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


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Climate change governance by central banks in an era of interlocking crises

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ABSTRACT

In this article, we survey the literature on central bank action on climate change, focusing particularly on how the combined crises of COVID-19, inflation, and Ukraine have affected this action. We argue that the current situation is a critical juncture in which recent crises have created a highly indeterminate situation regarding what central banks might do regarding climate change. To date, some central banks have used these crises as opportunities for expanding their role while others have succumbed to pressure to withdraw from climate action. We explore three dynamics that generate this openness to various potential trajectories for climate action: competing interpretations of inflation's implications for climate policy; shifting forms of expertise within central banks; and attempts at global coordination of central bank activity. We then argue that how this critical juncture is resolved depends critically on national variations in the institutional character of central banks and their political context.

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Introduction

This literature review focuses on the role that central banks have been playing in climate change governance, in particular in the context of the global crises that have unfolded since 2020: COVID-19, the return of inflation, and the invasion of Ukraine. We analyse the responses that central banks have developed to date, showing their limits and potential. We make two key arguments. First, we need to see the current situation as a critical juncture in which recent crises have created considerable *indeterminacy* in central banks' future role in climate governance: that is, while there are pressures pushing banks in various directions, there is considerably more possibility of radical changes both in central bank climate action and in the basic institutional norms of central banks – including in the widespread norm of central bank independence (CBI). To date, we can see that some central banks have used these crises as opportunities for expanding their role in tackling climate change while others have succumbed to pressure to withdraw from climate action. Second, we argue that how this critical juncture is resolved thus depends critically on *national variations* in the institutional character of central banks and their political context.

After developing this argument at a general level, we demonstrate it through an analysis of the principal areas of focus in existing literature regarding central bank climate action. We develop the argument about the indeterminacy of the current situation by examining debates about the implications of renewed inflation for climate action, the likelihood that central banks' expertise can be adapted to address climate concerns, and the possibilities for global coordination: all areas in which we see considerable openness in the direction that central banks are likely to take. We then develop our argument about the importance of national variation – particularly among European and North American banks and between Western and non-Western ones – by examining the actions that different central banks have taken to date and by considering the extent to which they can effectively mobilize their powers. Critical decisions in each of these areas, both within and beyond central banks, can generate path-shaping processes for future climate action.

These variations have important implications for the forms of political authority that central banks exert and their relations to other parts of the State. Most notably, they raise the question of the appropriateness of their political independence in an era in which coping with climate change will require more active and connected central banks.

The debate about central banks and climate governance

Central banks have become increasingly involved in climate change governance over the course of the last decade (Langley and Morris 2020,

Dikau and Volz 2021a, Quorning 2023, Thiemann *et al.* 2023, Bailey and Jackson 2024). This follows from private financial sector activity regarding climate change since the mid-1990s. Initially driven by insurance sector concerns about climate risks (Paterson 2001), these include a plethora of non-state financial sector governance initiatives, of which the best known is the Carbon Disclosure Project, through which investors sought to get disclosure from companies regarding a range of climate-related risks (physical, financial, regulatory) as well as emissions trends and strategies (MacLeod and Park 2011). Such disclosure initiatives fed into the broader field of carbon accounting (Thistlethwaite and Paterson 2016, Maechler 2023), putting pressure on state financial regulators for mandatory emissions reporting. In the aftermath of the financial crisis of 2008, pressures for financial regulatory reform also included proposals for ‘greening’ the financial regulatory apparatus (Helleiner 2011). But central banks were curiously absent from this earlier phase of climate-focused financial governance.

From around 2015 onwards, since at least Bank of England Governor Mark Carney’s ‘Breaking the Tragedy of the Horizon’ speech (Carney 2015), central bankers have developed various initiatives regarding climate change and have debated among themselves about their role in climate policy. Although some central bankers, notably in the US, have argued that they will only address climate issues that directly affect their financial and monetary policy mandates, others have become more proactive, developing policies in various areas. Initiatives undertaken by central banks relating to climate change include: climate-sensitive monetary policy (building climate risks into interest rate decisions); banking supervision (requiring banks to manage and report on climate-related risks and engage in the ‘climate stress testing’ of their investments); climate-related financial instruments (e.g. encouraging green bonds); differential interest rate policy (preferential lending rates for low carbon investments); asset purchases (tilting asset portfolios away from high carbon or high climate-risk investments); and collateral frameworks (taking climate risks into account in what is permitted as collateral).

Scholarly analysis of central bank climate action is driven largely by normative concerns: many commentators focus their argument on how central banks *should* do more to address climate change (e.g. Campiglio *et al.* 2018, Kedward *et al.* 2023). Scholars have argued for various key measures that central banks ought to introduce or develop further. These include: imposing mandatory climate risk disclosure (Robins *et al.* 2021, Schoenmaker 2021, Boneva *et al.* 2022); developing preferential lending facilities and differential capital charges for investments to favour low carbon and penalise high carbon ones (Boneva *et al.* 2022); aggressively managing central banks’ own assets to shift investment towards zero carbon

investments (Schoenmaker 2021); enhancing coordination among central banks to avoid competitiveness issues and maximise the effectiveness of their own policies; strategically coordinating credit with key ministries as well as other publicly owned financial institutions to maximise the effectiveness of central bank climate activity (Monnet 2018, Svartzman *et al.* 2021, Mikheeva and Ryan-Collins 2022, Bezemer *et al.* 2023); implementing climate-adjusted credit requirements that would better reflect physical and liability risks in collateral and capital requirements; and prioritising green bonds, both public and private, during central bank purchases.

Much of the literature on central banking and climate change can be understood as a debate between those who are more pessimistic about the potential for central banks to implement many of these measures and those who are more optimistic about these prospects. It is widely acknowledged that central bank activity remains limited by prevailing economic orthodoxies and institutional and policy mandates, which is reflected in a central bank focus on financial system risk management more than directing investment towards decarbonisation (Langley and Morris 2020, Baer *et al.* 2021, Dafermos, 2022; Dafermos *et al.* 2022a; Jackson and, Bailey 2023, Deyris 2023). However, more optimistic voices emphasize that central banks retain ample scope for action and are already shifting their thinking and practices in important ways (Dikau and Volz 2021a, Svartzman *et al.* 2021, Schoenmaker 2021, van 't Klooster 2022, Siderius 2022). From this perspective, action taken within central banks' capacious legal mandates may ultimately result in aligning capital flows with the objectives of the Paris agreement.

The pessimists don't necessarily disagree with the measures for climate action by central banks, but rather argue that both their capacity to do this, and the forms these initiatives have often taken, are too constrained by prevailing traditions of central banking and what are conventionally considered to be appropriate limits for state economic intervention (Langley and Morris 2020; Jackson and, Bailey 2023). In recent years, central banks' preference for a traditionally narrow mandate has been compounded by the emergence of right-wing populism in many countries, with opposition to climate action as a core plank of their campaigns (Patterson 2023, Paterson *et al.* 2023). This populist pressure has had noticeable effects on central bank room for manoeuvre on climate change, as in the UK governments instructions in 2023 to the BoE to downplay its climate activist stance (Costa 2023). These pressures to constrain central bank climate actions are particularly clear for Western banks; the situation for the People's Bank of China (PBoC) is rather more complicated (Larsen 2022).

Beyond 'optimism' and 'pessimism': indeterminacy and variation in central bank action

We argue that the existing literature tends to get too caught up in this debate about 'optimism' or 'pessimism' regarding the potential for climate action by central banks. This emphasis neglects two key dynamics that we focus on in this article: the impacts of recent crises on central bank strategies, and the variation in the institutional qualities of central banks across countries. We detail these dynamics in broad terms here before turning to the specific sites where they play out.

The crises that have unfolded since early 2020 raise significant questions about central banks' role in addressing climate change. COVID-19, the Russian invasion of Ukraine, and the return of inflation, in particular, each raise different challenges for central banks that interact with climate action in complex ways. Together, these crises can be understood as creating a critical juncture in the evolution of the global political economy of climate governance by central banks. Historical institutionalists suggest that critical junctures occur at moments of great uncertainty, breaking down existing patterns of path dependency and generating a range of different possible outcomes (Capoccia 2016). In this piece, we focus our analysis of existing literature through this lens, tracing the ways in which central banks have responded to this moment of interlocking crises by either scaling back their commitment to tackling climate change or expanding it.

These recent interlocking crises may undermine climate action in central banks in various ways. They risk distracting central banks from medium-term climate goals and re-asserting short-term economic imperatives which are core to their mandates. Following the 2008 global financial crisis, central banks shifted focus to longer-term issues not only regarding climate action but more generally in what is referred to commonly as 'macroprudential' management of more complex, systemic financial stability risks (Özgöde 2022, Morris and Collins 2023). The more recent crises unfolding since 2020 have drawn attention back to the short-term needs of stabilising economies during COVID-19 lockdowns; boosting them afterwards; and dealing with the inflationary pressures generated by rapid economic reflation and then intensified by gas shortages and supply chain bottlenecks arising from the Russian invasion of Ukraine. There are therefore good reasons for believing that central bank action on climate change is precarious and vulnerable to rollback in the face of what are framed as more immediate crises. This might suggest that climate action remains a second-order priority for central banks.

Conversely, there are good reasons for believing that these crises generate pressures for accelerated climate action. Given that the inflationary pressures that started in 2021 were largely driven by natural

gas prices and negative supply shocks combined with some corporations taking advantage of their market power (Weber 2022, Hansen *et al.* 2023), they generate powerful reasons to invest in decarbonisation. These dynamics challenge longer-standing assumptions that climate action would increase costs for business overall. This problem of ‘fossilflation’ (Schnabel 2022) also aligns climate action with central banks’ mandate to maintain price stability. There is some evidence that the loosening of monetary policy since 2020 provided significant expansion of low-carbon finance, with \$1.03tn of green bonds issued in 2021 as opposed to \$606bn the previous year (Schmidt *et al.* 2019, EF 2022, p. 3). Moments of crisis are always moments where there are opportunities to reshape the basic institutional rules of a game: given existing central bank climate action, the policy and regulatory shifts that would deepen and extend such action could become more feasible in the current context.

A principal effect of these crises on central banks’ climate role is to increase the *indeterminacy* of their trajectory: there is considerably more scope than usual for central banks to move (or be pushed) in different directions. This indeterminacy is, in effect, what a critical juncture looks like when you are (or at least *might be*) in the middle of it: it is the moment where various trajectories appear possible, but which will emerge cannot be clearly discerned. As part of broader political struggles over climate change, central banks are being pushed by climate activists and relatively progressive policymakers to take on more climate action, but simultaneously by anti-climate populists to dismantle climate action. And they are being pushed by quite heterogeneous forces across their differing national contexts.

How central banks respond will also be strongly shaped by the domestic roles that central banks play. Most Western countries have a strong norm of CBI, thought to be key to the monetary stability in OECD countries for much of the last 40 years. Yet those norms could now be under threat. This is in part because responding to these crises and acting on climate change generates new mandates for expanded political oversight of central bank decisions. But it is also driven by a wider populist backlash pushing opposition to action on climate change, which has included attacking central banks that have engaged in climate action. Central banks are thus being politicised from both those pushing for more climate action, and those opposing it, both of which threaten the norm of CBI. Even some former central bankers do not seem horrified by the idea of abandoning CBI in response to the demands of climate change (Davies 2023), and there is a diversity of views within central banks about the relationship between climate action and CBI (Jackson *et al.* 2024). In this context, we might see some central banks assuming more active developmental roles supporting industrial and economic transformation of

the kind that some played in the pre-neoliberal era and that central banks such as the PBoC continue to play today (including with respect to climate change) (Helleiner 2014, Costabile and Epstein 2017, Monnet 2018). How long this openness to broad institutional and political change in western countries will remain is unclear, since the current crises themselves may well signal a prolonged period of economic instability and stagnation (Copley 2023). In countries without a tradition of CBI – of which China is the most important for climate change politics – the trajectory of CB action will be more *directly* shaped by government priorities than in those places with CBI.

Indeterminacy: inflation, expertise and global coordination

Here, we focus on three specific drivers of the indeterminacy that global crises have produced: the contradictory dynamics of inflation and competing interpretations of that phenomenon, the shifting forms of expertise on which central banks rely, and the challenges around a globally coordinated climate response.

Competing interpretations of inflation

The first way that contemporary crises have generated a new openness in central bank approaches to climate governance concerns the effects of the dramatic rise in inflation from 2021 onwards. Central banks have as one of their principal responsibilities to ensure price stability. Inflation rates of the kind that we have witnessed in 2021–23—edging close to double digits in many countries for the first time in decades – are guaranteed to get central banks’ attention. As inflation took off in 2021, many mainstream economists and commentators blamed central banks for taking their eye off inflation as they pursued more ‘glamorous tasks [like] fighting climate change’ (Economist 2022). But the implications of inflation for central bank climate action are much more complicated than this simple argument by *The Economist*. The key question is whether inflation is framed in terms of fossilflation and climateflation, generating pressure within banks for more aggressive climate action to control inflation, or greenflation, which tends to undermine it by making central banks focus on the costs of action to mitigate climate change.

There are some encouraging signs that the recent increase in inflation has triggered new thinking about the relationship between inflation and climate change among policymakers. Until quite recently most of the attention on the macroeconomic consequences of climate change has been on the effects of climate mitigation policies on economic growth, with inflation largely ignored and at best an indirect concern (Cline 1992, Stern 2007; or, Kotz

et al. 2024). They mostly ignore inflation because the macroeconomic equilibrium models they use typically assume that, while climate policy tends to increase prices, it also dampens consumption and lowers GDP, causing prices to decline. The more recent literature, however, has focused on three different aspects of the climate change–inflation relationship all with significant implications for the core mandate of central banks.

First is ‘climateflation’, with scholars seeking to measure the inflationary implications of climate change (Batten 2018, Keefe 2022, Cevik and Jalles 2023). These scholars point to the increasing signs that the severe weather events associated with climate change can seriously disrupt supply chains, creating the kind of inflationary shocks that we saw in the context of the COVID-19 pandemic and in recent food commodity price instability (e.g. Tappe 2022). This concern with supply chain disruption adds a novel twist to the widespread existing concern with the financial risks of climate change (e. Wagner 2022), more commonly focused on the risks to investors from the damage to industrial infrastructures due to flooding or hurricane damage. Many of these challenges require actions that are not part of the usual toolkit of central banks, and they are inherently uncertain and therefore very difficult to model and plan for, posing serious challenges for banks’ inflation-fighting mandates. As Benoît Cœuré, then ECB Executive Board Member, noted in 2018, climate change is likely to lead to supply shocks, which ‘are less easy to accommodate for central banks as they pull output and inflation in opposite directions’ (Cœuré 2018). For example, shocks to food supplies from droughts or flooding will simultaneously reduce overall economic output (for which central banks might want to respond by loosening monetary policy to stimulate demand) and increase food prices (which would push central banks to tighten monetary policy to control inflation).

The second of these aspects of the climate change–inflation relationship involves the specifically inflationary dynamics of climate change action – ‘greenflation’ (Angeli *et al.* 2022, Crawford and Gordon 2022, Yan 2023, Del Negro *et al.* 2023). While the earlier literature cited above focused on the broad macroeconomic implications of climate policy, the newer literature has focused much more specifically on the increasing risks of ‘repeated supply shocks’ in strategic supplies such as critical minerals and rare earth metals, all of which are fundamental to any sort of low carbon transition (Lagarde 2023). While there are good economic responses to this issue (see Wagner 2024) – in measures to increase the supply of such low carbon technologies (although typically these are not measures central banks can control) – political actors opposing climate action have been very effective in framing ‘green energy’ as the driver of inflation (Paterson *et al.*, 2023), feeding an environment which has made central banks more cautious in pursuing climate action.

However, as inflation has returned with a vengeance, the idea of ‘greenflation’ has been countered considerably by a third strand in recent analyses, focused on the inflationary implications of *not* transitioning away from fossil fuels. Inflation since early 2021 has been in part driven by rises in oil and natural gas prices, highlighting that heavy reliance on fossil fuels is a flawed strategy for keeping inflation under control. As Isabel Schnabel, a member of the European Central Bank’s (ECB) Executive Board, noted in 2022, ‘fossilflation’ poses a real danger, with the potential to disrupt entire economies (Schnabel 2022).

These three possible climate change-inflation dynamics have opposing implications for climate action: fossilflation and climateflation narratives tend to favour central bank action on climate change, while greenflation ones tend to undermine climate action. Again, there are economic reasons to doubt the latter claim, but politically, this has been the dominant narrative. All three dynamics co-exist in complicated ways, and each also has contradictory effects; this means that climate-related inflation contributes to the critical juncture in climate finance, producing multiple implications for central bank climate action but with its broader implications remaining indeterminate.

How these debates about inflation may play out can be seen in various current contradictory activities among central bankers. Some central banks have returned to a narrow orthodox approach to their mandate – treating their 2% inflation target as the holy grail and bumping interest rates up dramatically in an attempt to squeeze excess demand out of the economy, despite the evidence that it is supply-side factors driving prices up (Bank of England 2022). Given the evidence that cheap money is correlated with greater private sector financial investments in the green transition (EF 2022, Schnabel 2023), the recent return to the 1990s’ approach to monetary policy is likely to slow climate change efforts. The Bank of England also paused its work on developing green capital requirements in order to shift its attention to exploring vulnerabilities in the shadow banking system 2023 (Clarke 2023, Bank of England 2023, Jackson and, Bailey 2023). The Bank later deprioritised climate risks, after having it removed from their mandate by the UK government, to instead focus on its core responsibility of restoring financial stability.

Changing forms of expertise

How these competing accounts of the implications of inflation play out in central bank activity depends in part on the forms of expertise they rely on. Here again, however, we see significant uncertainty about how central banks’ expertise will shape their path forwards in this critical juncture. Some central banks have brought in new sorts of expertise to inform their climate change

action; yet whether these new forms of expertise will overcome the objections from more orthodox economic approaches remains uncertain.

Central banks' authority depends on claims to economic expertise. Central banks' expert knowledge about the economy has justified their enormous influence over the macroeconomy and legitimized their institutional autonomy from direct democratic oversight in Western states. As technocratic institutions committed to the value of expert knowledge, central banks would seem to be well-suited for integrating climate change expertise into their models and decision-making. And as Quorning argues (2023), shifting forms of expertise influencing central bank approaches to climate change have driven some changes in central bank practice. Yet, as she also notes, it is not at all clear that the kind of expertise that central banks possess is particularly useful for effective climate governance: as shown by a Federal Reserve working paper, central banks 'tend to use "speculative language", or language that indicates uncertainty, more frequently in climate-related discourse than in other discourse' (Arseneau *et al.* 2022, p. 3).

As Helgadóttir (2021) shows, the expertise that has most currency in central banks is often of a very specific, highly quantitative kind, reliant on large and complex macroeconomic models that by their nature prioritize stability (equilibrium) over transformation (see also Mudge and Vauchez 2019, Svartzman *et al.* 2021). The global financial crisis did open up central banks to new forms of non-economic expertise, most notably conceptions of complex systems rooted in the biological and environmental sciences (Langley 2015). Some, including Christine Lagarde, have also started to advocate for the need to diversify staff so as to disturb traditional forms of 'groupthink' (ECB 2020, see also Schnabel 2020) in ways that may encourage different policy priorities (Vallet 2022).

As central banks begin the task of addressing the implications of climate change for their policies, their reliance on certain economic orthodoxies has posed challenges. Scholars have shown that the complex forms of uncertainty that climate change raises are difficult to reconcile with the more reductive forms of calculation at the heart of even the most sophisticated macroeconomic models. As various scholars have argued, the 'radical uncertainty' of climate change dynamics make it extremely unlikely that more conventional approaches that seek to integrate climate dynamics into existing models will work (Bracking 2019, Bolton *et al.* 2020, Svartzman *et al.* 2021, Chenet *et al.* 2021, Aitken 2023, Quorning 2023, Maechler and Graz 2024). There has been some move among economists to formulate climate-augmented models (Chen *et al.* 2021), a direction that the ECB has considered in its most recent strategic review (ECB 2021). However, such attempts to revise existing models not only pose technical challenges but, more seriously, fail to adequately address the problems posed by climate uncertainty. This echoes a recent proposal by the Bank for International Settlements (BIS) and the

Banque de France in a landmark report entitled ‘Green Swan’, according to which facing the climate crisis requires ‘alternative epistemologies of risk, grounded in the acknowledgment of uncertainty’ (Bolton *et al.* 2020, p. 3).

However, others argue that central bankers develop and apply expert knowledge in ways that are more complex and nuanced than the theories that they use would suggest. Even Federal Reserve Chairman, Paul Volcker, the architect of the ‘rules-based’ era of central banking that has dominated at least Western central banking for decades, relied on highly experimental approaches to managing the money supply when introducing a monetarist approach to inflation-management in the early 1980s (Best 2022). Langley (2015) shows that in the aftermath of the 2008 global financial crisis, central bankers were forced once again to develop this creative relationship to orthodox economic theory. He shows that this was an era of learning by doing rather than strictly applying economic theories. This improvisational logic is reflected most clearly in the introduction of quantitative easing – buying up assets to keep long-term interest rates down; ultimately, central banks even introduced negative interest rates, which economic theory had previously suggested would not work (Langley 2015).

Some of this adaptation by central banker economists entailed drawing on a more diverse range of expertise; in so doing, central banks drew inspiration from the world of environmental science in their attempt to theorize systemic risks and develop more precautionary forms of macroprudential regulation to avoid future financial crises (Baker 2013, Thiemann 2022). This research served to legitimise pre-emptive interventions in the financial system.

Enhancing central banks’ capacity to integrate and deploy climate science expertise would build on this trajectory established in the wake of the financial crisis. However, one question this raises is whether it makes more sense to bring non-economists into their institutions or to develop their capacity to orchestrate expertise that exists outside of central banks. If central banks are to develop usable forms of knowledge about climate change, they will have to start involving climate scientists and ecological economists. If central banks do not use climate risk models effectively in, for instance, their climate stress testing exercise, they could end up underestimating risks, which would have negative consequences for financial stability (Fiedler *et al.* 2021, Pitman *et al.* 2022). Such fears have already prompted calls to integrate scenario building and catastrophe modelling practices employed in the (re)insurance sector in conjunction with the high level IPCC pathway scenarios employed by NGFS central banks (Ranger *et al.* 2022).

The ECB has claimed to be the first central bank to hire a climate scientist (Elderson 2023a). However, it remains to be seen whether it is possible to bring sufficient expertise of this sort in-house and whether that expertise could be usefully combined with the dominant approaches of existing central

bank experts. The latter approach would enable central banks to mobilise a wider range of expertise with climate science institutions but may raise questions for central banks' expert authority if this means they must rely heavily on expertise that is beyond their own epistemic norms and institutional capacities. As a consequence, whether the forays into more diverse expertise can deliver more effective climate interventions by central banks remains indeterminate.

Attempts at global coordination

The indeterminacy of the present critical juncture is being driven not only by competing interpretations of inflation and different approaches to expertise but also by the uneven experience of attempts to coordinate central bank activities across borders. In recent decades, central bankers have begun to participate in increasingly dense transgovernmental networks (TGNs) that help to shape their views and activities in ways that encourage convergence. As Juliet Johnson (2016, p. 5) puts it, these TGNs act as 'wormholes' involving 'constant transnational interaction, socialization, and ideological reinforcement', fostering common norms among central bankers, particularly on topics around which there exists considerable professional uncertainty. Their influence has been evident in the creation and implementation of various common international regulatory and supervisory standards developed by TGNs such as the Basel Committee on Banking Supervision.

In the case of climate change, convergence in views and activities has been encouraged by the emergence of a new transnational central banking 'wormhole' titled the Network of Central Banks and Supervisors for Greening the Financial System (NGFS). Created in late 2017 by eight central banks and financial supervisors, this body was initially mandated by its founders to 'help strengthen the global response required to meet the goals of the Paris agreement' on climate change and 'to enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments in the broader context of environmentally sustainable development' (NGFS 2017, p. 1). The NGFS has quickly attracted many new members; indeed, by early 2024, the NGFS' membership had grown to include 138 central banks and financial supervisors representing all regions of the globe. It has also issued many reports and recommendations that have encouraged central banks collectively not just to take climate issues seriously but also to approach them in similar ways, including with respect to technical issues such as the development of scenario analyses (Helleiner *et al.* 2024).

But the limitations of the NGFS in fostering a common response from the central banking community to of the current moment are very evident. Its core recommendations are pitched at a high level of generality and are non-

binding. Their implementation has also been very uneven and the NGFS' activities have begun to provoke opposition in places such as the United States from domestic politicians opposed to their central bank's engagement with climate issues (DiLeo *et al.* 2023, Helleiner *et al.* 2024).

At the same time, the significance of the transnational flows of ideas amongst central banks should not be underestimated. For example, at a 2022 conference co-organized by the NGFS, ECB president Christine Lagarde invoked China's new CERF initiative as a model that her colleagues should be considering: 'China is doing it. Why wouldn't we have an open mind about it?' (quoted in Larsen 2023, p. 1213).

Some other transnational and global pressures also play a role in generating the current openness to multiple trajectories. They include transnational market pressures. Many policies that central banks could develop, such as preferential lending facilities, collateral frameworks, or new banking regulatory controls, could generate significant international competitiveness issues for domestic institutions and markets. These kinds of competitiveness issues have encouraged central bankers to deepen international regulatory cooperation in the past, a dynamic that is also now evident with respect to climate-related initiatives. For example, as they seek to strengthen climate-related regulation and supervision at home, ECB officials have simultaneously pushed for wider international coordination in order to foster 'an international level playing field' (Elderson 2023b, Helleiner 2024). At the same time, these kinds of international competitiveness concerns can also prompt domestic opposition to the development and implementation of international standards. In the absence of an internationally coordinated tightening of regulation and supervision, unilateral initiatives in some jurisdictions might also prompt financial institutions to move elsewhere (akin to the carbon leakage problem in industrial emissions). That outcome would not only reduce climate effectiveness but also possibly generate international tensions, akin to the problem of carbon border adjustments (Eicke *et al.* 2021) or solar pV subsidies (Lewis 2014, Hughes and Meckling 2017) in the trade arena.

At the global level, the intensified geopolitical competition integral to the current interlocking crises also renders central bank climate collaboration more difficult. Political tensions between Russia and the West, and competition between China, the US, and the EU, have all become more acute with the COVID-19 and Ukraine crises, straining collaboration in general over climate change. As Christine Lagarde recently suggested, an era of greater geopolitical fragmentation has very serious consequences not only for central banks' inflation-management mandate but more specifically for their ability to pursue it in the context of the current climate crisis (Lagarde 2023). At the same time, these developments also highlight how central banks can quickly be mobilized to serve broader political goals, even when they have a highly independent legal position. Quaglia and Verdun (2023) highlight

a particularly striking example: the way that the independent ECB was quickly enlisted in the European Union's financial sanctions against Russia in ways that seemed to prioritize political objectives over its primary price stability mandate. While national divergence remains a key factor in explaining central banks' domestic policy responses to climate change, it is thus possible to imagine that this divergence may one day be reduced as western central banks become more comfortable with a more activist political role and find common ground to coordinate effectively at a global level.

National variation in central bank governance

If contemporary crises have generated complex pressures on all central banks, creating indeterminacy regarding their approaches to climate governance, the ways this will play out varies according to the existing ways that central banks fit into a broader architecture of economic governance in different states. This variation includes both important differences among western central banks (particularly between European and North American banks), and between western and non-western institutions. If we are to understand how central banks are likely to respond to the current critical juncture in climate politics, we need to pay careful attention to the ways in which different national and regional institutional forms and political pressures shape the policy options.

Variation in climate action

Some central banks have acted extensively in the area of banking supervision, with the most common climate-related action by central banks being the development of stress-testing models that incorporate climate risks (so far adopted by 66 central banks, see FSB and NGFS 2022). These have been conducted in a wide range of jurisdictions ranging from Brazil and Colombia, the UK and the ECB, to Hong Kong, Indonesia and South Korea. However, these stress testing exercises differ considerably in terms of balance sheet assumptions, level of granularity and risk coverage (FSB and NGFS 2022). To date the overriding benefit of stress tests has been to push banks to better conceptualise, measure and understand climate-related risks. In such a way, this compromise allows both regulators and banks to claim 'success', without actually determining how central banks or private institutions will reduce or redistribute such risks, making stress testing among the least ambitious of climate-focused policies, although in some instances, notably the ECB, stress testing has been followed up by more ambitious supervisory initiatives (Smoleńska and van 't Klooster 2022).

Some central banks recently adopted a somewhat more ambitious strategy by tilting corporate asset purchase programs to mitigate climate-related financial risks (Schoenmaker 2021, Dafermos *et al.* 2022a). The results so far are mixed: the ECB's tilting measures, announced in October 2022, have largely been discontinued as the corporate sector purchases have ended (ECB 2023, Elderson 2023b, Gogolewski 2023), while in the UK, the BoE's programme announced in early 2021 has so far seen little effect (Dafermos *et al.* 2022a).

These initiatives show how Western central banks seek to address climate change within existing constitutional structures (van 't Klooster 2022). National institutional variations have thus played a key role in shaping which policies central banks have adopted in response to this critical juncture in global politics. Most Western central banks have been constrained by neoliberal norms of CBI and 'market neutrality,' and have thus limited themselves to questions of banking supervision and risk management (NGFS 2019, van 't Klooster and Fontan 2020).

In China, by contrast, the central bank has not been constrained by neoliberal norms. Instead of being independent of the Chinese government, the PBoC has directly served Chinese official priorities ever since it became the country's central bank in 1983. Specifically, it has supported the Chinese leadership's ambitious development goals with various activist policies, including credit policies such as window guidance. Gerald Epstein (2009) has suggested the term 'developmental' central bank to distinguish this kind of central bank from the 'neoliberal' variety that became dominant in the West in recent decades.

The distinct character of the PBoC has informed its engagement with climate issues. When the Chinese political leadership became more interested in addressing climate change, the PBoC followed this priority directly and with activist policies (e.g. Dikau and Volz 2021b). A recent example is its 2021 creation of a Carbon Emission Reduction Facility (CERF) that offers cheaper capital to banks lending to projects that reduce the country's carbon emissions, including renewable energy projects. This facility was the first of its kind and emerged as a direct response to Chinese president Xi Jinping's (2020) announcement of his goal to make China 'carbon neutral' by 2060 (Larsen 2022, Christophers 2024, pp. 290–93).

Power, capacity, and institutional variation

Underlying this variation in climate action is the considerable variation in underlying institutional settings that central banks find themselves in and the power they therefore have to coordinate climate change responses in specific states and societies. Central banks have tremendous power to shape economies as a whole (Buiter 2014, Braun 2020, Wansleben 2023). How effectively

this power can be translated into climate action at this present critical juncture, however, depends greatly on the central banks' different national institutional forms.

Central banks have three kinds of power: that arising from their own balance sheet of assets and liabilities, from their banking supervision responsibilities, and from their regulatory powers. These powers position central banks at the strategic nexus of public monetary governance and private financial practices (Braun and Gabor 2020), making them capable of significantly influencing financial market conditions and liquidity.

The extent to which central banks are able to make use of these powers depends not only on their degree of independence from the government, as discussed earlier, but also on the breadth of their mandates, the degree of political contestation around their role, and their relative structural power in the global financial system. Central banks' mandates vary in important respects: some, like the European Central Bank and the Bank of Canada, have quite narrow formal mandates focused on ensuring price stability, while others like the Federal Reserve have dual mandates that combine price stability with support for employment. Since the 2008 global financial crisis, a significant number of banks also have responsibility for banking regulation, which clearly expands the scope for many of the kinds of climate-related action that we have discussed in this paper. In addition to their formal mandate, central banks are also in some cases able to *de facto* move into new areas, like climate change, as the ECB has done by defining it as relevant to their monetary and banking responsibilities (Deyris and Bonnet 2022, Siderius 2022).

The capacity of central banks to exercise these powers thus also depends on their broader institutional legitimacy and the degree of public contestation over their role; the ECB's more activist stance towards climate policy was enabled by political support for that shift (Massoc 2022) whereas the Federal Reserve's more conservative stance reflects their response to more divided political pressures (Best 2024). The US is also unique globally in that the dollar is the global reserve currency, giving it structural power in the global economy that no other country possesses. The power of the dollar means that the US does not face the same fiscal constraints as other states, allow it to address climate change through Bidenomics, which relies heavily on industrial policy. This structural advantage reduces the pressure on the Federal Reserve to use its monetary and regulatory powers to address climate change.

Kedward *et al.* (2024) show that there are several ways in which central banks' power has been mobilized in climate action in the West, such as in identifying the financial risks of climate change and in forcing more transparency among banks regarding their exposure to these risks. This power could be used more aggressively to favour a rapid transformation away from fossil fuels by steering demand and investment flows. Yet there is little evidence to date that central banks in Western Europe and North America

have used this power to systematically pursue low carbon investments. While there are various examples (already alluded to) of central bank regulation having effects on investment, a rapid transition nevertheless depends on action from numerous state agencies beyond central banks to shift investment toward net zero.

Moreover, there remain internal tensions between potential central bank activities and other aspects of macroeconomic governance in the West. For example, the recent focus on the provision of fiscal ‘carrots’ to ‘de-risk’ investment into the green transition, in the form of the US’ Inflation Reduction Act and the European Green Deal Industrial Plan, may create perverse barriers to disciplining fossil fuel investments. Governments seeking to catalyse private investment by institutional investors to compete in the green industrial race face strong competing incentives to avoid penalising their fossil-fuel profits. Without robust political coalitions to support dismantling fossil fuel industries, central banks deploying prudential tools to impose harsh penalties on fossil fuel investments thus risks stoking conflict with governments and private investors alike (Gabor 2023).

In countries not limited by CBI, on the other hand, central banks have gone further in mobilizing their power to address the climate crisis. For example, they have been able to set separate interest rates for different types of investments, favouring low carbon investments (Robins *et al.* 2021, Larsen 2022). The PBoC’s CERF has already been noted as an example. Even in the authoritarian Chinese context, however, political constraints exist. At the same time that the PBoC introduced the CERF to promote renewable energy, the PBoC increased its lending to the coal sector, reflecting the enduring political importance of the latter in the country (DiLeo *et al.* 2023).

Nevertheless, these stark differences in central banks’ capacity to mobilize their power to address climate change may not be inevitable. Some Western central banks have been much more activist and developmentally-oriented in the past than they are at present. As the climate crisis deepens, political pressure may build for the neoliberal model of independent central banking to give way to this more developmental approach. That some central banks are extending their risk management approaches beyond climate stress testing, and for example developing preferential lending facilities and introducing differential capital charges targeting ‘dirty’ vs ‘clean’ investments, suggests that we might see this kind of developmental orientation taking hold once again.

Conclusion and implications

Central banks have key roles to play in accelerating climate action, and many have started to act. We have tried to show in this article, through exploring the literature around key themes in the literature on central banking, that the

current moment of intersecting crises of COVID-19, increased inflation, and the Russian invasion of Ukraine has destabilised the conditions under which central banks have engaged in climate action, creating a critical juncture which renders future paths indeterminate. While these crises have threatened climate action in some ways, we argue that the principal effect is to create much more openness to novel ways that central banks can act in general, and therefore on climate change. Those mobilizing for more ambitious climate action now therefore have considerable opportunity to push central banks in new directions.

At the same time, this opportunity is significantly conditioned by national variation in the institutional contexts for central banks. While in the West there is a widespread norm of independence from direct political authority, and a set of related market-liberal norms about the role of a central bank, this is starkly contrasted with central bank roles in other parts of the world, of which the most important for climate policy is China. There, the more direct, and developmentally-oriented, role of the central bank has enabled various climate-focused initiatives that are noticeably more difficult to imagine in the West.

Taking advantage of this openness entails advocating for a range of new initiatives. Perhaps at the most general level, it involves reframing the approaches of central banks in terms of actively shaping patterns of overall economic development in a low or zero carbon direction. Central banks have played this developmental role in the past and do so today in some countries like China, where their role is not simply about price stability, financial risk management, and bank regulation, but rather is about shaping overall development paths through coordinating investment strategies across public and private finance. Clearly, simply emulating the PBoC's approach will be impossible in many countries because of existing institutional structures, and undesirable politically given the authoritarian nature of the Chinese state in which the PBoC's approaches are embedded.

Nevertheless, other states have already become more directly involved in allocating capital over the last decade or so (Alami and Dixon 2023, Alami *et al.* 2024), a process in which central banks are directly implicated (Matikainen *et al.* 2017, Sokol 2022, Bailey 2023). This policy change may make a shift in central bank practice easier to legitimise. Indeed, Thiemann *et al.* (2023) claim some of this shift away from economic orthodoxy was already underway prior to the current intersecting crises. The broad shift towards industrial strategy across OECD states (Lavery 2023) and beyond (Schindler *et al.* 2022) during the 2010s, intensified by responses to COVID-19 and the Ukraine crises, is broadly consistent with a potential shift towards central bank developmentalism. A full-blown 'central bank climate developmentalism' would intensify and extend many of these shifts towards strategic use of central bank power to direct decarbonisation processes.

These trends might also enable climate interventions more informed by the political strategies of just transition movements, given that central bank orthodoxies of the last 40 years have been associated with intensifying a range of social inequalities, notably class and gender (Green and Lavery 2015, Clarke and Roberts 2016, Young 2020, Stephens and Sokol 2023, forthcoming). Feminists in particular have made significant proposals for ‘feminist Green New Deals’ that would entail specific policy interventions, for example to complement green gilts with ones focused on expanding the social economy (Nikolaïdi 2022, Powell 2023).

Future research can both investigate whether this shift to ‘central bank climate developmentalism’ which enables just transitions is actually unfolding, but can also inform strategies to pursue this potential outcome. This review article points towards the need for a new research agenda that links scholarship on the political economy of central banks and global climate governance focused on the different dynamics of the current critical juncture. There is a pressing need for scholarship that assesses how the indeterminacy that we identify here plays out in different contexts: where do we see the current openness leading to new central bank policies on climate change and where do we see those possibilities being closed off? How will the various themes we identify – competing accounts of the relationship between climate change inflation, forms of expertise on which central banks draw, and attempts at global coordination of central bank activity – be resolved and shape future central bank action on climate change? What are the institutional and political drivers that would help us understand these variations? Our findings also underline the need for new scholarship tracking the effects of the current crises on the forms and extent of CBI, as well as the implications of these dynamics for climate action.

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