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Varieties of capitalism, increasing income inequality and the sustainability of long-run growth

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We model US household debt accumulation during the neoliberal boom (1990–2007) as a response to emulation effects and the decline of the social wage, which has 'privatised' an increasing share of the costs of providing for services such as health and education. The debt dynamics of the US economy are then studied under alternative assumptions about the configuration of distributional variables, which is shown to differ across varieties of capitalism that have 'neoliberalised' to different degrees. A key result is that distributional change alone will not make contemporary US capitalism financially sustainable due, in part, to the paradoxical nature of inequality as a spur to household borrowing, and hence a source of both demand-formation and financial fragility. Achieving sustainability requires, instead, more wide-ranging reform.

Key words: Varieties of capitalism, Neoliberalism, Inequality, Growth, Financial fragility, Financial sustainability
JEL classifications: E12, E44, O41

1. Introduction

It is commonly argued that the relatively rapid growth of the US economy 1990–2007 owed, in part, to the willingness of less-affluent households to borrow in order to offset the otherwise negative impact on consumption spending of increased income inequality caused, in part, by real wage stagnation (Palley, 2002; Brown, 2008; Cynamon and Fazzari, 2008; Barba and Pivetti, 2009; Setterfield, 2013; Wisman, 2013).[1] A number of these contributions—conceived and written before 2008—anticipate the Great Recession as a consequence of the exhaustion of an unsustainable debt-financed, consumption-led growth regime (see also Godley and Izurieta, 2002).

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[1] On the stagnation of real wages in the US economy over the past 3–4 decades, see, for example, Wisman (2013) and Mishel *et al.* (2015). The problem and its relationship to income inequality are crystallised in the (in)famous real wage—productivity disconnect —see, for example, Fleck *et al.* (2011).

Since the crisis, much attention has been paid to the inequality–debt–crisis nexus in a varied and still-growing literature (Kumhof and Rancière, 2010; Rajan, 2010; Bartolini *et al.*, 2014; Kirschenmann *et al.*, 2014; van Treeck, 2014).

According to Setterfield and Kim (2016) and Setterfield *et al.* (2016), in the presence of emulation effects in consumption behaviour and fundamental uncertainty about the long-term consequences of debt accumulation, rising income inequality of the sort witnessed in the USA since 1980s can boost growth but simultaneously undermine the sustainability of the growth process. This last result is shown to be sensitive to the way that net debtor households organise their debt-servicing obligations (together with their related consumption and saving from current income). In particular, and in keeping with empirical evidence on the way that households respond to financial distress (Lusardi *et al.*, 2011), if net debtors sacrifice savings whenever debt-servicing obligations increase, the sustainability of growth in the face of an increase in income inequality is adversely affected.

The purpose of this paper is twofold. First, it revisits the motivation for borrowing by less-affluent households. In Setterfield and Kim (2016) and Setterfield *et al.* (2016), net debtor worker households seek to borrow from positive net worth rentier households because of emulation effects that, in the presence of real wage stagnation, increase their satisficing target levels of consumption expenditure at a pace that exceeds the growth of consumption spending that can be funded by wage income. But as explained by Lapavitsas and Powell (2013), 'households have been pushed into the arms of the private financial system as public provision has retreated across a range of fields and real incomes have been broadly stagnant' (p. 364). In other words, part of the motivation for borrowing stems not from 'keeping up with the Joneses' but from what we call 'running to stand still': a desire to maintain access to, for example, higher education and health care, and in so doing to simply *maintain* (rather than advance) household welfare, even as the costs of these services are shifted from the public sector onto individual households.

The second purpose is to extend the investigation to reflect the spatial dimensions of neoliberalism. It is important to be precise about the meaning we attach to this latter term, which is widely used and has different meanings in different contexts. In this paper, we adhere to a vision of growth and development according to which capitalism evolves through discrete stages characterised by qualitatively different institutional frameworks.[2] We regard neoliberalism as one such stage, having origins in the 1980s, being characterised by a particular institutional form to which classical liberal principles of laissez-faire are central and that privileges the position of finance (O'Hara, 2002; Kotz, 2015), and having fostered a long upswing (hereafter, the neoliberal boom) from 1990 to 2007. Bearing these definitions in mind, we then ask: to what extent has the 'neoliberalisation' of capitalism been geographically variegated and how (if at all) does this affect the inequality–debt–crisis nexus?; it is well known that the epicentres of the 2007–09 financial crisis and Great Recession were the USA and UK, two 'liberal market economies' (Hall and Soskice, 2001) where, by 2007, neoliberalism was most advanced and where increases in income inequality have been most pronounced over the last 35 years. Even as 'coordinated market economies' (Hall and Soskice, 2001) such as Germany have become increasingly neoliberal over the

[2] Such thinking can be associated with schools of thought such as Social Structure of Accumulation Theory Kotz *et al.* (1994), Regulation Theory Boyer (1990) and evolutionary Keynesianism (Cornwall and Cornwall, 2001).

past 35 years (on which see Anselmann and Krämer, 2015), have there been limits to increases in inequality in these economies? And if so, would the growth process in a liberal market economy such as the USA have been made more robust by exposure to the more tempered increases in inequality experienced in coordinated market economies during the neoliberal era? In short, do *varieties of capitalism* persist in contemporary capitalism, reflected in different *degrees of neoliberalism* and can this be shown to meaningfully affect the character and/or sustainability of the growth process?[3]

It is important to recognise that while the first of these questions is necessarily empirical, our approach in this paper is essentially theoretical. Hence while a suite of distributional variables is used to assess whether or not there are different degrees of neoliberalism across varieties of capitalism, these are chosen specifically to permit simulations of our extended version of the Setterfield and Kim (2016) model. The purpose of these simulations, meanwhile, is to assess whether or not degrees of neoliberalism affect the sustainability of growth by means of analysis that, although reliant on real-world data for suitable parameter values (as shown in Table 1), is essentially an exercise in comparative statics. That said, our simulations are rooted in the Kaleckian growth model, the 'workhorse' model of growth and distribution in contemporary heterodox macroeconomics. As such, our inquiry can be thought of as a prelude to further investigation of the research questions stated above, that seeks to establish whether or not there is prior reason to believe that varieties of capitalism can meaningfully affect the sustainability of a debt-financed growth regime, from the perspective of the most prominent theoretical model of the interaction of distribution and growth in contemporary heterodox macroeconomics.

The remainder of the paper is organised as follows. In Section 2, we outline the basic model on which our analysis is based. We highlight the impact of the social wage on household borrowing and call attention to features of the debt dynamics of the system as a whole. In Section 3, a numerical analysis is used to investigate the impact on the financial sustainability of contemporary US capitalism of changes in key distributional variables. These changes are motivated by observed differences in the distributional regimes characteristic of the neoliberal boom in the USA and Germany, archetypes of 'liberal market' and 'coordinated market' economies in the varieties of capitalism literature (Hall and Soskice, 2001). We show that while US capitalism would benefit from the less extreme distributional outcomes associated with other varieties of capitalism, more thorough-going reform is required in order to render the US growth regime sustainable. Finally, Section 4 concludes.

2. The model

2.1 Firm and household behaviour

The model in this paper is based on the stock-flow consistent Kaleckian macrodynamic model of Setterfield and Kim (2016) and Setterfield *et al.* (2016).[4] The model is demand-led, and we focus here on the contribution of firms and (in particular) households to demand formation.

[3] See also Behringer and van Treeck (2017), Bizberg (2018), Huber *et al.* (2018) and Hein *et al.* (2019) for evidence of growing interest in this question.

[4] Accounting relationships demonstrating the stock-flow consistency of the model developed in this paper are summarised in the social accounting matrices (Tables A1 and A2) found in Appendix A of this paper.

Table 1. *Parameter values*

Parameter	Value (US)	Value (Germany)	Source
c_W	0.94	–	Author's calculations based on Bunting (1998)
c_π	0.20	–	Setterfield and Budd (2011)
β	0.10	–	Author's calculations[a]
λ	0.29	–	Ravina (2007)
δ	*74.89*	*61.06*	Author's calculations based on Mishel and Sabadish (2012), Anselmann and Krämer (2015 and Melcher (2016)
ϕ	*2.27*	*1.85*	Author's calculations based on Mishel *et al.* (2007) and Anselmann and Krämer (2015)
α	0.25	–	Author's calculations based on Mishel *et al.* (2007, p.118)
ω_p	*0.42*	*0.485*	Author's calculations based on Mohun (2006) and Anselmann and Krämer (2015)
π	*0.34*	*0.29*	Setterfield and Budd (2011) and Anselmann and Krämer (2015)
κ_0	0.015 or 0.0805	–	Author's calculations[b]
κ_r	0.5	–	Lavoie and Godley (2001) and Skott and Ryoo (2008)
i	*0.0481*	*0.0871*	Author's calculations based on World Bank Data[c]
t	*0.375*	*0.491*	Author's calculations based on Anselmann and Krämer (2015)
η	*21.72*	*17.71*	Calculated as $\eta = \lambda\delta$

[a]Set in accordance with other parameters to satisfy the Keynesian stability condition.
[b]Set in accordance with other parameters to yield a capacity utilisation rate of approximately 80 per cent.
[c]See data.worldbank.org.

Firms contribute to demand formation according to an investment function of the following form (Stockhammer, 1999):

$$g_K = \kappa_0 + \kappa_r r \tag{1}$$

where $g_K = I/K$ is the rate of accumulation (aggregate investment, I, per unit of the capital stock, K) and r is the rate of profit. This investment function is Robinsonian or 'neo-Keynesian' rather than Kaleckian since it lacks the independent accelerator term—through which the rate of accumulation varies directly with the rate of capacity utilisation independently of the profit rate—that is associated with the canonical Kaleckian growth model.[5] Unlike the standard Robinsonian growth model (Robinson, 1956), however, long-run variability of the rate of capacity utilisation is assumed in what follows. As demonstrated in Setterfield and Kim (2017), in tandem with equation (1), this makes the resulting model stagnationist but renders the growth rate invariant with respect to the profit share, so that initially growth is neither wage- nor profit-led. Since our concern is with the effects of inequality on macrodynamics when households borrow, we regard this as a suitably neutral starting point for our investigation.

Given that[6]:

$$r = \pi u \tag{2}$$

[5] See, for example, (Lavoie, 2014, chpt. 6)

[6] The decomposition of the rate of profit that follows can be treated as true by definition, or can alternatively be viewed as a behavioural equation that, in Kaleckian macrodynamics, embeds the relationship between the profit share of income and the mark up applied to unit costs by firms in the process of markup pricing.

Equation (1) can be re-written (upon substitution) as:

$$g_K = \kappa_0 + \kappa_r \pi u \tag{3}$$

Turning now to household behaviour, following Setterfield and Kim (2016) and Setterfield *et al.* (2016), we posit two classes of income recipients: positive net worth rentier households (made up of capitalists and managers) and negative net worth worker households. Rentier households consume a conventional fraction of their income, which consists of profit, managerial salaries and interest income from loans to working households. Worker households likewise not only consume a conventional fraction of their (wage) income but also consume by borrowing from rentiers. Workers' borrowing behaviour is motivated by their propensity to emulate the consumption of rentiers and also by a desire to maintain consumption in the face of any diminution of social provision. In other words, part of the motivation for increased borrowing by workers is understood to be the 'privatisation' of social provision—reductions in the social wage (cuts to health care, education, etc.) associated with 'rolling back the frontiers of the welfare state' that have increasingly shifted the burden of providing for certain basic services from the public sector onto individual households.

First, note that total household income can be written as:

$$Y = W_p N + W_s \alpha N + \Pi \tag{4}$$

where W_p is the real wage of production workers, N is the number of production workers employed, W_s is the real wage of supervisory workers, $\alpha < 1$ denotes the necessary ratio of managers to production workers (given by the technology of the production process) and Π denotes total profit income. As noted, we treat the three types of income recipients (production and non-supervisory workers, supervisory workers and capitalists) as two distinct types of households (working and rentier households), so that $W_s \alpha N + \Pi$ becomes the income of rentiers (capitalists and supervisory workers). Furthermore, the fixed real wage earned by supervisory workers is assumed to be a constant multiple of the real wage of production workers:

$$W_s = \phi W_p \quad , \quad \phi > 1 \tag{5}$$

so that total real wage income is:

$$W = (1 + \phi\alpha) W_p N \tag{6}$$

Denoting the profit share of income as π and the income share of production workers as ω_p, it follows that:

$$1 - \pi = (1 + \phi\alpha)\omega_p$$

$$\Rightarrow \omega_p = \frac{1 - \pi}{1 + \phi\alpha} \tag{7}$$

Aggregate consumption by households is written as:

$$C = C_W + C_R + \dot{D} \tag{8}$$

where C_W and C_R are consumption out of profit and/or wage income by working and rentier households and borrowing by working households to finance additional consumption (independently of their income) is denoted as $\dot{D}$. Borrowing by working households is then modelled as:

$$\dot{D} = \beta(C^T - C_W) \quad , \quad \beta > 0 \tag{9}$$

where β is an adjustment parameter that depends on various factors including both household borrowing and financial market lending norms. C^T is a target level of consumption to which working households aspire. In our model, this target level of consumption is influenced by two factors. The first is the level of consumption achieved by more affluent households. These familiar emulation effects ('keeping up with the Joneses') can result from direct imitation of the consumption patterns of the most affluent households, or more indirectly through 'expenditure cascades' (Cynamon and Fazzari, 2008; Frank *et al.*, 2014).[7] The second factor influencing the consumption target C^T is the size of the *social wage*—that is, the extent of public provision of services such as health care and education. We postulate that C^T varies inversely with the social wage: as public provision of services such as health and education diminishes, households must increase their target level of private consumption expenditures in order to merely *maintain* established consumption standards.[8] We refer to this process as 'running to stand still'. Ultimately, both 'keeping up with the Joneses' and 'running to stand still' drive C^T (and hence borrowing by working households). We therefore write:

$$C^T = \eta C_R - \omega_S \tag{10}$$

where ω_s denotes the social wage and the parameter η represents the propensity to emulate. Note that for $\omega_s > 0$ sufficiently large, it is possible to obtain $C^T < 0$—in other words, with a sufficiently generous social wage, workers aspire to a target level of *saving* out of current net wage income. The stylised facts of the neoliberal era suggest that this condition is not satisfied, however, and that for worker households as a whole $\eta C_R - \omega_S > 0$, implying that $C^T - C_W > 0$ so that $\dot{D} > 0$. We, therefore, assume that $C^T - C_W > 0 \Rightarrow \dot{D} > 0$ in order to capture the phenomenon of less-affluent households as a whole steadily accumulating debt by virtue of their reliance on credit to supplement stagnant real incomes in order to finance growing consumption expenditures.[9]

Next, we model the social wage as:

$$\omega_S = t\Pi \tag{11}$$

Equation (11) describes the social wage as being entirely funded by a proportional tax (t) on total profits, so that the public sector runs a balanced budget. Effectively, the public sector acts as an 'intermediary' between capitalist and worker households,

[7] The empirical significance of emulation effects as a driver of household debt accumulation has been contested recently by Stockhammer and Wildauer (2017), but see Thompson (2018), Petach and Tavani (2017) and Berlemann and Salland (2016) for contrary evidence. Evidence suggests that expenditure cascades resulting from peer-group influence on individual household consumption can also run in the opposite direction, as more affluent households are prompted to spend on status goods in response to increased consumption spending by their less-affluent peers Chai *et al.* (2019).

[8] The rising tide of student debt in the USA is an example of this process, whereby 'cost shifting' from the public sector to the household sector results in households accumulating more debt in an effort to maintain their standards of living. See, for example, Webber and Burns (2017). As remarked by (Lapavitsas, 2013, p. 240), 'rising household indebtedness has been associated with changes in the social provision of basic services including housing, health, education, transport and so on. To the degree to which social provision has retreated, or failed to expand, private provision has taken its place, mediated by finance'.

[9] Note, then, that our focus is exclusively on the use of credit to finance current consumption. We abstract from that part of debt used by working households to accumulate assets (and in particular, housing).

taxing profits and redistributing the resulting revenues to workers, accumulating no net worth in the process. This not intended to be a realistic depiction of public provision in the USA, where the social wage received by working households has typically been financed by tax revenues paid by the same households, with the result that it plays no inter-class redistributive role (Shaikh and Tonak, 1987, 2000; Shaikh, 2003—but see also Moos, 2017, for a new view). Instead, equation (11) is motivated as follows. First, the stylised facts of recent US capitalism draw attention to the coincidence, during the neoliberal era, of tax cuts for the most affluent households coupled with a process of shifting the costs of providing health care and education (among other things) from the public sector to the household sector ('rolling back the frontiers of the welfare state'). Note that in equation (11), the social wage varies directly with the rate of taxation on profits, so that the equation is capable of capturing these coincident developments through a decline in a single parameter, t. It is, therefore, a parsimonious representation of two important features of neoliberalism. Second, we wish to capture the notion that, hypothetically, the USA could use (increased) taxes on top incomes to fund the public provision of basic services to working households. In this way, equation (11) serves as a useful counterfactual [at least according to the evidence of Shaikh and Tonak (1987, 2000) and Shaikh (2003)], drawing attention to the opportunity cost of tax cuts for the most affluent members of society. In the context of our model, this opportunity cost includes not only the reduced burden on working households for providing basic services such as health and education, but also (given the implications for household borrowing and debt accumulation) enhanced sustainability of the growth regime.

As a result of their borrowing, working households accumulate debt that they must, of course, service. Following Setterfield and Kim (2016), we conceive workers' debt-servicing behaviour as conforming to a distinct behavioural hierarchy or 'pecking order', according to which they first consume from current income, then service their debts and finally save. The flow of savings per period is thus a 'residual of a residual'—that part of total income that remains after consumption and debt-servicing expenditures. The motivation for this approach can be found in Cynamon and Fazzari (2012) and Lusardi *et al.* (2011). Cynamon and Fazzari (2012) argue that debt-servicing expenditures by households are better thought of as a monetary outlay undertaken volitionally by households, rather than an autonomous deduction from gross household income (in the manner of a tax). At the same time, Lusardi *et al.* (2011) observe that 'just as corporations tend to fund themselves first by drawing upon internal funds, households address financial shocks first by drawing down savings' (p. 27). In other words, it is savings specifically, rather than household income more generally, that is sacrificed in response to an increase in creditors' claims on debtor households.

These considerations can be captured if we describe consumption out of wage income by workers as:

$$C_W = c_W W_p N \tag{12}$$

and specify saving by the same households (S_W) as:

$$S_W = (1 - c_W) W_p N - iD_R \tag{13}$$

where $D_R = D - D_W > 0$ is that part of total workers' debt (D) that is owned by rentiers, so that the transfer payment that workers must make to rentiers in order to service their debts is of size iD_R. Note that according to equations (12) and (13), even as

they borrow and accumulate debt, workers save and accumulate assets (nevertheless emerging with negative net worth, of course, since $D_R > 0$). These assets are assumed to be exclusively some part of the total debt that working households themselves accrue (denoted as D_W).[10] Our description of behaviour here is designed to be consistent with stylised facts: the observation that negative net-worth households do engage in some saving out of current income even as they borrow and accumulate debt. This can be explained by a combination of fundamental uncertainty and imperfect credit markets, which combination makes it reasonable for any household that ultimately consumes in excess of its current income to simultaneously save and borrow. 'This is because uncertainty implies a precautionary demand for liquidity to meet unforeseen contingencies, while imperfect credit markets mean that dis-saving and borrowing are not perfect substitutes: a household is always legally entitled to draw down its previously accumulated wealth, but has no similar entitlement to borrow' (Setterfield and Kim 2016, p. 24).

Finally, the consumption of rentier households is described as a fixed proportion of their total wage, profit and interest income:

$$C_R = c_\pi[\phi\alpha W_P N + (1-t)\Pi + iD_R] \tag{14}$$

2.2 Model solution

Goods market equilibrium in our model can be stated as:

$$Y = C_W + C_R + \dot{D} + G + I \tag{15}$$

where $I = g_K K$. Equilibrium values of the rate of capacity utilisation, rate of profit and rate of growth can now be found by combining equations (1), (2), (7), (9)–(10), (11), (12) and (14) with the equilibrium condition stated in equation (15) above and normalising all variables by the capital stock. This exercise is undertaken in Appendix B of this paper. Note that the equilibrium solutions derived in Appendix B are strictly short-run or *temporary* equilibria, in the sense that they assume a constant net debt-to-capital ratio, $d_R = \frac{D_R}{K}$.[11] This net debt-to-capital ratio will, however, vary endogenously over time, as workers accumulate debt and the economy grows. It is to the examination of these debt dynamics and their implications for the growth that we now turn.

2.3 Debt dynamics

Recall that the consumption, debt servicing and saving behaviours of workers implies that:

$$S_W = (1-c_W)W_p N - iD_R$$

Saving is a 'residual of a residual'—what remains after debtor households have first consumed and then serviced their debts from their available wage income. Given this behaviour, it follows that workers' *maximum feasible* debt-servicing payment, iD_{Rmax}, satisfies:

$$0 = (1-c_W)W_p N - iD_{Rmax}$$

[10] Workers thus accumulate no equity, so that the capital stock is owned exclusively by capitalists.

[11] Recall that workers owe only some fraction of their total debt to rentier households —hence, d_R is a *net* debt-to-capital ratio.

Standardising by K and solving for the resulting maximum net debt-to-capital ratio, we find that:

$$d_{Rmax} = \frac{(1 - c_W)\omega_p u}{i} \tag{16}$$

As long as $d_R \leq d_{Rmax}$, workers can service their debts and subject to the 'ordinary' workings of financial markets (that allow accumulated debt to be rolled over from period to period), function as Minskyan speculative units. If, however, $d_R > d_{Rmax}$, and assuming that C_W in equation (12) is required for the basic social reproduction of the household from period to period (so that the propensity to consume, c_W, cannot be reduced), then working households become 'Lehman units' (Pressman and Scott, 2018). This describes a point at which households 'cannot sustain themselves and also pay interest on past debts' (Pressman and Scott, 2018, p. 10) and are, therefore, susceptible to default.[12] Lehman finance so-defined falls short of Minsky's concept of Ponzi finance, a situation where debt-servicing obligations exceed current income so that the debtor unit must borrow merely in order to service previously accumulated debt. Households cannot realistically approach such a position, however, because it involves devoting all current income to debt servicing, and 'households, unlike firms, need food, clothing, and shelter in order to survive' (Pressman and Scott, 2018, p.10).[13] The concept of Lehman finance, and the prospect that a Lehman unit is likely to default, draws attention to the fact that a capitalist growth regime that depends on household (as opposed to corporate) debt accumulation is more susceptible to problems of financial fragility, which problem is more likely to become pressing *before* debtor units approach the threshold of Ponzi finance. The significance in practice of this observation will become clear in what follows.

Having identified its maximum feasible value in equation (16), we can identify the steady-state value of the net debt-to-capital ratio, d_R^*, by studying the behaviour of:

$$d_R = \frac{D_R}{K}$$

$$\Rightarrow \dot{d}_R = \frac{\dot{D}_R}{K} - g_K d_R \tag{17}$$

under the equilibrium condition $\dot{d}_R = 0$, where $\dot{D}_R$ is that part of workers' total borrowing that is funded by the savings of rentier households. In other words:

$$\dot{D}_R = \dot{D} - \dot{D}_W \tag{18}$$

where $\dot{D}_W = S_W$ is borrowing by workers that is funded by savings generated by other working households. Explicit solution of equation (17) is provided in Appendix C of this paper.

[12] If C_W is not required for basic social reproduction then households cannot be categorised as Lehman units when $d_R = d_{Rmax}$: d_{Rmax} is a local (rather than global) constraint that can be relaxed by reducing c_W in order to avoid default. Note, however, that a reduction in c_W is not without consequences for demand-formation, and hence the steady-state value of the capacity utilisation rate that appears on the right hand side of equation (16), and hence the value of d_{Rmax}. How 'soft' a 'soft landing' of this sort would be is, therefore, open to question—which question we leave for future research.

[13] Of course, firms need to pay wages and acquire material inputs (as well as meet their debt-servicing obligations) in order to remain in operation, but such needs for working capital are—unlike the basic needs of households—ordinarily financed by borrowing.

Inspection of equation (17) reveals that if g_K is increasing in d_R, then $\dot{d}_R$ will vary indirectly with d_R at *higher* values of d_R, and the debt dynamics of the system will be of the 'unconventional' (inverted U-shape) type as shown in Figure 1.[14] This is significant because equation (17) is typically quadratic, and unconventional debt dynamics mean that it is the *larger* of the two equilibrium solutions of this expression that is stable, reducing the likelihood (*ceteris paribus*) that such position can feasibly be attained. Meanwhile, the explicit solution of equation (17) in Appendix C reveals that the 'running to stand still' effect on the proclivity of working households to borrow means that the value of $\dot{d}_R$ varies indirectly with the rate of taxation on profits, t. This is for two distinct reasons. First, a decrease in t results in a lower social wage [through equation (11)] which stimulates more borrowing [via equation (10)], as workers try to make up for the loss of publicly provided consumption goods by increasing private expenditures to defend their standard of living. Second, a decrease in t raises capitalist consumption [in equation (14)], which stimulates worker borrowing and spending through the emulation effect in equation (10).

Having thus elucidated the debt dynamics of the system, we can now turn to address two key questions: is $d_{Rmax} \geq d_R^*$, and, if so, how large is the value of $d_{Rmax} - d_R^*$?[15] The first question addresses the *sustainability* of the growth regime, by identifying whether or not the steady-state value of the net debt-to-income ratio is feasible (so that the system can, in principle, achieve and remain in its steady-state configuration). In Figure 1, for example, if $d_{Rmax} = d_{Rmax1}$, then as long as $d_R \leq d_{Rmax1}$ initially, the economy will converge to the stable, steady-state debt-to-capital ratio d_{R1} and the accompanying steady-state growth rate will be sustainable indefinitely (*ceteris paribus*). If, however, $d_{Rmax} = d_{Rmax2}$, then even if $d_R \leq d_{Rmax2}$ initially, unless it is *also* the case that $d_R < d_{R2}$ (in which case, the economy will move towards a situation in which working households cease to be net debtors), the stability of d_{R1} will eventually pull the debt-to-capital ratio above its maximum sustainable value.

The second question concerns the *vulnerability of the economy to shocks*. In the case of $d_{Rmax} > d_R^*$, the larger the value of $d_{Rmax} - d_R^*$, the greater the capacity of the economy to sustain shocks to the net debt-to-capital ratio without these shocks rendering the debt-servicing payments of working households infeasible (given the way we have described their consumption, debt servicing and saving behaviour). These questions are taken up in the following section.

3. Numerical results

The results of our previous research into the characteristics and sustainability of household-debt-financed growth regimes were based on numerical solutions to equations akin to (16) and (24) (Setterfield and Kim, 2016; Setterfield *et al.*, 2016). Our first objective in this section is, therefore, to add to the parameter set of this previous work to incorporate values of the tax rate, t, and re-calibrate key distributional

[14] As will become clear from the numerical solutions of equation (C.5) in the following section, this is, in fact, the case.

[15] Note that d_R^* is closely related to the more intuitive steady-state debt-to-income ratio, d_Y^*, since it follows that:

$$d_Y = \frac{D_R}{W_p N} = \frac{\frac{D_R}{K}}{\frac{W_p NY}{YK}} = \frac{d_R}{\omega_p u}$$

We calculate and report values of both d_R^* and d_Y^* in the numerical analysis that follows.

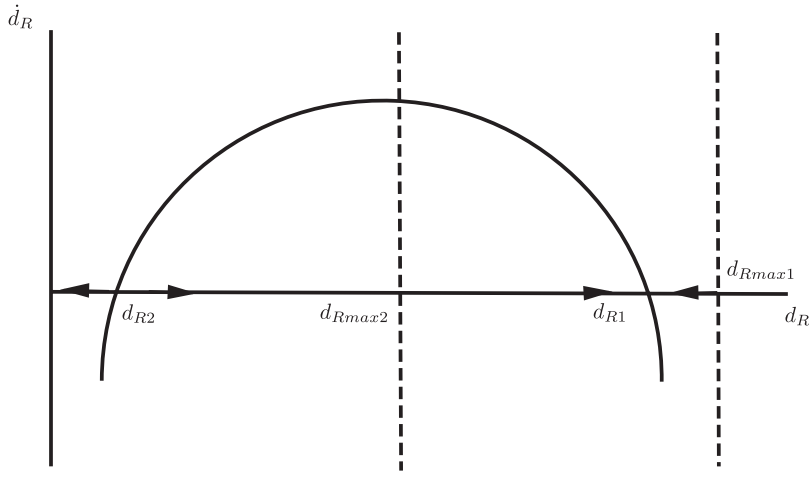

Fig. 1. *Debt dynamics and macroeconomic sustainability.*

parameters to account for the characteristics of the German economy. This will first allow us to identify whether or not there exist meaningfully different 'distributional regimes' across different varieties of capitalism during the neoliberal boom. If successful, we can then examine the sensitivity of US macrodynamics to the differing degrees of neoliberalism associated with the different distributional characteristics of (the USA and Germany) varieties of capitalism. The specific question we seek to address is: do different 'distributional regimes' affect the sustainability and vulnerability to shocks of a household-debt-financed growth regime and, in particular, how would US capitalism have fared during the period 1990–2007 with a distributional regime more characteristic of German capitalism?

3.1 Degrees of neoliberalism across varieties of capitalism

Table 1 reports the parameter values used in this study and their sources.[16] Of particular interest here are the values given in italics, which reflect different facets of the *distributional regimes* in the USA and Germany during the period 1990–2007. It is the sensitivity of debt dynamics to these distributional regimes that we wish to gauge. Comparing the parameter values in columns two and three of Table 1 suggests a clear contrast between the US and German economies. Distributional outcomes have worsened in Germany over time as the German economy has neoliberalised

[16] Following Setterfield and Kim (2016), we calculate η—the propensity of working households to emulate the consumption of the rentier class—as:

$$\eta = \lambda\delta \tag{19}$$

where λ is Ravina's emulation parameter (see Ravina, 2007), and δ is a scaling parameter defined as the ratio of consumption by the upper-middle class (capitalists and the working rich) to consumption by the median rentier family, and proxied by the ratio of CEO pay to median rentier household income. The presence of δ in our calculation of η allows us to take account of the extent to which the consumption standards of the very affluent affect the aspirations of working households. This influence may be direct, arising from exposure to much-publicised 'celebrity lifestyles' or the propensity of working households to believe in upward social mobility (and the resulting need to consume in accordance with their expected future social status; Wisman, 2009, 2013). Alternatively, it may be indirect, resulting from the 'expenditure cascades' discussed by Frank *et al.* (2014).

(Anselmann and Krämer, 2015), but in general there is less income inequality in Germany than in the USA. This is reflected in the values of key parameters such as ϕ and π (the ratio of supervisory to production worker wages and the profit share of income, respectively), both of which are lower in Germany, and ω_p and t (the wage share of supervisory workers and the tax rate on top incomes, respectively), both of which are higher.[17]

One important exception to this generalisation is the real interest rate, i, which is almost twice as high in Germany as in the USA. Interest rates are, of course, distributional variables insofar as they inevitably set up flows of transfer payments between debtors and creditors. According to some post-Keynesian analysis, however, interest rates are *primarily* distributional variables (rather than primarily determinants of the level of activity), despite their prominent contemporary use as a tool of macroeconomic stabilisation policy (Rogers, 1989; Lavoie, 1992). In this regard, the German economy is unequivocally more pro-rentier than the US economy. To a substantial extent, this is, of course, the by-product of macroeconomic policy rather than any explicit distributional objective: the European Central Bank (ECB) has been more aggressively focussed on targeting low inflation during the neoliberal boom than the more accommodative Federal Reserve Bank, and this has translated into different interest rate regimes in Germany and the USA by virtue of the fact that both central banks use an overnight rate as the primary instrument of their monetary policies.

The conclusion that emerges from this review of the parameter values in Table 1 is that neoliberalism is gradable: it has differed by degree across countries in accordance with pre-existing notions of 'varieties of capitalism'. This conclusion is congruent with the findings of Boyer (2015, 2016), who identifies contrasting regimes of inequality between countries during the neoliberal boom, rather than undifferentiated increases in inequality based on a universal or global (and, therefore, spatially invariant) mechanism.

3.2 Contemporary US capitalism

We now consider the implications of different distributional regimes for debt dynamics and the question as to whether or not the associated growth regime is sustainable. We start with the basic configuration from Setterfield and Kim (2016) representing US capitalism during the 1990–2007 neoliberal boom, but now with a hypothetical social wage paid for by a tax on profits. As previously noted, the social wage has traditionally been funded by workers themselves (Shaikh and Tonak, 1987, 2000; Shaikh, 2003). Here we study the effect of a counterfactual social wage funded by a tax on top incomes. The purpose of this exercise is to investigate whether or not there is a simple policy solution—redistributive fiscal policy, at tax rates associated with existing US capitalism—to the unsustainability of the current US growth regime reported by Setterfield and Kim (2016)?

The debt dynamics of this first regime are illustrated in Figure 2. As anticipated, these debt dynamics are 'unconventional' (inverted U-shape), precisely the qualitative property called to attention by Setterfield and Kim (2016) and associated with the

[17] These findings are consistent with other measures of distributional outcomes. For example, compared to the USA, Germany engages in consistently higher levels of public social spending as a share of GDP. See the OECD social expenditure database (http://www.oecd.org/social/expenditure.htm) for more detail.

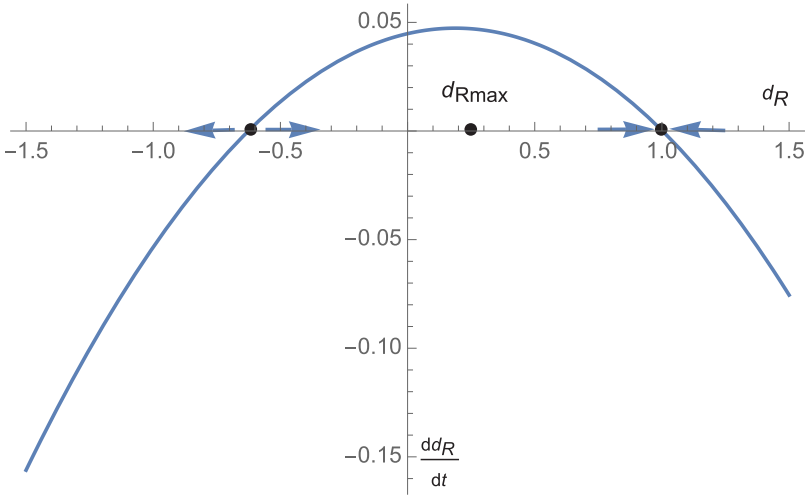

Fig. 2. *The baseline case: contemporary US capitalism.*

debt-servicing behaviour of working households described earlier.[18] The significance of this observation is that the larger of the two equilibrium values of the net debt-to-capital ratio, found in Figure 2 where the relationship between the rate of change of the net debt-to capital ratio and its level intercepts the abscissa, is the *stable* equilibrium value of this ratio. This stable equilibrium value, denoted as d_R^*, is the focus of attention in what follows.

In Figure 2, we observe $d_R^* = 1.00$, with an associated value of $d_Y^* = 2.99$. As a point of comparison, note that the middle three quintiles of the US wealth distribution, with household net worth of between $200 and $473,000, had a debt-to-income ratio of 1.57 in 2007 (Wolff, 2010; Table 6). More significantly, recall from equation (16) that:

$$d_{Rmax} = \frac{(1 - c_W)\omega_p u}{i}$$

Consistent with the outcomes depicted Figure 2, we find on the basis of this calculation that, evaluated at the steady-state rate of capacity utilisation, $d_{Rmax} = 0.25$, so that $d_{Rmax} - d_R^* = -0.75$. In other words, regardless of the implied debt-to-income ratio for working households, the steady-state debt burden associated with this regime is infeasible. The conclusion is straightforward: introduction of a social wage funded by a tax on top incomes at prevailing US rates does not suffice to make the US growth regime sustainable.

3.3 Contemporary US capitalism with German taxation

Does a 'less neoliberalised' (i.e. more generous) welfare state, such as that found in Germany, improve on the situation just described? Specifically, can more aggressive

[18] As noted in Setterfield *et al.* (2016), the debt dynamics of the system convert to the more orthodox U-shape observed elsewhere in the literature [see, e.g. Hein (2012), pp. 94–8] if working households first use their wage income to service debt, and then consume a conventional fraction of what remains.

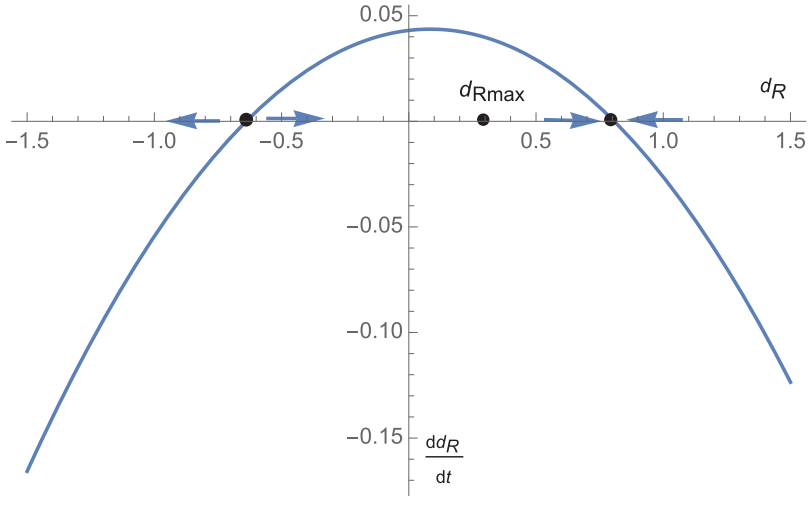

Fig. 3. *US capitalism with German tax on top incomes.*

redistribution through taxes and transfers make the US growth regime sustainable and eliminate (or at least appreciably reduce) the debt burden placed on working households, so that the resulting system is at least to some extent 'shock proof?'[19] We begin the process of addressing the questions just posed by modifying the previous configuration of our model to incorporate a larger social wage, funded by the higher German tax on top incomes reported in Table 1. All other parameters are unchanged from the second column of Table 1. The debt dynamics of the resulting system are illustrated in Figure 3.

In this configuration of the model, we observe $d_R^* = 0.81$ and $d_Y{}^* = 2.29$. Consistent with the higher rate of taxation and more aggressive redistribution through the social wage, then, we obtain a lower debt-to-income ratio for workers. These same distributive changes, moreover, bring about an increase in the steady-state capacity utilisation rate (which rises from 80% in the baseline scenario discussed previously to 84%). This is consistent with ordinary Keynesian logic, according to which redistributing income from high- to low-income groups with (respectively) low and high marginal propensities to consume boosts demand formation and hence economic activity.[20] Finally, since $d_{Rmax} = 0.31$, the capacity of workers to carry debt is enhanced. Note, however, that while $d_{Rmax} - d_R{}^* = -0.50$ is higher than in the baseline scenario, it is still negative and as such, the growth regime remains unsustainable. It appears, then, that in keeping with the claims of Taylor *et al.* (2015), redistributive fiscal policy alone cannot be relied

[19] Recall that by 'shock proof' we mean a situation where the equilibrium debt burden is sufficiently within the interior of its maximum feasible value as to permit a substantial disequilibrating increase in the debt burden without this inviting default by debtor households.

[20] Note, however, that in the context of the present model, this result is far from assured. Hence the 'traditional' channel through which redistribution from more- to less-affluent households affects consumption spending just described is now only one among several. For instance, a reduction in rentier consumption will lower the target level of consumption set by working households, which is influenced by emulation effects. Enhancement of the social wage brought about by redistributive taxation will have the same effect. Working together, these adjustments will (*ceteris paribus*) reduce borrowing by working households and so adversely affect demand formation and economic activity.

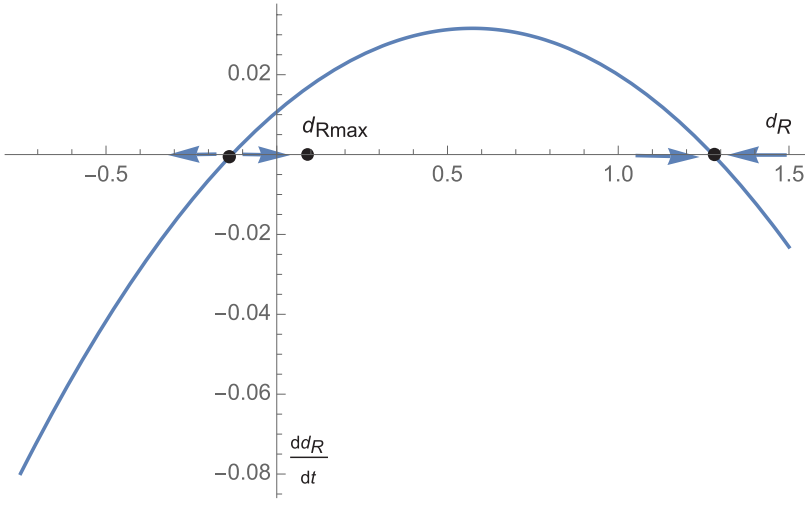

Fig. 4. *US capitalism with German distributional regime.*

upon to address the inequality created under neoliberalism and the macroeconomic ailments it entails. Specifically, although the higher German tax rate (and correspondingly higher social wage) has a moderating influence on US capitalism, reducing both the steady-state debt burden of working households and the size of the 'sustainability gap' [the interval that needs to be closed in order for the steady-state debt burden of workers to be feasible, given by $-(d_{Rmax} - d_R^*)$], it does not successfully address the fundamental problem of the innate unsustainability of the system as a whole.

3.4 Contemporary US capitalism with Germany's distributional regime

As a further experiment, we now transplant the *entire* German distributional regime reported in the third column of Table 1 into US capitalism. This involves modifying the previous configuration of our model (US capitalism with a higher social wage funded by a Germanic tax on top incomes) by introducing: more compressed income distribution (less wage inequality, less inequality in the functional distribution of income and a smaller gap between top incomes and median income) *and* higher German (i.e. ECB) interest rates. The debt dynamics of the resulting system are illustrated in Figure 4.

An intriguing feature of this scenario is that macroeconomic performance unequivocally *deteriorates*. The equilibrium rate of capacity utilisation drops to 81%. More significantly, we observe $d_R^* = 1.23$ (so that $d_Y^* = 3.25$) and $d_{Rmax} = 0.10$, so that $d_{Rmax} - d_R^* = -1.13$. In other words, the equilibrium debt-to-income ratio of workers rises and the maximum feasible debt-to-capital ratio falls, so that not only is the growth regime still unsustainable but also the sustainability gap actually widens.

These results demonstrate the central importance of monetary policy in a highly financialised, debt-dependent economy. The seemingly advantageous features of the German distributional regime (which involves both higher taxes on top incomes and hence, in our model, a higher social wage, coupled with less pre-tax income inequality) are ultimately outweighed by higher interest rates, that set up a greater flow of transfer payments from worker to rentier households for any given amount of accumulated debt. As a result, equilibrium worker indebtedness rises and the

steady-state debt burden of working households moves further away from its maximum feasible value. Ultimately, the source of these problems is the more 'hawkish' attitude of the ECB towards inflation, and the correspondingly higher interest rate regime instituted by the ECB during the neoliberal boom as compared with the US Federal Reserve Bank under Governors Greenspan and Bernanke. The results suggest that contrary to the claims of the first-generation dynamic stochastic general equilibrium (DSGE) models that guided monetary policy during the 'Great Moderation', central banks would do well to worry about the consequences for an indebted private sector of sudden increases in interest rates in the single-minded pursuit of lower inflation.[21]

3.5 'Fully reformed' US capitalism

Suppose now that we retain the German distributional regime used in the previous sub-section, but substitute the Federal Reserve's monetary policy (as represented by the lower interest rate in the second column of Table 1) for that of the ECB. As might be expected, this relieves some of the financial stress on the system by reducing the steady-state debt burden of working households and increasing their maximum sustainable debt burden. It does not, however, make the growth regime sustainable. Meanwhile, it causes a marked deterioration in the real performance of the economy, captured by a precipitous decline in the steady-state capacity utilisation rate. The intuition for this result is as follows. The logic of neoliberalism is such that it is heavily dependent on borrowing by workers to prop up demand formation that (*ceteris paribus*) is undermined by high income inequality. As the squeeze on workers' income emanating from the labour market and/or their debt-servicing obligations is reduced—and with it, their need to borrow—real performance suffers. This draws attention to a curious tension within neoliberalism: its financialisation of less-affluent households is both an unwanted source of financial fragility and a necessary source of aggregate demand formation. Too great a squeeze on working households and the system becomes unsustainable; too little a squeeze and the system generates insufficient aggregate demand to be viable. In the situation considered here, lowering the interest rate *ceteris paribus* raises the economy-wide savings rate, by increasing that part of the residual of workers' wage income that is saved rather than transferred to rentiers as debt servicing and hence partially spent. At the same time, this reduction in the rentiers transfer income and hence consumption spending reduces workers' consumption target and hence borrowing. The net result is a veritable collapse in aggregate consumption demand. The motto of this unfortunate story is simple: just as we saw that aggressive monetary policy in the single-minded pursuit of an inflation target can imperil an indebted economy, so we now see that even accompanied by the 'right' pre- and post-tax labour market outcomes, a more enlightened monetary

[21] In first-generation DSGE models, debt is accumulated by consumption-smoothing households whose dynamic optimisation rules out the possibility of default. In the model developed here, meanwhile, debt is accumulated by households seeking to offset the squeeze on their wage income created by labour market outcomes, under conditions that make the expected future consequences of debt accumulation subject to fundamental uncertainty. In the first environment, private sector balance sheets need be of no concern to monetary policymakers as they manipulate the interest rate. In the second—as amply demonstrated by the results in this sub-section—concern about the balance sheet consequences of higher interest rates is warranted. Fortunately, there is some evidence to suggest this lesson has been learned since the Great Recession (European Central Bank, 2017, pp. 14–6; Cloyne *et al.*, 2018).

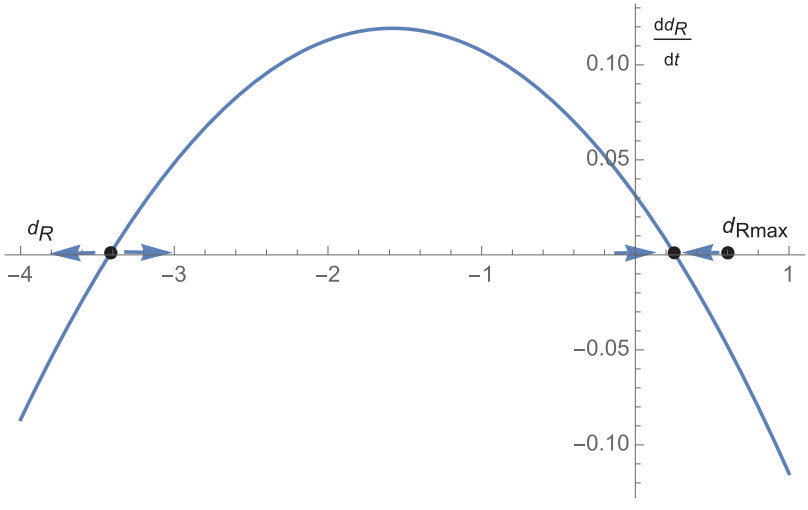

Fig. 5. *Fully reformed US capitalism.*

policy alone cannot solve the macroeconomic and financial ills of neoliberalism due to its paradoxical nature.

A policy solution is, however, at hand. Suppose that *in addition* to lowering the interest rate as postulated above, we *also* increase the value of κ_0 to the higher of the two values reported in the second row of Table 1. By construction, this restores the steady-state rate of capacity utilisation to its original value (in the baseline simulation) of approximately 80%. Note that the parametric variation we are contemplating has an important behavioural interpretation. Given that κ_0 is the intercept term in our investment function [see equation (1)], it represents the rate of fixed capital formation that takes place independently of the profit rate. One interpretation of an increase in κ_0 is, therefore, a fiscal stimulus by the public sector in the form of an infrastructure policy.

Consider, then, the financial dynamics of a now 'fully reformed' US capitalism involving not just Germanic labour market outcomes and a tax-and-transfer scheme based on a Germanic tax on top incomes, but also coordinated monetary and fiscal policies designed to keep interest rates low and to boost public spending by improving public infrastructure. The debt dynamics of this system are illustrated in Figure 5. Consistent with the outcomes depicted in this figure, we observe $d_R^* = 0.26$ and $d_{Rmax} = 0.52$, so that $d_{Rmax} - d_R{}^* = 0.26 > 0$. In other words, the equilibrium debt burden of workers falls considerably, their maximum feasible debt burden rises and the former value now lies in the interior of the latter so that the growth regime is finally sustainable. Meanwhile, $d_Y{}^* = 0.68$, a value that is quite respectable compared with actual outcomes over the past four decades. It is less than half of the value of the debt-to-income ratio sustained by the middle three quintiles of the US wealth distribution in the early 2000s, and almost identical to the value of the debt-to-income ratio of the same group in 1983 (0.67), prior to the onset of the neoliberal boom (Wolff, 2010; Table 6). Finally, there is reason to believe that the system would be reasonably shock-proof. Evaluated at the steady-state rate of capacity utilisation, the value of d_Y associated with d_{Rmax} is 1.36, meaning that starting from a position of equilibrium, the debt-to-income ratio can double without creating 'Lehman units' among working households and thus imposing the likelihood of default on the economy as a whole.

3.6 Summary

As we have seen, a 'fully reformed' version of US capitalism, involving Germanic labour market outcomes and taxes on top incomes, a monetary policy that is responsive to the needs of the real economy (and of debtor households) and a program of public expenditure on infrastructure, is required to create a sustainable growth regime. This result highlights the substantial extent to which the US economy needs to be reformed merely in order to produce a variant of capitalism that 'works' (i.e. a growth regime that is both financially robust and sustainable). Simply instituting a 'moderated' variant of neoliberalism, as represented in the exercises above by a German distributional regime, does not suffice. Instead, what appears to be required is a mixture of more progressive labour market, monetary and fiscal policies, where the latter involves not just redistributive taxation but also public spending directed towards infrastructure improvements.[22]

4. Conclusions

This paper draws attention to spatial variation in neoliberalism and, in particular, the extent to which we can identify differing 'degrees of neoliberalism' in the contemporary distributional regimes of what have previously been identified as liberal market and coordinated market varieties of capitalism. The ultimate purpose is to study the impact of these variations on the deterioration of working households' balance sheets resulting from rising income inequality and the retreat of the welfare state, and the impact of this financialisation of the less affluent on the sustainability of growth.

The paper demonstrates that neoliberalisation has been uneven: varieties of capitalism persist, at least as reflected in the differing distributional regimes of the liberal market and coordinated market economies such as the USA and Germany. Furthermore, these degrees of neoliberalism have an important but not decisive effect on the sustainability of the contemporary growth regime. Although the US economy would benefit from both more redistributive taxation on top incomes and less unequal labour market outcomes, a 'fully reformed' US capitalism that also involves low interest rates and a program of public spending on infrastructure is required to produce a robust and financially sustainable growth regime.

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[22] See also (Bartolini *et al.*, 2014, pp. 1035–8) who go still further in their advocacy of change, suggesting that simultaneous reductions in the 'consumption bias' of US society and in the time devoted to market work are also required in order to re-balance the US economy.

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Appendix A. Social accounting matrices (SAMs)

Table A1. *Balance sheet matrix*[a]

	Workers	Rentiers	Firms	Banks	Sum
Capital			K		K
Deposits	D_W	D_R		$-(D_W + D_R)$	0
Loans	$-D$			D	0
Equity		E	$-E$		0
Net worth	$D_W - D$	$D_R + E$	$K - E$	$D - (D_W + D_R)$	K

[a]The government sector is omitted from the balance sheet matrix because it holds no assets or liabilities.

Table A2. *Transaction flow matrix*

				Firms		Banks		
	Workers	Rentiers	G'ment	Current	Capital	Current	Capital	Sum
Consumption from income	$-C_W$	$-C_R$		$C_W + C_R$				0
Consumption from borrowing	$-\dot{D}$			$\dot{D}$				0
Investment				I	$-I$			0
Wages	W_pN	$W_r\alpha N$		$-W$				0
Social wages	ω_s		$-\omega_s$					0
Firms' profits		Π		$-\Pi$				0
Tax		$-t\Pi$	$t\Pi$					0
Deposit interest	iD_W	iD_R				$-i(D_W + D_R)$		0
Loan interest	$-iD$					iD		0
Deposit flows	$-\dot{D}_W$	$-\dot{D}_R$					$(\dot{D}_W + \dot{D}_R)$	0
Loan flows	$\dot{D}$						$-\dot{D}$	0
Equity issues		$-\dot{E}$			$\dot{E}$			0
Sum	0	0	0	0	0	0	0	0

In the SAMs above, banks appear as passive intermediaries between debtor and creditor households, earning no income and accumulating no net worth.[23] This simplified treatment of the banking sector is typical of closed-economy, real-side-only Keynesian models, in which saving fully funds autonomous spending in equilibrium. The outcome just described should not be confused with loanable funds theory, however, our model is demand-led, so that changes in autonomous spending precede changes in the quantity saved in the movement between equilibrium positions. As demonstrated by Chick (1983), the disequilibrium traverse so-described must assume the temporary creation of financing by banks that is then extinguished once equilibrium is recovered. For purposes of simplification, our model is deliberately set up to avoid explicit description of these disequilibrium monetary processes—a feature of our analysis that is, again, typical of real-side-only Keynesian macro models, and which explains the denuded characterisation of banks in our SAMs.

Appendix B. Short-run model solution

Using equations (1), (2), (7), (9)–(12) and (14) in combination with (15), and normalising all variables by the capital stock, we obtain the following solutions for the rates of capacity utilisation, profit and accumulation:

[23] Note that as defined in the text, $D = D_W + D_R$. In other words, the total debt of workers is funded entirely by the accumulated savings (and hence deposits) of workers themselves (D_W), plus that part of rentiers' savings that accumulates as bank deposits (D_R). In short, the net debt of workers is entirely funded by part of the accumulated savings of rentier households: $D_R = D - D_W$.

$$u = \frac{\kappa_0 + id_R c_\pi(1+\beta\eta)}{\{1 - [c_\pi(1+\beta\eta)(1-t) - \beta t + \kappa_r]\pi - \frac{[1-\pi][c_W(1-\beta)+c_\pi(1+\beta\eta)\phi\alpha]}{1+\phi\alpha}\}}$$

$$r = \frac{\pi[\kappa_0 + id_R c_\pi(1+\beta\eta)]}{\{1 - [c_\pi(1+\beta\eta)(1-t) - \beta t + \kappa_r]\pi - \frac{[1-\pi][c_W(1-\beta)+c_\pi(1+\beta\eta)\phi\alpha]}{1+\phi\alpha}\}}$$

$$g_K = \kappa_0 + \frac{\kappa_r\pi[\kappa_0 + id_R c_\pi(1+\beta\eta)]}{\{1 - [c_\pi(1+\beta\eta)(1-t) - \beta t + \kappa_r]\pi - \frac{[1-\pi][c_W(1-\beta)+c_\pi(1+\beta\eta)\phi\alpha]}{1+\phi\alpha}\}}$$

Appendix C. Debt dynamics

The debt dynamics of the system can be derived from the expression:

$$d_R = \frac{D_R}{K}$$

$$\Rightarrow \hat{d}_R = \hat{D}_R - \hat{K}$$

$$\Rightarrow \dot{d}_R = \hat{D}_R d_R - g_K d_R = \frac{\dot{D}_R}{D_R}\frac{D_R}{K} - g_K d_R$$

$$\Rightarrow \dot{d}_R = \frac{\dot{D}_R}{K} - g_K d_R \tag{C.1}$$

equation (C.1) being merely a re-statement of equation (17) from the main body of the paper. Now recall from equation (9) that total borrowing by working households is described as:

$$\dot{D} = \beta(C^T - C_W)$$

Substituting equations (10)–(12) and (14) into this expression, we arrive at:

$$\dot{D} = \beta(\eta c_\pi[\phi\alpha W_p N + (1-t)\Pi + iD_R] - t\Pi - c_W W_p N) \tag{C.2}$$

Meanwhile, on the basis of equation (13), that part of borrowing by workers that is funded by the savings of working households themselves can be written as:

$$\dot{D}_W = S_W = (1 - c_W)W_p N - iD_R \tag{C.3}$$

Substituting equations (C.2) and (C.3) into equation (18), we now arrive at:

$$\dot{D}_R = (\beta\eta c_\pi - t[\beta + \beta\eta c_\pi])\Pi - (1 - \beta\eta\phi\alpha c_\pi - (1-\beta)c_W]W_p N + (1 + \beta\eta c_\pi)iD_R \tag{C.4}$$

Finally, substituting equation (C.4) into equation (C.1) yields:

$$\dot{d}_R = [(\beta\eta c_\pi - t[\beta + \beta\eta c_\pi])\pi - (1 - \beta\eta\phi\alpha c_\pi - (1-\beta)c_W)\omega_p]u + [(1 + \beta\eta c_\pi)i - g_K]d_R \tag{C.5}$$

Inspection of (C.5) reveals that if g_K is increasing in d_R, then we will observe $(1 + \beta\eta c_\pi)i - g_K < 0$ at higher values of d_R, so that $\dot{d}_R$ will vary indirectly with d_R

at higher values of d_R. Under these conditions, the debt dynamics of the system will conform to the 'unconventional' (inverted U-shape) pattern discussed in Sub-section 2.3.

Drawing on the parameter values reported in Table 1, equation (C.5) provides the basis for the simulations and discussion of debt dynamics in Section 3 of the paper.