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Macroeconomic policy at the end of the age of abundance*

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Progressive policy proposals influenced by post-Keynesian economics emphasise the use of fiscal policy and income redistribution to maintain aggregate demand at levels which achieve full employment. Given persistent evidence of weak demand, excess capacity and unemployment in rich economies since around 1980, expansion of demand would have been appropriate over much of this period. Tighter supply constraints – both short-run constraints due to disruption caused by climate change and geopolitical tensions, and longer-run constraints due to absolute carbon budgets – impose additional challenges in designing policy. In order to increase investment sufficiently to achieve net zero goals, constraints on consumption may be required. Such constraints would weaken the multiplier mechanisms emphasised by post-Keynesian analysis, implying lower growth and higher public debt stocks. Traditional progressive policy proposals will need updating to reflect these constraints. New institutional arrangements will be required to implement updated policy packages.

Keywords: *macroeconomics, post-Keynesian economics, supply constraints, climate change*

JEL codes: *E12, E22, E31, E62*

1 THE END OF THE AGE OF ABUNDANCE?

'The age of abundance' is not intended to convey the impression that the last 40 years have been a period of widely shared prosperity and security. Since the shift in economic policy that occurred from around the late 1970s, average growth rates have been lower and crises have been frequent; inequality within and between countries is high. Instead, the intended meaning is that the economies of rich countries have generally operated with excess capacity: unemployed or underemployed labour has coexisted with underutilised capital. Aggregate demand was often insufficient to achieve genuine full employment. For much of the period, in many rich countries, macroeconomic policy, and fiscal policy in particular, was too tight: stronger economic activity and higher employment could have been achieved with higher aggregate demand. In the post-2008 period, the persistent undershooting of inflation targets could have been avoided.

The period was also characterised by rising inequality within rich countries: income inequality rose substantially during the 1980s, and despite partial reversals in some

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countries over some periods, remains substantially higher in most rich countries than during earlier decades. Given spare economic capacity, income disparities could have been reduced by raising incomes for those at the bottom of the distribution without requiring absolute reductions in income for those on high incomes.

This era of spare supply-side capacity and low inflation in rich economies may be coming to an end. If so, policy-makers now face the more difficult prospect of confronting the challenges of unequal income distribution and an inadequate supply of decent work alongside tighter supply-side obstacles to growth. But the most important driver of the end of abundance is the climate crisis. A heating planet will generate increasingly frequent disruption of production. If we are to avoid the worst outcomes of global heating, carbon budgets must bind. This poses a challenge for Keynesian economists.

Following this introduction, the paper has two main sections. The first discusses supply constraints and their economic implications. Different kinds of supply constraints are distinguished, followed by a discussion of the drivers of post-pandemic inflation and the prospects for ongoing supply shocks. The relationship between climate change and GDP is illustrated using historical data and scenario analysis using the Kaya identity. The section concludes with a discussion of the justifications for constraining consumption. The second main section considers the updates to a progressive macroeconomics policy programme required in the presence of supply constraints. A representative policy programme is outlined, followed by a discussion of investment-led and consumption-led strategies.

2 SUPPLY CONSTRAINTS

2.1 Categorising supply constraints

In considering the mechanisms by which supply constraints affect macro policy design, it will be useful to distinguish different kinds of supply constraints. The issues can be framed using a conventional fixed-proportions production function. If units are normalised so that one unit of labour, L, works with one unit of capital, K, this can be written $Y = \lambda \min(L, K)$ with λ representing productivity. The usual approach is to treat the output–capital ratio as a measure of capacity utilisation, $u = Y/\lambda K$. The capital stock imposes a maximum level of output, even if unemployed labour still exists at that level of output. Denoting the maximum output that can be produced using the current capital stock as Y^*, this implies full capacity utilisation, $u = Y^*/\lambda K = 1$.

Four types of supply constraint can be distinguished.

First, if the available labour supply, N, is insufficient to achieve full capacity output, $N < Y^*/\lambda$, strong aggregate demand will lead to inflationary pressure originating in the labour market as a result of incompatible claims on the share of national income from workers and capitalists: as unemployment falls, the disciplinary mechanism of the 'reserve army' is weakened and workers will succeed in obtaining higher nominal wage deals. Beyond a certain point, the probability of a wage–price spiral increases (Rowthorn 1977; Godley/Lavoie 2007). It is generally assumed that zero unemployment is not feasible – at least without major social and institutional changes – so that inflationary pressure increases as unemployment gets closer to zero.[1]

It is usually assumed that in rich countries, this labour constraint is the main source of domestic inflationary pressure. These countries are characterised as relatively capital-abundant

1. The question of exactly where the point at which inflation occurs, and how it is determined, is theoretically and empirically contested (Stockhammer 2008).

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and labour-constrained: the size of the labour force imposes a maximum on output and employment such that $Y < Y^*$. This contrasts with the situation in lower- and middle-income countries where labour is abundant and capital is the limit so that at full capacity output, $N > L$: the available labour force substantially exceeds employment (Aboobaker/Ugurlu 2023). This kind of capital-constrained supply-side characterises the second type of supply constraint. Capital constraints can be loosened over time, and excess labour absorbed into production as a result of investment and structural transformation. However, capital constraints are themselves a potential obstacle to achieving increases in investment, as are foreign exchange constraints and financial constraints (Aboobaker/Michell 2022).[2]

The third type occurs in the case of a relatively sudden reduction in the global supply of commodities such as food and energy for which supply is highly inelastic. Even small reductions in supply can lead to substantial increases in price. For import-dependent countries, these shocks show up as terms of trade shocks. Even in countries which are net exporters, households and businesses will face the new global price, so these shocks are experienced as lower average disposable income. Such shocks have substantial distributional impact and lead to terms-of-trade gains for commodity-exporting countries and large windfall profits for corporates which dominate global value chains in these commodities (Weber/Wasner 2023).

The effects of global commodity shocks are similar to capital capacity constraints, and susceptibility to these shocks can be reduced over the medium term by appropriate investment. If installation of new facilities can increase domestic energy production and storage, for example, this will reduce reliance on global markets and thus provide some insulation from price shocks. For some commodities, agricultural products in particular, the extent to which higher investment and changed methods of production can offset the negative effects of climate change is open to question (Nelson et al. 2014; Asseng et al. 2015; Ray 2019; Dasgupta/Robinson 2022). As climate-driven disruption of production becomes more frequent and severe, the extent to which greater investment can lead to effective insulation is thus uncertain.

The fourth and final type of supply constraint is the carbon budget. Rather than directly constraining production in the present, damage is done over a long period of time at a global level; the global distribution of the resulting damage is highly uneven and most severely affects geographical areas which have least historical responsibility for emissions. While there is no immediate market feedback mechanism from current emissions to current prices, commodity supply disruptions will become increasingly frequent and severe as a result of cumulative emissions; outright capital destruction may occur as a result of rising sea levels and storm damage (Dietz/Stern 2015). If we are to avoid catastrophic outcomes, budgets for net carbon emissions over the forthcoming decades must be treated as absolute.

We can thus identify four distinct (if overlapping) possible supply constraints: a labour constraint, a capital constraint, a commodity constraint and a carbon constraint. None of these necessarily imposes limits to absolute levels of income per capita in the long run: labour supply adjusts to demand conditions as workers move between inactivity and unemployment and, where permitted, through migration; the capital stock depends upon investment; the extraction and production of commodities can be expanded. The invention and deployment of appropriate new technology should eventually lead

2. Both constraints are presented in stylised terms based on a fixed-proportions production function. In reality, some substitution between labour and capital will be possible, however most estimates find that the elasticity is low. The distinction between labour constraints and capital constraints thus does not rely on the specific functional form of the production function.

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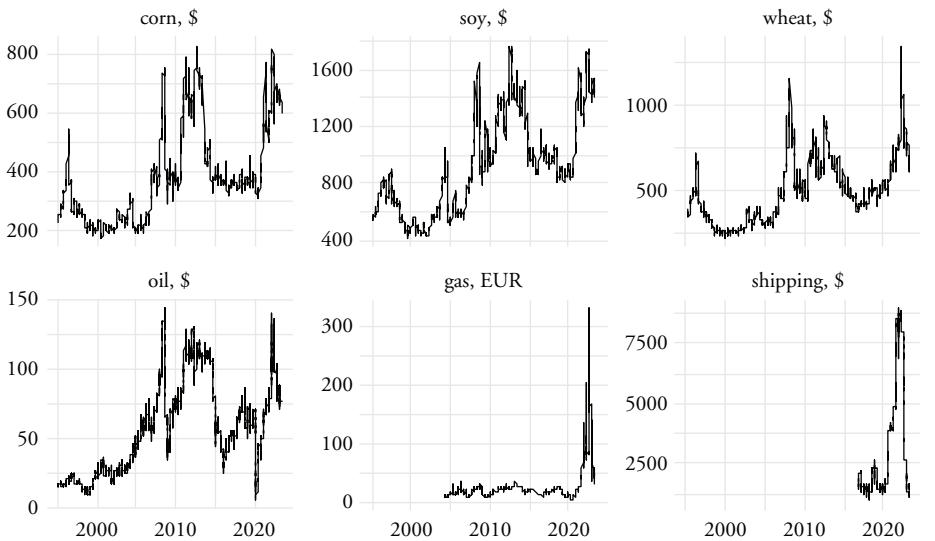
to net zero emissions. In the coming decades, however, short-run supply constraints are likely to bind more frequently and more tightly.

2.2 Post-pandemic inflation

The outbreak of inflation in the aftermath of the COVID-19 pandemic inflation led to debate on its causes and likely duration. Most economists concurred that pandemic-related supply chain disruption and shifts in expenditure patterns followed by commodity shocks caused by the Russian invasion of Ukraine were important factors. Beyond this, however, opinions were divided between those who expected the effects to be relatively short-lived and the secular drivers of aggregate demand deficiency to resurface, and those who saw a danger of inflation becoming ingrained due to shifts in expectations, wage–price spirals and loose policy, that is, excessive fiscal stimulus during the pandemic (for example, Summers 2021a, 2021b) alongside low interest rates and quantitative easing. The observation that corporate profit margins appeared to rise along with inflation, at least in the US, led to another narrative: the idea that opportunistic mark-up pricing on the part of monopolistic corporations was a driver of inflation (Weber/Wasner 2023; Lavoie 2023).

At the time of writing, the data remain inconclusive: the correct view on the *duration* of high inflation is likely to be somewhere between the two camps: inflation has persisted for longer than originally predicted by the 'transitory' camp, yet there are signs that supply-side bottlenecks are easing and price rises abating or reversing. While nominal wages have generally not kept pace with prices, they have increased, and there are signs of inflation spreading to domestic services sectors in the US and Europe rather than being confined to prices of imported goods. (see Figures 1 and 2).



CBoT Corn Composite, Wheat Composite and Soy Composite Commodity Futures;
Brent crude; European natural gas TTF day ahead; Xeneta Shipping Index, far east to US West Coast

Source: Refinitiv.

Figure 1 Commodities prices

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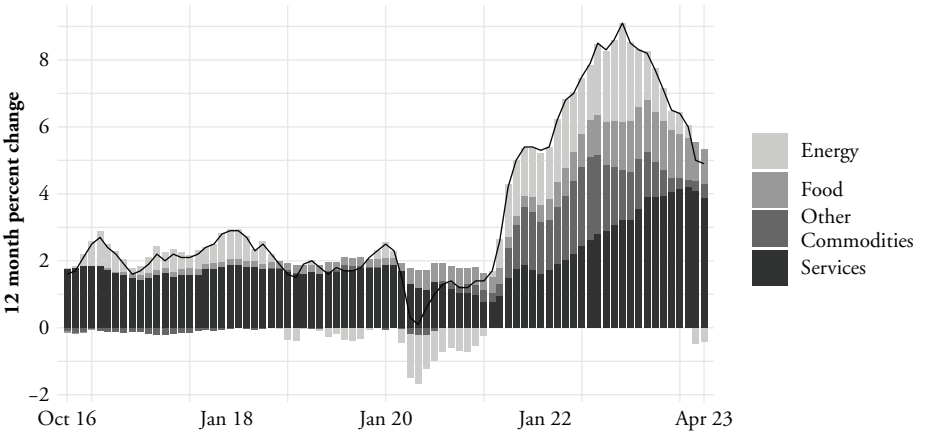

Source: Author's calculation based on US Bureau of Labour Statistics data.

Figure 2 US consumer price inflation, headline figure and contributions

Beyond pandemic- and war-related inflation, however, some have raised the possibility of a 'new normal' of persistent or recurrent inflationary pressure as a result of the climate crisis: extreme weather, drought, floods, wildfires, cyclones, desertification and soil depletion will contribute to crop failures, destruction of productive capacity and homes and human dislocation. In this view, current inflation driven by transitory factors will ease, but we are entering 'a new age of energy inflation' (Schnabel 2022) in which recurrent commodity shocks are a persistent feature of the new macro landscape (Meadway 2022; Tooze 2022; Cevik/Jalles 2023). While some 'deglobalisation' narratives are overstated, there is potential for ongoing geopolitical tensions and protectionist policy to lead to an increasingly multi-polar world in which fragmented supply chains and hoarding of raw materials contribute to inelastic commodity supply and persistent inflationary pressure (Ferguson/Storm 2023).

Alongside climate-driven disruption, ageing populations, rising long-term sickness, historically low unemployment rates, growing restrictions on immigration and high post-pandemic quit rates have led to concerns about the potential for persistent labour shortages to contribute to inflationary pressure (Goodhart/Pradhan 2020).

2.3 Climate constraints and growth

Beyond the possibility of recurrent short-run supply disruptions, we face the need for self-imposed constraint in order to keep carbon emissions within limits which will avoid the most severe effects of global heating. There is no serious disagreement that zero net emissions is the only plausible way to respond to global heating; reasonable debates focus on how this should be achieved and over what timescale.[3]

3. Estimates of the scale of economic and social change required vary substantially: Taylor et al. (2016: 203) conclude that 'mitigation investments of about 1% of world GDP can mitigate almost all of net carbon emissions over time', while Schröder/Storm (2020: 159) argue that 'the climate constraint is binding in the sense that future global economic growth would have to be not just significantly lower than historical growth, but even negative'.

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The well-known and widely used 'Kaya identity' provides a useful way to decompose the interactions between economic activity and carbon emissions:[4]

$$\text{Greenhouse Gas Emissions} = \underbrace{\text{Population} \times \frac{\text{GDP}}{\text{Population}} \times \frac{\text{Energy}}{\text{GDP}}}_{\text{Consumption}} \times \underbrace{\frac{\text{Emissions}}{\text{Energy}}}_{\text{Technology}}$$

Given that achieving net zero emissions requires the left-hand side to fall to zero, one or more terms on the right-hand side must likewise fall to zero.[5] This is not plausible for any of the first three terms: population, economic activity and energy use will all remain positive. In the long term – the idealised net zero future – the only option is for the final term to fall to zero as a result of the development and installation of technology.

In the intervening period, with our remaining carbon budget rapidly depleting, shifting emissions from an increasing trajectory to a sufficiently steep decline will require reductions in terms other than emissions per unit of energy. The question is how these reductions should be distributed. Setting aside the possibility of meaningful population control as unrealistic and unethical, this leaves GDP per capita and energy intensity of GDP as the remaining variables.

Figure 3 presents historical data and scenario projections for the components of the Kaya identity. Projections for population are from the UN central forecast (these are not shown in the figure but are used to calculate GDP per capita). The projection for energy intensity of GDP growth is drawn from the IEA-IRENA (2017) 66% 2°C scenario projections (see also Schröder/Storm 2020). For the remaining variables (GDP per capita and emissions intensity of energy) two scenarios are shown. The first, 'towards net zero' assumes rapid reductions in carbon emissions to around 4 billion tons of CO_2 by 2050. In this scenario, projected reductions of emissions intensity of energy are also drawn from the IEA-IRENA (2017) 66% 2°C scenario. These leaves GDP per capita as the final variable, with its trajectory determined by the other four variables. Despite assuming historically unprecedented reductions in emission intensity of energy, and in line with the results of Schröder/Storm (2020) the implied path for GDP per capita shows continuous reductions from around 2027, with the level in 2050 close to that in 1990. This is despite the assumptions for investment and technology representing 'a hugely ambitious pace of decline that would require robust policy support', according to IEA-IRENA (2017: 62).[6] Care must be taken with interpreting this scenario. As already noted, in order to reach zero emissions, at least one component of the identity must equal zero; if all components except GDP per capita are fixed, and a trajectory zero emissions assumed, then the implication is that GDP per capita must fall to zero. This is why low positive emissions rather than zero emissions in 2050 are shown. The emissions in this scenario are probably compatible with temperature rises of around 1.5°C.

This scenario is not particularly plausible: it is more likely that global GDP per capita growth will remain positive. A second scenario shows global GDP per capita continuing to grow at the historical average of around 1.5 per cent per annum. This scenario also assumes a slower decline in emissions intensity of energy production. The carbon emissions implied in this scenario are substantially higher, coming down to only around 1990 levels by 2050. This scenario would likely imply global temperature rises in excess of 2°C. While the

4. This representation of the identity follows Hampshire-Waugh (2021).
5. The equation can be interpreted in either net or gross terms. Since the target is zero *net* emissions, the final term can be understood as net emissions per unit of energy, potentially including the effects of proposed carbon capture technologies.
6. Population growth projections are taken from UN DESA (2015).

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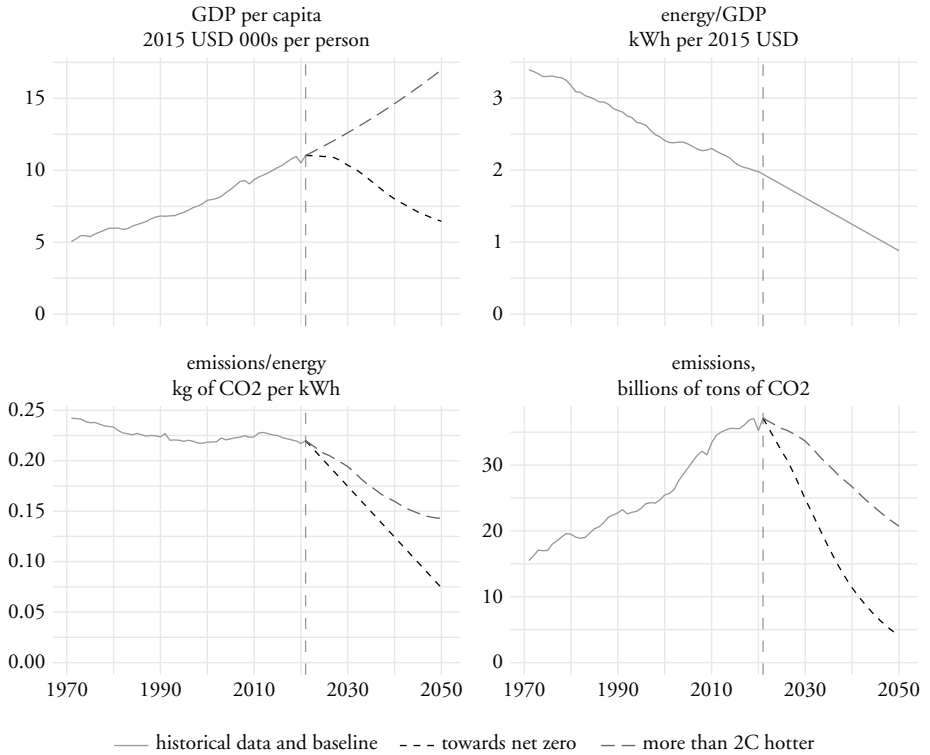

Sources: author's calculations based on Schröder/Storm (2020), IEA-IRENA (2017) and data from UN, World Bank, Global Carbon Project and IEA.

Figure 3 Decomposition of the Kaya identity, 1970–2050, projections from 2021 onwards

difference between 1.5°C and 2°C sounds small, the probability of 'tipping points' increases substantially across these two scenarios. As noted by a recent OECD report,

> … recent state-of-the-art research shows that important tipping points are already "possible" at current levels of warming and may become "likely" within the Paris Agreement range of 1.5 to 2°C warming, questioning the previously well-accepted notion that climate tipping points have a low probability of being crossed under low levels of warming … Given the potential for catastrophic impacts associated with climate system tipping points, missing the opportunity to implement [strategies limiting heating to 1.5C] could lead to immeasurable economic and ethical costs in the near-future. (OECD 2022: 8–9)

Such projections are highly sensitive to assumptions about technological trajectories. However, current trends, announced pledges and implemented policies all fall far short of what would be required to generate the required structural breaks in emissions intensity of energy production and energy efficiency of GDP. During the period of transition to substantially lower (or zero) emissions, it is hard to see how to avoid a requirement that limits to the growth of GDP per capita also play a part in achieving emissions reductions: even if absolute falls on a global scale are implausible, reduced or even negative growth rates for richer countries for some periods of time may be unavoidable.

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The carbon budget is a hard constraint; while many supply-side or financial constraints are substantially less binding than is sometimes claimed, there is no Keynesian logic which allows us to escape from a finite net carbon budget.[7] Instead we must identify the combinations of growth, investment and technological advance – and the distribution of these factors – which can keep emissions within this budget.

2.4 Should spending be constrained?

The idea that there are limits to growth is not new: there is a substantial literature on ecological economics which includes an influential strand on the potential need for zero or negative growth (Cosme et al. 2017; Jackson/Victor 2020). The implication of the Kaya identity is that negative or zero growth in GDP per capita is not a necessary long-term requirement. With much of the global population living in countries that require substantial growth and development to bring their standard of living to levels comparable with those in rich countries, a zero-growth requirement for these countries is also not feasible – particularly if imposed by those rich countries which are responsible for the majority of historical emissions. However, it is plausible that the transition to net zero may require periods of zero or negative per capita income in rich countries. Considering the implications of such intentional stagnation is therefore warranted.

There is a growing literature which explores the boundaries between post-Keynesian economics and degrowth analysis. Some contributions identify the significant structural implications of a permanent transition to zero growth: Fontana/Sawyer (2013, 2016, 2022) observe that in a zero-growth economy, steady-state net investment must be close to zero and, as a result, the rate of profit will be low or zero.[8] The implications for financial dynamics in degrowth systems are significant. Any persistent flow imbalance between sectors in a zero- or negative-growth system will not be offset by growth in income. Non-zero net lending alongside positive interest rates will therefore lead to explosive dynamics in financial or monetary stocks (see Berg et al. 2015; Jackson/Victor 2015; Cahen-Fourot/Lavoie 2016; Richters/Siemoneit 2017; Hein/Jimenez 2022). Persistent government deficits in a zero-growth system will thus lead to unsustainable growth in interest payments on government debt unless, as might be expected, the rate of interest on government debt also falls to zero. In long-run (supermultiplier) models of zero growth or degrowth, therefore, sectoral balances equal zero and thus the public sector must operate balanced budgets.

The implication of such analysis is that fundamentally different socio-economic systems would be required for permanent stationary state systems. Rather than thinking about growth as a target, however, we should understand that the underlying constraints may imply paths for investment and consumption which, in combination with population trajectories, imply low, zero or negative GDP per capita growth. If, or when, technological net zero can be reached, such considerations no longer bind; during the transition, however, macroeconomic management which takes the carbon budget into account is required.

7. Carbon capture technology is regarded as potentially allowing for positive *gross* emissions while still keeping to low or zero *net* emissions. Even the most optimistic projections regard the overall contribution of carbon capture as relatively low, however.
8. If gross investment is zero, household saving is zero, and the government runs a balanced budget, in a closed economy, profit will be equal to the consumption spending of capitalists and rentiers. Positive profits are also possible in the case of investment to cover depreciation, negative household saving, public budget deficits and/or positive net exports.

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As already noted, beyond the carbon budget, there are a number of supply constraints – labour constraints in rich countries, capital constraints in lower- and middle-income countries and primary commodity constraints in both – which may impose limits to achievable growth rates. Whether the maximum rates achievable given these constraints exceed the rates which are compatible with net zero carbon is uncertain. What is certain is that in order to achieve net zero, sustained increases in capital investment will be required to develop and deploy sources of green energy and other necessary technology and capital. Production of capital goods and installation of infrastructure generate substantial carbon emissions and rely on large amounts of raw commodities as inputs. With tight labour markets, and without reorganisation of production, the available short-run capacity required to achieve this growth of investment may not be available: attempts to engineer rapid increases in investment may therefore lead to inflationary pressure, both domestically in tight labour markets and globally in markets for primary commodities. In a global competition for the scarce commodities required for green investment, the US and other rich countries will use their geopolitical power and their dominant position in currency hierarchies to obtain an outsize share of global resources, including resources extracted from lower-income countries.

Alongside the need to raise investment in the face of supply constraints, the difficulties in managing distributional issues will become more acute if growth rates are structurally lower. Inequalities in income and wealth are directly linked to current emissions. The International Energy Agency estimates that 10 per cent of the global population are responsible for nearly half of all global emissions and that 30 per cent of the global population are responsible for over 75 per cent of emissions (IEA 2023). Kartha et al. (2020) estimate that the richest 10 per cent were responsible for nearly half of all emissions, while the poorest 50 per cent were responsible for only 7 per cent of emissions.

Figure 4 shows estimates by Chancel et al. (2022) of the difference between per capita carbon emissions for specific income groups and countries, and the overall Paris Agreement 2030 targets – which fall well short of reductions required for 1.5°C or even 2°C trajectories – for each country. In order to reach Paris Agreement per capita levels, the richest 10 per cent in the US (by income) would have to reduce their emissions by 87 per cent and the next 40 per cent would have to halve their emissions. Emissions per head of the bottom 50 per cent in the US are currently close to the Paris target. Large reductions would likewise be required from the top 10 per cent in high-income European countries and in China. In contrast, much of the populations of lower-income countries will need to increase their carbon emissions for catch-up in incomes to occur as development and structural transformation takes place: per capita emissions for 90 per cent of the Indian population are currently below Paris 2030 levels.

The implication of the need to raise investment in the presence of supply constraints is that resources will need to be redeployed from the production of other goods and services. Some kinds of consumption (and potentially investment) will have to be prevented from increasing or even reduced in absolute terms to enable available productive capacity, commodities and carbon budgets to be directed towards necessary investment. Given the strong correlation between income distribution and responsibility for emissions, there is a clear justification for constraining the spending of those at the top of the income distribution, in the form of constraints on luxury consumption goods, and potentially the investment directed at producing those goods. Increased taxation of those on high incomes and of some kinds of luxury consumption are therefore likely to be necessary alongside any programme of large-scale green investment.

While some progressive economists have begun to discuss the potential need for restraint in demand, at least in some areas (for example, luxury consumption) and for

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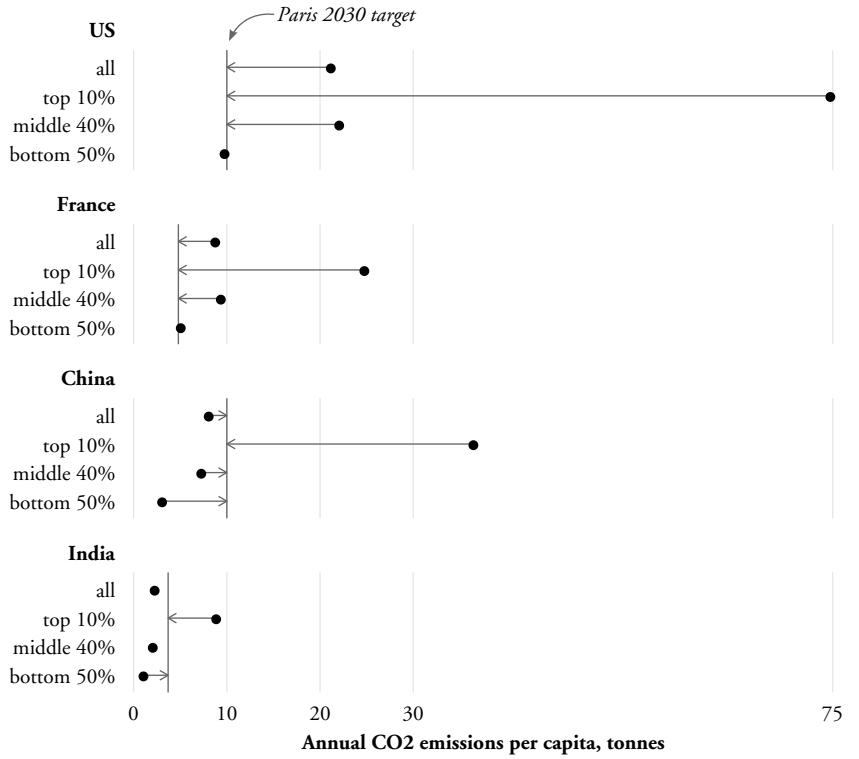

Source: Author's elaboration based on Chancel et al. (2022).

Figure 4 Estimated emissions by country and income group compared with 2030 Paris Agreement per capita targets

some groups (for example, the rich), others have argued that constraints on any part of aggregate demand are unnecessary or regressive. On the basis that the supply side responds to demand pressure by raising investment, increasing productivity and reorganising production, Mason/Jayadev (2023) argue for rapid growth driven by strong aggregate demand, supported by interventions to mediate the distributional conflicts arising from bottlenecks and the temporary dislocation arising from the reorganisation of production. Such reorganisation will take place more rapidly, it is argued, if driven by demand. An extreme version of this argument is made by Kelton (2019), who argues that the investment required for a 'Green New Deal' in the US can be achieved entirely by running larger deficits, thus avoiding any increased taxation of the wealthy.[9]

9. Other authors who share Kelton's commitment to Modern Monetary Theory are more cautious: Nersisyan/Wray (2019: 14) note that '(t)here is no doubt many sectors of our economy really are at full capacity today. Others lag far behind with substantial excess capacity'. A list of demand-restricting policies including taxation and savings incentives are suggested for use *if* inflation arises. Nonetheless, the authors conclude that 'it is likely that excess capacity is sufficient to handle the expected increased demand on resources that will result from GND spending, so long as programs are phased in at a measured pace' (Ibid.: 49).

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It is time, therefore, for a debate on the design of progressive policy packages in the context of supply constraints. If it is indeed the case that a multi-decade period of supply elasticity is giving way to climate-driven disruption and inflationary pressure, how should progressive economists respond?

3 PROGRESSIVE POLICY IN THE CLIMATE TRANSITION

3.1 A traditional progressive policy programme

Progressive policy packages informed by post-Keynesian economics often assume, in line with the evidence of recent decades, that increased demand will be accommodated on the supply side. In order to raise employment and incomes, fiscal expansion is usually proposed. Given the empirically weak relationship between monetary policy and investment (and the potential problems caused by debt-financed consumption), monetary policy is not regarded as a reliable means of ensuring full employment and strong economic activity. Conventional inflation targeting regimes are thus regarded as inadequate. (Arestis/Sawyer 2008; Stockhammer 2022)

Fiscal expansion should generally be weighted towards public expenditure rather than tax cuts, both because of the positive social effects and the likely stronger macroeconomic stimulus effects (Arestis 2013). Both current and capital government spending are appropriate as well as transfer payments that reduce income inequality. Given a higher relative propensity to consume for wage workers and those on lower incomes, income redistribution in favour of these groups will be expected to raise consumption spending and thus aggregate demand (Lavoie/Stockhammer 2012; Onaran/Galanis 2012).

While monetary policy is not viewed as an effective tool for directing aggregate demand, interest rates have important distributional effects. Low interest rates have the desirable property of reducing the flow of income from borrowers, whether businesses or households, to owners of wealth (rentiers) (Rochon/Setterfield 2007).

On management of the public finances, there is less agreement. Post-Keynesians largely agree that when aggregate demand is below the level required for full employment – when private sector desired saving exceeds investment (for a given external position) – fiscal expansion should be used to reduce unemployment. How the resulting debt should be managed is more controversial. At one end of the spectrum, proponents of modern monetary theory (MMT), argue that for a 'monetary sovereign' there is *no* financial constraint on government borrowing, so policy-making should focus *only* on the macroeconomic effects of fiscal policy – on output and employment. The magnitudes of public finance variables are regarded as holding no significance as indicators of the sustainability of public finances and, indeed, even use of the term 'debt' is disparaged when applied to the public sector (Wray 1998; Tymoigne/Wray 2013; Tymoigne 2016).

In general, post-Keynesians do not adopt this view but do regard political concerns about the public finances to be over emphasised relative to the costs of unemployment and to other policy objectives: fiscal expansion is often regarded as appropriate despite the potential for higher public debt stocks. A number of arguments are made to support this position. The positive effects of fiscal expansion on growth are sometimes held to be sufficient to generate lower debt/GDP ratios because the denominator will rise by more than the numerator, an effect sometimes summarised using Keynes' aphorism 'look after the unemployment, and the budget will look after itself' (Keynes 1933/1978: 150). Most would acknowledge, however, that outside of specific circumstances this requires an implausibly large fiscal multiplier – the relationship between new spending and final increases in GDP – or in growth terms, strong Kaldor–Verdoorn effects.

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In order to prevent unsustainable growth in public debt and interest payments, therefore, a combination of taxation and financial management are required.[10]

Taxation should be directed towards those on higher incomes both because these people have a lower propensity to consume and thus the contractionary effects of taxing this group are weaker, and because most progressive economists regard lower inequality as desirable. Financial management can be done in a number of ways: low central bank policy rates, debt monetisation and regulation of the interest rates paid on public debt have all been proposed alongside a range of other options (Hein/Martschin 2020).

Post-Keynesians regard distributional conflict, particularly conflict over the distribution of income between wages and profits, as an important determinant of inflation (Rowthorn 1977). Lower rates of unemployment are usually expected to lead to higher inflation via conflict inflation, as workers' bargaining power increases. Inflation-targeting regimes are criticised on the basis that inflation is not an appropriate final target for policy, at least if it takes precedence over employment; on the basis that the policy rate of interest does not have a sufficiently direct and reliable relationship with aggregate demand; and on the basis that raising unemployment as a way to tame wage–price conflict places the burden of adjustment on workers (Setterfield 2006).

Criticisms of conventional macroeconomic policy also focus on the presence of a policy-invariant threshold for output or employment at which inflation is steady. Various formulations of the concepts in the form of natural rates of output, employment or interest are criticised on the basis that supply is not independent of demand, and thus the thresholds at which inflationary pressure occur are influenced by demand (Storm/Naastepad 2007). Despite this, post-Keynesians do generally acknowledge that in the short run, at some point below genuine full employment, inflationary pressure will arise and thus a policy trade-off between inflationary pressure and unemployment exists (Stockhammer 2008).

This brief sketch is inevitably an oversimplification. Post-Keynesian economics is characterised by rich debates on the interactions between the supply side and the demand side (for example, Setterfield 2013; Tavani/Zamparelli 2015; Michl/Tavani 2021). An emerging ecological post-Keynesian modelling synthesis explicitly acknowledges the potential incompatibility between full employment and environmental sustainability (Fontana/Sawyer 2016; Dafermos et al. 2017). Post-Keynesian authors emphasise the importance of industrial policy (for example, Hein/Detzer 2015); the balance-of-payments–constrained growth and structuralist approaches are core components of the post-Keynesian literature. Nonetheless, structural change tends to be emphasised less in discussions of rich countries than in the context of development; in many post-Keynesian growth models, the supply side is left implicit or proxied by a Kaldoor–Verdoon relationship: Setterfield observes that canonical models are effectively 'little more than moving *IS* relationships' (Setterfield 2023: 1). Policy recommendations sometimes reflect this relative neglect of the supply side.

What of this canonical policy framework needs updating to reflect the potential for persistent climate-driven supply shocks during the transition to net zero? A distinction between *consumption-led* and *investment-led* policies may be a useful place to start (Aboobaker/Michell 2022).

3.2 Consumption-led and investment-led strategies

The distinction between *consumption-led* and *investment-led* policies refers to which component of aggregate demand – consumption or investment expenditure – policy aims to

10. Even in the case that deficits are not held to be 'self-financing', positive fiscal multipliers are sometimes used as arguments in favour of particular policy packages, for example, Onaran/Oyvat (2023).

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stimulate *directly*. It is usually held that higher total expenditure in the current period – leading to higher capacity utilisation and higher employment – will induce investment and thus expansion of capacity in subsequent periods. Many post-Keynesian models assume that the growth rate of the capital stock reacts to current demand conditions via the rate of profit (sometimes decomposed into the rate of capacity utilisation and the profit margin). In turn, in most post-Keynesian models, the overall rate of GDP growth is determined by the rate of growth of investment (for example, Hein 2012). Thus, higher current consumption is expected to lead to an increase in the rate of growth. Likewise, policy which induces an increase in investment spending will, via the multiplier, raise consumption spending. In each case, therefore, both consumption and investment will be expected to rise; and in both cases, the aim is to raise investment – either directly or indirectly – and thus to increase growth.

In the presence of substantial excess capacity with no immediate supply constraints, either strategy can be accommodated by expansion of supply. As long as there is sufficient capacity for *both* investment and consumption to expand, there is no trade-off between the two. In the case that spare capacity is limited, however, expansion of consumption may come at the expense of investment and vice versa. Following an increase in consumption, demand-induced investment spending may not lead to additional output but to increased prices and conflict over distribution and the composition of production. Likewise, if an increase in investment stimulates higher consumption via the multiplier, supply constraints may place a limit on the total increase in output, thus introducing a trade-off. The final mix between consumption and investment, and the distributional consequences, will depend upon how the inflationary process plays out.

In such cases, it may be that investment spending should take priority over consumption. Given the need for substantial capital investment in order to reach net zero, there is a strong case for prioritising investment spending over consumption spending in the short run, despite the higher emissions per unit of GDP from investment spending. If so, consumption-led strategies will not be appropriate, and the design of investment-led strategies will need to consider the potential interaction between multiplier effects and supply side constraints.

The categories *consumption-led* and *investment-led* are broad and encompass more narrowly defined categories such as *wage-led* and *profit-led*. A wage-led strategy is a type of consumption-led strategy: the aim of redistribution from profits or rents to wages is to raise total consumption spending with the intention of raising the rate of capital accumulation.[11] In the presence of supply constraints, the increased consumption resulting from income redistribution may need to be offset with measures to constrain some kinds of spending.

The emphasis on investment-led strategy contrasts with some of the post-Keynesian literature which engages with degrowth themes (e.g Fontana/Sawyer 2016; Cahen-Fourot/Lavoie 2016; Richters/Siemoneit 2017; Hein/Jimenez 2022). This literature examines the conditions for low- or zero-growth steady states and finds that investment and profit

11. Care must be taken with these categories: *wage-led* is often used to refer to a particular configuration of consumption propensities and income distribution: in certain configurations, redistribution from profits to wages will lead, via higher overall consumption expenditure and thus profit, to increased growth – such a configuration is labelled as a wage-led *regime*. In a wage-led regime, policy which redistributes income from profits to wages will thus be expected to lead to higher growth. On the basis of empirical investigation, many countries have been argued to constitute wage-led regimes and, on this basis, authors have argued in favour of wage-led *strategies* (Lavoie/Stockhammer 2013).

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shares of output will be substantially lower. In contrast, an investment-led path during the climate transition will require a rising ratio of investment to GDP. The difference in emphasis reflects different objectives: the degrowth-informed literature asks what the macroeconomic implications of zero-growth systems are; the purpose of this paper is to ask how policy should be designed in the period of transition to net zero.

3.3 Some unpleasant Keynesian arithmetic

Progressive economists generally regard the multiplier as a fortunate feature of capitalism: increases in government spending or business investment lead to increases in total expenditure in excess of the initial impulse via stimulation of consumption spending. This limits the increase in debt-to-income ratios even if the initial impulse is financed by borrowing: fiscal expansions will be at least partly 'self-financing' because GDP and tax revenues will rise in response to expenditure. Likewise, fiscal contractions may be ineffective in reducing debt/GDP ratios because fiscal contraction leads to economic contraction, thwarting attempts to lower debt/GDP ratios.[12]

In a situation where rapid increases in investment are required alongside limits to productive capacity and allowable emissions, substantially positive multipliers may become a hindrance. In such cases, the additional consumption generated as side effect of raising investment spending may raise total expenditure beyond the level at which inflationary pressure emerges, and will add to carbon emissions. Policy packages built around the investment spending required for the green transition may therefore require elements aimed at consumption constraint. The result would be that the multiplier of the overall policy package would be reduced. While increased taxation could reduce the need for borrowing to fund investment, it would also dampen overall GDP increases and thus counteract the 'self-financing' effects of raising the denominator of the debt/GDP ratio.

It will become increasingly difficult to justify policy on the basis of an overall expansionary effect on GDP in the presence of potential supply constraints and shrinking carbon budgets. If lower growth is unavoidable, this will limit the extent that debt stocks can be reduced as a share of output via a rising denominator.[13] Public debt/GDP ratios may be larger for longer; this will require management of the interest costs of these debt stocks.

3.4 An updated progressive macro policy programme

If it is correct that supply side will impose greater constraints on expansionary policy in the coming decades, then changes to the traditional post-Keynesian-inspired progressive policy package are required, as summarised in Table 1. An investment-led strategy will require growth in public investment alongside policy that increases the incentives for private investment and ensures that financing is available for that investment.

Measures to constrain consumption, particularly the luxury consumption of those on high incomes, will be required both to limit the distributional conflict arising from short-run supply constraints and to limit carbon emissions. Taxation will need to play a substantial role; alongside conventional carbon pricing and taxation systems, a direct approach will be required in the form of more aggressive progressive taxation of incomes and the imposition of taxes on carbon-intensive and luxury consumption. Incentives for personal

12. As is now widely accepted, the imposition of austerity in the eurozone in the post-2008 period provides an important example of this mechanism (Semmler 2013).
13. High inflation will act in the opposite direction if debt instruments are not index-linked.

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Table 1 An updated progressive policy programme

	Traditional	**Updated**
Primary policy objective	High employment via high growth	High employment alongside investment for climate transition
Capacity	Excess capacity	Constrained capacity
Target GDP growth	High	Indeterminate but potentially low or negative
Fiscal multipliers	Positive	Low or negative
Public debt	Eroded by GDP growth	Persistently high
Distributional conflict	Incomes policy	Incomes policy, taxation, tiered pricing, savings incentives

saving, such as tax breaks on long-maturity savings instruments, may be useful in constraining the consumption of middle-income households. Windfall taxes on companies which benefit from spikes in commodity prices should be applied routinely. Fiscal mechanisms could be designed such that total tax shares in GDP rise automatically as inflationary pressures emerge.

In countries with high degrees of wage bargaining coordination, incomes policies will likely continue to play a role in managing distributional conflict. Given the increasingly fragmented nature of bargaining in countries without historical use of coordination, the scope for the use of incomes policies to manage distributional conflict and inflationary pressure in these countries will be limited, requiring other mechanisms. Expanded use of fiscal policy to manage the distributional consequences of supply shocks will be required, including the use of price controls such as energy price caps. Tiered price caps and taxation mechanisms can be deployed to limit carbon-intensive consumption such as air transport and to provide incentives to reduce energy use. Allocations per household or per individual can be made available at an affordable price, with consumption in excess of this allocation charged at a higher rate via the implementation of taxes or the removal of price caps (see, for example, Stirling/Caddick 2022; Weber et al. 2023). Renewed efforts at economic analysis of the supply side in order to identify and predict bottlenecks and inflationary pressure will be required. Research using techniques such as input–output analysis could inform the design of effective non-market allocation mechanisms (for example, Jackson/Jackson 2021; Weber et al. 2022).

If environmentally sustainable or supply-constrained levels of activity are found to be insufficient to generate full employment, redistribution in the form of substantially higher unemployment benefits funded by higher taxation will be required. Redistribution and reduction of working time may be preferable to high unemployment and substantial income redistribution, at least in some sectors (Watt 2012; Lewis et al. 2023). It is likely that the accepted meaning of 'full employment' will have to evolve, as it has in the past: a benchmark 35- or 40-hour working week may no longer be appropriate.

Sustained growth in public investment alongside interventions to manage increased distributional conflict will require public borrowing. The scale of such borrowing is not irrelevant, contra the claims of MMT proponents, at least for countries other than the dollar-issuing US. If growth is low or negative, there is potential for continually expanding debt/GDP ratios if deficits and interest costs are not constrained. Taxes on the wealthy can be used to moderate the growth of public debt. Nonetheless, it is likely that persistently high public debt/GDP ratios will be a feature of any successful climate transition.

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The costs of debt stocks will require management to prevent interest payments spiralling out of control; given potentially low or even negative growth rates, central bank intervention to control interest rates on government debt is likely to be required. Increased policy coordination between the treasury and the central bank will therefore be required to manage the connected policy aims of managing aggregate demand and the public finances. A return to conventional inflation targeting regimes is neither feasible nor desirable. Instead, new institutional arrangements will be required which allow for increased judgement and flexibility in macroeconomic management in preference to rules-based approaches. The need to coordinate and finance large-scale public and private investment will also require institutional innovation to enable the allocation decisions made by national investment banks to be coordinated with the fiscal policy actions of treasuries and liquidity management by central banks (Dafermos et al. 2023).

4 CONCLUSIONS

The purpose of this paper is to highlight the potential trade-offs involved in progressive policy-making in the presence of supply constraints. The points raised are likely to be controversial; disagreements are possible under a broadly shared theoretical framework. While some progressive economists oppose any proposals which involve demand constraint or acknowledgment of financial constraints to government spending, differences in policy conclusions also result from the specific magnitudes placed on the various growth rates, levels and thresholds involved and on views taken on the likely trajectories of technological development and upgrading.

In emphasising areas where traditional post-Keynesian proposals may need to be updated, weight has been placed on issues of consumption constraint and investment promotion. This should not be taken to mean that the traditional objectives of post-Keynesian policy – full employment and a widely shared decent standard of living – are to be demoted. On the contrary, the purpose is to raise issues which must be confronted if these objectives are to be achieved equitably and sustainably over the coming decades.

The emphasis on the supply side is not intended to imply that the recurrent problems of aggregate demand shortages in capitalism will no longer occur. Absent fundamental changes to political and economic systems, capitalism will remain a system in which overall economic activity is primarily demand-determined, and the tendency to generate demand deficiency and unemployment will persist. It is likely that demand deficiency at domestic sectoral level will coexist with supply bottlenecks and emissions which exceed carbon budgets. The problems of insufficient aggregate demand – which policy-makers have dealt with inadequately over the last decades – will be compounded by disruption on the supply side.

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