriou, D. B., Hannsgen, G., & Zezza, G. (2007). *The US Economy: Is There a Way Out of the Woods?* Levy Institute Strategic Analysis. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/sa_nov_07.pdf.

Godley, W., Papadimitriou, D. B., Hannsgen, G., & Zezza, G. (2008). *Prospects for the United States and the World: A Crisis that Conventional Remedies Cannot Resolve*. Levy Institute Strategic Analysis. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/sa_dec_08.pdf.

Goodwin, R. M. (1967). A Growth Cycle. In C. H. Feinstein (Ed.), *Socialism, Capitalism and Economic Growth* (pp. 54–58). London: Cambridge University Press.

Hein, E., & Van Treeck, T. (2010). Financialisation and Rising Shareholder Power in Kaleckian/Post-Kaleckian Models of Distribution and Growth. *Review of Political Economy, 22*(2), 205–233.

IMF. (2017). *Annual Report on Exchange Arrangements and Exchange Restrictions*. Washington, DC: International Monetary Fund.

IPCC. (2018). *Special Report: Global Warming of 1.5°C*. Geneva, Switzerland: World Meteorological Organization.

Ioannou, S. (2018). Sovereign Ratings, Macroeconomic Dynamics, and Fiscal Policy. Interactions Within a Stock Flow Consistent Framework. *Metroeconomica, 69*(1), 151–177.

Jackson, T., & Victor, P. A. (2015, December). Does Credit Create a 'Growth Imperative'? A Quasi-stationary Economy with Interest-Bearing Debt. *Ecological Economics, 120,* 32–48.

Kalecki, M. (1972). *Selected Essays on the Dynamics of the Capitalist Economy*. Cambridge, UK: Cambridge University Press.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money* (2017 edition). Ware, UK: Wordsworth Editions.

Keen, S. (2016). *The Need for Pluralism in Economics*. Steve Keen's Debtwatch. Available at: http://www.debtdeflation.com/blogs/2016/08/13/the-need-for-pluralism-in-economics/.

Kinsella, S., & Tiou-Tagba Aliti, G. (2012a). *Towards a Stock Flow Consistent Model for Ireland* (Unpublished Working Paper).

Kinsella, S., & Tiou-Tagba Aliti, G. (2012b). *Simulating the Impact of Austerity on the Irish Economy Using a Stock-Flow Consistent Model* (Unpublished Working Paper). Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2157420.

Kinsella, S., & Tiou-Tagba Aliti, G. (2013). Modeling Moments of Crisis: The Case of Ireland. *Journal of Economic Issues, 47*(2), 561–566.

Krugman, P. (2018). Good Enough for Government Work? Macroeconomics Since the Crisis. *Oxford Review of Economic Policy, 34*(1–2), 156–168.

Kydland, F. E., & Prescott, E. C. (1982). Time to Build and Aggregate Fluctuations. *Econometrica: Journal of the Econometric Society, 50*(6), 1345–1370.

Lavoie, M. (2008). Financialisation Issues in a Post-Keynesian Stock-Flow Consistent Model. *Intervention: European Journal of Economics and Economic Policies, 5*(2), 335–361.

Lavoie, M. (2014). *Post-Keynesian Economics: New Foundations*. Cheltenham: Edward Elgar.

Lavoie, M. (2015). Book Review: Macroeconomics: Institutions, Instability, and the Financial System. *European Journal of Economics and Economic Policies: Intervention, 12*(1), 135–142.

Lavoie, M., & Daigle, G. (2011). A Behavioural Finance Model of Exchange Rate Expectations Within a Stock-Flow Consistent Framework. *Metroeconomica, 62*(3), 434–458.

Lavoie, M., & Zhao, J. (2010). A Study of the Diversification of China's Foreign Reserves within a Three-Country Stock-Flow Consistent Model. *Metroeconomica, 61*(3), 558–592.

Lequain, M. (2003, February). A Three-Country Study of the Euro Zone Versus the Rest of the World: The Implications of a Monetary Union in an Open Environment. In *Annual Conference of the Eastern Economic Association.* New York.

Lindé, J., Smets, F., & Wouters, R. (2016). Challenges for Central Banks' Macro Models. In J. B. Taylor & H. Uhlig (Eds.), *Handbook of Macroeconomics* (Vol. 2, pp. 2185–2262). Amsterdam: Elsevier.

Long, J. B., Jr., & Plosser, C. I. (1983). Real Business Cycles. *Journal of Political Economy, 91*(1), 39–69.

Mankiw, N. G. (2006). The Macroeconomist as Scientist and Engineer. *Journal of Economic Perspectives, 20*(4), 29–46.

Mazier, J., & Tiou-Tagba Aliti, G. (2012). World Imbalances and Macroeconomic Adjustments: A Three-Country Stock-Flow Consistent Model with Fixed or Flexible Prices. *Metroeconomica, 63*(2), 358–388.

Mazier, J., & Valdecantos, S. (2015). A Multi-Speed Europe: Is It Viable? A Stock-Flow Consistent Approach. *European Journal of Economics and Economic Policies: Intervention, 12*(1), 93–112.

Miess, M., & Schmelzer, S. (2016a, June 10). Stock-Flow Consistent Modelling of Real-Financial Cycles and Balance Sheet Dynamics. In *Preliminary Version for 13th EUROFRAME Conference*, Utrecht (The Netherlands). Available at: http://www.euroframe.org/files/user_upload/euroframe/docs/2016/conference/Session%206/EUROF16_Miess_etal.pdf.

Miess, M., & Schmelzer, S. (2016b). *Extension of the Empirical Stock-Flow Consistent (SFC) Model for Austria: Implementation of Several Asset Classes, a Detailed Tax System and Exploratory Scenarios*. Final Report, Study Commissioned by the Austrian Chamber of Labour, Vienna (Austria). Available at: http://irihs.ihs.ac.at/4135/1/Report_MiessSchmelzer_SFCfinal.pdf.

Michell, J., & Toporowski, J. (2012). The Stock-Flow Consistent Approach with Active Financial Markets. In D. B. Papadimitriou & G. Zezza (Eds.), *Contributions in Stock-Flow Modeling* (pp. 173–196). London: Palgrave Macmillan.

Monasterolo, I., & Raberto, M. (2018, February). The EIRIN Flow-of-Funds Behavioural Model of Green Fiscal Policies and Green Sovereign Bonds. *Ecological Economics, 144,* 228–243.

Morris, N., & Juniper, J. (2012). Modern Money Theory (MM) and Minsky: Towards a Stock-Flow-Consistent (SFC) Synthesis. *AHE Panel on Modern Monetary Theory*, pp. 5–7.

Naqvi, S. A. A. (2015). *Modeling Growth, Distribution, and the Environment in a Stock-Flow Consistent Framework* (Working Paper No. 2015/02). Institute of Ecological Economics.

Nikiforos, M., & Zezza, G. (2017). Stock-Flow Consistent Macroeconomic Models: A Survey. *Journal of Economic Surveys, 31*(5), 1204–1239.

Papadimitriou, D. B. (2009). Global Imbalances: Strategic Prospects for the US and the World. Intervention. *European Journal of Economics and Economic Policies, 6*(1), 55–62.

Papadimitriou, D. B., Hannsgen, G., & Zezza, G. (2011). *Jobless Recovery Is No Recovery: Prospects for the US Economy*. Levy Institute Strategic Analysis. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/sa_mar_11.pdf.

Papadimitriou, D. B., Nikiforos, M., & Zezza, G. (2013a). *A Levy Institute Model for Greece. Levy Institute Technical Report*. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/rpr_7_13.pdf.

Papadimitriou, D. B., Nikiforos, M., & Zezza, G. (2013b). *The Greek Economic Crisis and the Experience of Austerity*. Levy Institute Strategic Analysis. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/sa_gr_7_13.pdf.

Papadimitriou, D. B., Nikiforos, M., & Zezza, G. (2015, May). *Greece: Conditions and Strategies for Economic Recovery*. Levy Institute Strategic Analysis. Annandale-on-Hudson, New York, USA: Levy Economics Institute of Bard College. Available at: http://www.levyinstitute.org/pubs/sa_gr_5_15.pdf.

Rankin, N. (2011). *Calvo's Continuous-Time Model of Staggered Pricing: A Basic Exposition* (Unpublished Working Paper).

Reyes, L., & Mazier, J. (2014). Financialized Growth Regime: Lessons from Stock Flow Consistent Models. *Revue de la régulation. Capitalisme, institutions, pouvoirs*, 16(2e semestre).

Richters, O., & Siemoneit, A. (2017, June). Consistency and Stability Analysis of Models of a Monetary Growth Imperative. *Ecological Economics, 136,* 114–125.

Romer, P. (2016). *The Trouble with Macroeconomics*. Available at: https://paulromer.net/wp-content/uploads/2016/09/WP-Trouble.pdf.

Sawyer, M., & Veronese Passarella, M. (2017). The Monetary Circuit in the Age of Financialisation: A Stock-Flow Consistent Model with a Twofold Banking Sector. *Metroeconomica, 68*(2), 321–353.

Smets, F., & Wouters, R. (2003). An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area. *Journal of the European Economic Association, 1*(5), 1123–1175.

Skott, P., & Ryoo, S. (2008). Macroeconomic Implications of Financialisation. *Cambridge Journal of Economics, 32*(6), 827–862.

Stiglitz, J. E. (2018). The Rebuilding Macroeconomic Theory Project: An Analytical Assessment. *Oxford Review of Economic Policy, 34*(1–2), 70–106.

Tobin, J. (1969). A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking, 1*(1), 15–29.

Tobin, J. (1982). Money and Finance in the Macroeconomic Process. *Journal of Money, Credit and Banking, 14*(2), 171–204.

Valdecantos, S., & Zezza, G. (2015). Reforming the International Monetary System: A Stock-Flow-Consistent Approach. *Journal of Post Keynesian Economics, 38*(2), 167–191.

Van Treeck, T. (2008). A Synthetic, Stock-Flow Consistent Macroeconomic Model of 'Financialisation'. *Cambridge Journal of Economics, 33*(3), 467–493.

Veronese Passarella, M. (2012). A Simplified Stock-Flow Consistent Dynamic Model of the Systemic Financial Fragility in the 'New Capitalism'. *Journal of Economic Behavior & Organization, 83*(3), 570–582.

Veronese Passarella, M. (2019). From Abstract to Concrete: Some Tips to Develop an Empirical SFC Model. *European Journal of Economics and Economic Policies: Intervention*. First published online: February 2019. https://doi.org/10.4337/ejeep.2019.0044.

7

Fiscal Policy and Ecological Sustainability: A Post-Keynesian Perspective

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1 Introduction

Environmental problems are now more pressing than ever in human history. Climate change, biodiversity loss, ocean acidification, deforestation, ocean plastic pollution and water scarcity are only some examples of these problems. Human activity is almost entirely responsible for these environmental pressures. For instance, climate change is directly linked with the build-up of greenhouse gases (GHGs) in the atmosphere caused by industrial activity over the last decades. The accumulation of plastics in the oceans is a direct outcome of the inherent

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tendency of the current economic system to generate large amounts of non-recyclable hazardous waste, which is disposed into the environment. Deforestation is the result of urbanisation, cattle ranching, the use of trees for fuel and other human-related developments and activities.

There is, therefore, an urgent need to change fundamentally the way that our economies and societies produce and consume. Failure to do so could result in environmental collapse, harming fundamentally the future of humanity. Fiscal policy is one of the key tools that can be used in this direction. Green fiscal policy is not confined to the use of taxes as a means to incentivise more environmentally friendly production and consumption patterns. Green fiscal policy has also to do with government spending (for example, through subsidies and investment) that affects the use of renewables, energy efficiency, waste generation, recycling and other aspects of production and consumption that have an impact on the environment. Green fiscal policy also includes public investment in research and development of new green technologies.

Post-Keynesian economics has traditionally emphasised the importance of fiscal policy for achieving macroeconomic stability and high levels of employment (see, for example, Fazzari 1994–1995; Wray 2007; Arestis and Sawyer 2010; Hein and Stockhammer 2010; Nikolaidi 2014; Dafermos 2018). This comes in contrast to the limited role fiscal policy is considered to play in the 'New Consensus Macroeconomics'. In this consensus, which continues to play a prominent role in modern macroeconomics, fiscal policy is not considered to be an effective instrument for regulating aggregate demand and higher government spending is postulated to have a neutral impact on long-run growth and an adverse effect on budget deficits (see Arestis and Sawyer 2003; Lavoie 2006; Arestis 2012).

However, despite their emphasis on the positive economic and social effects of fiscal policy, post-Keynesian economists have not paid enough attention to the way that fiscal policy could be used to achieve ecological sustainability. This has largely to do with the fact that ecological sustainability has only very recently incorporated into post-Keynesian approaches (see Fontana and Sawyer 2013, 2016; Jackson and Victor 2016; Taylor et al. 2016; Dafermos et al. 2017).

Therefore, the investigation of the environmental effects of fiscal policy from a post-Keynesian perspective is still at a very preliminary stage.

The aim of this contribution is to critically discuss how green fiscal policy has been so far analysed within both conventional and post-Keynesian frameworks, placing particular emphasis on the assumptions that have been adopted in different types of models and the implications that these assumptions have for the results of the analysis. It also intends to explore how green fiscal policy could contribute to ecological sustainability, using a recently developed post-Keynesian ecological macroeconomic model that allows us to provide a comparative assessment of different types of green fiscal policies. Our evaluation, which relies on a scenario analysis, focuses both on the environmental effects of these policies (primarily climate change), and their key economic and financial implications. The green fiscal policies that we examine are carbon taxes, green subsidies and green public investment. We also discuss directions for future heterodox macroeconomic research in this area.

We proceed as follows. In Sect. 2, we briefly describe the main fiscal policies for ecological sustainability. In Sect. 3, we discuss how the effects of green fiscal policies have been analysed in mainstream and post-Keynesian models and we briefly analyse some key methodological issues. In Sect. 4, we outline the model used for our evaluation of green fiscal policies. In Sect. 5, we describe our scenario analysis and we present our simulation results. In Sect. 6, we summarise our key findings and provide directions for future research.

2 Which Are the Key Green Fiscal Policies?

Carbon taxes remain the most popular green fiscal policy since today. The idea behind this policy is straightforward: by imposing such taxes on carbon emissions, firms have an economic incentive to rely less on fossil fuels and invest more in renewables and energy efficiency. Furthermore, carbon taxes can induce households to choose less carbon-intensive goods. Proponents of carbon taxes often argue that their beneficial effects are not confined to the reduction of carbon emissions. These taxes can be a source of significant revenues for the governments,

allowing them to spend in areas that are highly important for the environment (such as low-carbon infrastructures) or reduce taxes on other economic activities or income sources, via the so-called 'revenue recycling' (High-Level Commission on Carbon Prices 2017; OECD 2017; World Bank 2019).

However, carbon taxes are likely to have significant distributional effects (Zachmann et al. 2018). For example, a tax on carbon can lead to a rise in energy prices, which are more likely to hurt much more significantly poorer households whose electricity and heating costs constitute a significant proportion of their income. In addition, carbon taxes may affect those who work in carbon-intensive sectors or small and medium-sized enterprises that rely on carbon-related activities. Consequently, it is often argued that these policies have to be accompanied by offsetting measures that attenuate these adverse distributional effects.

Carbon taxes are not the only type of environmental taxes (World Bank 2019). Environmental taxes include all the taxes that are imposed on a physical unit that has an adverse impact on the environment. Examples of other environmental taxes are the taxes on transport (e.g. heavy goods vehicle taxes), pollution taxes (e.g. air pollution and landfill taxes) and resource taxes (e.g. mineral resources extraction taxes). The idea behind these taxes is similar to that of carbon taxes: they are meant to create incentives for more environmentally friendly behaviours and can, at the same time, raise public revenues that can be used for other beneficial purposes.

Green subsidies are another green fiscal policy. They can take many forms. For example, they can be tax exemptions (as is the case, for example, with electric vehicles in many countries), feed-in tariffs for renewable energy production[1] or grants that fund part of investment projects that intend to have a positive environmental impact. Quite ironically, subsidies have not overall played a beneficial environmental role over

[1]Feed-in tariffs are long-term contracts, which allow green energy producers to receive a fixed payment for the electricity that they generate; these payments are independent of the market price of electricity.

the last decades. This is because a significant amount of subsidies has supported—and continues to support—energy consumption and production related to fossil fuels (High-Level Commission on Carbon Prices 2017; Monasterolo and Raberto 2019). The removal of fossil fuel subsidies is, thus, an essential part of any green fiscal policy mix.

However, green fiscal policies are not restricted to the use of taxes and subsidies. The spending decisions of governments also have a significant impact on ecological sustainability (Pollin et al. 2014). For example, instead of trying just to incentivise and fund green private investment, governments can also invest directly in low-carbon infrastructure (such as electricity transmission grids and electric vehicle charging facilities), energy efficiency retrofits for publicly owned buildings as well as research and development in green technologies (like battery storage technologies and technologies for the electrification of the industrial sector). This investment can take place within the context of a mission-oriented approach (Mazzucato and McPherson 2018). In addition, the government can employ people to work in the public sector in order to provide environment-friendly services through a jobs guarantee programme (Forstater 2003) or via standard public sector employment contracts.

3 Modelling Green Fiscal Policies

Carbon taxes constitute the green fiscal policy whose implications have been most extensively explored in the economic modelling literature. This has largely been done via Integrated Assessment Models (IAMs). These models include both economic and environmental modules, allowing the combined assessment of the economic and environmental effects of various types of policies. IAMs can be classified into two broad categories: (i) the Policy Optimisation Models (POMs) which identify optimal policies by relying on cost–benefit analysis; and (ii) the Policy Evaluation Models (PEMs) whose key aim is to identify a least-cost approach to achieve a specific goal; for example, a specific change in atmospheric temperature (Farmer et al. 2015).

The most well-known POM is the Dynamic Integrated Climate-Economy (DICE) model, which has been developed by the Nobel

Prize-winning economist, William Nordhaus. The DICE model (Nordhaus 2018) uses the standard neoclassical optimal growth framework whereby a social planner decides about the level of consumption and investment such that the discounted sum of per capita population-weighted utility is maximised. Within this framework, output is supply-determined and is affected by the level of investment, which builds up capital stock. Consumption and investment are substitutable. Lower consumption today leads to higher investment today, which in turn leads to higher output and higher consumption in the future.

Economic activity generates carbon emissions, which are considered a kind of externality. These emissions enter into the carbon cycle. The part of carbon that is not absorbed by oceans and the biosphere remains in the atmosphere contributing to climate change. Climate change in turn has adverse feedback effects on economic activity: the DICE model uses a damage function, which links atmospheric temperature with economic damages in a non-linear way. These damages reduce GDP and, thus, consumption and economic welfare. The *social cost of carbon* represents the decline in the discounted value of economic welfare caused by an increase in CO_2 emissions by 1 tonne. The rate that is used to discount economic welfare reflects social time preferences. The higher the discount rate the lower the value assigned to damages that will be experienced by future generations.

Firms can reduce emissions, and thus climate damages, by undertaking mitigation activities. However, mitigation has a cost: an increase in mitigation reduces the resources that are available for consumption and conventional investment. Therefore, the social planner weighs off the cost of mitigation against the benefit of reducing climate damages and selects the optimal level of mitigation that equalises the cost with the benefit. At this optimal level, the social cost of carbon is equal to the incremental cost of mitigation. When the social cost of carbon is derived, based on this cost–benefit analysis, it is considered to reflect the optimal carbon price and, if a carbon tax is imposed, its value should be equal to this optimal price.[2]

[2]Note that the carbon price derived by DICE and other IAMs is also compatible with cap-and-trade systems.

According to the most recent estimates that rely on the DICE model (Nordhaus 2017), the optimal carbon price for 2015 is $31 per tonne of CO_2 in 2010 US$.[3] Interestingly, such a price for carbon derives a 3.5 degrees global warming at the end of this century, which is much higher than 1.5 or 2 degrees threshold that has been set by the Paris Agreement. However, within the IAM community there is no consensus on what the right value for the optimal carbon price is. Many IAMs, which have modified key assumptions in the DICE model, have estimated different optimal carbon prices, which in most cases are higher compared to those estimated by Nordhaus. These higher estimates can, for example, be the result of the incorporation of climate tipping points, the use of a lower discount rate, the incorporation of a more pessimistic damage function, the assumption for a higher climate sensitivity to the increase in carbon concentration or the introduction of intra-region inequality (see e.g. Botzen and van der Bergh 2012; Lemoine and Traeger 2014; Dennig et al. 2015; Dietz and Stern 2015; Espagne et al. 2018).

Other well-known POMs that have been used to estimate optimal carbon prices are FUND (Anthoff and Tol 2013), PAGE (Hope 2011) and WITCH (Bosetti et al. 2006). FUND has a very detailed analysis of damages since it includes damage functions for a variety of effects of climate change, including the impact on health, agriculture, forestry, migration and water resources. It analyses a large number of world regions and it endogenises many GHG emissions, not only the carbon dioxide ones, as is the case in DICE. However, the economic module in FUND is relatively simple and economic growth is exogenous. The social cost of carbon is estimated by monetising the welfare effects of climate change, including the value of life. PAGE is close to FUND in the sense that economic growth is exogenous and different type of damages in different regions are analysed. However, it is less complicated.[4]

In WITCH, economic growth is endogenously determined via a Ramsey-type neoclassical model. The model covers different regions

[3]This price should increase by 3% every year.

[4]For a more detailed comparison of the two models and their similarities and differences with the DICE model, see Bonen et al. (2014).

around the world. In each region, a social planner determines the optimal path that maximises welfare. The distinguishing feature of the model is the endogeneity of technology and the emphasis on the role of learning processes and R&D investment. In addition, the strategy of each region is determined via an intertemporal game. The model has been used to explore the combined effects of carbon pricing and innovation policies, showing that innovation policies can reinforce the positive environmental effects of carbon pricing (Bosetti et al. 2011).

It is important to point out that although the primary aim of POMs is to estimate the social cost of carbon that corresponds to an optimal path, they have also been used to derive non-optimal paths. For example, Nordhaus (2017) has himself calculated the social cost of carbon that would result in no more than 2.5 degrees global warming. As expected, this social cost of carbon is much higher than the one that is derived based on the optimal path.

Contrary to POMs, PEMS do not use cost–benefit analysis since they do not typically include monetised damages from the environment. Generally speaking, they have a more detailed sectoral representation and a more detailed analysis of the energy system and emissions. This allows them to be employed for exploring how mitigation policies can affect different sectors of the economy, as well as the use of energy and the generation of GHG emissions in a more comprehensive way. This is why many PEMs have been used in the scenarios of the Intergovernmental Panel on Climate Change (IPCC) (see Krey et al. 2014). Some well-known PEMs are the Economic Projection Policy Analysis (EPPA) model (Chen et al. 2016), the Global Change Assessment Model (GCAM) (Shi et al. 2017) and the Model for Energy Supply Strategy Alternatives and their General Environmental impact model (MESSAGE) (Riahi et al. 2011).

The economic module of many IAMs (both POMs and PEMs) is often built based on CGE (Computable General Equilibrium) modelling techniques. CGE models are multi-sector models in which household and firms are assumed to maximise their utility and profits. In these models product and factor markets are typically postulated to be competitive and clear through changes in relative prices; the latter

depend on the interaction between supply and demand. General equilibrium is achieved when all markets are in equilibrium.[5]

CGE models have been employed to analyse the effects of a wide range of green fiscal policies, including carbon taxes (e.g. Meng et al. 2013; Guo et al. 2014) and green subsidies or feed-in-tariffs (e.g. Kalkuhl et al. 2013; Wei et al. 2019). Many studies that rely on CGE models have also paid particular attention to the distributional effects of carbon taxes (and carbon pricing more general), whereby a common finding is that carbon taxes are regressive. However, their adverse distributional effects can be offset if the associated tax revenues are used to compensate poorer households (e.g. Rausch et al. 2011; Liang and Wei 2012).

In CGE models employment is determined via the interaction between labour supply and labour demand. In these models, a policy mix that increases environmental taxes and reduces labour taxes can increase employment, by raising both labour supply and labour demand, but it can also decrease it because of the impact of environmental taxes on prices. If the labour market is assumed to be perfect and no involuntary unemployment exists (which is the case in the vast majority of CGE models), it is less likely that such a policy mix will have a favourable employment effect. Positive employment effects become more likely when labour market is imperfect and involuntary unemployment exists (World Bank 2019).[6]

Now, a crucial question arises: can IAMs and CGE models provide an appropriate framework for analysing environmental economic policies, including green fiscal policies? As the recent literature on economy-environment modelling has emphasised, these approaches have several limitations. Let us briefly refer to those of them that are more relevant for our analysis.[7]

First, in the vast majority of CGE models and IAMs it is assumed that economies function at full capacity and full employment. This is at

[5]For detailed discussions of the use of CGE models in the analysis of environmental policies, see Bergman (2005) and Babatunde et al. (2017).

[6]For a CGE model that permits imperfections in the labour market, see Capros et al. (2013).

[7]For a detailed discussion of additional issues see, among others, Scrieciu et al. (2013), Farmer et al. (2015), van den Bergh and Botzen (2015) and Pollitt and Mercure (2017).

odds with reality: modern economies are characterised by idle resources (see, for example, Chewpreecha et al. 2017), which means that an increase in aggregate demand always causes an increase in GDP.[8] In the standard IAMs and CGE models, this is not the case: if, for example, public green investment demand increases, the creation of new jobs should be accompanied by an equivalent reduction in jobs in other sectors of the economy. Although there are IAMs or CGE models in which involuntary unemployment is introduced (as mentioned above), aggregate demand still plays a negligible role.

The lack of a role for aggregate demand is important for an additional reason. Climate damages are likely to affect consumption and investment demand significantly and hence GDP (Batten 2018; Dafermos et al. 2017, 2018). For example, in areas in which there will be a secular increase in the severity and frequency of climate-related events, firms might be less willing to invest in physical assets and households might increase their propensity to save. Without an explicit analysis of demand, these effects cannot be examined.

Second, the way that mitigation is modelled in CGE models and IAMs is problematic. Mitigation in these models is considered to constitute only a cost. This violates the Keynesian principle that one person's spending is another person's income. For example, if a company buys some solar panels to reduce its carbon emissions, the spending on these panels will be an inflow for the company that produces the panels. This spending contributes to GDP and cannot be considered only as a cost. It is also problematic that green capital that is built via mitigation spending does not contribute to future GDP. Taking into account that mitigation can have a positive contribution to GDP would call into question the whole rationale of cost–benefit analysis.

Third, money in these models is not created endogenously as is the case in the real-world financial systems (see Arestis and Sawyer 2006; McLeay et al. 2014). The financial system, if it appears in the models, plays merely an intermediary role. A direct implication is that

[8]Of course, the magnitude of this effect on GDP depends on some potential capacity constraints that have to do, for example, with skills and geographical location.

environment-related spending (of the private or the public sector) always crowds out other types of investment spending or leads to lower consumption. This is because credit cannot expand to support investment; prior savings can only fund the latter. This means that the possibility that climate policies are expansionary is ruled out (Pollitt and Mercure 2017). Moreover, the expansion of green private investment is restricted since firms cannot acquire credit created out of 'thin air'. This is highly important as an assumption, given that credit can be a very crucial source of funding for green investments, like those linked to renewables, which tend to have high upfront costs.

The way that money and the financial system are treated in CGE models and IAMs has additional implications. In particular, it makes it very difficult to analyse the financial stability effects of climate change. As has been extensively discussed in the recent literature on climate-related financial risks (e.g. Scott et al. 2017), climate policies and climate change can lead to defaults and asset price deflation, disrupting the credit provision process through interconnected balance sheets. The effects cannot be properly explored in CGE models and IAMs. Moreover, these models are not suitable for the analysis of the effects of environmental financial policies that have been recently suggested, and whose aim is to reallocate credit and funds from brown investment towards green investment (Campiglio 2016; Volz 2017; Campiglio et al. 2018; D'Orazio and Popoyan 2019).

Fourth, most IAMs and CGE models rely on the idea that the agents have a common understanding of the way that the economy works (which is captured by the model that is used by economists) and they know the data-generating process about the economy, which follows a predetermined probability distribution. However, in reality fundamental uncertainty exists (Davidson 1991, 2002; Fontana and Gerrard 2004). The future path of the economy is unknown and unknowable, which stems from the fact that this path is determined based on the decisions of people today, which cannot be known by definition.[9]

[9]This, in particular, relies on the concept of 'ontological' uncertainty, which is one of the two forms of fundamental uncertainty, the other one being 'epistemological' uncertainty. For the differences between ontological and epistemological uncertainty see Lavoie (2014, Chapter 2).

Consequently, in their decision-making process, agents follow norms and rules of thumb in line with the concept of 'procedural' rationality (Lavoie 2014, Chapter 2). Within that context, an 'optimal' path cannot be by definition identified. Needless to say, the importance of fundamental uncertainty is reinforced when the uncertainties about environmental issues are taken into account.[10]

Fifth, the idea of analysing the environmental problems simply as externalities, whose value can be priced, raises many questions. In practice, these prices are estimated using methodologies that often rely on subjective valuations of life and pollution, which cannot reflect the intrinsic value of nature and the actual social cost of environmental degradation (Neuteleers and Engelen 2015; Berger 2017). In addition, according to the tradition of ecological economics, the environmental problems should not be viewed as side effects of economic activity. Instead, the economy should be analysed as a subsystem of the wider ecosystem (Daly and Farley 2011). An implication of this is that the stability of the ecosystem is a prerequisite for a stable society and economy. If the prices imposed on 'externalities' are not enough to prevent severe ecological disruptions, the economy will be destabilised as well. IAMs take implicitly that into account when they analyse, for example, how a higher than 2 degrees global warming can be prevented, instead of using cost–benefit analysis (which is the case in PEMs). However, IAMs and CGE models do not generally adopt a systems approach that could explicitly examine how the dynamic interactions between the ecosystem and the economic system could result in instability and collapse.

Over recent years, alternative models have been developed, which do not suffer from most of the above-mentioned problems. The majority of these models draw on the post-Keynesian tradition and they thereby postulate that output is demand-determined, money is created endogenously, finance plays a non-neutral role, economies do not operate at equilibrium and agents take decisions based on rules of thumb and norms. A few of these models also rely on agent-based methodologies,

[10]See, for example, Aldred (2012) on the importance of climate change uncertainty and its links with fundamental uncertainty à la Keynes.

which provide an alternative to the representative agent approach of most IAMs (Lamperti et al. 2018).

Some of these heterodox macro models have recently been employed to examine the effects of green fiscal policies. Monasterolo and Raberto (2018) have explored the impact of green subsidies using a stock-flow consistent (SFC) model.[11] Their model does not include an environmental or climate module, but it has a detailed economic module in which an explicit distinction is made between green and brown capital. In their scenarios, subsidies are funded via sovereign green bonds or taxes. Their results show that green subsidies have a positive impact on green investment. However, the effects on employment and total capital accumulation depend on the type of funding. If green subsidies are funded via taxes, the economic effects are negative since taxation reduces disposable income. If, on the other hand, sovereign bonds are issued to finance green subsidies, employment and capital accumulation increase; however, in this scenario public indebtedness also increases. Monasterolo and Raberto (2019) have used an extended version of this model to examine the implications of phasing out fossil fuel subsidies. In their simulations, a smooth phasing out of these subsidies not only increases green investment, but also improves macroeconomic performance.

Godin (2012) has developed an SFC model that analyses the implications of a green employer of last resort (ELR) programme. According to this programme, all those who are unemployed do not receive unemployment benefits, but work instead in green jobs in the public sector. The simulation analysis shows that such a programme can reduce both private unemployment and energy consumption.

D'Alessandro et al. (2018) have built a post-Keynesian model for the French economy, which is used to conduct projections for a variety of environmental policies. These policies include a carbon tax and a jobs guarantee programme that incorporates green jobs. In their simulations, carbon taxes do not have a very significant environmental effect because

[11]For the stock-flow consistent approach to macroeconomic modelling, see Godley and Lavoie (2012), Caverzasi and Godin (2015) and Nikiforos and Zezza (2017).

only a relatively small amount of emissions is affected by these taxes. The jobs guarantee programme has a positive effect on employment, but it also increases the fiscal deficit.

Bovari et al. (2018) have developed an SFC model in which a climate module à la DICE is incorporated. They analyse the effects of carbon taxes and green subsidies. Although carbon taxes have a beneficial effect on the path of atmospheric temperature, they decrease corporate profits, increasing thereby firms' reliance on private debt. When carbon taxes are implemented in combination with green subsidies, the reduction in atmospheric temperature is reinforced and the rise in private indebtedness is less severe. However, green subsidies cause a rise in public indebtedness.

Mercure et al. (2018) have used a large-scale global post-Keynesian macro-econometric model to analyse the effects of a wide range of climate policies, including green fiscal policies. They examine policies such as feed-in tariffs, subsidies for renewables and heating systems, carbon prices and fuel taxes. Their model also includes a climate module and the role of technology diffusion. Their results show that the combination of such policies can significantly reduce the pace of global warming. The economic effects of these policies are both positive and negative. On the one hand, electricity prices go up, reducing the real disposable income of households and slowing thereby economic activity. On the other hand, green public investment increases employment and household income. The impact on fiscal balances is typically positive since revenues from taxes are higher than the expenditures in each region of the world. The impact on trade balance varies. Regions that produce fossil fuels are adversely affected since their exports decline, while in regions in which fossil fuels are imported the impact is positive since their imports go down.

Deleidi et al. (2019) have investigated the way that government spending on both green innovation and green capital can affect ecological sustainability, using an SFC model. Their simulation analysis shows that this type of spending has positive effects on making the use of energy and matter more efficient, slowing down climate change and the depletion of energy and material resources.

Although the above-mentioned studies have examined various aspects of green fiscal policies from a post-Keynesian perspective, they have not systematically compared carbon taxes with other types of green fiscal policies (including green public investment) with explicit reference to their combined effects on the economic, financial and environmental variables. In what follows we provide such a comparative evaluation using the DEFINE (Dynamic Ecosystem-FINance-Economy) model developed by Dafermos et al. (2017, 2018). This model serves our purposes because it combines aspects of post-Keynesian and ecological economics and pays particular attention to the interactions between the ecosystem, the financial system and the macroeconomy. The purpose of our analysis is to open the avenue for a more systematic examination of the links between fiscal policy and ecological sustainability in heterodox macroeconomics.

4 The DEFINE Model

The DEFINE model portrays the economy as a subsystem of the broader ecosystem. The economy uses material and energy resources from the environment on a continuous basis. Production and consumption lead to the generation of waste (such as hazardous solid waste and carbon emissions), which causes the degradation of the ecosystem. This degradation has feedback effects on humans and the function of the macroeconomy and the financial system. These negative effects include, for example, (i) the destruction of capital stock due to climate-related events (like floods and hurricanes); (ii) global warming-related reductions in labour productivity; (iii) the negative impact of hazardous waste on the health of the population and the ability of people to work; and (iv) the adverse impact of climate damages on economic units' expectations that affect their consumption and investment decisions. These effects can worsen the financial position of households and firms and can result in financial instability via a large number of feedback loops related primarily with the process through which credit is provided via banks and the bond market.

The way that energy and matter are analysed draws on the tradition of Georgescu-Roegen (1971). The model uses material flow analysis, which ensures a consistent representation of material flows in and out the socio-economic system, in line with the First Law of Thermodynamics (according to which matter and energy are not created or destroyed). Special emphasis is placed on the interaction between material extraction, recycling and the generation of waste. The model reports how waste is accumulated and pays particular attention to the potential emergence of matter depletion problems. The model also captures a key implication of the Second Law of Thermodynamics: as fossil fuels are burned, low-entropy energy is transformed into high-entropy energy. The model shows the dynamic evolution of the stock of fossil-fuel energy in order to capture the depletion of low-entropy energy.[12]

Carbon emissions are generated when non-renewable energy is produced. These carbon emissions contribute to the accumulation of carbon dioxide in the atmosphere. This build-up of carbon leads to higher radiative forcing, which expresses the difference between the solar energy absorbed by the Earth and the energy that is radiated back to the outer space. In turn, the rise in radiative forcing causes an increase in atmospheric temperature.

The way that the macroeconomy and the financial system are analysed is broadly in line with the SFC literature. For example, (i) all financial inflows correspond to financial outflows and all financial assets correspond to financial liabilities; (ii) the interaction between financial stocks and flows are explicitly modelled and the accumulation of private debt can have important negative feedback effects on macroeconomic and financial stability; and (iii) money is endogenously created when loans are provided.

Some key features of the model that differentiate it from the majority of previous SFC models are the following. First, banks do not provide credit in a passive way. There is an explicit credit rationing procedure: banks reject a proportion of the loan applications or provide a lower amount of loans than those that are demanded by the potential

[12]For a discussion of the First and the Second Law of Thermodynamics and their implications for economics, see Daly and Farley (2011).

borrowers. Banks decide about the level of credit rationing based on both their own financial position and the financial position of their potential borrowers. Lending interest rates are also endogenous; apart from being affected by central bank decisions, they also tend to increase when banks' financial position deteriorates.

Second, although output is demand-determined, supply constraints are also taken into account. This is crucial because environmental degradation, captured for example by climate change, is very likely to have significant supply-side effects, since it can reduce labour/capital productivity and labour force, and it can also destroy a large proportion of capital stock. In addition, the model uses a Leontief-type production function whereby energy and matter are essential for the production process. Thus, a potential depletion of energy and material reserves can restrict economic activity.

Environment-related technical change is endogenous. As green capital is accumulated (compared to conventional capital), the use of renewables increases, energy efficiency improves, material intensity declines and recycling increases. Technical change is governed by logistic functions, which capture learning effects; the latter are crucial for the way that green technology is developed and diffused.

DEFINE consists of two big blocks. The first block is the ecosystem block, which includes equations about (i) matter, recycling and waste, (ii) energy, (iii) emissions and climate change and (iv) ecological efficiency and technology. This block is built around a physical flow matrix and a physical stock-flow matrix that allow us to track explicitly the evolution of material and energy flows and stocks that play a key role for the stability of the ecosystem. The evolution of these physical stocks and flows is affected by human activity in both a negative and a positive way. On the one hand, higher economic activity leads to the accumulation of stocks that degrade the ecosystem (like carbon concentration and hazardous waste stock) and the depletion of useful resources. On the other hand, green technical progress can attenuate the adverse environmental impact per unit of GDP.

The second block is the macroeconomy and financial system block, which includes equations about (i) output determination, (ii) firms, (iii) households, (iii) banks, (iv) the government sector and (v) the

central banks. This block is represented by the transactions flow matrix and the balance sheet matrix, as is the case in SFC models. Firms invest in conventional and green capital by using retained profits, loans and bonds. Commercial banks accumulate capital and distribute part of their profits to households. Firms can default on these loans. When this happens, there is an adverse effect on the capital of banks. In addition, firms can receive funding via the bond market. Households receive labour income, buy durable consumption goods and accumulate wealth in the form of deposits, corporate bonds and government securities (there are no household loans). Corporate bonds can be either green or conventional. When the demand for green bonds increases, the price of these bonds tends to go up, leading to a lower cost of borrowing for green projects.

Central banks determine the base interest rate; they also provide liquidity to commercial banks and purchase government securities and corporate bonds. The government sector collects taxes (including carbon taxes), decides about the level of government consumption and government investment (the latter can be green or conventional) and can implement bailout programmes, if there are financial problems in the banking sector.

In what follows, we use the new version of the model, DEFINE 1.1. Compared to DEFINE 1.0, the latter version has various additional features that have to do with the role of fiscal and financial policies. The new features that are relevant for our analysis here are the following. First, carbon taxes are explicitly incorporated, which means that firms have to pay taxes based on the carbon emissions that they generate. The implication of this is that carbon taxes reduce the profitability of the firm sector. Since investment depends on profits, carbon taxes have an adverse effect on economic activity and accumulation of capital. Note that the adverse effect on economic activity is magnified by the fact that lower profitability also reduces loan provision. However, the adverse effect of carbon taxes on firms' profitability induces them to replace conventional investment with green investment. This tends to reduce carbon emissions.

Second, the government sector covers a proportion of green private investment spending via green subsidies. This has the opposite effect

on profitability compared to carbon taxes. This policy also incentivises firms to invest more in green capital.

Third, the government sector undertakes public investment, which can be either green or conventional. As a result of this investment, public capital is accumulated. The evolution of green public capital compared to conventional capital affects ecological efficiency. For example, the building of public electricity grids can increase the use of renewables and improve energy efficiency. In the model, the decision of the government about the level of green investment is exogenously determined based on its policy priorities. In addition, the government decides about the level of its green and conventional investment separately.

We have made the simplifying assumption that the government decides about this spending without taking into account the potential effects on public debt. We have assumed so because we wish to focus on the implications of green government spending, instead of exploring the drivers of fiscal decisions, which are quite complex, differ around the world and depend significantly on political factors.

Fourth, the firm sector has been disaggregated into four broad sectors ('mining and utilities', 'manufacturing and construction', 'transport' and 'other sectors')[13] whose conventional capital stock is assumed to have a different 'degree of brownness'. This degree of brownness is proxied by the carbon dioxide emissions that each sector produces compared to its gross value added. Hence, the higher this value, the higher the brownness of the capital of the sector, and the larger thereby the adverse environmental effect of the conventional investment of this sector.

A detailed description of these extensions as well as an analysis of all the equations of the model and its technical details can be found on the website of the model.[14] The website also includes information about the

[13]This disaggregation relies on ISIC (International Standard Industrial Classification of All Economic Activities) rev. 3.1. The 'mining and utilities' sector includes ISIC C ('mining and quarrying') and ISIC E ('electricity, gas and water supply'), the 'manufacturing and construction' sector includes ISIC D ('manufacturing') and ISIC F ('construction'), the 'transport' sector corresponds to ISIC I ('transport, storage and communication') and the 'other sectors' include ISIC A, B, G, H and J-P.

[14]Available at: www.define-model.org.

data that has been used to calibrate the model and estimate some of its key behavioural equations. Our econometric estimations rely on panel data for a large number of countries and refer to (i) the consumption function, according to which the spending of households depends on their disposable income and financial wealth; (ii) the investment equation which portrays the investment of firms as a function of the profit rate, the rate of capacity utilisation and the unemployment rate; (iii) the labour productivity function whereby labour productivity depends on the growth rate of output in line with the Kaldor–Verdoorn law; (iv) the credit rationing function, which is indirectly estimated via an econometric equation that analyse the determinants of corporate loan growth; and (v) the equation about the endogenous spread on corporate loans.

The evaluation of policies in DEFINE does not rely on any cost–benefit analysis, despite the fact that damages are taken into account. Mitigation, which takes the form of green investment, does not represent just a cost, as in traditional IAMs. Instead, green investment contributes to GDP and is not necessarily financed by prior savings; it can also be financed by newly created public or private debt. This is not in line with the rationale of the cost–benefit analysis used by IAMs.

In DEFINE we, instead, adopt a systems approach. Policies are evaluated based on their ability to achieve high well-being in a way that does not cause a collapse of the highly interconnected macroeconomic, financial and ecological systems (in both the short run and the long run). In other words, when the model is used for policy analysis, the purpose is to identify a mix of policies that permits the socio-economic system to function within the environmental limits and achieve the highest possible welfare.

5 A Comparative Evaluation of Green Fiscal Policies

The model is run for the period 2017–2120. The reason why such a long period has been selected is because we wish to evaluate how green fiscal policy could alter the long-run trends in key environmental

variables (and the feedback effects of these trends on the stability of the economic and financial systems). We first develop a baseline scenario for this period. In this scenario, the global economy continues to expand in broad line with recent trends and ecological efficiency improves slowly, due to green technical progress and some moderate mitigation action. However, this action is not enough to avoid a significant rise in atmospheric temperature by the end of this century.

Table 1 describes the main features of this scenario. The economy grows on average at a rate close to 2.5% until 2050; in other words, we postulate an economic expansion a little bit slower than the one observed over the last two decades or so. Crucially, economic growth has a declining trend, partially because of demographic changes. In 2050, population becomes equal to about 9.77 billion people (based on United Nations 2017). The unemployment rate remains, on average, slightly lower than 6% until 2050. Moreover, the default rate on

Table 1 Key features of the baseline scenario

Variable	Value/trend
Economic growth till 2050	Approximately 2.5% (on average)
Unemployment rate till 2050	Slightly lower than 6% (on average)
Population in 2050	9.77 billion
Labour force-to-population ratio in 2050	0.45
Default rate on corporate loans till 2050	Slightly higher than 4% (on average)
Carbon tax	Increases by 3% per year
Green public investment	Remains stable as a proportion of GDP
Green subsidies	Remain stable as a proportion of green investment
CO_2 intensity in 2050 as a ratio of CO_2 intensity in 2017	Around 0.9
Share of renewable energy in total energy in 2050	Around 25%
Energy intensity in 2050 as a ratio of energy intensity in 2017	Around 0.7
Annual green investment in the period 2017–2050	Around US$1.5 trillion
Yield of conventional bonds	Quite stable till around 2050
Yield of green bonds	Declines slightly in the next decade or so

Source Own construction

corporate loans is assumed to remain, on average, close to its current level, which is slightly higher than 4%.

In terms of environmental policies, the carbon tax is assumed to increase by 3% per year. In our model, the carbon tax has been calibrated to US$1 per tonne of CO_2 in 2017. This is derived by dividing the global total revenue from carbon taxes (available from World Bank 2018) by the total industrial carbon emissions. This figure is relatively low since in reality only a small proportion of carbon emissions (about 20%) is taxed (World Bank 2018), while in our model all the industrial emissions are taxed. Thus, the carbon tax should be low enough in our simulations in order for the value of carbon tax revenues in our model to match the data for 2017.

The subsidy rate on green investment remains unchanged, close to 28% according to our calibration for 2017. Green public investment increases, but remains constant as a proportion of GDP. For 2017, this has been calibrated at about 0.25%. It is implicitly assumed that environmental regulation becomes gradually stricter, contributing to the moderate rise in green investment as a proportion of conventional investment. Overall, annual total (private and public) green investment during the period 2017–2050 is equal to around US$1.5 trillion.[15]

The accumulation of green capital leads to an improvement in ecological efficiency indicators. The share of renewable energy increases to about 25% until 2050 (from about 14%, which is the current level), while energy intensity is assumed to become approximately 30% lower in 2050 compared to its 2017 level. Material intensity and recycling rate also improve moderately.

We also assume that the yield on conventional bonds remains relatively stable until 2050, while the yield of green bonds improves in the next decade or so. The latter is a result of an increasing demand for green bonds that outstrips their supply, in line with recent trends (Climate Bonds Initiative 2017, 2018a, b).

[15]Note that in the reference scenario of IRENA (2018, p. 41) the annual investment in renewables and energy efficiency over the period 2015–2050 is close to US$1.3 trillion. Recall that green investment in our model does not only include investment in renewables and energy efficiency; it also includes investment that improves material intensity and the recycling rate.

Figure 1 illustrates how some key variables of the ecosystem, the financial system and the macroeconomy evolve under our baseline scenario. Since the rise in green investment is moderate (see Fig. 1b, which refers to the desired investment in the 'mining and utilities' sector), the share of renewable energy does not increase sufficiently by the end of the century (Fig. 1c). The improvement in energy efficiency is also moderate (not shown in the figure). This fact, combined with the continuous rise in GDP (Fig. 1a), results in a continuous rise in carbon emissions in the next 4–5 decades (Fig. 1d) that ultimately leads to an increase in atmospheric temperature by about 3.8 °C (compared the pre-industrial levels) in 2100 (Fig. 1e).

Global warming has adverse effects on the economy and the financial system. There is a long-run decline in the profitability of firms (Fig. 1f), which is driven both by the climate-related destruction of capital and the fall in aggregate demand due to climate change. This decline becomes more pronounced once the 2 degrees threshold is passed, at the mid of this century. The fall in profitability triggers liquidity problems that cause a rise in the default rate on corporate loans (Fig. 1g). Consequently, the capital of banks is hurt and their capital adequacy ratio follows a downward trend (Fig. 1h). At some point, bank capital is not enough in order for banks to comply with the minimum capital requirements, so the government sector steps in and bailouts the banking sector.

Bank bailouts have an adverse effect on the public debt-to-GDP ratio (Fig. 1i). However, this is not the only reason why public indebtedness deteriorates. Public indebtedness primarily goes up because of the decline in economic activity that reduces tax revenues. Note that in our model we have not incorporated the financing of adaptation measures to climate change. If this were the case, the adverse impact of climate change on public indebtedness would be magnified.

Climate change is not the only environmental issue. The combination of continuous economic expansion with an insufficient improvement in material efficiency and recycling leads to a continuous rise in the waste produced by the socio-economic system (Fig. 1l). This has negative feedback effects on the health of the population since a proportion of this waste is hazardous and can lead to chronic diseases. These diseases reduce the ability of people to work, inducing a fall in labour force.

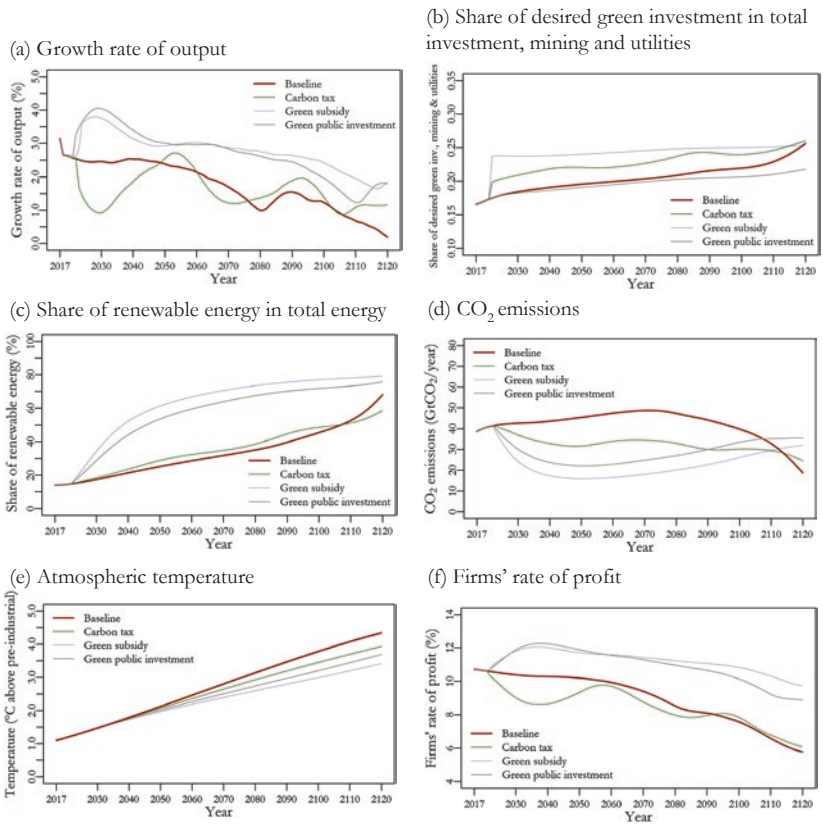

Fig. 1 Effects of carbon tax, green subsidy and green public investment policies, selected variables (*Note* The figure reports across-run averages from 200 Monte Carlo simulations. The values used in the baseline scenario are available at www.define-model.org. All policy shocks take place in 2022. Under 'carbon tax', the tax on total carbon emissions increases to \$16/tCO_2 and grows at 3% thereafter. Under 'green subsidy', the subsidies as a proportion of green investment increase to 60%. Under 'green public investment', green public investment increases to 1%, as a proportion of GDP). *Source* Own construction

We now examine how the above-mentioned trends could be modified if different types of green fiscal policies are introduced at the global level in 2022. The green fiscal policies that we analyse are the following:

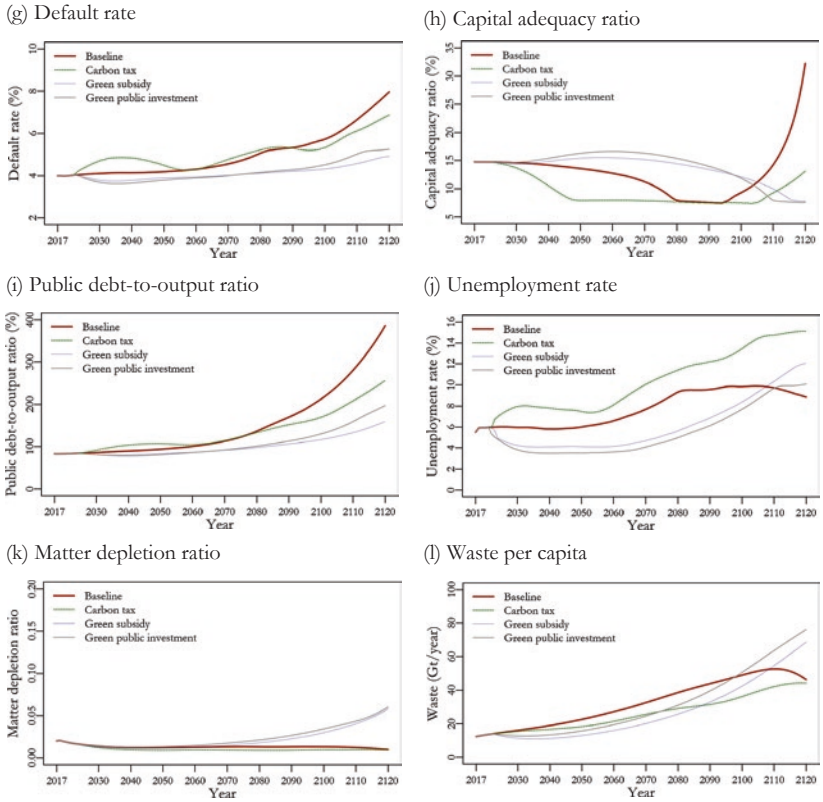

Fig. 1 (continued)

- *Carbon tax*: The carbon tax increases to US$16 per tonne of CO_2 in 2022 and grows by 3% per year thereafter. The increase in carbon tax to US$16 per tonne of CO_2 in 2022 corresponds to a carbon tax of US$80 per tonne of CO_2, if the latter is imposed only on those emissions that are currently covered by carbon pricing schemes (20% of total emissions). Note that US$80 per tonne of CO_2 is the upper limit for the carbon price suggested by High-Level Commission on Carbon Prices (2017) for 2020.
- *Green public subsidies*: The green subsidies provided by the government increases from 28 to 60% as a proportion of green investment in 2022 and remain constant thereafter.

- *Green public investment*: The green investment of the government increases from 0.25% to 1% (as a proportion of GDP) in 2022 and remains constant thereafter.

Note that each one of these policies corresponds to US$0.6–0.7 trillion. This amount is either the increase in government revenues (in the case of carbon tax) or the increase in government spending (in the case of green subsidies or green public investment) after the introduction of the policies.

The effects are shown in Fig. 1. Let us first focus on the impact of a rise in carbon tax. This rise has a direct adverse effect on the profitability of firms (Fig. 1f): since they cannot directly cut carbon emissions substantially, they have to pay a significant amount of money in the form of taxes, which causes a fall in profits. This has various implications for macroeconomic performance and financial stability.

To begin with, since firms have fewer profits, they cut their desired investment and their access to finance is distorted. The latter happens because lower profits increase the debt service ratio of firms, and this makes banks less willing to approve applications for corporate loans. The decline in desired investment, in conjunction with the increase in credit rationing, triggers an overall decline in private investment. Consequently, economic activity slows down (Fig. 1a) and the unemployment rate increases significantly (Fig. 1j). Moreover, lower profitability deteriorates the liquidity position of firms, causing a rise in the default rate, which affects adversely the stability of the financial system. Therefore, in our simulations the increase in carbon tax increases the so-called climate-related transition financial risks. In the related literature (e.g. Scott et al. 2017), these risks refer, among others, to the adverse impact that an abrupt implementation of climate policies could have on the financial system.[16]

However, these risks are not confined to the direct negative effect of a higher carbon tax on loan defaults. The interaction between the

[16]Other causes of climate-related transition financial risks include rapid green technical progress that might render carbon-intensive assets unprofitable and abrupt changes in environmental preferences.

macroeconomy and the financial system generates second-round effects that exacerbate these risks and influence the evolution of macroeconomic activity. In particular, as the default rate remains high, the capital adequacy ratio of banks declines. Since banks have less capital, the cut in lending is reinforced.[17] This keeps economic growth at a low level for a prolonged period, magnifying financial instability.

This higher financial instability is reflected, more precisely, in two developments. First, the capital adequacy ratio of banks continues to decline for many years, reaching the minimum level required by regulatory authorities (which in our simulations is assumed to be 8%). This induces the government sector to bailout banks. Second, lower macroeconomic activity reduces the financial wealth of households and, hence, their demand for corporate bonds goes down. The overall result is that the price of corporate bonds declines, causing an increase in the yield of bonds, which affects the cost of borrowing for firms (not shown in the figure). Thus, we overall have that in our simulations the sudden increase in carbon tax brings about a kind of *climate Minsky moment* that has prolonged adverse effects on the economy.[18]

These effects of the rise in carbon tax have an additional important implication. The conventional wisdom is that such a rise benefits public indebtedness because it increases tax revenues. The argument is that, if these revenues are not 'recycled', the government deficit goes down and this can improve the financial position of the government. However, this conventional wisdom ignores the aggregate demand and financial effects of carbon taxes, described above. These effects make carbon taxes have adverse implications for the long-run financial position of the government. In particular, in our simulations the increase in the carbon tax initially reduces the public deficit, as expected by the conventional wisdom (not shown in the figure). However, the reduction in aggregate demand, amplified by the adverse financial conditions, reduces the revenues that the government receives from taxes. Hence, the deficit

[17]Note that the effect of bank capital on bank lending, which is incorporated explicitly in our model, is in line with the recent empirical literature. The latter shows that changes in the capital adequacy ratio affect loan supply (see e.g. Aiyar et al. 2016; Gambacorta and Shin 2018).

[18]This term was first used by Carney (2015).

gradually gets back to its initial level. At some point, the contractionary effects make the public debt-to-GDP ratio higher than its value in the baseline scenario (see Fig. 1i).

The carbon-tax induced stagnation does not continue forever. The increase in carbon tax incentivises firms to invest more in green capital and reduce their brown investment. This is reflected in the rise of the share of desired green investment in total investment. Figure 1b shows how this share in the 'mining and utilities' sector increases due to the increase in the carbon tax. A similar increase takes place in other sectors, generating an improvement in the use of renewables (Fig. 1c) and a decline in energy efficiency (not shown in the figure).

As a result, carbon emissions go down and, hence, firms have gradually to pay less carbon taxes. This improves their profitability and liquidity position, producing an increase in desired investment and loan supply. These positive economic developments are reinforced by the fact that the prolonged stagnation has declined the level of private debt, making firms and banks more willing to participate in new debt contracts that stimulate economic activity. Hence, although the increase in carbon tax triggers important contractionary effects, these effects are gradually faded away and economic growth bounces back.

How about the impact of the increase in carbon taxes on the environment? As alluded to above, an important implication of this policy is that firms start reducing their carbon emissions since they now have to pay more for the adverse environmental impact of their activity. However, the decline in emissions is not only caused by the change in firms' investment mix. Quite ironically, the contractionary effects of carbon taxes also drive this decline; this is so since economic activity slows down, and, thus, the emissions that the economy generates decline too. Hence, a more integrated approach to the environmental effects of carbon taxes needs to take explicitly into account the adverse impact that such taxes might have on economic activity.

The reduction in carbon emissions, compared to the baseline scenario, slows down global warming. However, atmospheric temperature is still high at the end of this century (close to 3.5 °C according to Fig. 1e). A higher decline in global warming would be possible by imposing a higher carbon tax. However, the side effect of doing so

would be an even higher decline in economic activity in the first years after the introduction of a stricter carbon tax policy.

Importantly, other environmental variables are also positively influenced by the rise in carbon tax. The induced increase in green investment, in combination with the reduction in economic activity, leads to a lower extraction of matter for production purposes. Hence, the depletion of material reserves slows down, compared to the baseline scenario (Fig. 1k). The waste that is generated by the socio-economic system is also reduced (Fig. 1l).

However, the overall restriction of environmental problems is not sufficient to prevent a new round of severe economic and financial problems. This time the physical effects of climate change primarily cause these problems, as it was the case in the baseline scenario. Climate damages increase the default rate of firms (Fig. 1g), reinforcing the under-capitalisation of banks (Fig. 1h). At some point, the economy somehow recovers once debt levels have fallen sufficiently and credit expansion slightly bounces back. However, since this economy is constantly hit by climate shocks, it is not possible for the default rate to get back to levels that ensure financial stability. Therefore, climate-induced financial volatility becomes the new norm.

Overall, the increase in carbon tax in our model initiates a process that generates two long cycles in which climate and financial factors interact. The first cycle is induced by a partial transition to a low-carbon economy that takes place via the increase in carbon taxes. The carbon tax-related stagnation lasts until carbon emissions and private debt decline sufficiently. However, relatively shortly after the recovery of the economy a new cycle begins. This cycle starts because of the physical effects of climate change that bring the economy into a period of constant volatility.

Next, we turn to the impact of green subsidies. The rise in the green subsidy rate has quite the opposite effects compared to those of carbon taxes: since firms now receive money from the government, their profitability and liquidity increases. Hence, all those macrofinancial dynamic interactions described in the case of carbon taxes now work in the opposite direction, leading to an increase in economic activity (Fig. 1a), a fall in unemployment (Fig. 1j), a decline in loan defaults (Fig. 1g)

and an improvement in the financial position of banks (Fig. 1h). This implies that green subsidies do not pose transition risks to the financial system. Quite the contrary: they improve financial stability.

However, do they harm the financial position of the government? As shown in Fig. 1i, the public debt-to-GDP ratio does not increase, compared to the baseline scenario. Actually, after a few years it becomes lower than what it was the case in the baseline scenario. This is due to the positive expansionary effects of this policy on growth and thus on tax revenues. Hence, the impact of higher green subsidies on public indebtedness should not be the primary concern for those policymakers worrying about the government financial position.

Of particular interest are the environmental effects of green subsidies. As in the case of carbon taxes, green subsidies motivate firms to invest more in green capital. Hence, there is a reduction in atmospheric temperature (see Fig. 1e). This improvement in temperature is higher in comparison with the carbon taxes scenario. This is so basically because the green subsidy policy (i) affects green investment in all sectors (not only in the sectors that produce the majority of carbon emissions) and (ii) has a positive impact on green credit availability.

One would might expect an even higher reduction in atmospheric temperature. However, this is not the case because of the macroeconomic rebound effect that refers to the adverse environmental impact of the increase in macroeconomic activity.[19] In other words, although green subsidies reduce the carbon emissions per GDP, the rise in GDP weakens the decline in these emissions. Moreover, the rise in green subsidies leads to a higher material depletion ratio and a higher generation of waste in the long run, compared to the baseline scenario (see Figs. 1k and l, respectively).

We now consider the impact of an increase in public green investment. As in the case of green subsidies, such an increase leads to more economic activity (Fig. 1a). Note that green public investment affects

[19]For a description of the rebound effects, see Barker et al. (2009). Our analysis captures the macroeconomic aspects of these rebound effects since a rise in investment induced by a climate policy leads to higher economic activity that results in a rise in carbon emissions, waste and the use of energy and matter.

directly GDP; the government sector builds infrastructure by demanding directly investment goods produced by the private sector. On the contrary, when green subsidies are provided, the impact on investment is indirect (via the profitability of firms). Moreover, ecological efficiency now improves without observing an increase in the share of desired green private investment in total private investment (Fig. 1b). This improvement in ecological efficiency stems now directly from the increase in green public capital. Actually, it is interesting that the share of desired green investment in the 'mining and utilities' sector goes down. This happens because the reduction in overall carbon emissions (due to green public infrastructure) makes this sector pay less carbon taxes, and thus disincentivises it to undertake more green investment.

As in the scenario of green subsidies, the increase in economic activity is not beneficial to the environment. The decline in atmospheric temperature is less impressive than one would might expect (Fig. 1e). In addition, as shown in Figs. 1k and l, the high economic growth caused by the increase in public green investment amplifies the material depletion and waste generation problems. Therefore, although an increase in public investment appears to be an attractive policy in terms of economic and employment effects, it does not have very strong effects on improving environmental sustainability, when it is implemented in isolation.

As is clear from Fig. 1, the rebound effects on green public investment should be of a much larger concern than any effects on public indebtedness. Actually, the higher economic growth caused by the rise in green public investment reduces after some years the public debt-to-GDP ratio, compared to the baseline scenario (similarly to what happens when the green subsidies increase).

Table 2 summarises the main similarities and differences between the effects of all green fiscal policies described above. A common feature of all these policies is that they reduce global warming. In the case of green subsidies and green public investment, this happens primarily because of the rise in green investment compared to conventional investment. In the case of carbon taxes, the reduction in global warming is also caused by the slowdown that it causes to the global economy. Since all

Table 2 Key similarities and differences between the effects of the three green fiscal policies

	Increase in carbon tax	Increase in green subsidy rate	Increase in public green investment
Economic growth	Declines	Increases	Increases
Transition financial risks	Yes	No	No
Physical financial risks	Decline moderately	Decline	Decline
Public indebtedness	Increases	Declines moderately	Declines moderately
Global warming	Declines moderately	Declines	Declines

Note The policies are compared with the baseline scenario
Source Own construction

these policies reduce the pace of climate change, they also reduce the climate-related physical financial risks.

Both green subsidies and green public investment policies stimulate economic activity. This is beneficial to the economy, but has adverse effects on the environment due to the macroeconomic rebound effects described above. On the contrary, the carbon tax policy hits the profitability of firms and, thus, the transition to a low-carbon economy is accompanied by financial instability and a deterioration in macroeconomic performance. A side effect of this is that public indebtedness increases. This is not the case under the policies of green subsidies and green public investment: their positive economic and financial effects cause a decline in public indebtedness, compared to the baseline scenario.

We now ask what the effects are of a combined implementation of all the above-mentioned policies. Figure 2 shows that this fiscal policy mix has several advantages. First, the combined implementation of the three policies represents a very large positive economic shock, which affects the economy on a constant basis. The contractionary effects of a higher carbon tax are overcompensated by the expansionary effects of the green subsidy and green public investment policies. Thus, economic growth increases (Fig. 2a) and unemployment declines substantially (Fig. 2j). Note that the stimulating effect of the shock continuously

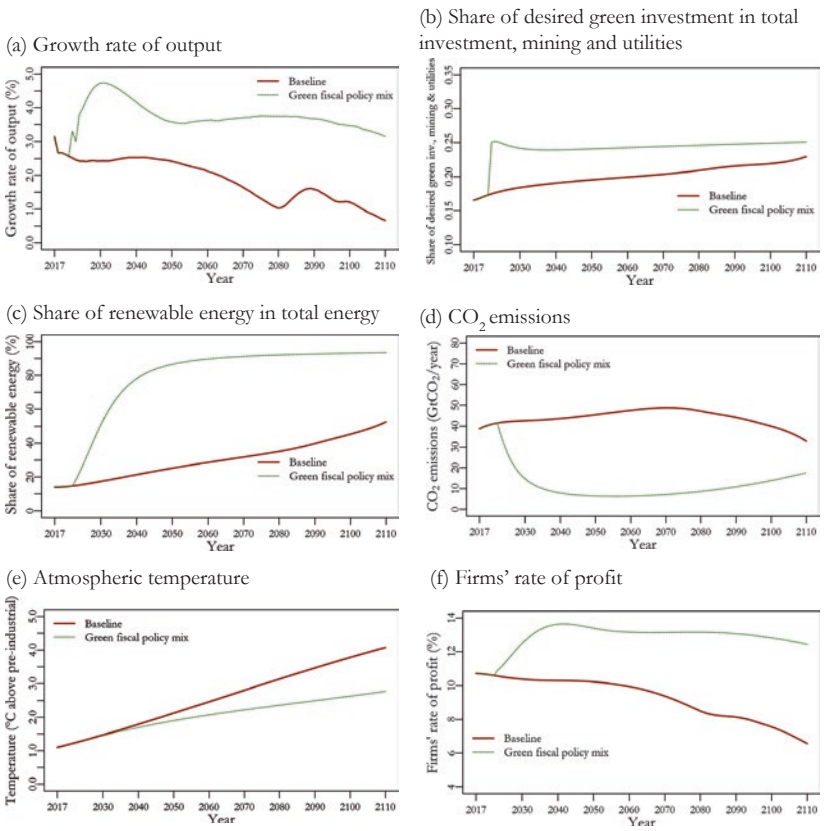

Fig. 2 Effects of a green fiscal policy mix, selected variables (*Note* The figure reports across-run averages from 200 Monte Carlo simulations. The values used in the baseline scenario are available at www.define-model.org. The 'green fiscal policy mix' is implemented in 2022. It combines a 'carbon tax', a 'green subsidy' and a 'green public investment' policy. Under 'carbon tax', the tax on total carbon emissions increases to \$16/tCO_2 and grows at 3% thereafter. Under 'green subsidy', the subsidies as a proportion of green investment increase to 60%. Under 'green public investment', green public investment increases to 1%, as a proportion of GDP). *Source* Own construction

increases since, as time passes, private green investment goes up (and thus green subsidies) and carbon emissions go down (and thus carbon taxes). Second, the boost in green investment is now much stronger,

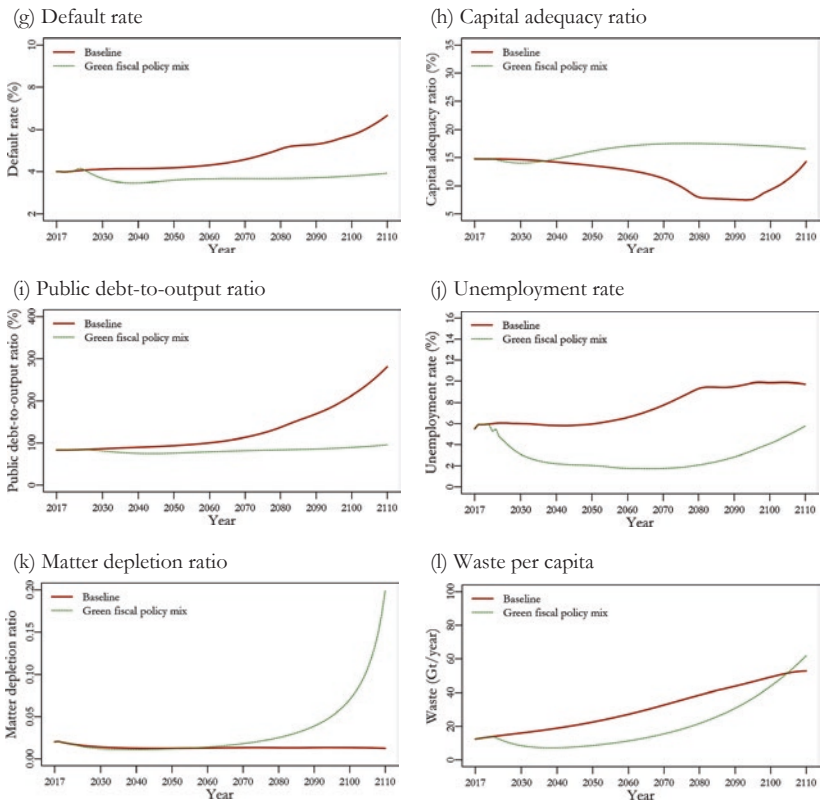

Fig. 2 (continued)

producing a pronounced improvement of ecological efficiency indicators. For example, the share of renewable energy increases much more rapidly by the mid of this century (Fig. 2c). Consequently, there is a significant decline in carbon emissions (Fig. 2d) that restricts the rise in atmospheric temperature to about 2.6 °C by the end of this century (Fig. 2e). Third, the slower pace of climate change makes the climate damages much less pronounced. This, in conjunction with the rise in economic activity, improves substantially firm profitability compared to the baseline scenario (Fig. 2f); the same holds for the default rate

(Fig. 2g), the capital adequacy ratio (Fig. 2h) and the public debt-to-GDP ratio (Fig. 2i).

However, the high level of economic activity comes at an environmental cost. Although green investment reduces material intensity and increases recycling, this is not sufficient to prevent an increase in the waste per capita generated by the socio-economic system (Fig. 2l). Moreover, there is a substantial rise in the material depletion ratio (Fig. 2k). This happens, in particular, at the beginning of the next century and poses a significant challenge to macroeconomic stability. Actually, with the values that we have used in our simulations for the parameters and variables that refer to material flows and stocks, it turns out that the economy exhausts most of its material reserves until 2110. This results in severe economic instability.[20]

Regarding the global warming effects of the green fiscal policy mix, several additional points are worth mentioning. First, the path of atmospheric temperature shown in our simulations is significantly affected by the assumptions made about the climate system. Our assumptions follow those that Nordhaus (2018) has made in the recent version of the DICE model. Two key parameters of the climate system are the climate sensitivity and the carbon absorption capacity of the upper ocean and the biosphere. The climate sensitivity shows how much the equilibrium temperature of the atmosphere increases when carbon concentration doubles compared to pre-industrial levels. The carbon absorption capacity of the upper ocean and the biosphere reflects how much carbon is absorbed by these reservoirs. The lower the value of climate sensitivity and the higher the value of the carbon absorption capacity, the lower the adverse effects of carbon emissions on global warming. Under more optimistic assumptions about the value of these parameters, our green fiscal policy mix could produce a temperature path closer to 2 degrees.

Second, our analysis does not consider the case of 'negative emissions' technologies, like the carbon capture and storage ones. The inclusion of such technologies could significantly affect the path of atmospheric

[20]This is why we do not report the value of variables after 2110 in Fig. 2.

temperature in our scenarios. Note that these technologies play a key role in the IPCC scenarios that produce 1.5 or 2 degrees (IPCC 2018).

Third, even if optimistic assumptions about the reaction of the climate system are adopted and 'negative emissions' technologies are introduced, it might well still be the case that our green fiscal policy mix, or more aggressive versions of it, are insufficient to keep climate change close to the targets set by the Paris Agreement. This means that many other policies need to accompany our green fiscal policy mix. These could include stricter environmental regulation, policies that reduce the growth of carbon-intensive consumption and financial policies that support actively the transition to a low-carbon economy. Actually, a key message of our analysis is that the complex interactions between the ecosystem, the macroeconomy and the financial system make it almost impossible for isolated policies to achieve stability in all systems simultaneously. The environmental and social challenges facing humanity in the next decades will require an innovative combination of different types of policies, as well as a fundamental change in our consumption patterns.

6 Conclusions and Directions for Future Research

Fiscal policy has a crucial role to play in the fight against environmental problems. Contrary to conventional wisdom, this role moves beyond environment-related taxation; the spending decisions of the government can also have important implications for ecological sustainability. The main purpose of this contribution has been to provide a comparative evaluation of different types of green fiscal policies, drawing on some recent developments in post-Keynesian ecological macroeconomic modelling. In our assessment, we focused on the role of carbon taxes, green subsidies and green public investment.

Our analysis has produced various interesting results. We have shown that carbon taxes can reduce global warming, as is the case in conventional environment-economy models. However, the explicit

incorporation of the financial system in our model has allowed us to pay particular attention to an additional aspect of this policy, which has so far been neglected in conventional approaches: the implications of carbon taxes for the stability of the financial system. In particular, we have illustrated that the adverse effect of carbon taxes on the profitability of firms can give rise to a type of *climate Minsky moment* whereby the default rate of firms increases, with negative effects on the capital position of banks and the availability of credit. The rise in financial instability exacerbates the negative effects of carbon taxes on economic growth and employment. However, quite ironically, these economic and financial adverse effects of higher carbon taxes reinforce their positive environmental impact, since lower economic activity leads to less carbon emissions.

Green subsidies and green public investment also have positive environmental effects since they increase green capital compared to conventional capital. However, their positive impact on economic activity has as a result that their beneficial environmental effects are partially offset by macroeconomic rebound effects. The latter refer to the fact that the rise in green private and public investment leads to higher use of natural resources. This does not only have a negative impact on the dynamics of atmospheric temperature. It also causes some quite significant matter depletion problems at the beginning of the next century and it places upward pressures on the waste generated by the socio-economic system. Another interesting result is that, quite paradoxically from a conventional point of view, higher spending on public green investment and green subsidies reduces public indebtedness. This happens because of the positive effects of higher growth on tax revenues, but also because these policies reduce climate damages, which have an adverse impact on public indebtedness.

Combined implementation of higher carbon taxes, green subsidies and green public investment turns out to be more beneficial compared to the case in which these policies take place in isolation. Since green public investment and green subsidies boost the profitability of firms and growth, the financial instability effects of higher carbon taxes do not materialise. At the same time, the contractionary effect of higher carbon taxes counterbalances to some extent the adverse impact of the

macroeconomic rebound effect on carbon emissions and other environmental variables. Therefore, a green fiscal policy mix is more effective from both an environmental and an economic/financial point view. This, however, does not mean that such a policy mix solves the environmental problems: the rise in atmospheric temperature is not so pronounced and high economic growth causes some material depletion and waste generation problems in the very long run. Hence, a green fiscal policy mix should be viewed as only one of the tools of a broader set of policies that are essential for achieving ecological sustainability.

There are various aspects of green fiscal policies that have not been accounted for in our model and can be the subject of future research. First, we have not explored the distributional effects of carbon taxes. These effects can be investigated by disaggregating the household sector into different types of households (see e.g. Dafermos and Papatheodorou 2015) or by using agent-based techniques (e.g. Dosi et al. 2013; Russo et al. 2015). This needs to be accompanied by an analysis of the pricing policies of the carbon-intensive sectors in order to study how income distribution is affected by different pricing policies, depending on whether higher carbon taxes are passed on to consumers or not. This would provide some additional insights into our transition-related *climate Minsky moment*. For example, one could expect that if carbon taxes are passed on to consumers, such a moment could be triggered not by higher firm financial fragility, but by higher household financial fragility. For a preliminary analysis of the distributional effects of carbon taxes within a post-Keynesian framework, see Monasterolo and Raberto (2018).

Second, we have not analysed green public R&D expenditures. Nowadays, the risk of investing in innovative green technologies is relatively high and the private sector does not seem sufficiently willing to take that risk. Therefore, future research should investigate how public spending on innovative research in green technologies could facilitate the transition to a low-carbon economy and accelerate the change in the technological paradigm. Deleidi et al. (2019) have conducted a preliminary investigation of the impact of green public spending on green innovation.

Third, public green employment has not been incorporated into our model. This is a crucial aspect of green fiscal policy. By hiring public sector employees to work in green jobs, the government can both support environmental targets and reduce the unemployment rate. Nonetheless, higher green public employment can have macroeconomic rebound effects, as it was the case with green subsidies and green public investment in our model. The implications of these rebound effects need to be explored in detail.

Fourth, we have adopted a global perspective for the analysis of the implications of green fiscal policies. However, regional and country-level approaches are a prerequisite for a well-informed implementation of such policies. Although some post-Keynesian analyses have been conducted along these lines (e.g. Barker et al. 2012; Pollin et al. 2014), a deeper look into the financial aspects and implications of green fiscal policies is in order. The incorporation of environmental aspects into the recently developed country-specific empirical SFC models (see Burgess et al. 2016; Zezza and Zezza 2019) would be a significant step in this direction.

Finally, in our analysis we have restricted our attention to a small subset of environmental problems: climate change, material/energy depletion and waste generation. However, fiscal policy can also affect many other aspects of the environment, including biodiversity, forests, fisheries and oceans. A broad research programme on green fiscal policy needs to pay attention to these aspects of the environment as well. This is particularly important due to the highly interconnected ecological subsystems of the global ecosystem. The systems approach adopted in our analysis would be the natural starting point for such an interdisciplinary research programme.

References

Aiyar, S., Calomiris, C. W., & Wieladek, T. (2016). How Does Credit Supply Respond to Monetary Policy and Bank Minimum Capital Requirements? *European Economic Review, 82*, 142–165.

Aldred, J. (2012). Climate Change Uncertainty, Irreversibility and the Precautionary Principle. *Cambridge Journal of Economics, 36*(5), 1051–1072.

Anthoff, D., & Tol, R. S. (2013). The Uncertainty About the Social Cost of Carbon: A Decomposition Analysis Using Fund. *Climatic Change, 117*(3), 515–530.

Arestis, P. (2012). Fiscal Policy: A Strong Macroeconomic Role. *Review of Keynesian Economics, 1,* 93–108.

Arestis, P., & Sawyer, M. (2003). Reinventing Fiscal Policy. *Journal of Post Keynesian Economics, 26*(1), 3–25.

Arestis, P., & Sawyer, M. (2006). The Nature and Role of Monetary Policy When Money Is Endogenous. *Cambridge Journal of Economics, 30*(6), 847–860.

Arestis, P., & Sawyer, M. (2010). The Return of Fiscal Policy. *Journal of Post Keynesian Economics, 32*(3), 327–346.

Babatunde, K. A., Begum, R. A., & Said, F. F. (2017). Application of Computable General Equilibrium (CGE) to Climate Change Mitigation Policy: A Systematic Review. *Renewable and Sustainable Energy Reviews, 78,* 61–71.

Barker, T., Anger, A., Chewpreecha, U., & Pollitt, H. (2012). A New Economics Approach to Modelling Policies to Achieve Global 2020 Targets for Climate Stabilisation. *International Review of Applied Economics, 26*(2), 205–221.

Barker, T., Dagoumas, A., & Rubin, J. (2009). The Macroeconomic Rebound Effect and the World Economy. *Energy Efficiency, 2,* 411–427.

Batten, S. (2018). *Climate Change and the Macro-economy: A Critical Review* (Staff Working Paper No. 706). Bank of England.

Berger, S. (2017). *The Social Costs of Neoliberalism: Essays on the Economics of K. William Kapp*. Nottingham: Spokesman.

Bergman, L. (2005). CGE Modeling of Environmental Policy and Resource Management. In K.-G. Mäler & J. R. Vincent (Eds.), *Handbook of Environmental Economics* (Vol. 3, pp. 1273–1306). Amsterdam: Elsevier.

Bonen, A., Semmler, W., & Klasen, S. (2014). *Economic Damages from Climate Change: A Review of Modeling Approaches* (Working Paper No. 3). Schwartz Center for Economic Policy Analysis, The New School.

Bosetti, V., Carraro, C., Duval, R., & Tavoni, M. (2011). What Should We Expect from Innovation? A Model-Based Assessment of the Environmental and Mitigation Cost Implications of Climate-Related R&D. *Energy Economics, 33*(6), 1313–1320.

Bosetti, V., Carraro, C., Galeotti, M., Massetti, E., & Tavoni, M. (2006). WITCH a World Induced Technical Change Hybrid Model. *The Energy Journal, 2,* 13–37.

Botzen, W. W., & van den Bergh, J. C. (2012). How Sensitive is Nordhaus to Weitzman? Climate Policy in DICE with an Alternative Damage Function. *Economics Letters, 117*(1), 372–374.

Bovari, E., Giraud, G., & Mc Isaac, F. (2018). Coping with Collapse: A Stock-Flow Consistent Monetary Macrodynamics of Global Warming. *Ecological Economics, 147*, 383–398.

Burgess, S., Burrows, O., Godin, A., Kinsella, S., & Millard, S. (2016). *A Dynamic Model of Financial Balances for the United Kingdom* (Staff Working Paper No. 614). Bank of England.

Campiglio, E. (2016). Beyond Carbon Pricing: The Role of Banking and Monetary Policy in Financing the Transition to a Low-Carbon Economy. *Ecological Economics, 121*, 220–230.

Campiglio, E., Dafermos, Y., Monnin, P., Ryan-Collins, J., Schotten, G., & Tanaka, M. (2018). Climate Change Challenges for Central Banks and Financial Regulators. *Nature Climate Change, 8*(6), 462–468.

Capros, P., Van Regemorter, D., Paroussos, L., Karkatsoulis, P., Fragkiadakis, C., Tsani, S., et al. (2013). *GEM-E3 Model Documentation* (JRC Scientific and Policy Reports No. 26034). European Commission.

Carney, M. (2015). *Breaking the Tragedy of the Horizon—Climate Change and Financial Stability*. Speech given at Lloyd's of London, London, Bank of England.

Caverzasi, E., & Godin, A. (2015). Financialisation and the Sub-prime Crisis: A Stock-Flow Consistent Model. *European Journal of Economics and Economic Policies: Intervention, 12*(1), 73–92.

Climate Bonds Initiative. (2017). *Green Bonds Highlights 2016*. London: CBI.

Climate Bonds Initiative. (2018a). *Green Bonds Highlights 2017*. London: CBI.

Climate Bonds Initiative. (2018b). *Green Bond Pricing in the Primary Market: January–June 2018*. London: CBI.

Chen, Y. H. H., Paltsev, S., Reilly, J. M., Morris, J. F., & Babiker, M. H. (2016). Long-Term Economic Modeling for Climate Change Assessment. *Economic Modelling, 52,* 867–883.

Chewpreecha, U., Fragkiadakis, K., Fragkos, P., Goldman, M., Lewney, R., Paroussos, L., et al. (2017). *Case Study—Technical Analysis on Capacity Constraints and Macroeconomic Performance: Technical Study on the Macroeconomics of Climate and Energy Policies*. European Commission.

Dafermos, Y. (2018). Debt Cycles, Instability and Fiscal Rules: A Godley-Minsky Synthesis. *Cambridge Journal of Economics, 42*(5), 1277–1313.

Dafermos, Y., Nikolaidi, M., & Galanis, G. (2017). A Stock-Flow-Fund Ecological Macroeconomic Model. *Ecological Economics, 131,* 191–207.

Dafermos, Y., Nikolaidi, M., & Galanis, G. (2018). Climate Change, Financial Stability and Monetary Policy. *Ecological Economics, 152,* 219–234.

Dafermos, Y., & Papatheodorou, C. (2015). Linking Functional with Personal Income Distribution: A Stock-Flow Consistent Approach. *International Review of Applied Economics, 29*(6), 787–815.

D'Alessandro, S., Dittmer, K., Distefanol, T., & Cieplinski, A. (2018). *Eurogreen Model of Job Creation in a Post-Growth Economy*. Greens-EFA.

Daly, H. E., & Farley, J. (2011). *Ecological Economics: Principles and Applications*. Washington, DC: Island Press.

Davidson, P. (1991). Is Probability Theory Relevant for Uncertainty? A Post Keynesian Perspective. *Journal of Economic Perspectives, 5*(1), 129–143.

Davidson, P. (2002). *Financial Markets, Money, and the Real World*. Cheltenham, UK: Edward Elgar.

Deleidi, M., Pariboni, R., & Passarella, M. V. (2019). *Supermultiplier, Innovation and the Ecosystem: A Stock-Flow Dynamic Model* (IIPP Working Paper 2019–01). Institute for Innovation and Public Purpose, UCL.

Dennig, F., Budolfson, M. B., Fleurbaey, M., Siebert, A., & Socolow, R. H. (2015). Inequality, Climate Impacts on the Future Poor, and Carbon Prices. *Proceedings of the National Academy of Sciences, 112*(52), 15827–15832.

Dietz, S., & Stern, N. (2015). Endogenous Growth, Convexity of Damage and Climate Risk: How Nordhaus' Framework Supports Deep Cuts in Carbon Emissions. *The Economic Journal, 125*(583), 574–620.

D'Orazio, P., & Popoyan, L. (2019). Fostering Green Investments and Tackling Climate-Related Financial Risks: Which Role for Macroprudential Policies? *Ecological Economics, 160,* 25–37.

Dosi, G., Fagiolo, G., Napoletano, M., & Roventini, A. (2013). Income Distribution, Credit and Fiscal Policies in an Agent-Based Keynesian Model. *Journal of Economic Dynamics and Control, 37*(8), 1598–1625.

Espagne, E., Pottier, A., Fabert, B. P., Nadaud, F., & Dumas, P. (2018). SCCs and the Use of IAMs: Let's Separate the Wheat from the Chaff. *International Economics, 155,* 29–47.

Farmer, J. D., Hepburn, C., Mealy, P., & Teytelboym, A. (2015). A Third Wave in the Economics of Climate Change. *Environmental & Resource Economics, 62*(2), 329–357.

Fazzari, S. M. (1994–1995). Why Doubt the Effectiveness of Keynesian Fiscal Policy? *Journal of Post Keynesian Economics, 17*(2), 231–248.

Fontana, G., & Gerrard, B. (2004). A Post Keynesian Theory of Decision Making Under Uncertainty. *Journal of Economic Psychology, 25*(5), 619–637.

Fontana, G., & Sawyer, M. (2013). Post-Keynesian and Kaleckian Thoughts on Ecological Macroeconomics. *European Journal of Economics and Economic Policies: Intervention, 10*(2), 256–267.

Fontana, G., & Sawyer, M. (2016). Towards Post-Keynesian Ecological Macroeconomics. *Ecological Economics, 121,* 186–195.

Forstater, M. (2003). Public Employment and Environmental Sustainability. *Journal of Post Keynesian Economics, 25*(3), 385–406.

Gambacorta, L., & Shin, H. S. (2018). Why Bank Capital Matters for Monetary Policy. *Journal of Financial Intermediation, 35,* 17–29.

Georgescu-Roegen, N. (1971). *The Entropy Law and the Economic Process*. Cambridge: Harvard University Press.

Godin, A. (2012). *Guaranteed Green Jobs: Sustainable Full Employment* (Working Paper No. 722). Levy Economics Institute.

Godley, W., & Lavoie, M. (2012). *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*. Basingstoke: Palgrave Macmillan.

Guo, Z., Zhang, X., Zheng, Y., & Rao, R. (2014). Exploring the Impacts of a Carbon Tax on the Chinese Economy Using a CGE Model with a Detailed Disaggregation of Energy Sectors. *Energy Economics, 45,* 455–462.

Hein, E., & Stockhammer, E. (2010). Macroeconomic Policy Mix, Employment and Inflation in a Post-Keynesian Alternative to the New Consensus Model. *Review of Political Economy, 22*(3), 317–354.

High-Level Commission on Carbon Prices. (2017). *Report of the High-Level Commission on Carbon Prices*. International Bank for Reconstruction and Development and International Development Association, The World Bank.

Hope, C. (2011). *The Social Cost of CO_2 from the PAGE09 Model* (Working Paper Series No. 5/2011). University of Cambridge Judge Business School.

IPCC. (2018). *Special Report: Global Warming of 1.5 °C*. Intergovernmental Panel on Climate Change.

IRENA. (2018). *Global Energy Transformation: A Roadmap to 2050*. International Renewable Energy Transformation.

Jackson, T., & Victor, P. A. (2016). Does Slow Growth Lead to Rising Inequality? Some Theoretical Reflections and Numerical Simulations. *Ecological Economics, 121,* 206–219.

Kalkuhl, M., Edenhofer, O., & Lessmann, K. (2013). Renewable Energy Subsidies: Second-Best Policy or Fatal Aberration for Mitigation? *Resource and Energy Economics, 35*(3), 217–234.

Krey, V., Masera, O., Blanford, G., Bruckner, T., Cooke, R., Fisher-Vanden, K., et al. (2014). Annex II: Metrics and Methodology. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, et al. (Eds.), *Climate Change 2014: Mitigation of Climate Change: Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Lavoie, M. (2006). A Post-Keynesian Amendment to the New Consensus on Monetary Policy. *Metroeconomica, 57*(2), 165–192.

Lavoie, M. (2014). *Post-Keynesian Economics: New Foundations*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar.

Lamperti, F., Dosi, G., Napoletano, M., Roventini, A., & Sapio, A. (2018). Faraway, So Close: Coupled Climate and Economic Dynamics in an Agent-Based Integrated Assessment Model. *Ecological Economics, 150,* 315–339.

Lemoine, D., & Traeger, C. (2014). Watch Your Step: Optimal Policy in a Tipping Climate. *American Economic Journal: Economic Policy, 6*(1), 137–166.

Liang, Q. M., & Wei, Y. M. (2012). Distributional Impacts of Taxing Carbon in China: Results from the CEEPA Model. *Applied Energy, 92,* 545–551.

Mazzucato, M., & McPherson, M. (2018, December). *The Green New Deal: A Bold Mission-Oriented Approach*. IIPP Policy Brief, Institute for Innovation and Public Purpose, UCL.

McLeay, M., Radia, A., & Thomas, R. (2014). Money Creation in the Modern Economy. *Bank of England Quarterly Bulletin, 54*(1), 14–27.

Meng, S., Siriwardana, M., & McNeill, J. (2013). The Environmental and Economic Impact of the Carbon Tax in Australia. *Environmental & Resource Economics, 54*(3), 313–332.

Mercure, J. F., Pollitt, H., Viñuales, J. E., Edwards, N. R., Holden, P. B., Chewpreecha, U., et al. (2018). Macroeconomic Impact of Stranded Fossil Fuel Assets. *Nature Climate Change, 8*(7), 588–593.

Monasterolo, I., & Raberto, M. (2018). The EIRIN Flow-of-Funds Behavioural Model of Green Fiscal Policies and Green Sovereign Bonds. *Ecological Economics, 144,* 228–243.

Monasterolo, I., & Raberto, M. (2019). The Impact of Phasing Out Fossil Fuel Subsidies on the Low-Carbon Transition. *Energy Policy, 124,* 355–370.

Nikiforos, M., & Zezza, G. (2017). Stock-Flow Consistent Macroeconomic Models: A Survey. *Journal of Economic Surveys, 31*(5), 1204–1239.

Nikolaidi, M. (2014). Margins of Safety and Instability in a Macrodynamic Model with Minskyan Insights. *Structural Change and Economic Dynamics, 31,* 1–16.

Neuteleers, S., & Engelen, B. (2015). Talking Money: How Market-Based Valuation Can Undermine Environmental Protection. *Ecological Economics, 117,* 253–260.

Nordhaus, W. D. (2017). Revisiting the Social Cost of Carbon. *Proceedings of the National Academy of Sciences, 114*(7), 1518–1523.

Nordhaus, W. D. (2018). Projections and Uncertainties About Climate Change in an Era of Minimal Climate Policies. *American Economic Journal: Economic Policy, 10*(3), 333–360.

OECD. (2017). *Environmental Fiscal Reform: Progress, Prospects and Pitfalls*. OECD Report for the G7 Environment Ministers.

Pollin, R., Garrett-Peltier, H., Heintz, J., & Hendricks, B. (2014). *Green Growth: A U.S. Program for Controlling Climate Change and Expanding Job Opportunities*. PERI.

Pollitt, H., & Mercure, J. F. (2017). The Role of Money and the Financial Sector in Energy-Economy Models Used for Assessing Climate and Energy Policy. *Climate Policy, 18*(2), 184–197.

Rausch, S., Metcalf, G. E., & Reilly, J. M. (2011). Distributional Impacts of Carbon Pricing: A General Equilibrium Approach with Micro-data for Households. *Energy Economics, 33,* S20–S33.

Riahi, K., Rao, S., Krey, V., Cho, C., Chirkov, V., Fischer, G., et al. (2011). RCP 8.5 A Scenario of Comparatively High Greenhouse Gas Emissions. *Climatic Change, 109*(1–2), 33–57.

Russo, A., Riccetti, L., & Gallegati, M. (2015). Increasing Inequality, Consumer Credit and Financial Fragility in an Agent Based Macroeconomic Model. *Journal of Evolutionary Economics, 26*(1), 25–47.

Scott, M., van Huizen, J., & Jung, C. (2017). The Bank of England's Response to Climate Change. *Bank of England Quarterly Bulletin, Q2,* 98–109.

Scrieciu, S. Ş., Barker, T., & Ackerman, F. (2013). Pushing the Boundaries of Climate Economics: Critical Issues to Consider in Climate Policy Analysis. *Ecological Economics, 85,* 155–165.

Shi, W., Ou, Y., Smith, S. J., Ledna, C. M., Nolte, C. G., & Loughlin, D. H. (2017). Projecting State-Level Air Pollutant Emissions Using an Integrated Assessment Model: GCAM-USA. *Applied Energy, 208,* 511–521.

Taylor, L., Rezai, A., & Foley, D. K. (2016). An Integrated Approach to Climate Change, Income Distribution, Employment, and Economic Growth. *Ecological Economics, 121,* 196–205.

United Nations. (2017). *World Population Prospects: Key Findings and Advance Tables*. New York: United Nations.

van den Bergh, J. C., & Botzen, W. J. W. (2015). Monetary Valuation of the Social Cost of CO_2 Emissions: A Critical Survey. *Ecological Economics, 114,* 33–46.

Volz, U. (2017). *On the Role of Central Banks in Enhancing Green Financing* (Working Paper No. 17/01). UN Environment Inquiry, Geneva.

Wei, W., Zhao, Y., Wang, J., & Song, M. (2019). The Environmental Benefits and Economic Impacts of Fit-in-Tariff in China. *Renewable Energy, 133,* 401–410.

World Bank. (2018). *State and Trends of Carbon Pricing 2018*. World Bank Group.

World Bank. (2019). *Fiscal Policies for Development and Climate Action*. International Bank for Reconstruction and Development, The World Bank. World Bank Group.

Wray, L. R. (2007). *The Employer of Last Resort Programme: Could It Work for Developing Countries?* Geneva: ILO.

Zachmann, G., Fredriksson, G., & Claeys, G. (2018). *The Distributional Effects of Climate Policies* (Blueprint Series No. 28). Bruegel.

Zezza, G., & Zezza, F. (2019). *On the Design of Empirical Stock-Flow-Consistent Models* (Working Paper No. 919). Levy Economics Institute of Bard College.

8

Secular Stagnation and Income Class Structure in Europe: Policy and Institutional Implications

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1 Introduction

Growth in economically advanced countries has been relatively slow in recent decades. Some forecast that the economy will continue to stagnate in the medium to long term, fuelling the debate around the risk of secular stagnation. At the same time, since the 1980s income inequality has widened in numerous wealthy countries as richer households have pulled away from their middle and lower income peers, although it has not evolved uniformly across countries and over time (OECD 2017). Thereby, slow growth prospects and rising inequalities constitute two key challenges of our societies. Some authors suggest that a 'new

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normal' is arising in industrialised countries characterised, on the one hand, by stagnant growth and, on the other, by increasing inequalities and a vanishing middle class (see, for instance, Summers 2013a, b; IMF 2015; Storm 2017; Kochhar 2017).

In this study, we address the current debate on secular stagnation and its connections with inequality, and empirically examine the degree of association between different levels of economic growth and income inequality in European countries. We consider inequality through the analysis of the income class structure, examining the lower, lower-middle, upper-middle and upper classes in terms of population and income shares. This approach seems to be more suitable than an overall measure of inequality in income distribution (e.g. Gini index) as it permits a differentiated analysis of each of the parts of income distribution to reveal a more complete picture of the situation. This way, we analyse possible links between growth and income class structure, focusing on primary income distribution before personal income taxes and transfers, that is, market incomes. We attempt to determine to what extent different levels of economic growth go hand in hand with changes in income classes occurring at the outset through the markets.

The chapter is organised as follows. The next section provides an overview of the origin and development of the current debate on secular stagnation from different theoretical perspectives, paying special attention to its links with inequality. Section 3 briefly reviews the theoretical literature on the relationship between growth and income distribution in both directions of causality. Section 4 presents estimations of the size and income share of income classes (lower, lower-middle, upper-middle, upper) in European countries between 1993 and 2016. Section 5 empirically examines the degree of association between levels of economic growth and the size and income share of income classes in European countries. Section 6 discusses some central ideas regarding potential policies and institutional reforms to tackle stagnant growth and inequality simultaneously. Finally, Sect. 7 summarises and offers some concluding remarks.

2 Understanding the Debate on Secular Stagnation and Its Links with Inequality

The question of whether slow growth prospects in advanced countries, and in Europe in particular, reflect some kind of ongoing stagnation problem, has been a hot debate since Summers's (2013a) speech at the International Monetary Fund's annual research conference in November 2013. Four years after the Great Recession technically ended in the US, Larry Summers, former World Bank chief economist and US Treasury Secretary, suggested that the slow growth rates and continuing uncertainties of the post-crisis years were not just temporary after-effects of the financial crisis itself. Summers (op. cit.) revived the original idea of secular stagnation proposed by Alvin Hansen in his Presidential Address entitled 'Economic Progress and Declining Population Growth' at the annual meetings of the American Economic Association in 1938 and published in Hansen (1939).[1] Hansen (op. cit.) used the term to refer to a historical trend rooted in American experience. He believed that economic growth in the US would remain weak for decades after the Great Depression of the 1930s, and described a situation in which economic fundamentals pointed to serious problems for economic growth. He argued that the US economy faced a crisis of underinvestment and deficient aggregate demand, as investment opportunities had significantly diminished, due to a slowdown in the rate of population growth and in technological progress. He was not confident that the economy of his time could produce strong profit-oriented incentives for investment spending and was sceptical that lower interest rates could encourage the large and vigorous investment levels that he felt were needed. In this context, he offered expansion in infrastructure investment as a major possible policy solution.

It is generally assumed that the secular stagnation hypothesis disappeared because it was refuted by events. The prevailing view is that Hansen's (1939) stagnation thesis was proved wrong by the post-war

[1]Actually, the term 'secular stagnation' was not introduced in Hansen's Presidential Address, but rather four years earlier in Hansen (1934, p. 19).

boom. It could be argued that Hansen's (op. cit.) initial argument for secular stagnation was reversed due to exogenous changes, particularly by the marked increase in government spending during World War II and the subsequent baby boom. Although the slowdown in population growth was certainly a fair reading of the trends at that time, Hansen (1939) completely missed that US fertility rates were about to take off less than a decade later. Moreover, in retrospect, the notion that technological innovation stopped in the 1930s seems clearly incorrect (see, for example, Taylor 2013).

Critical reactions to Hansen's (1939) secular stagnation hypothesis in the following decades largely discarded the doctrine of secular stagnation from the macroeconomic research agenda, although the topic never totally disappeared. Moreover, as Backhouse and Boianovsky (2016) emphasise, Hansen (1939) was not the only theory of stagnation. The problem of stagnation attracted the attention from some heterodox economists. On the one hand, the Marxian approach supported by Sweezy (1942) and Klein (1947), which combines some features of Hansen's (1939) framework with the vision of a downward tendency in the rate of profit. On the other hand, Schumpeter (1942, 1943) and Steindl (1952) provided distinct explanations of the lack of dynamism of capitalism. Although both were concerned with the potentially depressing consequences of the shift of capitalism from competition to oligopoly, Steindl (1952) takes Hansen (1939) as a starting point[2] whereas Schumpeter (1942, 1943) rejects what he called Hansen's 'theory of vanishing investment opportunity'. He argues that companies permanently have new investment opportunities and entrepreneurs always attempt to improve production through innovations.

From a historical perspective, Backhouse and Boianovsky (2016) recall that, from the 1950s onwards, secular stagnation increasingly became a concept used primarily in economic history, development

[2]Steindl (1952) looked at the growth of oligopoly as the explanation of the apparent decline in the rate of growth of the economy that, according to his microeconomic model, should be accompanied by an increase in profit margins and a fall in effective demand in relation to capacity.

economics and the history of economic thought (such as making sense of Malthus and Marx). They underline that, despite the situation of 'stagflation' suffered in the 1970s in numerous advanced economies, characterised by high inflation rate, slow economic growth and steadily high unemployment, secular stagnation remained absent from most of the mainstream macroeconomic literature. Only some heterodox economists, who had already discussed it in the past, such as Steindl (1979) and Sweezy (1982), sporadically revisited the topic, although without providing new significant developments. Backhouse and Boianovsky (op. cit.) draw attention, for instance, to the entry on 'stagnation' that Steindl (1987) wrote in *The New Palgrave Dictionary of Economics*, which mainly restated his 1952 interpretation and surveyed classic contributions by Hansen and Marxian authors.

Nevertheless, a critical stream that strongly emerged on the scene in the 1960s and 1970s was the questioning of limits to growth from an environmental standpoint. Some authors began to express serious doubts as to the desirability of continued economic growth. Mishan (1967), Schumacher (1973) and Hirsch (1977), among others, first set out the main reasons for this concern. They enumerated various alleged shortcomings of economic growth, including diverse forms of externalities, from pollution to congestion of travel facilities and holiday resorts. Much attention was particularly given to the warnings about the inevitable constraints on growth that were formulated in 'The Limits to Growth', a report commissioned by the 'Club of Rome' (Meadows et al. 1972). This study examined exponential trends in resource use and pollution since the Industrial Revolution and especially since 1950. It concluded that (i) continued economic growth would mean that the world would run out of resources of key materials in the not too distant future; (ii) population growth would outrun the world's capacity to increase food supply; and (iii) increasing environmental damage would make this planet uninhabitable. These conclusions attracted considerable controversy in its time and have inspired generations of economists and environmental and social thinkers. In this context, in recent years

there is an emerging interest in ideas around de-growth[3] (D'Alisa et al. 2014) and economics of 'post-growth' societies[4] (Jackson 2009, 2017; Cassiers et al. 2017). These approaches tend to accept that economic growth may be neither desirable nor indeed feasible.

Focusing on the debate over the plausibility of the secular stagnation hypothesis in current times, since Larry Summers reintroduced the term at the end of 2013, a number of arguments have been proposed from both demand- and supply-sides, frequently evoking diverse potential links with the ongoing concern about inequality.

The demand-side perspective on secular stagnation, formulated most notably by Summers (2014) and Eggertsson and Mehrotra (2014), focuses on the sustained decline of the natural rate of interest, which is a hypothetical construct that cannot be observed, referred to the interest rate at which real Gross Domestic Product is growing at its trend rate and inflation is stable. The central demand-side argument is that the combination of high savings and diminished investment tends to cause a situation of chronic excess savings over investment that pushes the natural interest rate into negative terrain,[5] contracting aggregate demand and increasing the output gap, hence inducing a low growth and low inflation environment. Given the zero lower bound constraint on nominal interest rates, it is difficult for central banks to sufficiently lower real interest rates to raise investment to a level compatible with full employment. Moreover, as Summers (2016) suggests,

[3]The French term *décroissance* (later translated into English as de-growth) was used for the first time by French intellectual André Gorz in the 1970s. De-growth means primarily the abolition of economic growth as a social objective. This implies a new direction for our societies, in which we would use fewer natural resources and would organise and live differently from today on the basis on an equitable downscaling of production and consumption.

[4]The 'post-growth' approach acknowledges that economic growth can generate beneficial effects up to a point. Concerned about the effects of growth beyond this point, 'post-growth' economics addresses the limits-to-growth challenge from an evolving complex systems perspective, interrelating economy with all aspects of self and society (psychology, culture, etc.).

[5]The pioneer in developing the concept of natural interest rate was Wicksell (1898), though he was not interested in secular stagnation (see Dufrénot and Rhouzlane 2018). However, Pigou (1943) was the one who introduced a theoretical formulation in which economic growth could remain low over a long period of time if the natural interest rate of the economy was negative, while the money market interest rates were positive but near zero.

in the secular stagnation scenario exceptionally high growth rates often come from dangerous borrowing that turns excess saving into unmaintainable investment levels, as illustrated by the housing bubble in the 2000s.

Summers (2014, 2015, 2016) points out that the excess of savings over investment is related to structural factors that exert downward pressure on the natural interest rate. A significant aspect is the decreasing population growth rate across the developed world, which tends to decrease investment demand. Likewise, the declining relative prices of investment goods, such as machines and equipment, the decline of capital intensity of some key industries, especially in sectors involving information and communication technology (ICT) and the consequent lower capital requirement per worker further raise savings over investment. Finally, he particularly emphasises that another major cause in generating tendencies of secular stagnation is a rise in within-country inequality. The propensity to consume is smaller among the high-income households than among the households with lower levels of income, so that an increase in inequality entails that the overall propensity to consume of the economy tends to decrease.

This potential contribution of income inequality to secular stagnation is related to the old idea, developed by Pigou (1920), Keynes (1936) and later by Blinder (1975), among others, that income distribution is a key factor of aggregate economic activity in the sense that higher income inequality may reduce aggregate demand and employment. Auclert and Rognlie (2018) attempt to quantify these potential effects and find that higher inequality decreases output because marginal propensities to consume are negatively correlated with incomes, but this effect is likely to be small in the short run. By contrast, the long-run output effect of income inequality can potentially be up to ten times larger than the effect in the short-run case.

The supply-side perspective on secular stagnation proposed focusing on the diminishing long-run growth potential and the slow growth of productivity. Gordon (2015), one of the most prominent supply-side pessimists, compares the US economy when Hansen (1939) proposed the secular stagnation hypothesis with the current economic circumstances. Gordon (2015) highlights that in 1938 the economy faced a

crisis of woefully inadequate aggregate demand but not of aggregate supply, because the underlying rate of productivity growth in the late 1930s was as high as at any time in US economic history. By contrast, in the years following the Great Recession, the output gap has been small, while productivity growth has been only a fraction of the rate achieved in the late 1930s.

Gordon (2012, 2014, 2015, 2016) points out that lower potential growth is partly driven by a deceleration in the rate of technological progress over time, as well as a series of 'structural headwinds'. He argues that the Great Inventions that powered economic growth from 1870 to 1970, from electricity to the internal combustion engine and modern communication, were more important for boosting productivity and enhancing living standards than anything produced by developments in ICT. Moreover, fundamental changes in business methods related to the ICT revolution were concentrated around the turn of millennium. Once new equipment was installed and new business practices were adopted, the impact on productivity growth began to encounter diminishing returns.

He highlights some 'structural headwinds' that dampened economic growth, including aspects such as ageing of the population, the plateau in average educational attainment levels, rising inequality, the interaction between globalisation and ICT affecting the labour market, the fight against global warming and the twin high household and government debts. Among them, he underlines that 'the most important quantitatively in holding down the growth of our future income is rising inequality' (Gordon 2012, p. 17), even though he does not explicitly explain the reasons why inequality may be so detrimental for growth.

It is worth noting that two of the structural headwinds stressed, the ageing of the population and the rise in income inequality, are also relevant for the demand-side interpretation of secular stagnation. Gordon (2015) recognises that secular stagnation is not just about demand or supply, but also about the interaction between demand and supply. Slower growth in potential output from the supply-side is related to slow productivity growth but also to slower population growth and declining labour force participation, which reduces the need for physical

investment and this in turn lessens aggregate demand and reinforces the decline in productivity growth.

In this respect, Summers (2015) specifies that the demand- and supply-side perspectives on secular stagnation can be interconnected in the form of a kind of 'inverse Say's Law', so that a prolonged lack of demand creates a substantial lack of supply. In other words, recessions may adversely affect the subsequent economy's potential output in the sense that the longer demand remains weak, the greater the risk of labour and capital hysteresis[6] (see, for example, Glaeser 2014). This way, the hysteresis argument supports that total factor productivity is not solely determined by long-term supply-side developments but also by economic fluctuations. Productivity may decrease substantially in a downturn as firms postpone productivity-enhancing investments to the future, while labour force participation tends to become lower. Moreover, low potential output growth may also contribute to a reduction in the natural rate of interest. For example, on the one hand, a slower pace of innovation generates fewer attractive investment opportunities, decreasing investments; and, on the other, slower productivity and growth lower households' income prospects, reducing their present consumption and increasing savings (Fischer 2016).

Finally, it is worth noting that some prominent contemporary economists are very critical and sceptical about the problem of secular stagnation. Bernanke (2015), for example, suggests that a shortcoming of the secular stagnation hypothesis is that it only focuses on factors affecting domestic capital formation and domestic household spending. Adopting a global perspective, he argues the so-called 'global savings glut' and states that a global excess of desired saving over desired investment is a major reason for low global interest rates. Both secular stagnation and global saving glut ideas can account for slow growth, even though secular stagnation works through reduced domestic investment and consumption related to fundamental factors (inequality, demographics, technological change, etc.), while the global savings glut works

[6]See Blanchard and Summers (1986) for the seminal paper on labour market hysteresis.

through weaker exports and a larger trade deficit, which Bernanke (2015) attributes to government policies at the international level.

There have been debates between Summers and Stiglitz over secular stagnation in recent years. In essence, Stiglitz (2018) argues that Summers (2015) is wrong to say that the slow growth is secular. Stiglitz (op. cit.) emphasises that if there had been a counterfactual larger demand-side stimulus package to combat the Great Recession, there would have been a faster recovery without stagnation. He believes that there is nothing that inherently prevents industrialised economies from being run in a way that ensures economic prosperity, so that the future growth essentially depends on the pace of technological change, as well as other key factors such as environmental sustainability.

Gordon's view about secular stagnation and the idea of productivity stagnation has also been widely criticised by authors such as Aghion (2017) and Starbatty and Stark (2017), among others. From the Schumpeterian tradition, they rely on the 'creative destruction' argument in which activities naturally disappear when new ones appear. They conceive stagnation as a transitional and inherent phenomenon of capitalism that merely reflects the repetition of long cycles of innovation. Moreover, these Schumpeterian economists are optimistic regarding future growth prospects. They also underline that the ICT revolution has radically and durably improved IT-producing technology and globalisation has substantially increased the potential returns on innovation and the potential drawback of not innovating.

3 Growth and Income Distribution: A Complex Relationship

Although secular stagnation literature previously examined particularly emphasises inequality as one of the key root causes of secular stagnation from both demand- and supply-side perspectives, the relationship between growth and income distribution is more complex, and slow growth and inequality may be interconnected through multiple interactions, with potential causality going both ways.

A brief review of the literature highlights that the relationship between economic growth and income distribution has a long tradition. To begin with, for much of the second half of the twentieth century potential trade-offs between reducing inequality and improving growth performance received considerable attention. In the 1950s and 1960s a prevalent view was that inequality leads to higher savings because the rich save proportionately more than the poor, suggesting a positive relationship between inequality and capital accumulation, and, therefore, economic growth (Kaldor 1957). Moreover, both equality and efficiency were usually regarded as desirable, even though they were likely to trade-off, as captured by Okun's (1975) book 'Equality Versus Efficiency: The Big Trade-off' (for instance, more progressive taxation would achieve more equality but would distort in some way economic choices and thus reduce efficiency). In general, it has been frequently argued that inequality provides incentives for individuals to work hard, innovate, invest and undertake risks to take advantage of high rates of return (see, for example, Grusky and Szelenyi 2018).

More recently, however, other streams of the literature have highlighted the negative implications of excessive inequality for growth, providing a number of theoretical arguments from both the supply and demand sides. On the supply side, as pointed out by Gordon (2012) in the debate on secular stagnation, inequality can be considered a headwind for economic growth. Indeed, since the 1990s it is well documented that a high level of income inequality weakens an economy's production potential with regard to human and physical capital. For instance, in terms of 'endogenous fiscal policy' theory, high inequality may become unacceptable to the median voter, so voters insist on higher taxation and no longer trust business, reducing the incentives to invest (Bertola 1993; Alesina and Rodrik 1994; Persson and Tabellini 1994; Perotti 1996). This situation can lead to rent-seeking behaviour and even in extreme cases to political instability and social unrest (Alesina and Perotti 1996; Keefer and Knack 2000). In the same vein, in the context of 'human capital accumulation' theory, inequality is associated with borrowing constraints so that financial market imperfections prevent the talented poor to undertake profitable investments in human and physical capital. This limits the potential growth of

the economy (see, for example, Galor and Zeira 1993; Banerjee and Newman 1993; Aghion and Bolton 1997).

From a purely demand-side perspective, a high degree of income inequality weakens the demand for goods and services. The major argument revolves around the Keynesian view, in which income inequality is regarded as a key factor explaining aggregate consumption and savings. While high levels of inequality are associated with high saving ratios, lower inequality leads to a higher level of aggregate consumption, as decreasing inequality operates to raise the share of income going to those with a higher propensity to spend. Moreover, in line with Keynes (1936), investment can change in response to its expected profitability, which in turn is shaped, among other factors, by expectations about future (consumption) demand, so that inequality can also indirectly affect investment spending.[7]

Let us recall that these demand-side arguments constitute one of the cornerstones on which secular stagnationists rely to explain the excess of savings over investment and the consequent downward pressures on real interest rates and the weakness in demand leading to slow growth. Nevertheless, as discussed previously, the potential effects of inequality on growth, beyond demand and supply sides strictly, are about their interaction. One of the issues where the demand-side explanations meet with supply-side fundamentals is related to the aforementioned hysteresis problem, which considers that boosting demand in the current environment will help avoid secular stagnation in the future by strengthening growth potential. This way, an increase in investment helps raise current demand and promotes an improvement in supply conditions to boost economic growth in the future, as 'investment is not only tomorrow's supply, but also today's demand' (Jimeno et al. 2014, p. 162).

[7]In this context, a central debate from a Post Keynesian macroeconomics perspective is the distinction between profit- and wage-led growth (see, for example, Bhaduri and Marglin 1990; Vernengo and Rochon 2001). The question revolves around whether rising wage-shares bolster demand and increases the rate of capacity utilisation and, in turn, investment (wage-led growth models inspired by the contributions of Nicholas Kaldor), or whether rises in the profit share serve as the primary stimulus to investment and economic growth (profit-led models influenced by the work of Joan Robinson).

Regarding the relationship from growth to inequality, the work of Kuznets (1955), whose inverted U-curve hypothesis predicts that income inequality initially increases for a time as the economy grows, before subsequently declining, is the most popular and influential framework used in explaining potential effects of growth on inequality.[8] Nevertheless, this hypothesis and the mechanisms proposed by Kuznets to explain the U-inverted relationship are difficult to support these days. Nowadays, the debate on implications of (or the lack of) growth for inequality essentially revolves around Piketty's contribution in his book *Capital in the 21st Century* published in 2014.

Piketty (2014) argues that rising inequality is a direct result of the declining growth rate and states that in the course of this century inequality in income and wealth may reach proportions only seen during the nineteenth century, or worse. He uses a few equations, notably $\alpha = r \times \beta$ (First Fundamental Law of Capitalism), and $\beta = s/g$ (Second Fundamental Law of Capitalism). The former means that the share of total income that is received by the owners of capital (α) equals the rate of return on capital (r) multiplied by the capital/income ratio (β), and the capital/income ratio is equal in the long run to the savings rate (s) divided by the growth rate (g). In other words, for a given savings rate (s), a low growth rate (g) and/or an increase in the rate of return on capital (r) will increase the share of capital income in the national income. In this sense, the worst situation would be a high s/g and a widening of the difference ($r - g$), which would cause extreme inequality.

Thus, assuming a constant (and positive) net savings rate, Piketty (2014) argues that the share of capital income in the national income will rise in the future as g is bound to fall significantly (basically related to the decline in the growth rate of the population and the rate of

[8]The key element in Kuznets's (1955) argument is industrialisation, which leads to a situation where households begin to migrate from the poor agricultural sector, characterised by relatively low inequality, to the richer industrial sector, where income is usually less evenly distributed. The result of the initial stage is increasing inequality. However, as an economy grows and most workers move to urban areas and only a small portion remains in agriculture, inequality tends to decrease. This theory was tested over several decades after his article was published. At present, the evidence in favour of the existence of an inverted U-shaped curve is very limited in the literature (see, for example, Lyubimov 2017).

technical progress). Nevertheless, this conclusion has sparked considerable debate in the literature (see, for example, Pichelmann 2015). Some underscore that savings rates may tend to fall as growth falls, so that the share of total income that is received by the owners of capital would increase only modestly, not rapidly, as growth falls. Therefore, declining overall growth should not be automatically regarded as an inevitable force for generating high inequality. In a similar way, Stiglitz (2016) points out that, apart from the significant role of redistributive policies through tax-benefit systems in terms of income distribution, inequality is heavily influenced by policies, legal and formal institutional arrangements and social customs that operate simultaneously and interactively in determining primary income distribution. He underlines that even market forces themselves are partially shaped by policy decisions, and criticises that instead of market forces and politics balancing each other when the outcomes of market economy lead to growing disparities, over the last decades the two have been working together in the rich countries to increase inequality.

In sum, based on a wide range of both orthodox and heterodox positions, nowadays, against the prevalent view until a few decades ago, there is a widely held view that inequality is detrimental to economic growth and thereby can contribute to economic stagnation. Likewise, at present sluggish growth rates are frequently signalled as a possible factor contributing to increasing inequality or, at least, hindering the reduction of inequality. Thus, greater equality and improved economic performance seem to complement each other. Nevertheless, their links are not automatic; the institutional environment and numerous policy decisions influence them. In consequence, the challenge would be to avoid the risk of a persistent vicious circle of slow growth and high inequality over time.

The next two sections empirically examine possible links between levels of economic growth and income inequality in European countries over the last decades. We estimate the size and income share of income classes as an alternative way of measuring income distribution. We intend to shed some light on what can be expected in terms of income class structure under different future scenarios of economic growth, exploring to what extent the policy and institutional framework may play a significant role in shaping such a relationship.

4 Income Class Structure in European Countries

The study of inequality and the comparison of inequality across countries has been the subject of numerous studies. They show considerable variation in levels of inequality among countries, even among countries with similar levels of economic development. Most inequality studies usually focus on overall distribution, for example through Gini coefficient, or on the bottom of income distribution, even though recently numerous contributions address the top of distribution as well. Although the analysis of the middle of the distribution is less frequently undertaken, its interest is justified by the significant role of the middle class in present-day societies, not only from an economic perspective, but also as a driver of social and political changes (Temin 2017). There is also a strong correspondence between the country ranking, based on the size or income share of the middle class, and the degree of inequality measured through the Gini index (Atkinson and Brandolini 2013). Moreover, the detailed examination of each of the parts that make up the income distribution seems adequate to reveal the complete picture of the situation, taking into consideration that slow economic growth may accrue differentially to households in different parts of the income distribution. All this leads us to analyse the class structure and to focus our attention on different strata of the distribution, instead of on an overall measure of income distribution.

There is no agreement in the economic and sociological literature regarding the identification and measurement of class structure. While some authors identify classes in relation to income (Pressman 2007), others focus on definitions based on occupation or educational levels. Economists more often identify classes with respect to income distribution, since a one-dimensional indicator facilitates the identification of the class structure and the choice of income thresholds would be enough to delimit the different classes. Even so, there is no consensus on such critical thresholds.

The absolute definition identifies the middle class with households with income or consumption in a specific range of dollars in purchasing

power parity. The proposals in the literature are different. For example, Ravallion (2010) proposes limits of 2–13 dollars of income per day; and López-Calva and Ortiz-Juárez (2014) consider 10–50 dollars of income per day.

Among the relative definitions, two can be distinguished. The first establishes the thresholds based on the percentiles of the income distribution. In this case, the proportion of people that make up each class is fixed and the focus is on the evolution of the proportion of the total income of the population that makes up the class. This way, Levy (1987) proposes that the middle class is constituted by individuals located between the second and eighth deciles; Barro (2000) and Easterly (2001) the three middle quintiles; Solimano (2008), from the third to the ninth decile; and Piketty (2014) uses the second, third and fourth quintile. The second relative definition establishes thresholds relative to percentages of the median income of the distribution and calculates what proportion of the population is situated in the said middle class. In this study, we adopt this relative characterisation. In this sense, different definitions have been proposed in the literature: Thurow (1987) delimits the middle class as households with an income between 75 and 125% of the median; Blackburn and Bloom (1985) propose the limits of 60 and 225%; Davis and Huston (1992) between 50 and 150%. The most widespread seems to be the one that considers the limits of 75 and 125% of the median to demarcate the middle class. Recently, however, other authors such as Atkinson and Brandolini (2013) adopted a broader definition and considered that the middle class comprises households whose equivalent income is between 75 and 200% of the median, for the sake of differentiating the middle class from the rich. In fact, Ayala and Cantó (2018) show that changes in these last two groups are less correlated than could be expected, and that this partition is certainly relevant to study the distribution of the population by income strata as a consequence of economic, political and social changes. That is why we adopt the limits of 75 and 125% of the median as the demarcation criterion for the lower-middle class and 125–200% of the median for the upper-middle class. Correspondingly, those below 75% of the median income are lower class, whereas those at the top above 200% of the median income comprise the upper class.

For each of the four income classes we provide information on two relevant aspects: population share (size) and income share.

We make use of microdata on the European countries from the European Community Household Panel (ECHP) and the European Union Statistics on Income and Living Conditions (EU-SILC) databases from EUROSTAT to compute the size and income share of the income class. The ECHP is an eight-year, longitudinal household survey covering 14 EU member states. It contains information about a wide range of issues: demographic characteristics, the labour market, income, housing, health, education, etc. It is based on a harmonised questionnaire, created at the Community level and adapted to the situation in different countries by their national statistical offices; the eight waves available (interview years) were from 1993 to 2000. We use information about the household and each of the household adult members. The original sample respondents have been followed and they and their co-residents were subsequently interviewed at approximately one-year intervals. Children of sample members start being interviewed as sample members in their own right when they reach the age of 16. This data source has several advantages: it provides repeated observations over a number of years on the same set of people, respondents provide information about their incomes as well as many other personal and household characteristics; and it offers the possibility of making comparisons in the European context.

After a gap, in 2003 the EU-SILC replaced the ECHP. The EU-SILC data set is an instrument aimed at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions. The EU-SILC data set is at present the main source of information on living standards in the EU. At its inception in 2003, EU-SILC covered six Member States (Belgium, Denmark, Greece, Ireland, Luxembourg and Austria), plus Norway; since then, it has been extended to cover the remaining countries of the European Union, and several other non-member states. Currently, 31 countries are included in the EU-SILC data, namely all EU Member States plus three non-EU members: Iceland, Norway and Switzerland. However, some countries are not represented for all years

in the User Database.[9] The EU-SILC is based on a common framework with a common set of variable target definitions and rules. The EU-SILC database has numerous advantages: it comprises annual waves for a large number of European countries; it is based on a homogeneous conceptualisation of income; and it provides information on several individual and household features.

The EU-SILC differs from its predecessor, the ECHP, in some ways. For instance, the surveys differ in their design: whereas the ECHP was a panel survey in which the same individuals were reinterviewed year after year, the EU-SILC takes the form of a rotating panel, where individuals are interviewed usually for a maximum of four years, and the sample is regularly refreshed with new members. Nevertheless, overall, both datasets are highly comparable when analysing income distribution.

In this study, the income concept used to define class thresholds is that of household market income in order to exclude, as much as possible, the redistributive effects of the tax and transfer system. We take into account that the individuals, and not the households, are the ones who obtain income by going to the market. This way, they obtain income from work, whether it be salaries from work for others or income derived from self-employment. Furthermore, in advanced societies, a relatively high percentage of individuals also obtain income from capital—in the form of profits, interest or rents—from savings or wealth. All these payments for the use of the factors of production owned by individuals—work and capital—constitute the primary or market income that is obtained at the individual level and shared in the household. Therefore, the income concept used in this study includes all income from work (salaries of employees and income of self-employed workers), income from capital and property and transfers between households, as well as income from private pension plans. The variable income is collected with reference to the previous calendar year (with exceptions).[10] Solely taking into account market income implies that

[9]See Table 4 in the Appendix for the number of countries by year.

[10]For the UK, income reference periods refer to the period around the interview with total income converted to annual equivalents and for Ireland, income data refer to 12 months prior to the interview. Our analysis considers this feature. As argued by Böheim and Jenkins (2006), the

households that live on transfer payments such as retirees cannot be included in the analysis as their market income is close to zero in most cases. For this reason, we drop from our sample those individuals with zero market income whose market income does differ from their disposable income. This way, we avoid analysing individuals whose disposable income comes only from transfer payments.

The basic unit for collecting information is the household, which is usually taken as a unit of measure, since an individual's standard of living is influenced by his/her income and by the people with whom he/she lives. Although the unit of measurement is the household, whenever we try to examine people's economic position, we analyse the distribution of the income of individuals, the unit of analysis. To adjust household income according to its size, we use the modified OECD equivalence scale[11] and then allocate the equivalent household income to each member of the household. We use sample weights, as this is the conventional way to mitigate potential biases introduced by potential differential non-response in the initial interview and subsequently, together with differential attrition (sample dropout) after the first interview.

In order to describe the class structure by countries for the last year analysed, Fig. 1 shows the size and income share of income classes in 2016.[12] On average, 37% of the population live in households with incomes below 75% of the median income of the country, that is, they have lower class incomes; 25% of the population have lower-middle class incomes; 24% upper-middle class incomes and 14% of the population have upper class incomes. Nonetheless, we observe variability in the size of income classes between countries, especially in the size of the upper class, revealing the different influence of multiple

differences in income reference periods are unlikely to be a major source of non-comparability across countries.

[11]A value of 1 to the first adult in the household, 0.5 to each remaining adult and 0.3 to each member younger than 14.

[12]Data for Switzerland, Ireland, Iceland and Norway is for 2015, the last available year at the time this analysis was undertaken.

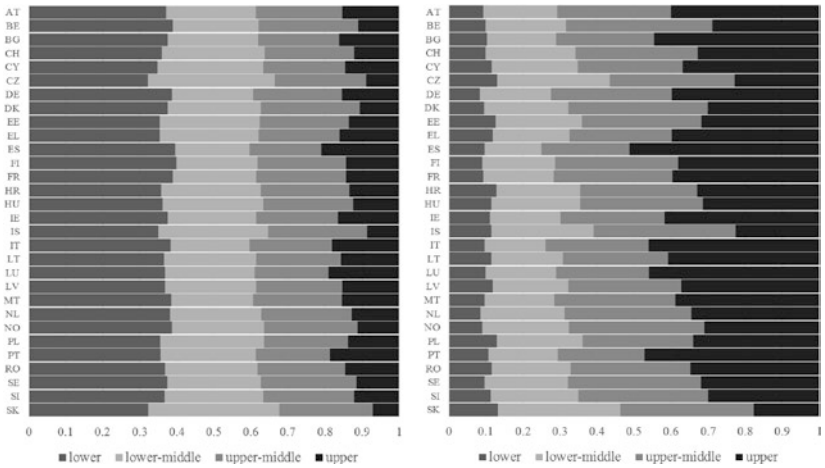

Fig. 1 Size (left) and income share (right) of countries' income classes, 2016 (*Note* AT: Austria; BE: Belgium; BG: Bulgaria; CH: Switzerland; CY: Cyprus; CZ: Czechia; DE: Germany; DK: Denmark; EE: Estonia; EL: Greece; ES: Spain; FI: Finland; FR: France; HU: Hungary; IE: Ireland; IS: Iceland; IT: Italy; LT: Lithuania; LU: Luxembourg; LV: Latvia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; SE: Sweden; SI: Slovenia; SK: Slovakia; UK: United Kingdom. Switzerland, Ireland, Iceland and Norway data is for 2015, last available year at the time of this analysis was made. *Source* Authors' calculations based on ECHP and EU-SILC database)

socioeconomic and political factors on each percentile of the income distribution. Spain has the largest (market income) upper class and smallest lower- and upper-middle class, and Finland the largest lower class, while Slovakia and Czechia have the smallest upper and lower class respectively.

In terms of the income share that each class receives, on average, 36% of the total income corresponds to upper-class individuals. As we go down the income classes this share descends to 32, 22 and 11% of total income for the upper-middle, lower-middle and lower class, respectively. Variability among countries' income shares is greater for the upper-income class. The largest income share of the lower income class is for Slovakia and the smallest for Germany, while the largest income share of the upper class is for Spain, followed by Italy and Portugal and the smallest is for Slovakia.

We corroborate the significant correspondence between the size and income share of the lower-middle class and the degree of inequality measured through the Gini index (−0.88 and −0.79 pairwise correlation, correspondingly), in line with Atkinson and Brandolini (2013).

5 Levels of Economic Growth and Income Class Structure in European Countries

We previously examined from different points of view different factors explaining the risk of secular stagnation in economically advanced countries. Taking as reference the variety of theoretical arguments examined, some studies emphasise that the risk of secular stagnation in Europe is even much greater than in the US (see, for instance, Crafts 2014; Jimeno et al. 2014; Lin 2016). They underline the lower productivity growth in European countries in recent decades, as well as some specific detrimental factors for economic growth, such as high levels of inequality in some European countries, less favourable demographics and the long-lasting effects of the global financial and sovereign debt crises on the euro area economy. Moreover, in terms of fiscal and monetary policies, the high public debt ratios, the Stability and Growth Pact and the European Central Bank's strict focus on low inflation are frequently regarded as additional constraints to impel economic growth.

Focusing on the empirical analysis of the potential links between levels of economic growth and market-income class structure in European countries, we use data on the size and income share of income classes previously estimated for 31 European countries over the period 1993–2016. We consider the proportional change of Gross Domestic Product per capita (GDPpc) at 2010 prices, calculated from Eurostat (2019) statistics, as a measure of growth. Given that we work with a 24-year panel, the decision of breaking the whole period into individual 6-year sub-periods would entail to work with a very small number of observations (only four). We consider the so-called 6-year 'moving' panel data with overlapping sub-periods. The consecutive observations cover the years 1993–1998, 1994–1999, 1995–2000 and so on.

Table 1 Average size and income share changes by income class, 1993–2016

	Size change				Income share change			
	Lower	Lower-middle	Upper-middle	Upper	Lower	Lower-middle	Upper-middle	Upper
Negative growth	1.37	−2.04	−0.31	1.40	−0.36	−2.04	−0.33	2.72
Modest growth	0.86	−1.40	−0.06	0.75	−0.34	−1.40	−0.07	1.81
Strong growth	−0.40	0.82	0.29	−0.57	0.01	0.82	0.57	−1.40

Source Own construction

The inclusion of the moving panel does not imply data redundancy because GDPpc from a given year is used only twice in the calculation of the final time series, one as the initial GDPpc and once as the final GDPpc.

A first inspection of the link between economic growth and income class structure (Table 1) shows that economic growth seems to affect each income class differently. Average annual real economic growth is grouped in three categories[13]: negative average annual GDPpc growth (negative growth), positive average annual GDPpc growth below 2% (modest growth) and average annual GDPpc growth of 2% or more (strong growth). Each cell in Table 1 shows average absolute change (change in percentage points) in the size (left) and income share (right) of each class. Note that of the 276 six-year period observations, there is a significant number (66 observations or more) in each category. From Table 1, it is evident that economic growth does not affect all income classes in the same way, resulting in differential changes in size and income share for each income class depending on the level of economic growth. For the lower and upper-income classes, the greater the economic growth process the smaller the size of the class, while the opposite takes place for the lower-middle and upper-middle classes. Regarding the income share, changes in the lower, lower-middle and

[13]The three categories are based on our interpretation of much of the literature and policy discussions on what is considered economic contraction and modest and strong growth levels in economically advanced countries.

the upper-middle classes have a similar pattern, that is, their income shares increase when growth increases, at the expense of the upper class income share, which decreases. Apparently, the intensity of this relationship is not the same for all classes.

This first approximation seems to reveal that periods of decline are associated to higher income polarisation, as lower- and upper-income classes increase their sizes in detriment of middle classes' size, while the income share of the upper class significantly rises at the expense of the rest of the income distribution. Nevertheless, as growth is stronger, the size and income share of the middle-income class tend to increase in favour of a more egalitarian market income distribution.

In order to delve deeper into the key question in our analysis, namely how class size and income shares, as a way of addressing income inequality, are related to different categories of economic growth, and specifically to modest economic growth, we perform a regression analysis. The country differences in terms of economic outcomes and policy and institutional framework reinforce the relevance of panel data analysis in estimating more precisely the potential links between economic growth and class structure. Furthermore, our modelling strategy allows unobserved fixed effects to be specified in the model, thus allowing for better control of unmeasured factors that affect outcomes in particular countries.

However, there are still many open questions that could be addressed using country panels. The high persistence of the size and income share of income classes is determinant in the choice of the dynamic panel data model. Given the importance of non-stationarity in generating spurious regressions and recent developments in panel data cointegration analysis, we provide a discussion on the most convenient method of estimation by studying the stationarity and cointegration of the time series in our database. In principle, variables that are bounded in the unit interval do not possess a unit root because they cannot have an infinite variance (see Jäntti and Jenkins 2010). However, it is possible that the distribution has a stochastic trend at other moments, such as at the mean or kurtosis (White and Granger 2010). Despite the fact that the size and income share of each income class are bounded by the unit interval, we test these and the GDPpc growth, breaking down in three

different sections (negative, modest and strong growth), for possible unit roots. To study the stationarity of all the time series, we run the Dickey-Fuller unit root tests, a Fisher type test that allows for unbalanced panels. The null hypothesis is that all panels contain a unit root against the alternative that at least one time series is stationary. This test starts computing the *p*-values from an independent test consisting of testing a unit root test in each panel's series separately and then combining the *p*-values to obtain an overall test of whether the panel series contains a unit root. The test uses the four methods proposed by Choi (2001). For the Fisher test, cross-sectional means are removed to mitigate potential cross-sectional dependence. The results for each variable in the model are shown in Table 5 in the Appendix. We clearly observe that the unit root hypothesis is rejected for all variables.

We propose a dynamic panel data model to analyse the size or income share of each income class and its relationship with GDPpc growth. A dynamic approach is shown to have important advantages with respect to time series or traditional static techniques. First, this approach allows us to work with the entire data panel, which ensures that unobserved or omitted fixed effects can be specified to estimate the relevant parameters in the model (Hsiao 2002). Second, the high persistence of the income class structure requires a dynamic model specification. Third, a dynamic specification highlights the short-term dynamics and whether there is conditional convergence among countries.

From Table 1 we conclude that economic growth might show an irregular association with class structure given that the relationship between economic growth and class size and class income share, is different depending on the sign of the growth rate, and even more on the magnitude of the growth rate. This is the reason why we group economic growth in the three categories defined above, making the relationship between economic growth and income class structure flexible. We define the following variables:

$$NG_{ct} = \begin{cases} \text{growth}_{ct} & \text{if negative growth} \\ 0 & \text{otherwise} \end{cases};$$

$$MG_{ct} = \begin{cases} \text{growth}_{ct} & \text{if modest growth} \\ 0 & \text{otherwise} \end{cases};$$

$$SG_{ct} = \begin{cases} \text{growth}_{ct} & \text{if strong growth} \\ 0 & \text{otherwise} \end{cases}.$$

The specification of the model is:

$$y_{ct} = \zeta_c + \beta_1 y_{ct-1} + \beta_2(NG_{ct}) + \beta_3(MG_{ct}) + \beta_4(SG_{ct}) + \omega_{ct} \quad (1)$$

where ζ_c is the fixed term for each country that captures individual-specific effects that are constant over time and not directly observed or included in the model; y_{ct-1} is the lagged level of the dependent variable (size or income share of each class) that controls for short-term dynamics and conditional convergence; NG_{ct}, MG_{ct} and SG_{ct} are the growth rate of real GDPpc at 2010 for different growth categories; and ω_{ct} is a normally distributed error term.

If β_1 in (1) is smaller than one, it is consistent with conditional convergence, which means that countries relatively close to their steady-state class size or class income share will experience a smaller change in their class size or income share. On the other hand, if β_1 is greater than one, there is no convergence effect.

To begin with, we test for the null hypothesis of no country effects, which is rejected in all estimations, implying that a pooled regression model is inappropriate (Breusch and Pagan 1980). Therefore, we must use panel data models, as they permit controlling for individual effects not controlled by the other variables introduced in the models. In the absence of suitable external instruments, we could apply the first-differenced generalised method of moments estimator proposed by Arellano and Bond (1991).

First differences in the regression equation are taken to remove unobserved time-invariant effects, after which the levels of the series, lagged two or more periods, are used as instruments. However, using the model only in first differences may lead to important finite sample bias problems when variables are highly persistent, which is expected

to be the case for variables such as the class structure. Moreover, the removal of unobserved time-invariant effects may lead to a spuriously better fit for the data and to a change in the inference drawn from the estimation (Bond et al. 2001; Malinen 2013). Under these conditions, lagged levels of the variables are only weak instruments for subsequent first differences. To overcome this problem, the system GMM procedure (Arellano and Bover 1995; Blundell and Bond 1998) adds a set of equations in levels to the first difference model, where the instruments of the levels are suitable lags of their own first differences.

In particular, we use the one-step system GMM estimator. It estimates a system of equations in both first differences and levels, in which the instruments in the level equations are lagged first differences of the variables. We consider panel-robust standard errors to control for possible heteroscedasticity and serial correlation in errors originated by unobservable variables persistently correlated over time with the size or income share class.

Our dynamic approach includes the lagged values of the dependent variable as explanatory variables, which control for omitted variables that change over time. It also takes into consideration the potential endogenous nature of the dependent variable. In this sense, consideration could be given to the possibility of a two-way causality that may run from the size (or income share) of the income class to economic growth as well. We consider the economic growth (the three categories) variables as endogenous, allowing for contemporaneous correlation with disturbances and for feedback from lagged dependent values to the current value for the control variable. This way, our dynamic panel data models treat the lagged information on the dependent variable and the economic growth variables as endogenous. This is more general than assuming exogenous or predetermined regressors that satisfy more restrictive assumptions. In particular, strictly exogenous ones cannot be correlated with disturbances at any date. Moreover, the omission of other regressors might cause their correlation with disturbances (Baltagi 2008). We follow Roodman's (2009) suggestion and collapse the matrix of instruments and restrict the number of lags in order to reduce the number of instruments, and thus avoid weakening the test of over-identifying restrictions.

We validate the assumptions underlying system GMM by testing the null of absence of first- (AR(1) test) and second-order (AR(2) test) serial correlation in the disturbances, respectively (Arellano and Bond 1991). Absence of autocorrelation requires that the AR(1) test reject the null, while the AR(2) does not. Additionally, the test of over-identifying restrictions is used in assessing the joint validity of the proposed instruments set, that is, the absence of correlation between the instruments and the regression residuals.

The results (Table 2) show that in all models β_1 is lower than one, so there is conditional convergence. A second interpretation of the coefficient on the lagged poverty rate is the ability to distinguish between the short-run—β_2 in (1)—and long-run effects—$\beta_2/(1-\beta_1)$ in (1)—of negative growth on the size or income share of each income class. Thus, the larger the parameter of persistence, β_1, is, the longer the influence of growth upon the income class structure series. The inclusion of the lag of the size or income share as an explanatory variable introduces long-term effects into the model (Gundersen and Ziliak 2004). Our baseline model includes the economic growth (three different categories) as an explanatory variable (Table 2) allowing for a nonlinear relationship between growth and the corresponding dependent variable.

According to the results shown in Table 2, growth has a statistically significant association with the size or the income share of the income classes for two of the growth categories. Thus, we can make a general statement on the significant relationship between economic growth and class size and income share over periods of economic contractions and during expansions with strong growth. We can infer that a greater economic decline is associated with an increase in the size and income share of the upper class, in detriment of a lower size and lower income share of the middle class. Likewise, in economic expansions strong economic growth is associated with an increase in the size of the lower-middle class, while the lower class decreases its size. Nevertheless, modest growth is not related to the size or the income share of income classes.

In short, we can support the argument that there is not a linear relationship between economic growth and the income class structure. Thus, while a sound relationship is observed in periods of economic

Table 2 Estimates of the class structure size and income share dynamic model by economic growth categories

	Size				Income share			
	Lower	Lower-middle	Upper-middle	Upper	Lower	Lower-middle	upper-middle	Upper
L. Lower	0.443***				0.435***			
	0.0781				0.078			
L. Lower-middle		0.538***				0.461***		
		0.067				0.0727		
L. Upper-middle			0.329***				0.448***	
			0.0776				0.0835	
L. Upper				0.520***				0.443***
				0.0727				0.0797
Negative growth	0.012	0.065**	0.056**	−0.110***	−0.019	0.107**	0.119**	−0.245**
	0.0203	0.0307	0.0248	0.0332	0.0177	0.0428	0.0576	0.106
Modest growth	−0.049	0.039	0.025	−0.033	0.026	0.07	0.074	−0.115
	0.0331	0.0495	0.0336	0.0475	0.0282	0.0686	0.0752	0.1607
Strong growth	−0.026***	0.027***	0.007	−0.011	0.005	0.018	0.001	−0.019
	0.0063	0.0093	0.0066	0.0088	0.0047	0.0115	0.0144	0.027
Constant	0.208***	0.117***	0.157***	0.067***	0.059***	0.117***	0.174***	0.200***
	0.0292	0.0167	0.0184	0.0106	0.0084	0.0158	0.0269	0.0293
Test								
AR(1) test	−5.456	−6.292	−5.607	−6.052	−6.276	−6.314	−5.658	−5.597
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.383	0.621	0.303	0.399	0.204	0.562	0.261	0.219
p-value	0.702	0.534	0.762	0.690	0.838	0.574	0.794	0.827
Overidentification test	21.552	21.883	60.645	29.734	15.444	13.556	28.882	15.526
p-value	0.158	0.147	0.072	0.157	0.117	0.194	0.184	0.114

**Significant at 5%; ***Significant at 1%
First line: estimated coefficient; second line: standard error
Source Own construction

recessions and some links in periods of strong economic expansion, modest growth should not be automatically identified with changes in the class structure in a certain direction.

To go further in the analysis, we consider the policy and institutional framework proxied by government effectiveness (*gov_effect*), as provided by the World Governance Indicators (ranging from −2.5—weak—to 2.5—strong—governance performance) (World Bank 2018).[14] The association that in principle seems to have growth and class structure can be analysed more closely in Table 3 where we account for the possible modulating effect of government effectiveness. The results reveal that the level of growth and the class structure have a link that is modulated by government effectiveness. In this sense, the effectiveness of government can adjust some types of association between growth and class size (income share) that would not be desirable. This is the case of the low-income class, for which in economic recessions the effectiveness of government seems determinant in shaping a positive association between growth and lower class size. For the lower-middle class, government effectiveness makes growth in economic recessions to be associated with greater size while for upper-middle and upper classes government effectiveness does not exert such modulating effect on growth in economic recessions.

In periods of strong economic expansion, growth is not linked to the size of the low or lower-middle class unless we consider the level of government effectiveness. Furthermore, government effectiveness reverses the link between growth and the size of the upper-middle and upper class. Even so, the most remarkable relationship is that of modest growth and class structure in the presence of effective government. Modest growth is linked to changes in the size of the upper-middle—that increase—and upper class—that reduces—only when taking into account policy and institutional framework.

[14]Government effectiveness assesses the capacity of the government to effectively formulate and implement sound policies. In particular, it captures perceptions of the quality of public services such as education and infrastructure, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Table 3 Estimates of the class structure size and income share dynamic model by economic growth levels controlling for sub-period and government effectiveness

	Size				Income share			
	Lower	Lower-middle	Upper-middle	Upper	Lower	Lower-middle	Upper-middle	Upper
L. Lower	0.517***				0.404***			
	0.0708				0.0742			
L. Lower-middle		0.509***				0.454***		
		0.0605				0.0652		
L. Upper-middle			0.285***				0.346***	
			0.0935				0.0983	
L. Upper				0.434***				0.374***
				0.0749				0.0779
Negative growth	0.095***	−0.089	0.120**	−0.133**	−0.074***	0.076	0.325**	−0.364
	0.0343	0.0483	0.0597	0.0676	0.0266	0.0582	0.1307	0.3261
Modest growth	−0.068	0.246	−0.41	0.443	0.134	−0.238	−0.914	−0.736
	0.1102	0.1966	0.2215	0.2489	0.069	0.134	0.4717	0.8458
Strong growth	−0.006	−0.008	−0.042***	0.050***	0.018**	−0.033	−0.100***	0.141***
	0.0094	0.0153	0.0151	0.0172	0.0077	0.0172	0.0327	0.0517
Negative growth*gov_effect	−0.089**	0.102**	−0.039	0.032	0.056**	0.018	−0.145	0.221
	0.0367	0.0509	0.0562	0.0646	0.0282	0.0641	0.1201	0.3128
Modest growth*gov_effect	0.018	−0.108	0.271**	−0.304**	−0.079	0.194**	0.593**	0.365
	0.0674	0.1203	0.1338	0.1504	0.0431	0.084	0.2851	0.5009
Strong growth*gov_effect	−0.021**	0.062***	0.038***	−0.063***	−0.005	0.055***	0.071**	−0.233***
	0.0098	0.0178	0.0147	0.0172	0.0073	0.0173	0.0313	0.0629
Constant	0.180***	0.121***	0.170***	0.078***	0.062***	0.119***	0.213***	0.234***
	0.0264	0.0151	0.0225	0.0106	0.0078	0.0141	0.0323	0.0294

(continued)

Table 3 (continued)

	Size				Income share			
	Lower	Lower-middle	Upper-middle	Upper	Lower	Lower-middle	Upper-middle	Upper
Test								
AR(1) test	−5.893	−5.496	−4.873	−5.285	−6.743	−6.270	−4.818	−5.073
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test	0.454	0.149	0.953	1.115	0.335	0.884	1.057	0.033
p-value	0.650	0.882	0.340	0.265	0.738	0.377	0.290	0.973
Overidentification test	28.451	31.012	15.211	13.788	29.827	26.007	12.656	10.892
p-value	0.161	0.096	0.230	0.183	0.154	0.301	0.244	0.283

**Significant at 5%; ***Significant at 1%
First line: estimated coefficient; second line: standard error
Source Own construction

Something similar takes place in terms of income share. Only when we account for government effectiveness is growth in recession periods linked to greater lower class income share. The association between negative growth and the income share of the upper-middle class is not statistically altered by government effectiveness. Regarding strong economic expansion, it is linked to greater income share for lower-middle class when we account for the presence of government effectiveness, and compensate the link to lower income share for upper-middle class and greater income share for upper class. Again, the most salient relationship is that of modest growth and the increase of income share of the middle class, which is only significant when effective government is considered, suggesting the ability of a good policy and institutional framework to result in a more prosperous middle class when growth is not strong.

6 Tackling Stagnant Growth and Inequality Simultaneously: Some Policy and Institutional Considerations

Our empirical findings confirm that, while episodes of recessions and strong economic growth are significantly associated with changes in terms of market-income class structure, modest growth is not directly related to any specific changes. In the case of modest growth, the capacity of the government to effectively formulate and implement sound policies seems to play an especially significant role. This supports the hypothesis that the links between modest growth and inequality are considerably influenced by the policy and institutional framework, which interacts concurrently in the processes of economic growth and income distribution. Thus, it is worth examining some central ideas on potential policies to boost economic growth from an equity perspective, assessing the extent to which public policies can tackle the concerns of stagnant growth and inequality simultaneously.

First, as the core of the secular stagnation hypothesis lies in the sustained decrease in the natural interest rate, from this standpoint

monetary policy should play a significant role. In principle, the first challenge for central banks should be to overcome the disinflation spiral, which is one of the symptoms of secular stagnation. This way, unconventional monetary policy measures, such as large-scale asset purchases, long-maturity lending to banks and forward guidance about intended future monetary policy actions, seem to be needed more often as the central bank's room for lowering key policy rates is limited given the effective lower bound on nominal interest rates. In this sense, we should also bear in mind that monetary policy decisions, both conventional and unconventional ones, are not neutral for income and wealth inequality, at least in the short- and medium term (see, for instance, Colciago et al. 2018, for a survey of the literature).[15]

On the fiscal policy side, the use of fiscal stimulus packages to overcome secular stagnation is at the heart of most policy discussions over how it can be cured (see, for instance, the aforementioned debates between Summers and Stiglitz). In an environment where private demand is low, public spending can contribute to absorb excess savings and stimulate aggregate demand. The main point is about the size of fiscal stimulus, as well as how to orientate public expenditure to maximise its impact on potential growth and how to make growth more inclusive and more egalitarian.

Beyond monetary and fiscal policies, it seems obvious that the threat of secular stagnation is not going to be dealt with by macroeconomic measures alone, and supply-enhancing policies and institutional reforms are needed in order to address low growth and inequality simultaneously.

Although there is no single best model of policy and institutional mix, and the challenges lying behind slow growth and high inequality

[15]In recent years a number of channels have been proposed to explain the mechanisms though which monetary policy affects income and wealth distribution. Most of them affect households' wealth operating through either inflation (portfolio channel, inflation tax channel or saving redistribution channel) or the transmission process of monetary policy impulses (financial segmentation channel or interest rate exposure channel). Others, however, primarily affect income distribution by means of the transmission mechanisms of monetary shocks, namely the income composition channel and earnings heterogeneity channel.

differ notably in each country, it might be relevant to consider exploring some policy alternatives. This way, it should be taken into account that some growth-enhancing measures may be 'win-win' in the sense of making a substantial contribution to both higher growth and narrowing income inequality, while other measures might entail a growth-equality trade-off as they tend to raise both growth and inequality or the opposite.

Regarding redistributive policies, it is widely accepted that they are mostly considered to promote trade-offs between growth and inequality reduction. For instance, shifting the tax mix from personal and corporate income taxes towards consumption taxes may be growth-enhancing policy reforms that are likely to raise income inequality. Likewise, reducing the level or duration of unemployment benefits may increase incentives to work and reduce the number of unemployed people, although at the cost of lowering the welfare of those who remain out of work and potentially depressing wages for individuals of the lower strata of the income distribution. Nonetheless, their real global impacts are not so clear and further specific empirical research is needed. In line with the Keynesian idea discussed above, for example, it is worth recalling that an increase of social transfers from higher-saving households in the higher part of the distribution to low-saving households in the lower part is frequently suggested to boost aggregate demand and consequently economic growth.

Given the doubts raised about the limitations[16] of redistributive policies, in recent years a debate has developed about the relevance of tackling market income inequality through *predistributive*[17] policies. These kind of policies include aspects such as the distribution of human and

[16]It is known that there are growing limits to the state's redistributive capacities, not only due to the low growth prospects, but also because of factors such as the current fiscal competition among states and the severe fiscal constraints facing numerous countries.

[17]*Predistribution* is a neologism coined by Hacker (2011) as the process that takes place before distribution (the way the market allocates income, supposedly on the basis of each individual's talent and effort) and redistribution (when the state modifies the outcome with taxes and transfers). Actually, it is a new label but not a new idea, as it is well known in the radical political tradition (Chwalisz and Diamond 2015).

physical capital, innovation processes and the institutional and regulatory framework of the underlying market forces boosting economic growth and shaping primary income distribution. More than alternative approaches, predistributive and redistributive interventions should be regarded as complementary ways that can reinforce each other to reach policy objectives of growth and inequality reduction.

Focusing on growth-enhancing policies and their predistributive effects, particular reference can be made to public investment in human and physical capital as complements to private investment. They are the foundation for long-term economic growth and may become pro-growth and pro-equality simultaneously (see, for example, Stiglitz 2012, 2015). In terms of education, special emphasis should be given to equal access to early, primary and secondary education in order to prevent labour market exclusion among the more disadvantaged groups. Likewise, public infrastructure investment, from roads and airports to energy and telecommunication systems, accurately distributed across the territory would have the advantage of raising long-term potential growth and yield dividends in the form of more productive businesses, creating a stronger economy and increasing opportunities.

In the case of innovation policies, potential policy measures could aim at supporting innovation through research and development. As measures that work through channels that require high-skilled labour, they may show a certain trade-off, impelling economic growth and at the same time increasing wage inequality in favour of individuals with certain skills. In this respect, supporting redistributive measures to offset or mitigate the impact on inequality may be helpful until economic performance and the supply of skills adjust to the new circumstances (OECD 2015). In this sense, Aghion (2017) suggests that, even though in the short-term innovation benefits those who generated or enabled the innovation, in the long term its returns are dissipated due to imitation and creative destruction. In other words, the inequality induced by innovation is temporary. In policy terms, strengthening education and providing a larger proportion of the population with the new skills required, particularly at the lower end of the skills distribution, is key in promoting the absorption of new technologies and contributing to

alleviate the challenges resulting from automation and other structural changes, while at the same time reducing inequality.

Other policies focusing on regulatory interventions to transform the rules of the game with which markets operate may also become strong instruments to jointly boost growth and reduce market income inequality. In addition to providing appropriate incentives to encourage investment and innovation and easing market access for start-ups and entrepreneurs, a well-designed institutional and regulatory framework may improve the performance of product and labour markets. In this vein, some reforms such as the reduction of regulatory barriers to entry and competition in sectors with large potential markets, apart from expanding economic activity, are likely to reduce inequality via employment, even in the face of wider wage dispersion (Criscuolo et al. 2014). Regarding labour market institutions, an example of pro-growth and pro-equality intervention would be the reduction of the gap between employment protection on temporary and permanent work, taking into account that low-income workers on temporary contracts earn less than workers with similar characteristics on permanent contracts (Fournier and Koske 2012). Other reforms increasing labour market participation that may enhance growth and reduce income inequality are those removing obstacles to the labour participation of women (e.g. expanding access to affordable childcare services) along with those that fight against all forms of discrimination, including between immigrants and non-immigrants (e.g. legal action against those who engage in discriminatory practices). Nevertheless, the distributive effects of other pro-growth labour reforms (e.g. easing employment protection legislation) often depend on the relative size of their employment and wage effects. Thus, the inequality-raising effect of higher wage disparities may be offset by higher income for those securing employment (see, for example, OECD 2015; Ostry et al. 2019).

To sum up, in an environment of threat of secular stagnation, policymakers may potentially address concerns of stagnant growth and market income inequality simultaneously. A wide range of different types of interventions might contribute to turning the vicious circle of stagnant growth and inequality into a virtuous circle with stronger

growth and a less polarised income class structure. Nevertheless, in order to effectively assess the effects of a policy measure on growth and income distribution, it is worth stressing that we should not only evaluate potential direct effects but also the diverse indirect effects that a measure may trigger. In this sense, we should be cautious about setting policy recommendations and consider each particular context and the way in which the policies may interact in shaping growth and income distribution.

7 Summary and Concluding Remarks

Although it is too early to evaluate if we are in a scenario of secular stagnation with deep structural roots as described above or simply in a context of more or less permanent modest growth, the lack of strong growth rates seems to be here to stay in economically advanced countries. Moreover, the risks of climate change and the growing awareness of environmental sustainability query the desirability (and feasibility) of strong growth on a finite planet with limited natural resources, calling into question the assumption that economic expansion is an indispensable good without which social progress is impossible.

As examined previously, the fundamentals of the threat of secular stagnation are structural and, as such, they would require addressing their root causes, including inequality. In this sense, in the last few years the concern about low growth and its links with high levels of income inequality is increasingly drawing the attention of economists and policymakers. The theoretical literature suggests that both phenomena are closely related, as inequality may be increasing the risk of secular stagnation and, in turn, the lack of growth may make it difficult to move forward in achieving a less polarised income class structure.

This chapter explores potential implications of different levels of growth on the income class structure in European countries in order to draw lessons for the future. Our empirical findings underline how market income polarisation tends to increase in recession periods as the

size and income share of middle class decrease, while the opposite tends to occur in periods with strong economic growth rates. Nevertheless, when growth rates are modest, the patterns are much less clearly defined and no powerful systematic relationship exists, pointing to other factors related to the policy and institutional framework operating simultaneously and interactively in the processes of growth and income distribution.

Contrary to some mainstream views, these findings highlight that, even though growth is modest, there is no inevitability in the rising inequality that has hit advanced economies in recent decades. There exists a considerable margin of manoeuvre of public policies to boost economic growth and reduce income polarisation simultaneously. This ranges from macroeconomic policies addressing the excess of savings over investment to supply-enhancing policies and institutional reforms acting on determinants of long-term growth potential, taking into consideration at all times that one apparently adequate policy decision does not fit all situations. It is not a matter of fostering economic growth at all cost in foreseeable future scenarios of low growth and high inequalities. The point is to assess the win-win or trade-off nature of policy decisions in every single environment and the relevance of considering both quantity and quality of economic growth, in order to take advantage as much as possible of economic prosperity in terms of sustainable wellbeing of the whole population.

Appendix

See Tables 4 and 5.

Table 4 Countries and years analysed

Country	Years	
AT	1994–2000	2003–2016
BE	1993–2000	2003–2016
BG		2006–2016
CH		2006–2015
CY		2004–2016
CZ		2004–2016
DE	1993–2000	2004–2016
DK	1993–2000	2003–2016
EE		2003–2016
EL	1993–2000	2003–2016
ES	1993–2000	2003–2016
FI	1995–2000	2003–2016
FR	1993–2000	2003–2016
HR		2009–2016
HU		2004–2016
IE	1993–2000	2003–2015
IS		2003–2015
IT	1993–2000	2003–2016
LT		2004–2016
LU	1993–2000	2003–2016
LV		2004–2016
MT		2006–2016
NL	1993–2000	2004–2016
NO		2003–2015
PL		2004–2016
PT	1993–2000	2003–2016
RO		2006–2016
SE	1996–2000	2003–2016
SI		2004–2016
SK		2004–2016
UK	1993–2000	2005–2016

Note AT: Austria; BE: Belgium; BG: Bulgaria; CH: Switzerland; CY: Cyprus; CZ: Czechia; DE: Germany; DK: Denmark; EE: Estonia; EL: Greece; ES: Spain; FI: Finland; FR: France; HU: Hungary; IE: Ireland; IS: Iceland; IT: Italy; LT: Lithuania; LU: Luxembourg; LV: Latvia; MT: Malta; NL: The Netherlands; NO: Norway; PL: Poland; PT: Portugal; RO: Romania; SE: Sweden; SI: Slovenia; SK: Slovakia; UK: United Kingdom

Source ECHP and EU-SILC database

Table 5 Phillips-Perron unit root test

Variable		Without trend		With trend	
		Statistic	*p*-value	Statistic	*p*-value
Size lower class	Inverse chi-squared *P*	140.294	0.000	113.286	0.000
	Inverse normal *Z*	−3.457	0.000	−1.549	0.061
	Inverse logit *t L**	−4.343	0.000	−2.092	0.019
	Modified inv. chi-squared *Pm*	7.031	0.000	4.606	0.000
Size lower-middle class	Inverse chi-squared *P*	158.411	0.000	100.204	0.002
	Inverse normal *Z*	−3.604	0.000	−0.683	0.247
	Inverse logit *t L**	−5.136	0.000	−1.306	0.097
	Modified inv. chi-squared *Pm*	8.658	0.000	3.431	0.000
Size upper-middle class	Inverse chi-squared *P*	136.345	0.000	107.816	0.000
	Inverse normal *Z*	−4.161	0.000	−3.176	0.001
	Inverse logit *t L**	−5.142	0.000	−3.390	0.000
	Modified inv. chi-squared Pm	6.676	0.000	4.114	0.000
Size upper class	Inverse chi-squared *P*	150.826	0.000	113.650	0.000
	Inverse normal *Z*	−4.167	0.000	−2.006	0.022
	Inverse logit *t L**	−5.677	0.000	−2.608	0.005
	Modified inv. chi-squared *Pm*	7.977	0.000	4.638	0.000
Income share lower class	Inverse chi-squared *P*	183.297	0.000	182.748	0.000
	Inverse normal *Z*	−5.429	0.000	−5.719	0.000
	Inverse logit *t L**	−7.154	0.000	−7.280	0.000
	Modified inv. chi-squared *Pm*	10.893	0.000	10.844	0.000
Income share lower-middle class	Inverse chi-squared *P*	154.5113	0.000	117.778	0.000
	Inverse normal *Z*	−4.2392	0.000	−2.208	0.014
	Inverse logit *t L**	−5.5173	0.000	−2.950	0.002
	Modified inv. chi-squared Pm	8.3078	0.000	5.009	0.000

(continued)

Table 5 (continued)

Variable		Without trend		With trend	
		Statistic	*p*-value	Statistic	*p*-value
Income share upper-middle class	Inverse chi-squared *P*	133.3342	0.000	102.511	0.001
	Inverse normal *Z*	−2.8723	0.002	−1.617	0.053
	Inverse logit *t L**	−4.2548	0.000	−2.196	0.015
	Modified inv. chi-squared *Pm*	6.406	0.000	3.638	0.000
Income share upper class	Inverse chi-squared *P*	183.4267	0.000	137.111	0.000
	Inverse normal *Z*	−3.7205	0.000	−2.254	0.012
	Inverse logit *t L**	−6.6974	0.000	−3.439	0.000
	Modified inv. chi-squared *Pm*	10.9044	0.000	6.745	0.000
GDPpc growth	Inverse chi-squared *P*	124.0675	0.000	82.312	0.043
	Inverse normal *Z*	−5.176	0.000	−2.307	0.011
	Inverse logit *t L**	−5.0032	0.000	−2.271	0.012
	Modified inv. chi-squared *Pm*	5.5738	0.000	1.824	0.034

Ho: All panels contain unit roots. Ha: Some panels are stationary. Cross-sectional means removed
Source Own construction

References

Aghion, P. (2017). Entrepreneurship and Growth: Lessons from an Intellectual Journey. *Small Business Economics, 48*(1), 9–24.

Aghion, P., & Bolton, P. (1997). A Theory of Trickle-Down Growth and Development. *Review of Economic Studies, 64*(2), 151–172.

Alesina, A., & Perotti, R. (1996). Income Distribution, Political Instability, and Investment. *European Economic Review, 40*(6), 1203–1228.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *Quarterly Journal of Economics, CIX*(2), 465–490.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies, 58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another Look at the Instrumental-Variable Estimation of Error-Components Models. *Journal of Econometrics, 68,* 29–52.

Atkinson, A. B., & Brandolini, A. (2013). On the Identification of the Middle Class. In J. C. Gornick & M. Jäntti (Eds.), *Income Inequality: Economic Disparities and the Middle Class in Affluent Countries*. Stanford: Stanford University Press.

Auclert, A., & Rognlie, M. (2018). *Inequality and Aggregate Demand* (NBER Working Paper No. 24280).

Ayala, L., & Cantó, O. (2018). The Driving Forces of Rising Inequality in Spain: Is There More to It Than a Deep Worsening of Low Income Households Living Standards? In B. Nolan (Ed.), *Inequality and Inclusive Growth in Rich Countries: Shared Challenges and Contrasting Fortunes*. Oxford: Oxford University Press.

Backhouse, R. E., & Boianovsky, M. (2016). Secular Stagnation: The History of a Macroeconomic Heresy. *The European Journal of the History of Economic Thought, 23*(6), 946–970.

Baltagi, B. H. (2008). *Econometric Analysis of Panel Data*. Hoboken, NJ: Wiley.

Banerjee, A., & Newman, A. (1993). Occupational Choice and the Process of Development. *Journal of Political Economy, 101,* 274–298.

Barro, R. (2000). Inequality and Growth in a Panel of Countries. *Journal of Economic Growth, 5*(1), 5–32.

Bernanke, B. (2015, April 1). *Why Are Interest Rates so Low, Part 3: The Global Savings Glut*. Ben Bernanke's Blog.

Bertola, G. (1993). Factor Shares and Savings in Endogenous Growth. *American Economic Review, 83*(5), 1184–1198.

Bhaduri, A., & Marglin, S. (1990). Unemployment and the Real Wage: The Economic Basis for Contesting Political Ideologies. *Cambridge Journal of Economics, 14*(4), 375–393.

Blackburn, M., & Bloom, D. (1985). What Is Happening to the Middle Class? *American Demographics, 7*(1), 18–25.

Blanchard, O., & Summers, L. H. (1986). Hysteresis and the European Unemployment Problem. In S. Fischer (Ed.), *NBER Macroeconomics Annual* (Vol. 1, pp. 15–78). Cambridge: MIT Press.

Blinder, A. S. (1975). Distribution Effects and the Aggregate Consumption Function. *Journal of Political Economy, 83*(3), 447–475.

Blundell, R., & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics, 87,* 115–143.

Böheim, R., & Jenkins, S. (2006). A Comparison of Current and Annual Measures of Income in the British Household Panel Survey. *Journal of Official Statistics, 22*(4), 733–758.

Bond, S., Hoeffler, A., & Temple, J. (2001). *GMM Estimation of Empirical Growth Models* (Economics Papers 2001-W2 1 Economics Group). Nuffield College, University of Oxford.

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics. *Review of Economic Studies, 47*(1), 239–253.

Cassiers, I., Maréchal, K., & Méda, D. (Eds.). (2017). *Post-growth Economics and Society: Exploring the Paths of a Social and Ecological Transition*. London and New York: Routledge Studies in Ecological Economics.

Choi, I. (2001). Unit Root Tests for Panel Data. *Journal of International Money and Finance, 20,* 249–272.

Chwalisz, C., & Diamond, P. (Eds.). (2015). *The Predistribution Agenda: Tackling Inequality and Supporting Sustainable Growth*. London and New York: I.B. Tauris.

Colciago, A., Samarina, A., & de Haan, J. (2018). *Central Bank Policies and Income and Wealth Inequality: A Survey* (Working Paper No. 594). De Nederlandsche Bank.

Crafts, N. (2014). Secular Stagnation: US Hypochondria, European Disease? In C. Teulings & R. Baldwin (Eds.), *Secular Stagnation: Facts, Causes, and Cures*, VoxEU.org (pp. 91–97). London: CEPR Press.

Criscuolo, C., Gal, P., & Menon, C. (2014). *The Dynamics of Employment Growth: New Evidence from 17 Countries* (OECD STI Policy Papers No. 14).

D'Alisa, G., Demaria, F., & Kallis, G. (Eds.). (2014). *Degrowth: A Vocabulary for a New Era*. London: Routledge.

Davis, J. C., & Huston, J. H. (1992). The Shrinking Middle-Income Class: A Multivariate Analysis. *Eastern Economic Journal, 18,* 277–285.

Dufrénot, G., & Rhouzlane, M. (2018). *Secular Stagnation: New Challenges for the Industrialized Countries in the 21st Century* (Working Papers halshs-01821669).

Easterly, W. (2001). The Middle Class Consensus and Economic Development. *Journal of Economic Growth, 6*(4), 317–335.

Eggertsson, G. B., & Mehrotra, N. R. (2014). *A Model of Secular Stagnation* (NBER Working Paper 20574).

Eurostat. (2019). *Real GDP per capita*. Available at: https://ec.europa.eu/eurostat/databrowser/view/sdg_08_10/default/table?lang=en. Accessed Mar 2019.

Fischer, S. (2016, October 17). *Why Are Interest Rates So Low? Causes and Implications*. Speech at the Economic Club of New York.

Fournier, J.-M., & Koske, I. (2012). The Determinants of Earnings Inequality: Evidence from Quantile Regressions. *OECD Journal: Economic Studies, 2012*(1).

Galor, O., & Zeira, J. (1993). Income Distribution and Macroeconomics. *Review of Economic Studies, 60,* 35–52.

Glaeser, E. L. (2014). Secular Joblessness. In C. Teulings & R. Baldwin (Ed.), *Secular Stagnation: Facts, Causes, and Cures*, VoxEU.org (pp. 27–38). London: CEPR Press.

Gordon, R. (2012). *Is US Economic Growth Over? Faltering Innovation Confronts the Six Headwinds* (NBER Working Paper No. 18315).

Gordon, R. (2014). The Turtle's Progress: Secular Stagnation Meets the Headwinds. In C. Teulings & R. Baldwin (Eds.), *Secular Stagnation: Facts, Causes, and Cures*, VoxEU.org (pp. 47–60). London: CEPR Press.

Gordon, R. (2015). Secular Stagnation: A Supply-Side View. *American Economic Review: Papers and Proceedings, 105*(5), 54–59.

Gordon, R. (2016). *The Rise and Fall of American Growth: The U.S. Standard of Living Since the Civil War*. Princeton: Princeton University Press.

Grusky, D., & Szelenyi, S. (2018). *The Inequality Reader Contemporary and Foundational Readings in Race*. Boulder: Routledge.

Gundersen, C., & Ziliak, J. (2004). Poverty and Macroeconomic Performance Across Space, Race, and Family Structure. *Demography, 41,* 61–86.

Hacker, J. (2011). *The Institutional Foundations of Middle Class Democracy*. London: Policy Network.

Hansen, A. H. (1934). Capital Goods and the Restoration of Purchasing Power. *Proceedings of the Academy of Political Science, 16*(1), 11–19.

Hansen, A. H. (1939). Economic Progress and Declining Population Growth. *American Economic Review, 29*(1), 1–15.

Hirsch, F. (1977). *Social Limits to Growth*. London: Routledge and Kegan Paul.

Hsiao, C. (2002). *Analysis of Panel Data*. Cambridge: Cambridge University Press.

International Monetary Fund (IMF). (2015). *The New Normal: A Sector-Level Perspective on Productivity Trends in Advanced Economies* (IMF Staff Discussion Notes No. 15/3).

Jackson, T. (2009). *Prosperity Without Growth: Economics for a Finite planet*. London: Routledge.

Jackson, T. (2017). *Prosperity Without Growth—Foundations for the Economy of Tomorrow*. London: Routledge.

Jäntti, M., & Jenkins, S. P. (2010). The Impact of Macroeconomic Conditions on Income Inequality. *Journal of Economic Inequality, 8,* 221–240.

Jimeno, J. F., Smets, F., & Yiangou, J. (2014). Secular Stagnation: A View from the Eurozone. In C. Teulings & R. Baldwin (Eds.), *Secular Stagnation: Facts, Causes, and Cures*, VoxEU.org (pp. 153–164). London: CEPR Press.

Kaldor, N. (1957). A Model of Economic Growth. *The Economic Journal, 67*(268), 591–624.

Keefer, P., & Knack, S. (2000). *Polarization, Politics and Property Rights* (World Bank Policy Research Working Paper No. 2418).

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London: Macmillan.

Klein, L. R. (1947). Theories of Effective Demand and Employment. *Journal of Political Economy, 55,* 108–131.

Kochhar, R. (2017). *Middle Class Fortunes in Western Europe* (LIS Working Paper Series, 702). Luxembourg Income Study (LIS), Luxembourg.

Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review, 45,* 1–28.

Levy, F. (1987). The Middle Class: Is It Really Vanishing? *The Brookings Review, 5,* 17–21.

Lin, H. (2016). *Risks of Stagnation in the Euro Area* (IMF Working Paper, 16/9).

López-Calva, L. F., & Ortiz-Juarez, E. (2014). A Vulnerability Approach to the Definition of the Middle Class. *Journal of Economic Inequality, 12*(1), 23–47.

Lyubimov, I. (2017). Income Inequality Revisited 60 Years Later: Piketty vs Kuznets. *Russian Journal of Economics, 3*(1), 42–53.

Malinen, T. (2013). Inequality and Growth: Another Look with a New Measure and Method. *Journal of International Development, 25,* 122–138.

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. (1972). *The Limits to Growth*. New York: Universe.

Mishan, E. J. (1967). *The Costs of Economic Growth*. London: Staples Press.

OECD. (2015). *In It Together: Why Less Inequality Benefits all*. Paris: OECD Publishing.

OECD. (2017). *Bridging the Gap: Inclusive Growth 2017*. Paris: OECD Publishing.

Okun, A. (1975). *Equality and Efficiency: The Big Tradeoff*. Washington, DC: The Brookings Institution.

Ostry, J. D., Loungani, P., & Berg, A. (2019). *Confronting Inequality: How Societies Can Choose Inclusive Growth*. New York: Columbia University Press.

Perotti, R. (1996). Growth, Income Distribution and Democracy: What the Data Say. *Journal of Economic Growth, 1*(2), 149–187.

Persson, T., & Tabellini, G. (1994). Is Inequality Harmful for Growth? *American Economic Review, 84*(3), 600–621.

Pichelmann, K. (2015). *When 'Secular Stagnation' Meets Piketty's Capitalism in the 21st Century: Growth and Inequality Trends in Europe Reconsidered* (European Economy Economic Papers 551). European Commission (DG ECFIN).

Pigou, A. C. (1920). *The Economics of Welfare*. London: Palgrave Macmillan.

Pigou, A. C. (1943). The Classical Stationary State. *Economic Journal, 53,* 343–351.

Piketty, T. (2014). *Capital in the Twenty-First Century*. Harvard University Press.

Pressman, S. (2007). The Decline of the Middle Class: An International Perspective. *Journal of Economic Issues, 41,* 181–200.

Ravallion, M. (2010). The Developing World's Bulging (but Vulnerable) Middle Class. *World Development, 38*(4), 445–454.

Roodman, D. (2009). A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics, 71,* 135–158.

Schumacher, E. F. (1973). *Small Is Beautiful*. London: Blond and Briggs.

Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. New York: Harper & Brothers.

Schumpeter, J. A. (1943). Capitalism in the Postwar World. In S. E. Harris (Ed.), *Postwar Economic Problems* (pp. 113–126). New York: McGraw-Hill.

Solimano, A. (2008). The Middle Class and the Development Process. *Serie Macroeconomía del Desarrollo*, 65. Comisión Económica para América Latina y el Caribe, Santiago, Chile.

Starbatty, J., & Stark, J. (2017). Schumpeter and Keynes: Secular Stagnation as Seen by the Austrian School. *International Economy, 31*(1), 52–55.

Steindl, J. (1952). *Maturity and Stagnation in American Capitalism*. Oxford: Basil Blackwell.

Steindl, J. (1979). Stagnation Theory and Stagnation Policy. *Cambridge Journal of Economics, 3,* 1–14.

Steindl, J. (1987). Stagnation. In J. Eatwell, M. Milgate, & P. Newman (Eds.), *The New Palgrave Dictionary of Economics* (Vol. 4, pp. 472–474). London: Macmillan.

Stiglitz, J. E. (2012). *The Price of Inequality: How Today's Divided Society Endangers Our Future*. New York: W. W. Norton.

Stiglitz, J. E. (2015). *Rewriting the Rules of the American Economy: An Agenda for Growth and Shared Prosperity*. New York: W. W. Norton.

Stiglitz, J. E. (2016). Inequality and Economic Growth. In M. Jacobs & M. Mazzucato (Eds.), *Rethinking Capitalism: Economics and Policy for Sustainable and Inclusive Growth*. Oxford: Wiley-Blackwell.

Stiglitz, J. E. (2018, August 28). The Myth of Secular Stagnation. *Project Syndicate*.

Storm, S. (2017). The New Normal: Demand, Secular Stagnation, and the Vanishing Middle Class. *International Journal of Political Economy, 46*(4), 169–210.

Summers, L. H. (2013a, November 14). Secular Stagnation. In *Speech at the 14th Annual IMF Research Conference*. Washington, DC.

Summers, L. H. (2013b, December 15). Why Stagnation Might Prove to Be the New Normal. *Financial Times*.

Summers, L. H. (2014). Reflections on the 'New Secular Stagnation Hypothesis'. In C. Teulings & R. Baldwin (Eds.), *Secular Stagnation: Facts, Causes, and Cures*, VoxEU.org (pp. 27–38). London: CEPR Press.

Summers, L. H. (2015). Demand Side Secular Stagnation. *American Economic Review: Papers and Proceedings, 105*(5), 60–65.
Summers, L. H. (2016). The Age of Secular Stagnation: What It Is and What to Do About It. *Foreign Affairs, 95*(2), 2–9.
Sweezy, P. (1942). *The Theory of Capitalist Development*. New York: Oxford University Press.
Sweezy, P. (1982). Why Stagnation? *Monthly Review, 34*(June), 4–10.
Taylor, T. (2013, December 12). Secular Stagnation: Back to Alvin Hansen. *Conversable Economist*.
Temin, P. (2017). *The Vanishing Middle Class: Prejudice and Power in a Dual Economy*. Cambridge, MA, USA: MIT Press.
Thurow, L. (1987). A Surge in Inequality. *Scientific American, 256,* 30–37.
Vernengo, M., & Rochon, L. (2001). Kaldor and Robinson on Money and Growth. *The European Journal of the History of Economic Thought, 8*(1), 75–103.
White, H., & Granger, C. W. J. (2010). Consideration of Trends in Time Series. *Journal of Time Series Econometrics, 3,* 1–38.
Wicksell, K. (1898). *Interest and Prices* (English translation, 1936). New York: Sentry Press.
World Bank. (2018, December). *Worldwide Governance Indicators (WGI) Project*. Washington, DC: The World Bank. wdi.worldbank.org.

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