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Article

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European Journal of Economics and Economic Policies: Intervention (EJEEP)

Provided in Cooperation with:

Edward Elgar Publishing

Suggested Citation: Huwe, Vera; Rehm, Miriam (2022) : The ecological crisis and post-Keynesian economics – bridging the gap?, European Journal of Economics and Economic Policies: Intervention (EJEEP), ISSN 2052-7772, Edward Elgar Publishing, Cheltenham, Vol. 19, Iss. 3, pp. 397-414,
<https://doi.org/10.4337/ejeep.2022.03.08>

This Version is available at:

<https://hdl.handle.net/10419/277559>

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The ecological crisis and post-Keynesian economics – bridging the gap?

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This paper investigates whether post-Keynesian economics is well-equipped to address the ecological crisis we face today. The major crisis of our times has three interrelated dimensions: ecological overshoot, socio-economic inequality and a growth imperative built into the economic system. We argue that the main building blocks of post-Keynesian thought – in contrast to neoclassical approaches – are well-placed for addressing the ecological crisis if reconfigured accordingly, and that such a development will likely be very fruitful. Yet, we identify the growth effects of reducing inequality, the capitalist growth imperative and political power from wealth concentration and incumbent industries as the main contradictions between post-Keynesian theory and fossil phase-out. While the first of these may be overcome with adequate industrial and regulatory policy, the second would require a fundamental transformation. This, in turn, is impeded by the third. We argue that more attention should be paid to resolving the residual contradictions and indicate advances in the broader Political Economy and Ecological Economics literature that may serve as a starting point, in particular focusing on human needs.

Keywords: *post-Keynesian economics, ecological economics, crisis, inequality, ecology, growth*

JEL codes: *E12, Q52, B51, D31, D21*

1 INTRODUCTION

Capitalism has massively improved the livelihoods of the majority of inhabitants in high-income countries and lifted millions of people out of poverty (Roser 2020). However, this has been accompanied by rising socio-economic inequalities within – and also between¹ – countries (Milanovic 2022). At the same time, the current economic system transgresses critical values for several ecological capacities (Fanning et al. 2021; Rockström et al. 2009), and thus, ultimately, undermines the livability of our planet (IPCC 2018, 2022).

Post-Keynesianism captures the fundamental workings of capitalism with regard to growth and distribution and shows how governments can moderate its negative effects. Yet like neoclassical economics, post-Keynesian economics has largely developed without

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1. Although between-country inequality has declined in the past decades, this will change in the near future when China's income passes the world average.

Received 08 March 2022, accepted 18 August 2022

a substantive notion of the environment, recent efforts to integrate the ecological effects of capitalism more consistently notwithstanding (for example, Fontana/Sawyer 2016).²

This paper aims to investigate whether post-Keynesian economics is well-equipped to address the ecological crisis we face today. We first argue that the ecological crisis can be characterized by three interlinked dimensions of ecology, inequality and the economic system. Given this problem description, we investigate how major economic theories conceptualize that crisis. Starting with neoclassical economics, we show that its conceptualization of global heating is inadequate and has contributed to decades of political inaction. In the main part of the paper, we elaborate how the post-Keynesian economic framework is better equipped to address the ecological crises. Concretely, we investigate post-Keynesian theory, its modelling framework and economic policy concepts and suggest that major building blocks of post-Keynesian thought are conducive to addressing the ecological crisis if configured accordingly. Yet, some contradictions remain, which mainly arise from the growth imperative of capitalism and political power. We argue that more attention should be paid to resolving the residual contradictions and indicate advances in the broader Political Economy and Ecological Economics literature that may serve as a starting point.

2 THE ECOLOGICAL CRISIS AND ITS THREE INTERLINKED DIMENSIONS

We are transgressing environmental capacities at an unprecedented and ever-increasing pace. In particular, greenhouse gas (GHG) emissions such as CO₂ threaten to heat our planet to an extent that makes it largely uninhabitable (IPCC 2021).³ That the basis of our (and subsequent generations') survival is undermined did not 'fall from the sky', but rather is the result of a specific economic system producing enormous material affluence for some, but also rising socio-economic inequality and persistent deprivation.

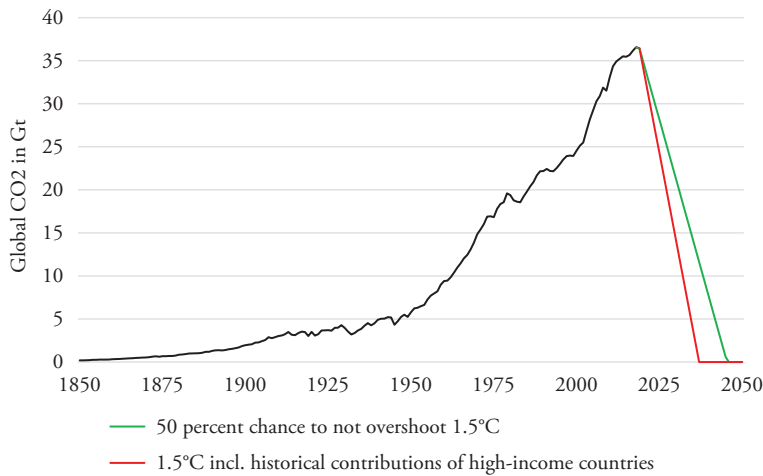
2.1 The ecological dimension of the crisis: required scope and speed of decarbonization

GHG emissions need to be virtually eliminated for global heating to not overshoot 1.5°C (IPCC 2021). This 'deep decarbonization' requires the global phase-out of all fossil fuels as well as the significant reduction of emissions of other GHGs like methane. Fossil fuels are part of interlinked infrastructures, technologies and institutions as well as behaviour (Seto et al. 2016), making fossil phase-out a systemic problem. Deep decarbonization thus requires a transformation of all major sectors of economic production (Tvinneim/Mehling, 2018).

The remaining carbon budget as estimated by IPCC (2021) implies that carbon emissions need to be phased out by 2045 for a 50 percent chance for global heating to not overshoot 1.5°C, assuming a linear reduction path (see the light grey line in Figure 1). If historical emissions are taken into account, deep decarbonization needs to be completed

2. Ecological Economics, in contrast, has taken biophysical limitations to the economy seriously early on, but did not develop a consistent macroeconomic theory. Rezai et al. (2013) take the reverse path to our study, showing how ecological economics' lack of a coherent macroeconomic theory can be overcome with post-Keynesianism. They establish a theoretical framework for an ecological macroeconomics, which has further developed over the last years (Rezai/Stagl 2016).

3. A comprehensive treatment of all planetary boundaries Rockström et al. (2009) and their interlinkages are beyond the scope of this article. Also planetary boundaries are sociopolitical constructs based on normative and political assumptions about what is considered acceptable (Brand et al. 2021).



Source: IPCC (2021), own calculations.

Figure 1 Global carbon emissions and reduction paths

by 2035 to 2040 in high-income countries (Anderson et al. 2020) (see the dark grey line in Figure 1). This requires unprecedented reduction rates of at least 10 percent per year.

2.2 The social dimensions of the crises: carbon inequality

As post-Keynesians have demonstrated, the long-run secular fall of the wage share, rising personal inequality and high wealth inequality imply not only individual suffering, but also economic instability (Wildauer/Stockhammer 2018; Ederer/Rehm 2020). These inequalities extend to ecological issues.

Carbon intensity of income is higher for low-income groups since income is generally distributed even more unequally than expenditure (Fessler et al. 2015), and expenditure of lower-income groups is mildly more carbon-intensive (Theine et al. 2022; Oswald et al. 2020). This is why CO₂ prices are typically regressive in high-income countries (Dorband et al. 2019).

In absolute terms, however, richer households have substantially higher carbon emissions, both from an inter- and intranational perspective (Bruckner et al. 2022; Gore 2021) and across all consumption categories (Theine et al. 2022). In the EU, for instance, the top 10 percent of the population with the highest carbon footprints emits more than the bottom 50 percent, and the average footprint of the top one percent exceeds the sustainable level by a factor of 22 (Ivanova/Wood 2020). Inequalities in carbon footprints within countries are even larger than inequalities between countries (Chancel 2020). The carbon footprints of the super-rich can be thousands of times higher than the national average, even in high-income countries (Barros/Wilk 2021). Over time, carbon inequality has widened, and mitigation adjustments primarily have fallen on middle- and low-income households (Gore/Alestig 2020).

For decarbonization, the composition of consumption matters: energy use for basic goods, such as heating and electricity, is more equally distributed than more elastic (luxury) consumption linked to transportation (in particular, vehicle fuel and package holidays), which is strongly concentrated among high-income individuals (Oswald et al. 2020). Since basic goods such as heating are easier to decarbonize compared to transportation, reducing global

income inequality makes deep decarbonization easier to achieve (Oswald et al. 2021). Intersectional inequalities beyond income also matter in the amount and purpose of energy use. Across all income groups, men use carbon-intensive means of transport more than women, but women perform a higher number of essential care trips (Huwe 2021).

Socio-economic inequalities are thus an integral part of the ecological crisis. A country's socio-ecological performance can be assessed on two axes: the provision of citizen's needs, and its environmental impact. Presently, no country provides basic needs within planetary boundaries (Fanning et al. 2021; O'Neill et al. 2018). Ecological overshoot is strongly driven by the (over-)consumption of the affluent (Wiedmann et al. 2020) and co-exists with insufficient provision with regard to basic social goals in many countries.

2.3 The economic dimension of the crisis: growth imperative

Organizing the economy around low-impact need satisfaction runs counter to the current economic system centred on (fossil) capital accumulation and growth. In modern economies, firms compete for market share and profits in a 'war of all against all' (Shaikh 2016: 14). Competition puts firms under permanent pressure to cut costs, since they are constantly threatened by existing competitors and potential new entrants. Firms set their margins and prices strategically and use all means available to them to defend their position. Reducing relative labour cost is achieved mainly through investment and innovation; the accumulation of capital is imperative if firms are to survive the fierce, cut-throat competition of capitalism. This leads to rising capital intensity. Mattioli et al. (2020) show this mechanism for the automotive industry.

The imperative for capital accumulation is not limited to the individual firm, but, as a general dynamic, expands to the whole economy: '[t]he competitive struggles of capitalist firms translate into profit dynamics of the entire economy' (Pirgmaier 2020). Profit expectations stimulate the accumulation of capital (Shaikh 2016) leading to positive net investment, which is equivalent to growth. The need to generate profit – under penalty of demise – makes capitalism an 'expansive – and ecologically overshooting – system' (Pirgmaier 2020).

There is thus a fundamental growth imperative inherent to capitalism, which is predicated on neither the moral disposition of the entrepreneur nor positive real interest rates (Cahen-Fourot and Lavoie 2016). Rather, the innate drive for growth is a systemic feature. Growth, however, is not necessarily linked to well-being.

3 PREVALENT SUGGESTIONS FOR CLIMATE POLICY AND THEIR LIMITATIONS

Section 2 argued that the challenge societies face is triple-faceted: if deep decarbonization does not happen rapidly enough, then the very basis for social and economic well-being is likely to collapse; inequality is rampant and rising, and extends to ecological questions; and our current economic system is hard-wired to generate investment and growth. This section looks at how some strands of neoclassical and post-Keynesian economics have dealt with these issues.

3.1 Prevalent suggestions for climate policy

3.1.1 *Neoclassical economics: carbon pricing*

Neoclassical economics conceptualizes GHG emissions as a negative externality, the only concept available for analyzing the climate crisis in the market economy. Since they are

unpriced, GHGs are over-produced. The logical policy implication is establishing a market for carbon with a price mechanism adjusting to what is conceptualized as its welfare cost. Hence global heating is reduced to a problem of sub-optimal allocation rather than system transformation (Rosenbloom et al. 2020).

Neoclassical climate economics spent decades estimating the social cost of carbon (that is, the net present value of emission reduction benefits minus its mitigation cost) in order to infer an ‘optimal’ level of global heating. Methodologically, computational-intensive integrated assessment models (IAMs) are used, which try to model the relationship between biophysical processes and economic output, embedded in a utilitarian cost–benefit calculus and an inevitable trade-off between climate stabilization and human welfare.

While results vary across different IAMs, Nordhaus warned early on about the economic costs of more significant measures (Nordhaus 1992) and infamously declared global heating of +4°C and low carbon prices of 43 USD per ton in 2020 as optimal in his Nobel Prize lecture in 2018 (Nordhaus 2019). IAMs have been criticized for discount rates that are ad hoc and too high, for the ignorance of tipping points and deep uncertainties and for the misspecification of damage functions and climate system dynamics (Grubb/Wieners 2020; Keen 2021; Rezai et al. 2020), among others. More fundamentally, cost–benefit analysis is unsuitable for fat-tailed uncertainty (Weitzman 2009). Furthermore, like all neoclassical models, they assume perfect factor substitution and ignore demand-induced growth, which means that they overestimate the adaptability of the economic system on the one hand and underestimate the adjustment efforts needed on the other. Despite attempts to improve the models in response to the critique, key results remain at odds with biophysical realities. For instance, an updated version of the DICE model suggests that a world with a 6°C rise in global temperature – which most climate scientists expect to be uninhabitable – would lead to only 8.5 percent in global income loss (Nordhaus 2019) or to an incremental 1.4 percent loss of global consumption when tipping points are factored in (Dietz et al. 2021).

Apart from more fundamental recalibration (Dietz et al. 2018; Hänsel et al. 2020), a pivot to cost–effectiveness instead of cost–efficiency as the normative basis has been the main – if contested (Aldy et al. 2021) – innovation within neoclassical economics to achieve consistency with the 1.5°C target (Stern/Stiglitz 2017; 2021). A cost–effectiveness approach takes the 1.5°C limit as given and then works backwards to the corresponding carbon price. Yet, although the need for complementary measures is often acknowledged, cost-effective IAMs remain centred on incremental carbon pricing by construction, now advocating for a somewhat higher 100 USD per ton by 2030 (Kaufman et al. 2020; Stern/Stiglitz 2021).

Even as neoclassical economists disagree on the precise method, the correct carbon price as well as the relevance of complementary measures, there is disciplinary consensus that carbon pricing of moderate magnitude, mildly increasing over time, should be the main mechanism of climate policy. That is, a gradual adjustment of relative prices is the core policy tool, and there is little need for substantive industrial, regulatory or fiscal policy. Neoclassical economics thus fails to address the systemic nature of the low-carbon transition. Moreover, neoclassical economics analytically disregards carbon inequality and the capitalist growth imperative and their interlinkages with ecological overshoot.

3.1.2 *Post-Keynesian economics: fiscal policy*

The major advantage of post-Keynesian ecological models over neoclassical ones is that they take demand effects into account (Fontana/Sawyer 2016; Taylor et al. 2016). Post-Keynesian

IAMs thus take the emissions implied by adjustment efforts as well as the second-round effects of government spending into account. Furthermore, distributional analysis is explicitly built into these models, which is also endogenously linked to emissions (Rehm et al. 2022).

Regarding mitigation, post-Keynesians typically extend their faith in governments' ability to stabilize capitalism to their approach to climate change. A main focus is thus government investment, employment and redistribution (Onaran et al. 2021). In general, public investment is seen as more effective in lowering emissions than just changing relative prices. For instance, Semieniuk et al. (2021) estimate a cost of only 3 percent of global output per year with an initial 'big push' of 6 percent to mitigate global heating. Policy recommendations often also include a carbon price (usually in the form of a carbon tax with border adjustment), green finance (Dafermos et al. 2018), work time reduction (Rezai et al. 2013) and reducing inequality. Post-Keynesian economics is thus open to suggest a policy mix that is concerned with effectiveness in lowering environmental impact (rather than prioritizing efficiency), which is what ultimately counts for decarbonization.

However, like neoclassical economics, many post-Keynesian solutions rest on the hope that the economy will enter a 'new Kondratieff cycle' (explicitly in Priewe 2021). This leads to the expectation that decoupling, and especially technological solutions, will suffice. However, neither carbon prices nor technological solutions are likely to fulfil that hope in time, as the following sections argue.

3.2 Evidence on limitations

3.2.1 Carbon prices

Advocating carbon pricing as the workhorse of climate policy, as endorsed by neoclassical economists, overlooks that any market, and thus also the emissions market, is highly political. As a consequence, political economy constraints and its vulnerability to regulatory capture have impacted real-world carbon pricing and led to prices that were far too low to lead to measurable technological change.

In fact, recent meta-evidence demonstrates that carbon pricing has mostly led to operational changes like fuel switching rather than fundamental technological change (Lilliestam et al. 2021) and to incremental emission reduction at best (Green 2021; Tvinnereim/Mehling 2018), even when carbon prices were comparably high. Energy incumbents in the EU even support the expansion of the carbon market precisely because it is thought unlikely to become effective (Markard/Rosenbloom 2020).

More fundamentally, optimality of carbon pricing is based on an individualized understanding of well-being as preference satisfaction and, by pre-determining the abatement path of least cost, de-politicizes the question about who should reduce their emissions (Huwe/Frick 2022). And second, the financialization of carbon markets risks them being affected by speculation and the concomitant large swings in prices (Ederer et al. 2016), which is not conducive to stabilizing expectations. This is the contrary of what would be required to phase out fossil fuels.

3.2.2 Decoupling

Both neoclassical and some post-Keynesian approaches to global heating are underpinned by a general, often implicit assumption of future green growth (that is, decoupling GDP from environmental impact). Recent research, however, casts doubt on this premise.

In order to qualify as sufficient, decoupling of GDP from environmental impact needs to be absolute, global and fast enough to not deplete the carbon budget. However, neither

the historically observed decoupling rates nor the rates implied by major scenario projections are sufficient to keep global heating below 1.5°C, even under optimistic assumptions (Haberl et al. 2020; Hickel/Kallis 2020).⁴ The higher the GDP growth, the higher the decoupling rates need to be. Decoupling of the required magnitude implies unprecedented leaps in technology development and deployment, especially in the hard-to-abate sectors of aviation, steel and cement (Davis et al. 2018), exacerbated further by the demand effects of initial government expenditures.

3.2.3 *The technological fix: negative emission technologies*

Not only neoclassical models, but virtually all IPCC mitigation scenarios rely on significant deployment of negative emission technologies for keeping global heating below 1.5°C, although these remain speculative at scale (Minx et al. 2018), and development and deployment sharply lags behind projections. Since bioenergy-related negative emission technologies rely on planting and burning large amounts of biomass, this implies risks for biodiversity, land enclosure and livelihoods (Creutzig et al. 2021a).

To conclude, this section argued that neoclassical economics lacks a proper theoretical lens for addressing the climate crisis, much like it lacks a framework for analyzing economic and financial crises. While the post-Keynesian literature asks good questions and provides useful tools, the climate crisis is immediate and so severe that it requires much more than the standard post-Keynesian approach of comparatively small-scale government intervention. Section 4 aims to show that such a combination of post-Keynesian and Ecological Economics is eminently possible.

4 (HOW) CAN POST-KEYNESIANISM ADDRESS THE ECOLOGICAL CRISES?

4.1 **Concepts conducive to addressing the ecological crisis**

This section discusses the theoretical and policy implications of prominent strands of the post-Keynesian approach, as well as whether and how they can be used to address the triple facets of the ecological crisis. Based on climate mitigation research, our analysis distinguishes between three types of mitigation strategies: supply-side decarbonization, which aims at improving energy efficiency and finding low-carbon substitutes for production; demand-side mitigation, which focuses on reducing energy demand; and redistribution.

4.1.1 *Theory and modelling*

Post-Keynesian models are demand-driven and focus on production and growth (Lavoie 2009) – which at a first glance is at odds with the ecological approach that emphasizes planetary boundaries. More concretely, however, textbook post-Keynesian modelling is underpinned by Leontief production functions, which require fixed ratios of inputs and are characterized by constant marginal costs (Lavoie 2009). That is, it is neither possible to increase output seamlessly in the short run nor can inputs (typically labour and capital, but which may well include energy or nature, see, for example, Naqvi and Stockhammer

4. For global resources (going beyond GHG), no absolute decoupling has yet been observed (Hickel/Kallis 2020).

(2018)) be readily substituted in infinitesimally small units. Combined with the post-Keynesian conception of the long run as a series of short runs, this leads to a realistic view of technological change, which is industry- and technology-specific. Plant life, depreciation and retrofitting – which are major elements of low-carbon transition – are issues that arise from the post-Keynesian view of technology. The demand-driven nature of post-Keynesian models implies that they take the second-round emissions resulting from abatement efforts into account. These features are key to addressing issues faced by a socio-ecological transition.

At the same time, post-Keynesian models are driven by net investment. This is how the formal post-Keynesian approach captures capital accumulation as a driving force, as discussed in Section 2.3. However, post-Keynesian models are typically based on comparative statics of steady states. While this may be criticized if a dynamic approach is valued, it makes a wide range of solutions possible. For instance, Hein and Jiminez (2022) demonstrate that an appropriate parameter choice yields a CO₂-neutral steady state in a post-Keynesian model. Positive net investment is thus *not* dictated by methodology or baked into the model structure; it is not a requirement of the modelling logic itself. However, as discussed in Section 2.3 above and in Section 4.2.3 below, there is nonetheless a ‘factual’ growth imperative. The growth imperative in post-Keynesian models is thus not methodologically driven, but a result of the economic structure which they represent.

Regarding actors, post-Keynesian thinking understands humans as social beings of bounded rationality (Simon 1957), embedded in institutions. This makes it well-suited to view the socio-political context of carbon lock-in (Seto et al. 2016). The foundation of post-Keynesianism in classical economics forms the basis of its approach to classes as social actors (Hofmann et al. 2016) and puts class interests – which also drive opposition to fossil fuel phase-out as we demonstrate in Section 4.2.3 – at the centre of its attention. In modern formal modelling, this shows up as a dominant focus on the functional distribution of income between labour and capital, rather than the personal income distribution. Since the distribution of income and wealth is directly linked to emissions as well as – via demand – to the production structure of the economy, the ecological question cannot be addressed without an intrinsic theory of distribution.

Differential saving rates by income type underpin the wage-/profit-led debate, which asks the question whether a redistribution to labour or to capital leads to higher growth (see Dammerer et al. forthcoming, for a review). The prominence of this strand of the literature within the post-Keynesian paradigm may lead some to conclude that post-Keynesians are mainly concerned with raising growth. However, an alternative interpretation of this debate is that it actually asks the question whether there is a trade-off between equity and efficiency – and in the case of wage-led growth, finds that this is not the case. The fact that this literature usually finds very small growth effects of redistribution towards either labour or capital (Kiefer/Rada 2015; Obst et al. 2020) supports this interpretation, which means that post-Keynesian theory and ecological economics are not in contradiction on this point.

Since post-Keynesianism has distributional questions at its core, it is analytically capable of capturing the interlinkages between ecological overshoot and social inequality. Apart from the distribution of income, the distribution of wealth, which is the foundation of class, has also garnered attention in post-Keynesian modelling (Ederer/Rehm 2020). Wealth inequality is much starker than income inequality (Rehm/Schnetzer 2015), and plays directly into the political feasibility of the socio-ecological transition. The affluent contribute to the ecological crisis directly through their disproportionate resource and energy consumption but also indirectly by shaping (unsustainable) consumption norms and as members of powerful factions of fossil capital (Nielsen et al. 2021; Wiedmann et al. 2020). The vicious circle of high

inequality and the political power of elites (Elsässer et al. forthcoming) might strengthen the opposition towards effective climate action. Consequently, reducing inequality and individual wealth is imperative for reducing environmental impacts. Finally, the distributional focus of post-Keynesianism can easily be expanded to intersectional inequalities like gender (Onaran et al. 2020), which also risk being amplified by global heating.

Post-Keynesian theory presumes cost-plus pricing, which consists of firms adding a mark-up to normal unit costs (Lavoie 2009). Combined with a view of wage setting as a bargaining process, this leads to a theory of inflation that is characterized by the question how income is distributed between capital and labour. Inflation is thus a distributional issue, and it can be controlled by mechanisms such as wage restraint and price controls, especially for products and services covering basic needs. As long as distributional conflict is managed, inflation concerns are thus not a constraining factor for financing economic policy for the ecological transition.

4.1.2 *Economic policy*

Post-Keynesian economic policy analysis prioritizes fiscal policy to stabilize fluctuations intrinsic to the capitalist economic system. Since the goal is neutrality over the business cycle, this does not contradict ecological concerns: there is no growth objective intrinsic to post-Keynesian fiscal policy recommendations at the macroeconomic level, making them at least not *a priori* incompatible with planetary boundaries. Additionally, large-scale public spending is key for the transition, especially for the low-carbon provision of basic goods like heating (Oswald et al. 2020) or public transport.

Relatedly, post-Keynesian economics favours a strong and active welfare state. This implies that the government has both the financial means and the technical ability to steer the socio-ecological transition. Sector-specific industrial policy is another mainstay of post-Keynesian thought, which tailors well with the ecological requirements for differentiated taxation and regulatory policy. From an inequality perspective, carbon-intensive luxury consumption should be taxed (more), regulated or even banned, while decarbonizing basic goods requires public investment (Oswald et al. 2020). Active industrial policy is also relevant for the deliberate phase-out of fossil products (Rosenbloom/Rinscheid 2020). An active state can carefully design its welfare state services to minimize environmental impact (Bohnenberger 2020). Finally, post-Keynesian public finance entails an in-depth understanding of the concrete functioning of the different levels of government. It does not necessarily imply an expanding role of a centrist state, but it allows for decentralization and a flexible approach to common ownership.

Monetary policy mainly plays a supportive role in post-Keynesian thought; its purpose is to accommodate the fiscal stance. Analytically, post-Keynesians pioneered endogenous monetary theory, which is espoused by virtually all central banks in practice today. The ‘horizontalist view’ (Moore 1988) suggests that the central bank is incapable of controlling the money supply. Instead, it sets interest rates while the demand for money, which is a result of economic activity, will at any point be met by commercial banks’ lending. Post-Keynesian monetary policy is thus not an obstacle to addressing ecological concerns (Gabor 2020).

4.2 **Contradictions (possibly) impeding addressing the ecological crisis**

This section turns to potential contradictions between post-Keynesianism and a more serious consideration of the ecological crisis. Key concerns are the growth effects of redistribution, the accumulation imperative under capitalism and the significance of political

power. We delineate entry points from critical Political Economy and Ecological Economics on how these contradictions could be overcome.

4.2.1 *Inequality*

A contradiction with planetary boundaries arises from the combination of post-Keynesian demand-driven growth with differential saving rates. Due to differential saving rates (Kaldor 1955) – which are one of the most consistently documented empirical stylized facts both over time and across countries (Ederer et al. 2021) – post-Keynesian textbook theory predicts that redistribution from higher- to lower-income groups leads to higher growth. While this Haavelmo effect is a desired feature of revenue-neutral budgetary expansions, it is one of several possible rebound effects that may undermine climate action. Combined with higher relative CO₂ emissions of low-income groups, this means that the post-Keynesian focus on redistribution in a demand-driven framework is expected to lead to an endogenous rise of emissions.

Ecological economists have, rather ingeniously, circumvented this dilemma by focusing on the dynamic and composition effects (Oswald et al. 2021), as discussed above in Section 2.1. Since emissions in high-income groups are mainly due to transportation, which is costly and difficult to decarbonize, while emissions in low-income groups are mainly due to heating, for which technically feasible alternatives and retrofits readily exist, lower inequality simplifies the required adaptation process. Additionally, a sharp reduction in global inequality would reduce the disproportionate energy footprints of (global and national) high-income groups, which are the most significant contributors to absolute GHG emissions, while the eradication of poverty would only lead to small increases in energy use (Bruckner et al. 2022; Oswald et al. 2021). Mitigation strategies that achieve greater social equity and emission reduction are possible, but may increase public deficits (D'Alessandro et al. 2020). Post-Keynesianism shows that these are fiscally sustainable (Lerner 1947), especially if nominal interest rates are below nominal growth rates. Finally, an emerging strand of the Ecological Economics literature advocates for sustainable consumption corridors (Di Giulio/Fuchs 2014; Sahakian et al. 2021), which guarantee universal access to basic needs as a social minimum and limit consumption (as well as income or wealth) to a sustainable maximum. Instead of voluntary behaviour change, these studies analyze consumption from a systemic view as linked to production (Brand-Correa et al. 2020) and the structural drivers and social relations of capitalism (Brand et al. 2021).

4.2.2 *Growth imperative*

There are thus plausible analytical solutions for the contradiction between redistribution and ecological concerns. The case is harder to make for the inherent tendency for capital growth (that is, positive net investment).

Ecological Economics has acknowledged this problem and, as result, is divided between reformist and more radical stances towards capitalism (Wiedmann et al. 2020). The latter argue that, if our current economic set-up is incompatible with guaranteeing the livability of the planet, then the latter unequivocally takes precedence over economic concerns. In view of the sluggish pace of GHG reductions in recent decades, some ecological economists thus argue that centering social provisioning on low-impact human need satisfaction requires a more fundamental transformation of the politico-economic system, which may well lead beyond what is called capitalism today (Schmelzer et al. 2021).

One option could be to move more towards a mixed economy by phasing out fossil-fuel-based sectors and increasing other low-carbon sectors and the care economy. Besides active industrial policy to steer the transition, removing economic domains from the profit logic and thus obviating the drive to capital accumulation, they could be reoriented towards a zero-emission production. Particularly relevant in this respect are the energy and transportation sectors. While this might alleviate political economy pressures for higher growth once these sectors have been removed from market orchestration, the process of actually removing them would face intense political pressure.

Meeting fundamental human needs is technically feasible at sustainably low levels of energy use based on technology already available (Grubler et al. 2018; Millward-Hopkins et al. 2020). Demand-side mitigation is feasible and consistent with high levels of well-being (Creutzig et al. 2021b). More fundamentally, how efficiently biophysical inputs are capable of achieving social goals depends on the configuration of the provisioning system, and their association varies substantially across countries (Ivanova/Wood 2020; O'Neill et al. 2018). High socio-ecological performance, in this sense, is associated with re-orienting the economic system towards high levels of public service quality and income equality, as well as low levels of extractivism and growth beyond moderate levels of affluence (Vogel et al. 2021). Reduced work hours would not only mitigate employment effects of reduced growth, but also lead to a higher quality of life (Spiegelaere/Piasna 2017).

4.2.3 *Political power*

Shaped by its partial roots in Marxism, post-Keynesianism involves a deep understanding of the conflicts of interest underlying distributional issues. As a result, it is theoretically open to consider class interests and political power. Yet, post-Keynesian economics has not sufficiently acknowledged or theorized the significant role of political power in obstructing climate action.

The previous section argued that cutting the carbon-intensive luxury consumption of the affluent is important to secure everyone's well-being within planetary boundaries. It also requires large-scale deployment of the most advanced technologies, substantial demand-side mitigation (Millward-Hopkins et al. 2020) and a significant strengthening of our collective provisioning systems (Vogel et al. 2021). All of these run counter to class interests of large sections of current capitalists, termed 'fossil incumbents'. These class interests of incumbent industries are thus a major obstacle to a socio-ecological transformation. Phasing out fossil fuels is foremost a problem of power and politics, not a scientific or technical one (Pohlmann et al. 2021).

This is demonstrated by the political economy history of climate research. Based on a growing – and ex post largely accurate – body of evidence on the potentially disastrous effects of burning fossil fuels, early warnings were issued to U.S. petroleum industry leaders as early as the late 1950s (Franta 2018). Fossil incumbents and their larger institutional network of trade association, think tanks and lobby groups then formed a coalition against climate policy (Brulle 2021). The strategies of this climate change counter-movement range from the denial of the climate science to the production and spread of misinformation in internationally coordinated campaigns, as well as opposition against legislation under the appearance of approving of the reality of climate change and, more recently, endorsement of climate action, as Bonneau et al. (2021) showcase for Total. As pressure for an energy transition mounts, energy incumbents try to shape an inadequate policy response that preserves their interests (Haas 2019; Szabo 2022).

Apart from the energy sector, incumbents in fossil-fuel-reliant automotive and heavy industry stand out in anti-climate lobbying in the EU (Influence Map Report 2021).

A neo-Gramscian approach currently developed in Critical Political Economy provides a useful framework to understand how incumbents draw on material, organizational and discursive power to resist and, where inevitable, accommodate change with the goal of defending their hegemonic position (Ford/Newell 2021). In the terminology of neo-Gramscian scholars, a hegemony is never a given, but needs to be actively stabilized. This implies that it can also be contested.

For this, we identify three possible entry points. First, social movements can shift public discourse. Treating the socio-ecological crisis as genuinely political is necessary to reopen the debate about how to organize social provisioning and about democratic means and procedures beyond the market to solve social conflicts (Huwe/Frick 2022). Second, academics can play an important role by providing critical and accessible research but also in facilitating change (Pirgmaier 2020). Apart from a research agenda for social change (Pirgmaier/Steinberger 2019), Ecological Economics discusses the role of scientists in a situation of climate emergency, in which some argue for more public advocacy, engagement with civil society and activism (D'Alisa/Kallis 2020; Gardner et al. 2021). Third, and crucially, within capitalism the interests of the elite need to change for policy to change sustainably (Page et al. 2013; Elsässer et al. 2017). The development of a fraction of capital that has an economic interest in abating global heating is thus perhaps the most important strategic goal. The renewable energy sector holds such potential, although it does not appear to have reached sufficient political clout to defend its interests, as recent removals of subsidies in countries like Germany and China have shown. The rise of asset manager capitalism (Braun 2021), which concentrates share ownership in a few companies who vote against environmental governance (Baines/Hager 2022), presents additional challenges.

5 CONCLUSION

This paper has argued that the major crisis of our times can be characterized by three interrelated dimensions: *ecological overshoot* is already severe, escalating and requires rapid phase-out of fossil fuels, which are built into the core of modern technology, infrastructure, institutions and consumption habits. It is inextricably linked to *socio-economic inequality*, which includes inequality in the causation of ecological overshoot. A root cause for why current attempts at supply-side decarbonization have remained insufficient is that our current economic system remains structured around a *growth imperative for capital* rather than the provisioning of human needs.

We then investigated how major strands of neoclassical and post-Keynesian economics conceptualize this triple-faceted crisis. Neoclassical economics see the ecological crisis as a negative externality. We demonstrate how viewing ecological overshoot as a problem of price adjustment does not capture the full nature and scope of the problem and, as a result, is unlikely to effectively address its underlying causes. In practice, neoclassical discourse has focused on the technical details of estimating the social cost of carbon and modelling techniques, which has led to decades of little political progress. While neoclassical economics has recently started to research the empirics of economic inequality, its theoretical contributions to the other two dimensions – socio-economic inequality and the growth imperative – are severely limited.

Post-Keynesianism, while also not integrating biophysical limits in its core theoretical analysis, is in a better position to respond to the triple challenge. Yet like neoclassical

economics, and in contrast to the empirical evidence, it too often implicitly assumes that decoupling and negative emission technologies will suffice. This paper argues that it is not only possible to configure post-Keynesian thinking in way that captures the three inter-related dimensions of the ecological crisis, but also that it will likely be very fruitful.

We identify the growth effects of reducing inequality, the capitalist growth imperative and political power from wealth concentration and incumbent industries as the main contradictions between post-Keynesian theory and fossil phase-out. While the first of these may be overcome with adequate industrial and regulatory policy, the second would require a fundamental transformation. This, in turn, is impeded by the third.

While Keynes still argued that ‘the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas’ (2000 [1935]: 383), post-Keynesians – who experienced the relevance of power first-hand in the ideological and political shift which sidelined their paradigm after the 1980s – should be more sympathetic to the emerging understanding that, to halt climate breakdown, good policy proposals alone are, in fact, not sufficient. We argue that a better understanding of the macroeconomics and politics of achieving high levels of well-being at sufficiently low levels of environmental impact, that is, of ‘living well within limits’ (Julia Steinberger), is urgently needed. Research is fundamental to understanding and addressing the socio-ecological crisis but can be harmful if it (explicitly or implicitly) justifies the status quo. If configured accordingly or combined with insights from Ecological Economics, post-Keynesian economics has the theoretical and methodological tools to help address the major crisis of our times.

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