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From price stability to climate stabilization?

The political economy of green central banking

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De la stabilité des prix à la stabilisation du climat ? L'économie politique du verdissement des banques centrales

Jérôme Deyris

Résumé en français [1]

Depuis quelques années, les banques centrales manifestent un intérêt croissant pour les dynamiques liées au changement climatique. D'une part, leurs missions de supervision financière les poussent à évaluer l'ampleur les risques financiers climatiques et d'encourager leur bonne intégration par les acteurs du marché. D'autre part, leur objectif de stabilité des prix les oblige à examiner les conséquences de ces dynamiques pour l'inflation et à repenser les canaux de transmission de leur politique monétaire. Pour autant, le phénomène de 'verdissement' des banques centrales recouvre des réalités bien diverses. Ainsi, tandis que certaines banques centrales développent des politiques proactives ambitieuses visant à réorientation les flux de capitaux pour faciliter la transition bas-carbone, d'autres demeurent entièrement indifférentes à ces questions. En cherchant à comprendre les déterminants ainsi que les conséquences de ce phénomène différencié, notre thèse vise à déplier l'économie politique du verdissement des banques centrales.

Mots-clé : banques centrales ; changement climatique ; transition bas-carbone ; économie politique ; économie institutionnaliste

[1] Cette thèse est rédigée entièrement en anglais. Un résumé long, adapté du chapitre introductif de la thèse, est disponible en version papier à la bibliothèque de l'Université Paris Nanterre, ainsi qu'en ligne sur le site personnel de l'auteur.

From price stability to climate stabilization
The political economy of green central banking

Jérôme Deyris

Abstract:

In recent years, central banks have shown a growing interest in climate-related dynamics. On the one hand, their financial supervision missions force them to evaluate the magnitude of climate-related financial risks and to encourage their proper integration by market actors. On the other hand, their price stability objective compels them to analyze the effect of climate and transition dynamics on inflation as well as to reflect on the transmission mechanisms of their monetary policy. That said, the phenomenon of green central banking encompasses very different realities. While some central banks develop ambitious proactive policies aimed at redirecting capital flows to facilitate the low-carbon transition, others remain entirely indifferent to those issues. By seeking to understand the determinants as well as the consequences of this differentiated phenomenon, our thesis aims to unfold the political economy of green central banking.

Keywords: central banks ; climate change ; low-carbon transition ; political economy ; institutionalist economics

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CHAPTER I

General introduction

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1 Introduction

Starting my PhD in September 2019, my aim was to help reach a better understanding of the adverse consequences of the transition to a low-carbon economy on financial stability. The road to net-zero is indeed likely to be bumpy. Unlike previous socio-technical transitions that were usually sectoral, profit-pulled, and self-paced, the low-carbon transition needs to be global, policy-pushed and time-constrained. In fact, we have consistently fallen behind on climate targets, reducing the chances of a smooth transition and increasing the scale of future required destruction of carbon-intensive capital. Having advanced the means of payment *ex ante* to benefit from augmented payback *ex post*, financial investors will bear losses proportional to their misguided bets on 'sunset' industries, which could escalate into a financial crisis.

Against this background, I had laboriously and painfully prepared a thesis project during the last weeks of my master's degree. The proposal included three chapters. First, my goal was to provide a quantification of financial losses to be expected due to the low carbon transition, relying on sectoral input-output matrices paired with financial data to assess the network effects of a carbon shock. Second, I intended to conduct a sociological fieldwork on how private financial actors integrated those new risks in their portfolio management operations. Last, I planned on discussing the policies financial regulators and supervisors should be implementing to respond to this challenge. Everything was on track, and I still think with a few years of hindsight that this research agenda was sound.

However, as I write this introduction, I must disclose that none of the subsequent chapters ended up conforming to this plan. In just a few years, my thesis moved further and further away from the original proposal. In my defense, I could argue that such drifts are at the very essence of research: literature develop quickly, especially on such trendy topics, and research gaps are constantly shifting, which requires scholars to adapt along the way. Besides, the *in media res* character of my focus made all the more complicated to delimit once and for all the boundaries of a multi-year project. But, in addition to those two sensible arguments, I argue

that this shift was largely a feature of chance. Fieldwork opportunities, reading encounters, developing thematic and methodological appetites, as well as unplanned collaborations have gone a long way in driving my thesis further away from the well-defined research questions and meticulously prepared empirical strategies laid out in my initial proposal. For better or worse, this manuscript only remotely addresses the questions initially raised.

Of course, my general interest in the climate-finance nexus remains, and the shift in focus has remained reasonable. On the one hand, the emphasis on the low-carbon transition impacts on financial stability was gradually broadened for a less unidirectional understanding of the interactions between climate change and finance. On the other hand, the initial focus on the financial system as a whole was narrowed, making the role and instruments of central banks the focal point of this essay. Thus, the final focus of this thesis is that of *green central banking*, understood as the intrusion of climate-related issues into central banks' agenda. The aim of this manuscript will be to understand how, when and through which channels this alien issue was able to make such a dramatic entry into such technocratic institutions, but also to better understand how and why this recent and global trend encompasses such variegated approaches in terms of both objectives and instruments. The diversity of green central banking regimes has important political economy roots, but also important political economy implications, which will be examined throughout this thesis.

Although the main chapters of this essay were originally written as independent articles, I hope that its overall coherence will be apparent to the reader. The purpose of this introductory chapter will be to facilitate this coherence. To this end, the remainder of this chapter is divided into five sections.

In section 2, we[1] explain why we focus on climate change (among other environmental crisis) and on central banks (among other financial actors). In section 3,

[1]In the remainder of the manuscript, I will predominantly employ the pronoun *we* rather than *I*. This is for two main reasons. First, because three of the subsequent chapters are based on collaborative work. Second, because, through a difficult to disentangle mix of force of habit, desire to mimic academic style, and concern for overall coherence, I have also preferred using *we* whenever possible, even in the three single-authored chapters.

we briefly walk the lector through the literature on climate-related risks. We recall how the climate change topic entered the financial and central banking sphere, and how private and public institutions reacted to that shift. We show how both the economic literature and the policy proposals have been mainly focusing on a unidirectional understanding of the problem, focusing on the threatening impact of climate change on financial dynamics. We therefore propose to flip the focus in section 4, highlighting how financial dynamics influence in turn climate change. Adopting a monetary view of the economy rather than a real view opens the door to alternative types of policies, pursuing a proactive 'promotional' greening rather than having a defensive 'prudential' approach of climate-related dynamics. After this broad overview, section 5 narrows back on the rest of the thesis. It presents our main research questions, the theoretical foundations of our work, our empirical materials as well as the methods used throughout the manuscript. Finally, section 6 provides an outline of subsequent chapters.

2 A focus on green central banking

This section aims at introducing our object of study - green central banking - by clarifying why we focus on the climate crisis and on central banks.

2.1 Planetary boundaries and the focus on the Climate Crisis

> *In a hundred or two hundred years the world, being criss-crossed by railways, by steamships, being covered with factories, will release trillions of cubic metres of carbonic acid and carbon monoxide, and as the forests will have been destroyed, these hundreds of trillions of carbonic acid and carbon monoxide may well disturb the harmony of the world.*
>
> (Huzar, 1857, p99, our translation)

One hundred and fifty years later, Eugène Huzar's conservative pessimism has unfortunately been borne out, and climate change is considered by many as the

challenge of the 21st century - or, in the words of economist Nicholas Stern, as 'the greatest market failure the world has seen' (Stern, 2006, p. 8). Climate change is driven by greenhouse gas emissions resulting from human economic activity. When the concentration of CO_2 in the atmosphere was first measured by Charles Keeling in 1958 at the Mauna Loa observatory of Hawai, its level was around 280ppm. After a few years of observation, he uncovered an upward dynamic beyond seasonal variations in the concentration of carbon dioxide in the atmosphere, a trend that has kept accelerating ever since. When the author of these lines was born, the concentration in CO_2 was measured at 359ppm. When this doctoral work began, it was around 409ppm. By the time it finished, it had reached 420ppm. Such a level is unseen on Earth since the Pliocene, 4 million years ago (Bonneuil and Fressoz, 2013).

Climate change is not the sole problem facing mankind. Rockström et al. (2009) identify nine planetary boundaries which, if crossed, would threaten the 'safe operating space for humanity'. They distinguish between planetary boundaries that are global in nature (climate change; ocean acidification; ozone depletion), and those whose impacts are local or regional in scope, but could become planet-wide (disruption of biogeochemical cycles of nitrogen and phosphorus; disruption of freshwater cycles; land-use change and deforestation; damage to the integrity of the biosphere and to biodiversity; atmospheric particulate load; introduction of new man-made entities - such as chemical pollution - into the environment). These nine planetary boundaries have to be addressed globally, which make them difficult to govern. These limits are also interdependent: exceeding one of them can have dramatic effects on the others, so that phenomena of propagation of disturbances from one cycle to another are common (known as positive retroaction loops). However, our thesis will focus primarily on one of these limits: climate change. We wish to defend this narrow focus on four grounds.

First of all, this was a pragmatic choice. We considered necessary to circumscribe the subject in order to avoid a dispersion in multiple directions which would surely have led to an often superficial treatment of the question. PhDs that manage to encompass the multiple facets of capitalism's environmental crises are scarce. When

they succeed to do so, it is often thanks to a strong material anchoring around well-defined materials, practices and technologies, allowing to unfold the various consequences of a specific economic activity on a plurality of planetary boundaries (see e.g. the thesis of Magalhães, 2022, with a special focus on concrete and its related extractivism, or the thesis of Vogl, 2023, on the decarbonization of steel). This is unfortunately not the case for our object of interest, as finance encompass very broad and different activities, each with their own environmental impacts. Finance (in general and in its contemporary form in particular) proceeds from a movement of increasing dematerialization and deterritorialization [2] as financial products gain in complexity, rendering it ever more difficult for researchers - as well as the practitioners who handle them - to trace their material footprints. This task is nonetheless not impossible, and several researchers have already began to deliver on this tedious mission (see section 4 of this chapter). But to our knowledge, this work has mainly focused on climate change, and other planetary boundaries have so-far remained largely off-scope.[3]

Second, focusing on climate change can be seen as strategic. First, it is the global environmental boundary that we are closest to crossing, according to the current state of knowledge (Boutaud and Gondran, 2020, p32-34). Some disruptions of the nitrogen and phosphorus cycles or losses of biodiversity are at even more alarming levels, but only on a local or regional scale. Second, climate change sits at the crossroad of all planetary boundaries, being 'probably the process most likely to impact the other planetary limits and to be impacted in return by their evolution' (Boutaud and Gondran, 2020, p50). This implies that alleviating the climate crisis has a wide range of co-benefits with respect to other global limits. For example, ocean acidification is largely caused by the same factors as global warming (CO_2 emissions), and features a two-way positive feedback loop with climate change (ocean acidification accelerates climate change, which is in turn accelerated by ocean acidification

[2] Of course, this process of *abstraction* never fully succeeds: financial 'fictious' capital remains ultimately bound to physical capital, and financial crises are triggered precisely when this link tightens and reminds the financial agents of its existence in a brutal manner (Durand, 2014).

[3] The only exception we know is very recent: see Hadji-Lazaro (2022) exploiting augmented input/output tables, or the work on biodiversity-related impacts discussed below.

causing a decrease in ocean CO_2 storage capacity). Clean water cycles disruptions and biodiversity losses are also greatly driven by global warming. While we do not intend to minimize the danger of crossing other planetary limits, this strategic concern might explain our focus on this phenomenon, which we concede participates in the relative overshadowing of other environmental crisis in the public debate.

This leads us to our third argument to focus on climate change, which is empirical. Indeed, financiers and central bankers began to integrate the climate change into their practices, but have not done so for other planetary limits. Although a few central bankers have begun to talk about 'biodiversity risks' in their speeches in the last two years of this thesis, this new topic remains very marginal, not commensurate with the rise of the climate topic, and has not yet triggered any changes in central bankers' practices (Kedward et al., 2022b). Yet, it is easier - and more fruitful - to research an existing empirical phenomenon than its absence. Otherwise, the danger can quickly become one of only discussing the normative (what central banks should do) rather than the positive (studying what they actually do). If social sciences are to provide a critical perspective on contemporary capitalism and its regulation [4] institutions, it should be first and foremost by analyzing the contours of what exists, before discussing what has been left out. In this regard, our most empirical-focused chapters (chapter III and chapter IV) would not have had a great deal of material to discuss if our research had been focused on other planetary boundaries.

Fourth, this choice is theoretical. Indeed, while this thesis is primarily focused on the integration of climate change by central bankers, we believe that many of its main insights can be useful for thinking about other environmental limits. The theoretical framework proposed in this introductory chapter and extended in chapter II could well be applied to future developments that would see other environmental issues enter the agenda of central bankers. Similarly, the critical discussion of the institutional disembedding of central banking proposed in chapter V is not limited to the climate change issue. Contemporary central banking is distributive, and therefore political. Whether it is a question of redirecting financial flows to facilitate

[4] Here understood in the broad sense of the French *Régulation* Theory (see Boyer, 2015).

the low-carbon transition or to alleviate the burden on other planetary limits, the question of democratic legitimacy remains.

2.2 Financial capitalism and the focus on Central Banks

In this subsection, we explain our focus on central banks. Again, our point is not to pretend that this choice is natural, nor that it is better than others. In fact, the financial industry is packed with private and public agents whose balance sheets are at risk due to climate-related dynamics and that hold powerful levers to deliver on the low-carbon transition. Nevertheless, we had to make a decision, and focusing on central banks appeared as relevant for three reasons.

First, because central banks are - by design and by definition - at the core of the monetary and financial regime. At the top of the balance sheet hierarchy, holding the ultimate liquidity and sovereign monetary power, central banks are the guarantor institution of money. Thus, the 'trade of promises' (Giraud, 2014) on which finance as a whole is based relies on the capacity of central banks to ensure sufficient stability of the currency to allow economic agents to project themselves into the future and to engage in illiquid investments. Besides, as lenders of last resort, central banks are the only institutions capable of keeping the financial system afloat in times of crisis through their unlimited monetary creation powers. In short, central banks are the core institutions for the regulation of the monetary and financial system as a whole, ensuring both price and financial stability, to a point they are sometimes labelled as 'masters of the universe' (Diessner & Lisi, 2020). These responsibilities and policy leverage make these institutions key players in case climate-related risks cause a financial crisis due to the absence of *ex post* validation of certain financial claims, as elaborated in section 3 of this chapter.

Second, because beyond managing climate-related risks and ensuring price and financial stability, central banks can be expected to reach for broader objectives. As recalled by Monnet (2021a), public central banks are tied to the birth of the Welfare State, and hold a crucial role of insurance and reduction of economic uncertainty. In this respect, they are not doomed to focus solely on the narrow issue of price and financial stability, but can play (and have done so in the past) much more important

roles in the allocation of capital, pursuing very broad objectives such as industrial policy, trade policy, financial policy, or even budgetary policy (see e.g. Bezemer et al., 2018; Mikheeva and Ryan-Collins, 2022; Monnet, 2018). In fact, they still do in many countries around the world, as it will be discussed throughout this thesis. Thus, central banks could prove to be crucial in the counter-movement to re-embed finance within planetary boundaries, as elaborated in section 4 of this chapter.

Third, because the scope of action of central banks has changed dramatically over the last fifteen years, effectively throwing them into the climate battle. As we will discuss more in depth in chapter V, central banks have indeed increased their footprint in financial dynamics, embracing macroprudential responsibilities, engaging in direct asset purchases, sovereign debt management operations, and differentiating refinancement operations for commercial banks. This activism has put them in the front line by revealing the distributive nature of their interventions, particularly with regard to climate change. For example, the decisions central banks make in their asset purchase programs (Dafermos et al., 2020b; Matikainen et al., 2017) or in the design of their collateral frameworks (Dafermos et al., 2020a) have important consequences for the low-carbon transition, often favoring the largest (carbon-intensive) incumbents, replicating yesterday's economy rather than preparing for tomorrow's. Thus, if we are a long way from the time when some central banks militated in their speeches against carbon taxes (see chapter IV), it is still rather unclear where the integration of climate change will lead modern central banking.

Although our thesis focuses on one of the usual suspects of International Political Economy (IPE) - central banks are indeed a *legacy* actor, as put by O'Connell and Elliott (2023) - our topical focus is quite new. Climate change remains an under-investigated topic in the IPE of finance (see LeBaron et al., 2021; O'Connell and Elliott, 2023), and we hope to contribute with this manuscript to answering Langley and Morris (2020)'s call to assess whether central banks could be turning into 'climate governors of last resort'.

3 Financial stability and climate dynamics

Now that we have delimited our object of interest, we provide a brief historical account of how climate change considerations entered western financial and central banking spheres. We then present the emerging literature around climate-related risks for the financial system. Last, we review the usual policy responses discussed to meet this challenge.

3.1 The slow emergence of a 'carbon bubble' narrative

The first thing to highlight is that the emergence of the climate change topic in the financial sphere was made possible through its translation as a financial risk. This fact is not surprising *per se*. Financial actors have always tried to identify how extra-financial features could impact their business. For example, there is a large literature seeking to determine whether firms that score higher on ESG (environmental, social and governance) criteria perform better than their less virtuous counterparts. What may seem surprising, however, is that this translation to risk was initially not based on the premise that climate change might *in itself* pose a threat to economic activity, but on the concern that *society's response* to this challenge might be a source of financial risk.

Indeed, the low carbon transition is bound to be disruptive for the fossil-fuel industry, which may cause financial losses for investors who had invested in shares or bonds, and to banks that granted credit to such firms. The reasoning is the following: to meet climate targets, there is a finite global carbon budget, i.e. a maximum amount of hydrocarbons that can be burnt while staying below climate targets (Meinshausen et al., 2009). According to McGlade and Ekins (2015), 33% of oil, 49% of gas and 82% of coal reserves will have to remain untapped if global warming is to be kept below 2°C above pre-industrial levels. Yet, as of 2011, the top 200 fossil fuel companies had enough reserves on their balance sheets to exceed the global carbon budget (Leaton, 2011). If the climate targets are to be met, the value of these excess reserves of 'unburnable carbon' will fall to zero, wiping out a significant portion of the market capitalization of these companies and rendering

their previously emitted bonds non-performing. In short, financial markets may be hosting a 'carbon bubble'. A new concept was born: that of 'stranded assets', i.e. 'those investments which have already been made but which, at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return' (Caldecott, 2017).

In fact, this narrative was not new: Krause et al. (1992) already made this point 30 years ago. They had calculated a carbon budget, and discussed the different ways of sharing remaining emissions across countries and sectors with climate justice considerations (taking into account historical emissions). They also already provided a first account of possible financial losses due to the write-off of fossil fuel reserves in private firms' balance sheets. However, it took another 20 years for this 'carbon bubble' narrative to really take hold in the financial sphere, thanks to the activism of former City sustainable finance advocates converted to NGO activists. With their knowledge of the financial industry, using the right vocabulary and presenting the issue not only as a factor to be taken into account to ensure individual profitability, but also as a threat to financial stability as a whole, Mark Campanale and Nick Robins started lobbying to put the 'unburnable carbon' issue on the agenda of central banks. With their new organization called 'Carbon Tracker', they released their first report in 2011, and were able to make their carbon bubble idea popular in financial networks thanks to a careful communication plan and a successful search for media coverage, sending their report to Naomi Klein and securing an article by journalist and author Bill McKibben in the Rolling Stones Magazine (Kupzok, 2022, p14).

To get to the ears of central bankers, Carbon Tracker also benefited from political relays.[5] Indeed, Carbon Tracker's activism initially did not pay off. The NGO sent a letter in January 2012 to the Bank of England that was co-signed with prominent academics and public figures. Mervyn King (Bank of England's Governor at that time) responded in a letter the following month, appreciating the interest of the issue, and organizaing a meeting with Andy Haldane (Executive Director of Financial

[5]This paragraph is based on archives of email correspondence provided by a member of Carbon Tracker, whom I thank, and on public second-hand sources

Stability). The meeting went well, and led to the issue being included in the Bank of England regular market intelligence gathering questionnaire to the financial industry, and being discussed in a Financial Policy Committee meeting in June 2012. But in the end, nothing significant happened. Industry respondents denied the pertinence of such a risk, and the issue was not raised again for more than a year... Until the Environmental Audit Committee of the British Parliament (in 2013) and British energy secretary Ed Davey (in 2014) started to pressure the head of the Bank of England to further investigate the issue and enforce new information disclosure rules regarding the carbon vulnerability of investors' portfolios. In a letter dated July 4, 2014, Mark Carney (Mervyn King's successor) responded to this audit by reasserting that the Financial Policy Committee did not consider the carbon bubble a significant risk.[6] The letter went on to state that the medium-term priorities for financial stability were different, implying that the Bank of England considered the issue closed for the next 12 to 18 months. Despite political support and pressure, the Bank of England seemed to consider the 'carbon bubble' issue as not relevant.

3.2 When climate-related risks became mainstream

Yet, six months after this unenthusiastic letter, at a World Bank closed-door event, Mark Carney gave a speech entirely dedicated to climate-related risks and their impact on financial stability. While the full text was never publicized, sources who attended and press reports attest that this speech was already very similar to the infamous speech he gave a year later, entitled '*Breaking the tragedy of the horizon - climate change and financial stability*' and that marked a milestone in the discussion of the issue (Carney, 2015). Although this speech was far from the first central bank discourse to address the issue of climate change in a thorough manner (see chapter IV), it marked a very important step in the mainstreaming of climate change in central banking spheres for three main reasons.

[6]The letter reads: 'In the period since February 2012 I note that risks to financial stability from a potential mis-pricing of carbon assets have not been raised by respondents to the Bank's bi-annual Systemic Risk Survey, and have not been cited as a concern by market contacts in the course of the Bank's regular market intelligence gathering'

The first is that this speech does not only talk about unburnable carbon and the carbon bubble, but generalizes the problem of *transition risk* to all activities that might suffer in the process of adjustment towards a low-carbon economy. This generalization is important because fossil reserves are only a small part of the costs of the transition. Beyond unburnable fuels and the associated capital used for extraction (e.g. oil rigs), transportation (e.g. pipelines) or transformation (e.g. refineries) that may be discarded prematurely, the transition will have major downstream repercussions, generalizing the issue of 'stranded assets' in the economic fabric. In the power generation sector, some fossil-based power plants expected to operate for 40 years under normal circumstances may be forced to close prematurely (Cui et al., 2019; Pfeiffer et al., 2018; Pfeiffer et al., 2016). In the manufacturing sector, chemical and plastics industries need oil as an input, whereas steel or cement industries need coal or gas as a combustible in their furnaces to reach adequate temperatures. Tong et al. (2019) show that cement manufacturing will be a major source of stranding, most notably in China, which produced 49,6% of the world's raw steel and 57,3% of the world's cement in 2016. In the housing sector, inefficient boilers and other fossil fuel-based heating systems will have to be phased out. As heating costs rise, and the need to save energy increases, poorly insulated houses and buildings will also loose value (Muldoon-Smith and Greenhalgh, 2019). In the transportation sector, the phasing out of oil and heavy fuels will bring to a halt a large number of vehicles rendered unusable, from container ships to personal combustion vehicles, not to mention the aviation and road haulage industries. Finally, it should be noted that stranded assets may cause collateral damage in other sectors disregarding their respective carbon intensity. Indeed, the network effect of complex value chains could lead to 'stranding cascades', triggering losses in sectors downstream not because of their own emissions, but due to their inter-connection and interdependence with activities at risk of stranding (Cahen-Fourot et al., 2020; Cahen-Fourot et al., 2021). In short, the move from a narrow focus on fossil fuel reserves towards a broader perspective on transition-led losses was a welcome one.

The second reason is that this speech did not focus only on 'transition risk', but also introduced two new types of climate-related risks, recognizing that the transi-

tion to a low-carbon economy is not the sole climate-related problem for financial stability. First, Mark Carney introduced *liability risk*, defined as the impacts that could arise tomorrow if parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible. In short, this represents a form of retroactive and court-based internalization of externalities that would threaten carbon-intensive activities - and the financial investors that hold their shares or bonds.[7] Although liability risks have been gradually merged with transition risks over time, this initial categorization allowed Carney to emphasize that even if political authorities fail to regulate and achieve the transition to a low-carbon economy, climate-damaging activities should not be considered immune from future repercussions, therefore encouraging financial investors to double-weight their investment decisions in carbon-intensive companies. Second, Mark Carney rightly pointed out that climate change ifself, if left unmitigated, will turn into a source of *physical risk*, as climate and weather-related extreme events might disrupt income flows or destroy capital stocks. Once again, this was not a new idea, and central bankers from climate vulnerable countries had already been discussing this issue at length over the previous years (see chapter IV), but it contributed to forge an ideational framework that holds to this day.

This represents the third reason why this speech matters: it was not given by just anyone, but by the Governor of the Bank of England, and director of the Financial Stability Board at the time. Weighing in with all his symbolic capital, Mark Carney's speech was not only quickly mimicked by other central bankers, notably European ones (see chapter III and chapter IV), but also had a lasting influence on the way the debate is framed. Indeed, beyond the categorization of climate-related risks, this speech also proved to be the starting point of a long path dependency regarding the discussed policy solutions. For Mark Carney, the insufficient consideration of climate change by investors can be explained by a temporal mismatch between investors' return maximization horizons and the mostly-long-term consequences of climate change - the 'tragedy of the horizon'. This diagnosis can be first

[7] As pointed out to Gunderson and Fyock (2022), such favorable climate outcomes are unfortunately closer to wishful thinking than to reality.

criticized in that it overlooks a second factor of misalignment of interests: since climate change is a problem of global externalities, the costs of damage are not only temporally distant, but above all rest on different actors. But most of all, what is intriguing is that Carney's diagnosis does not inform his policy proposals. Indeed, he argues that the solution must come from the private sector, 'for the market, by the market', and that the only role of central bankers and financial regulators should be to improve transparency between firms, investors and savors regarding climate-related indicators such as carbon footprints and forward looking decarbonization plans (Carney, 2016). In short, he argues as if the micro-foundation for climate blindness in financial markets were imperfect or asymmetric information, rather than the short-sightedness inherent to private short-term profit-seeking. And yet, despite this obvious discrepancy between the diagnosis and the proposed political solution, this 'informational' narrative proved highly effective in the years that followed (see chapter II).

3.3 A growing academic and policy concern

Ever since, climate-related risks received an increasing degree of attention by central bankers, financial actors and scholars. In this section, we propose a quick review of the academic and policy literature on this issue. The aim is not to be exhaustive, but to map the main areas of interest in a literature that remains very recent (Akomea-Frimpong et al., 2022; D. Zhang et al., 2019).

First, the literature seeking to quantify the potential losses associated with 'stranded assets' in the real economy has grown substantially, and the magnitude of the needed phase-out is now better understood. Since 2015, the 'carbon budget' has shrunk significantly as extraction continued (IPCC, 2021; Millar et al., 2017). To keep a 50% chance of limiting global warming to +1,5°C, Welsby et al. (2021) show that it is now 60% of oil and gas and 90% of coal must remain unextracted (as compared to the 33% of oil, 49% of gas and 82% of coal reserves estimated by McGlade and Ekins, 2015 a few years prior). As a result, the amount of currently-owned reserves characterized with 'contested assetization' (Janzwood et al., 2023) also raised, strengthening the incentives for fossil fuel producers to compete in a

'race to the bottom' of their wells to make sure that they would not be at risk of becoming unburnable carbon (Sinn, 2012; van der Ploeg, 2020; van der Ploeg & Rezai, 2020). The literature has also widely expanded with respect to downstream stranded assets. By computing 'committed emissions' embedded in fossil-based capital, academics have shown that a significant - and growing - share of the productive infrastructure will need to be decommissioned early in order to meet climate targets (for a literature review, see Fisch-Romito et al., 2020).

This increased knowledge has then been incorporated in financial-focused research, trying to assess how these disruptions in the real economy due to the transition to a low carbon economy might lead to losses in financial portfolios through multiple transmission channels (for a literature review, see Daumas, forthcoming). While initial estimates provided by Weyzig et al. (2014) were limited to measuring the share of banks', pension funds' and insurers' assets invested in fossil fuel activities, the literature has progressively incorporated other types of assets at risk of stranding in 'climate-policy relevant' sectors (Battiston et al., 2017). Indeed, although exposure to the fossil fuel extraction sector is small, the inclusion of downstream stranding cascades vulnerabilities led to a significant reassessment of the scale of the problem (Cahen-Fourot et al., 2020; Cahen-Fourot et al., 2021). In addition to incorporating stranding cascades in the real economy, this literature has also begun to incorporate contagion effects in the financial sphere. Indeed, some financial institutions may experience significant losses despite their low exposure to the most carbon-intensive sectors if their balance sheet are significantly exposed to other climate vulnerable financial actors. Such financial contagion effects are in fact likely to be more significant than the first round effects (Roncoroni et al., 2021). Since the seminal study by Batten et al. (2016), the literature has also made considerable progress in estimating potential losses from the physical impacts of climate change (see e.g. Gourevitch et al., 2023). The latest methodological advances now allow for asset-level estimates of climate change's acute and chronic impacts on firms revenues, financial valuation and investors' risk profiles (Bressan et al., 2022). A recent European Central Bank paper reveals that more than 80% of European banks

could be vulnerable to such climate impacts (Emambakhsh et al., 2022). [8]

The next step in this research effort was to quantify the extent to which climate-related financial risks are currently priced-in. Financial assets can be traded on secondary markets, and their value fluctuates according to the expectations of agents who continuously reassess the relevance of past financial claims. Therefore, as climate-related dynamics accelerate, the price of assets affected by physical or transition risk may experience drops in value as additional risks are factored in by market participants. The first attempts to measure the reaction of markets to these new climate risks led to systematically worrying conclusions. For example, Griffin et al. (2015) showed that the value of fossil fuel companies was little or not affected by events such as the release of the seminal Meinshausen et al. (2009) carbon budget study, the 2012-2013 rise of the 'unburnable carbon' narrative in the media, or the 2015 Paris Agreement. Monasterolo and de Angelis (2020) also pointed out that the Paris agreement created only a small increase in green asset prices, but no significant effect on the most carbon-intensive assets. Görgen et al. (2019) and Bernardini et al. (2019) both found that the stocks of firms most exposed to transition risk offer lower returns, which is inconsistent with a risk premium. This finding is also true in credit dynamics. For example, Delis et al. (2019) showed that while banks have began to incorporate small risk premiums for credits to fossil fuel extraction firms, they have only been doing so since 2015 and in insufficient proportions. Huang et al. (2019) found similar results: after the materialization of a transition policy shock, Chinese banks did apply a spread to the most polluting firms, but not large enough to compensate for the sharp increase in the default rate of these firms. More recent work hint that the pricing has since began, but is still insufficient, leaving climate-vulnerable and carbon-intensive assets still overvaluated (see e.g. Alessi & Battiston, 2022; Bolton & Kacperczyk, 2022; Bua et al., 2021; Capasso et al., 2020; Hong et al., 2019). A small, but burgeoning literature seeks to shed light on the reasons for this myopia regarding climate risks, and points in particular to institutional factors (Christophers, 2017; Silver, 2017; Thomä & Chenet, 2017) and to

[8] For a comprehensive review of literature on both physical and transition risks and their impacts on financial actors, see (Campiglio et al., 2022).

the short-termism of financial market participants (Louche et al., 2019; Silver, 2017; Thomä & Chenet, 2017). It highlights that transparency and information disclosure may not be sufficient to put financial flows back on track with climate objectives (Ameli et al., 2020; Chenet et al., 2021).

Finally, this body of research has led to a prolific debate on how central banks, regulators and financial supervisors should respond to climate-related financial risks in order to avoid a 'green swan' (i.e. a highly unexpected and destructive climate-related event leading to a financial crisis, see Bolton et al., 2020) or a 'climate Minsky moment' (i.e. a fire-sell contagion leading to a market collapse caused by a revision of transition expectations, see Carney, 2015). As we will see in more detail in chapter II, most climate-related financial policies are based on improving information and transparency related to climate-related risks. For example, policymakers have implemented disclosure guidelines (see e.g. ECB, 2020b), disclosure requirements (see e.g. the French 2015 law (Mason et al., 2016)) or mandatory supervision exercises dedicated to climate-related financial risks, known as 'climate stress-tests' (see e.g. Bank of England, 2019b; Baudino and Svoronos, 2021 for examples, and Baudouin, 2023 for a critical discussion).

Some policy proposals argue that regulators and supervisors should go beyond these *informational* policies by reforming prudential regulations. This could be achieved by weaponizing existing instruments to force carbon-intensive banks to increase their capitalization (e.g. using the systemic risk buffer, see Grunewald, 2023; Monnin, 2021) or by modifying existing regulations to incorporate capital surcharges for the most exposed institutions (see e.g. Campiglio, 2016; Campiglio et al., 2018; D'Orazio & Popoyan, 2019; Le Quang & Scialom, 2022). However, such interventionist and market-shaping policies have not yet been implemented, despite two recent attempts in that direction. First, a high-level Task force about climate-related financial risks was launched in 2020 by the Basel Committee on Banking Supervision (BCBS) to assess whether the current Basel III accords needed to be modified to incorporate climate-related risks. The task force concluded by the negative (BCBS, 2022). Second, the ECB asked the European Commission for an improvement of the flexibility of the existing macroprudential buffers in the face of

emerging (climate-related) risks. So-far, the request has been not been followed by any effect (ECB, 2022a).

What is important to note at this point, before moving to the next section, is that such climate-related financial policies are all *prudential* in nature, in the sense that they all aim to improve the robustness and soundness of the financial regime in the face of disruptive climate-related dynamics.

4 Climate stability and financial dynamics

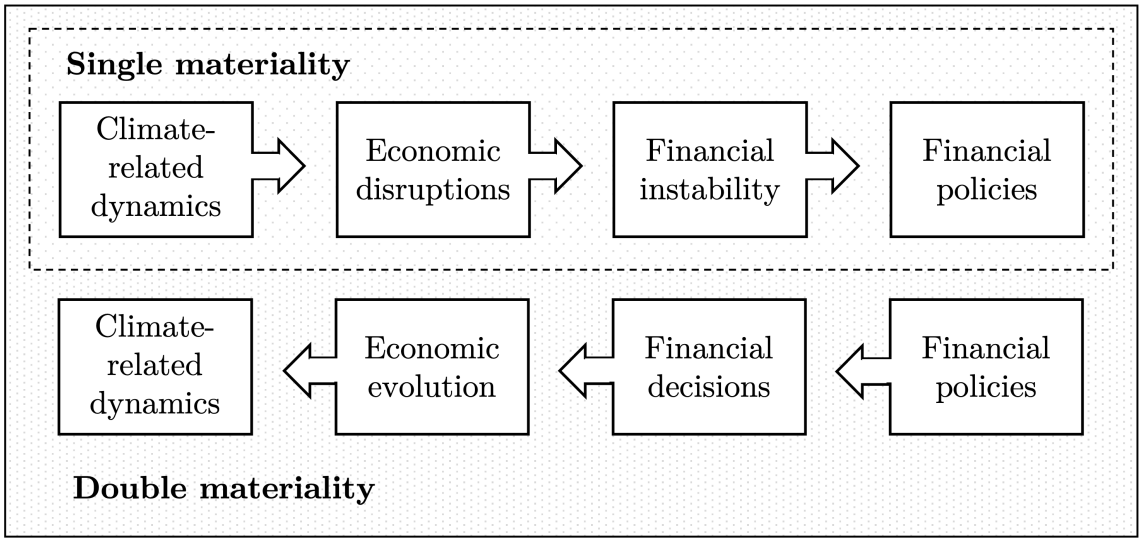
Although it is true that climate-related dynamics will have adverse consequences for the financial system, we now wish to highlight that this framing of the climate-finance nexus is one-sided. To do so, we present the concept of 'double materiality' and show how it provides a more comprehensive view of the links between financial and climate-related dynamics. We then highlight how financial flows contribute to reinforce the current carbon lock-in. Finally, we present the rationale for financial policy interventions aimed at facilitating climate stabilization.

4.1 From a single to a dual materiality lens

The literature on the climate-finance nexus has largely focused on the impacts of the former on the latter. This view is referred to in the literature as the *single materiality* approach, in that it considers only the materiality (i.e. relevance) of climate-related dynamics for finance. This view, although important to push financial actors to internalize some of those risks and avoid a climate-related financial crisis, is partial. Indeed, it fails to recognize that the link between climate change and finance is a two-way one. Finance is not only threatened by climate-related dynamics: it also contributes to shaping them. Adopting a 'double materiality' lens amounts to trying to consider both dimensions at the same time. This has important policy consequences, as illustrated in Figure I.1.

Why is this simple materiality lens so widespread? In our view, this could be due to the fact that neoclassical economics adopts, in the words of Schumpeter (2006), a 'real view' of the economy instead of a 'money view'. This theoretical foundation

Figure I.1 – Two approaches of the climate-finance nexus



Source: author's elaboration

means that neoclassical economics at its core thinks in relative terms abstract from nominal values, and tends to see finance and money respectively as a means and a veil, failing to take seriously the Keynesian insight that capitalist economies are first and foremost a *monetary production economy*.

Of course, this does not mean that mainstream economics do not recognize that financial decisions (and thus the policies that influence them) have an impact on the trajectory of economic evolution. Financial market imperfections or rigidities exist, and can explain malfunctions in the allocation of capital leading to sub-optimal outcomes. However, these studies generally consider that the goal of financial policies should be limited to removing these imperfections, while the low-carbon transition (and the internalization of climate externalities that it implies) should be achieved in the 'real' sphere - if possible in the form of a price mechanism that allows a social optimum to be reached. The division of labor between fiscal and monetary authorities is then clear [9]: the latter should not venture into the fight against climate

[9]This division of tasks is also reproduced in the academic field. On the one hand, economists specializing in monetary and financial economics usually don't embrace environmental- or climate-related research questions. Those who do tend to embrace micro empirical focus, e.g. comparing how 'green' financial instruments perform in comparison to their vanilla counterparts (e.g. Nobletz, 2022). On the other hand, economists specialized in environmental and climate change economics usually focus on 'real' variables to assess the optimal decarbonization pathways through 'real sphere' fiscal and regulatory measures (carbon taxes, subsidies, standards, etc.). They generally

change, which would risk diverting them from their main mission while introducing new deviations from market allocation. According to this view, financial policies are simply not suited to achieve climate-related goals. This is particularly clear in Tirole (2022) or Cochrane (2020a, 2020b, 2021).[10]

While this is appealing from an intellectual point of view, providing a clear set of responsibilities and robust normative groundings in terms of optimality, we argue that it should not lead to a dogmatic rejection of financial policies with climate-related objectives. Indeed, embracing a view of capitalist economies as monetary economies of production leads to recognize the strategic importance of finance in shaping the trajectory of economic evolution. As summarized by Schumpeter (1983, p191), finance is 'the headquarters of the capitalist system, from which orders go out to its individual divisions, and that which is debated and decided there is always in essence the settlement of plans for further development'.[11] Unlike incumbents who can often partly finance their production with retained earnings from previous periods, niche entrepreneurs need access to finance before they can produce anything. In short, finance is a 'precondition to production', without any substitute. This grants extraordinary importance to (private) financial actors, who with their decisions fulfill the role of a 'selection function' for capitalist development (Dosi, 1990). Indeed, financial actors ultimately decide what projects and technologies are

rely on integrated assessment models (IAM) that connect an economy module with a climate model, without incorporating a financial sector in the first place. For an overview of IAM models and their limitations, see Battiston et al. (2021), Keen et al. (2022), Pottier (2014), Schubert (2019), and Stern et al. (2022). For heterodox alternatives integrating financial dimensions, see Battiston et al. (2021) and Cahen-Fourot et al. (2022).

[10] Cochrane even goes further in that he does not believe in climate-related risks, denying even the pertinence of a single materiality lens for central bankers, financial regulators and supervisors.

[11] If we generally remember Schumpeter for his thoughts on entrepreneurs, innovation and creative destruction as the driving force behind economic development, it is often forgotten that according to his theory, the prerequisite for escaping from the stationary state is credit: 'By credit, entrepreneurs are given access to the social stream of goods before they have acquired the normal claim to it [...] It is only thus that economic development could arise from the mere circular flow in perfect equilibrium. And this function constitutes the keystone of the modern credit structure' (Schumpeter, 1983, p107). Financial institutions, by granting the monetary advance necessary to launch production, have the power to 'compel society to follow them in the introduction of novelty [...] The only essential function of credit consists [...] in that the granting of credit enables the entrepreneur to divert the means of production, which he needs, from their present uses, to assert a demand for them; thus, he compels the national economy to enter into new ways. Credit is the lever for this withdrawal of goods' (Schumpeter, 1983, p151). For more on the financial thinking of Schumpeter, see (Lakomski-Laguerre, 2002, 2006).

going to be deployed into the socio-technical system, and what others remain on the drawing board.

Schumpeter and neo-schumpeterian economists (see e.g. Perez, 2002 or Mazzucato and Semieniuk, 2018) are not alone in granting more importance to finance in their theorization of the economy. Marxian, (Post-)Keynesians or French Regulationists do as well. For example, the concept of *financial ante-validation* used by Aglietta (1976), De Brunhoff and Cartelier (1974), and Lipietz (1979) highlights that when finance provides capital today to a project that it expects to generate income tomorrow, it preempts real social validation (which is always *ex post*, by the market) via advanced means of payment. In doing so, finance alone can decide whether a project may or may not see the light of day. The role of finance in monetary production economies is also central in the Post-Keynesian school, which highlights that money is never neutral and that how it is injected into the monetary circuit always matters (Lavoie, 2022, p202). In fact, their concept of 'initial finance' resembles that of financial ante-validation (Carrera, 2023), as the 'finance motive' highlights how 'entrepreneurs have to secure a financial provision they will use to pay for production costs' *before* they have any chance of achieving market validation through the sale of their production (Gnos, 2023). Finally, International Political Economy scholars have also highlighted the importance of finance for capitalist evolution. Indeed, the 'structural' power of finance over society has been a central object of study for this literature since the seminal work of Strange (1988).

Why does this theoretical discussion matter for our topic? Because once finance is seen as the starting point of capitalist development, it appears as a crucial node in shaping future evolutionary dynamics and decarbonizing pathways, and can be investigated regarding its enabling or alleviating role in lifting the *carbon lock-in* of contemporary economies (Geddes & Schmidt, 2020; Seto et al., 2016; Unruh, 2000).

4.2 Financial ante-validation and carbon lock-in

From this point of view, the news are not particularly encouraging. Indeed, it seems that financial flows are not currently aligned with climate objectives, by several orders of magnitude. Here again, without wishing to be exhaustive, we trace

a brief panorama of the mismatch between finance *as it is* and finance *as it should be*.

First, the literature points to a 'green investment gap' that needs to be filled in order to achieve climate objectives. Evaluations vary a great deal depending on the time-horizon, the geographic focus, the sectoral scope and whether estimations include only climate mitigation or also adaptation needs. For example, according to ADEME, France's national low-carbon strategy would still require 24 billion in additional annual investments before 2030, while Think Tank I4CE estimates these needs between 14 and 30 billion (I4CE, 2022). Overall, many studies underline the insufficiency of credit for sustainable activities and low-carbon niches, pointing out the difficulties in finding sufficiently patient investors to fund the capital-intensive and long-term investments needed by the transition (Campiglio et al., forthcoming; Hafner et al., 2020; Mazzucato & Semieniuk, 2018). This is particularly the case for the development of renewable energies, which offers a high upfront cost and low operating costs, but also for the energy renovation of buildings characterized by a similar return profile (Akomea-Frimpong et al., 2022).

Yet, framing the problem of the low-carbon transition as one of a lack of green investment considerably reduces the scope of the issue at stake (Magalhães, 2021; Svartzman et al., 2019). Meeting climate objectives requires a socio-technical paradigm shift, which implies moving away from two centuries of dependence on fossil fuels and rethinking the technical, economic and geographical dimensions of global value chains. While new green investments in power generation, transportation or energy efficiency are necessary, they will be far from sufficient. Indeed, the accelerated phase-in of low-carbon capital is only useful if it replaces old carbon-intensive capital. Yet, the history of energy is one of sedimentation, with new energies adding to the old ones without replacing them (Fressoz, 2014). Despite the development of nuclear power and renewable energies in recent decades, the volume of coal consumed has more than doubled in 30 years and continues to grow, while oil extraction is now at a record level of 100 million barrels per day. It is therefore essential to move away from an evolutionary and deterministic vision of the history of technology, which would see green financing naturally chase away existing stocks of brown

capital thanks to disruptive technological advances such as 'backstop technology' that would instantly discard previous outdated production factors (Nordhaus et al., 1973). Energy paradigms coexist more than they succeed each other (Jarrige & Vrignon, 2020), and this type of teleological and linear narrative tends to underestimate the difficulty of achieving the energy transition ahead (Bonneuil & Fressoz, 2013). The challenge is therefore not to finance new 'green' activities, but to make the 'dirty' investments stop. Another argument against the frequent oversimplification of thinking that more green financing will necessarily lead to less emissions is the fact that money is endogenous (Lavoie, 2022, chapter 4). The view that there is only a finite amount of savings that can finance a limited amount of projects is wrong. Credits make deposits, and nothing prevents *a priori* green and dirty financing to grow simultaneously. Therefore, if the two issues are not entirely orthogonal, they should be addressed separately: the lack of green investment is a problem, but even more attention should be paid to closing the tap of polluting financial flows.

Unfortunately, on this second issue news are also bad if not worse. Financial flows are still largely directed towards the most polluting activities, slowing down the phase-out dynamics by allowing the build up of new stocks of polluting capital incompatible with planetary limits. Beyene et al. (2022) show that European banks have increased their lending to fossil fuel extraction firms since the Paris Agreement. This confirms the work by Kirsch et al. (2021) which showed that the world's 60 largest commercial banks have contributed more than $3.8 trillion to the fossil fuel industry over the past five years. Cojoianu et al. (2021) show that the fossil fuel divestment movement has been to some extent successful in reducing new capital flows into the domestic fossil fuel sector, but only to increase its dirty funding abroad. This is in line with multiple studies pointing out the very heterogeneous and unequal character of fossil fuel financing. Banks and other financial institutions in high-income (and poor in fossil resources) countries tend to take advantage of weaker regulations in Global South countries to finance abroad extractivism, cashing in on high interest rates in the process. According to Semieniuk et al. (2022), the financiers of to-be-stranded assets are 'overwhelmingly in OECD', benefiting from 'an international net transfer of more than 15%' of total asset value. Another

example: despite the 450 'carbon bombs' (i.e. extraction projects that would release more than 1Gt of CO_2 equivalent) being almost all outside Europe (Kühne et al., 2022), the financing that allows these bombs to be armed comes predominantly from developed countries. Thus, (western) financial ante-validation of carbon-intensive activities seems to be driving the climate trajectory further and further away from the goals set out in the Paris Agreement.

The literature seeking to link financial portfolios to final emissions is very new, and particularly complex from a methodological point of view (problems of data availability, transparency of financial structures, cross-shareholdings, fake domiciliations due to tax evasion, etc). Nevertheless, it appears critical to step back and denaturalize the normative premises embedded in the usual models of imputation. A few decades ago, the shift from production-based to consumption-based carbon footprints allowed to shed light on how high income countries off-shored their emissions and local pollutions to emerging countries, while reaping the benefits. The disadvantage of this imputation method is that it shifts all the blame to the end consumers, who have little visibility - and no power - over the structure of value chains and the technology choices upstream. Based on these criticisms, nascent literature around value-added-based carbon footprints allow to allocate emissions in proportion to the value captured at each stage of production (Piñero et al., 2019). This view provides a perspective on how the benefits of pollution are distributed heterogeneously along value chains, with the countries capturing the highest value-added often being those furthest from the production of environmental externalities.

Attempts at financial imputation, in turn, allow us to show how financial institutions in rich countries make pollution possible (by providing the funds necessary for the construction of new carbon-intensive productive infrastructures) and benefit from it (when the debts are repaid with interest on top of the capital). While this mode of imputation is, by definition, only one particular way of illuminating the problem, with its specific normative underpinnings, it nonetheless casts new light on financial contributions - and responsibilities - in the climate crisis. Moreover, such a view makes sense from a historical perspective. Malm (2016, 2017) shows that the decision to switch from hydro-power to coal in early 19th century England

was not driven by its lower cost or greater efficiency to run cotton mills. This decision was made because coal allowed to extract a higher rate of profit by abstracting production processes from natural cycles and to break the market power of workers by relocating the mills to the cities. While water-powered mills remained more efficient and less expensive to operate, they were progressively replaced by coal, a dense, storable energy source that provided a better grip for capital accumulation. This argument is brought into the contemporary world by Christophers (2021), who shows how Total's investment decisions are still driven by the need to extract higher rates of return to serve shareholders demands, even when it means ignoring more cost-efficiency sources of energy such as renewables, that due to their long term return prospects are at odds with short-term gains requested by shareholders. In short, it leads to a welcome questionning of the 'anthropocene' narratives that 'relies on a speciesist abstraction that conceives humanity as a unitary actor, and thus overshadowing its diversity and ultimately attributing the responsibility for climate change to a fictitious homogeneous actor' (San Román and Molinero-Gerbeau, 2023, see also on this topic Bonneuil and Fressoz, 2013). From this perspective, the climate crisis could be seen as a *capitalocene* (Christophers, 2021; Malm, 2016, 2017).

4.3 Towards promotional policies

From the discussion above, it appears that the *prudential* objective - ensuring financial stability in the face of climate-related dynamics - is not the only motivation for implementing climate-related financial policies. In this section, we present what we refer to as *promotional* policies - those that seek to influence financial dynamics in order to facilitate climate stabilization.

For promotional purposes, it appears that the main policy efforts have been aimed at closing the 'green investment gap' through the development of financial products adapted to the low-carbon transition long-term investment needs. This support can take many shapes. First, it can be informational-based, consisting in developing public labels and standards to avoid greenwashing and offer regulatory guarantees of the sustainability of certain financial assets: green bonds, green indexes, etc. In that case, the implicit assumption is once again that the lack of

financing for the transition is due to problems of asymmetry or imperfection of information that need to be resolved. Second, financial policymakers can also provide more substantial and direct support, in the form of incentive-based or quantity-based policies. The next chapter will discuss these policies in more detail.

The point we wish to make at this point is that these promotional policies all focus on the development of green financial flows (the *phase-in*), and never tackle the problem of curtailing dirty financial flows (the *phase-out*). Yet, for all the reasons mentioned above, the development of a green financial niche must not distract from the need to discourage carbon-based investments, whose termination is the only relevant criteria for climate stabilization. Some might argue that this 'repressive' component - discouraging carbon-based financial flows - is already taken care of by the prudential approach presented in the previous section. After all, policies aimed at ensuring financial stability in the face of transition risk do have the positive effect of making the most carbon-intensive investments less profitable by pushing financial institutions to protect themselves more against the risks they entail. Yet, we argue that while promotional and prudential policies can sometimes work together, they must be kept analytically distinct.

First, because prudential policies do not only address transition risk, but also physical risk. The integration of the latter therefore leads to a deterioration in the debt conditions of firms that are victims of climate change, not those that are responsible for it. All other things being equal, this tends to makes adaptation efforts more complex, and therefore works against a promotional agenda. For example, the pricing in of physical risks, although a good news for financial stability, lead to most vulnerable countries facing higher financing constraints (Beirne et al., 2021). More generally, prudential policies make borrowing opportunities - especially long-term ones - more scarce, which is particularly limiting for the development of renewable energies or energy renovation, whose long-term nature has been described above. Indeed, prudential requirements decided after the global financial crisis (such as liquidity ratios) do have adverse repercussions on the provision of long term credit necessary for the low-carbon transition (Campiglio, 2016).

Second, because promotional policies aimed at stabilizing the climate by ac-

celerating phase-in and phase-out dynamics may come at the expense of financial stability. First, phase-in promotional policies designed to support the green financial niche described above could well provoke a 'green bubble'. Possible capital relief measures for the most sustainable banks (e.g. green supporting factor to foster green loans) would reduce the capacity of financial institutions to absorb such a shock. Therefore, the promotional objective of accelerating the deployment of 'sunrise' industries may come at the expanse of financial stability (Semieniuk et al., 2021).[12] On the other hand, the necessary acceleration of the phase-out of 'sunset' industries in order to reach the climate objectives could lead to an abrupt and unanticipated transition leading to a 'climate Minsky moment'. There is thus a tension between the prudential desire for a smooth and anticipated phase-out compatible with financial stability and the promotional agenda requesting the immediate decommission of excess capital and the immediate end of all new fossil-fuel investments. Therefore, even when prudential and promotional approaches appear to work in tandem (i.e. when the incorporation of transition risk discourages new carbon-intensive investments), major differences remains. The prudential approach is perfectly compatible with a continuation - or even with an acceleration - of carbon-intensive funding, as long as it is provided by institutions that are strong enough to bear the losses in the event of a transition shock. Worse, if financial institutions are expected to diversify their portfolios to minimize their risk, it seems even desirable from a prudential point of view to let all financial institutions continue to invest a small portion of their portfolio in fossil assets to hedge against the prospect of a non-transition.

Consequently, it appears necessary not to reduce the distinction between promotional and prudential agendas with a mere separation between phase-in and phase-out focused financial policies. As summarized in Table I.1, the two approaches

[12] This point is particulary important given that finance already has a propensity to overinvest in 'innovative' sectors (Perez, 2002). Attracted by the prospect of new profits, the liquidity made abundant by the fading growth prospects of old, mature industries pours into the new sectors that hold the promise of a new economy - such as the internet industry in the early 2000s. Bubbles can then form, that are not due to an '*easy credit push*' like the ones described by Minksy, but '*opportunity pull*' (Perez, 2009, p780). If this phase of frenzy then gives way to a phase of development, synergy and then maturity, it is at the cost of an over-reaction of finance which, by seeking speculative gains, provokes 'the inflation of asset prices and the divorce between paper value and real value' (Perez, 2002, see figure p74).

support distinct objectives with respect to low-carbon transition dynamics.

Table I.1 – Prudential and promotional policies regarding transition dynamics

	Prudential	**Promotional**
Phase-in	Avoid a green bubble	Support the funding of mitigation **and** adaptation efforts
Phase-out	Price in transition **and** physical risks in a smooth and gradual way	Halt new funding of dirty assets as fast as possible

To sum up, the promotional approach is essentially proactive and extrinsic. It is proactive because it aims at market-shaping and at steering financial flows without regard to respective risks or market profit-led preferences (Ryan-Collins, 2019). It is extrinsic because it targets climate-objectives outside the financial sphere. On the contrary, the prudential approach is defensive and intrinsic. It is defensive because it only reacts to what is seen as exogenous shocks, fixing delimited and identified market failures. It is intrinsic in the sense that it aims to achieve a 'financial-sphere' objective (namely financial stability). Of course, this neat distinction should be understood as more of an analytical heuristic than as a framework into which any instrument or policy could clearly be placed. In reality, the line can be hard to draw, especially since central bankers often like to rely on 'strategic ambiguity' regarding the true motives of their action, in an attempt to game the limits of their mandate (van 't Klooster, 2021).

Besides, the macroprudential doctrine, which seeks to tackle collective and intertemporal risk instead of only focusing on individual and immediate vulnerabilities could provide a useful bridge from the prudential to the promotional (Dafermos, 2021). Indeed, a longer-term view of financial stability would make apparent that short term financial instability via rapid asset stranding could be a small price to pay for the considerable reduction in physical risk over the long term.[13] Yet, as

[13] Although - and this is an important and too often disregarded caveat - these two types of risks do not affect the same actors with the same force. This means that policymakers from carbon-intensive countries with low climate vulnerability might prefer low transition risks even at the cost of additional (physical) risk. Besides, there is an obvious political economy vicious circle at stake in trying to smooth out transition risks: delaying the transition leads to the build up of more stranded assets, increasing the costs of the transition and the pressures on policymakers to further

we will see throughout this manuscript, this reconciliation struggles to take place. Promotional policies remain scarce and focused on supporting the phase-in, while the policy attention regarding phase-out dynamic currently leads to informational microprudential and defensive response rather than proactive macroprudential and precautionary-driven approach with a 'promotional' market-shaping dimension (Chenet et al., 2021).

5 Back to the thesis

In the previous two sections, we have tried to unravel the nexus between finance and climate change, highlighting the two rationales for climate-related financial policies. We now introduce the main research questions, theoretical foundations, empirical materials and methods that will be used throughout the thesis.

5.1 Research questions: from diversity to legitimacy

In the subsequent chapters, four main research questions will occupy most of our attention. We present them in turn in the following paragraphs.

Research Question 1 *How diverse are green central banking objectives and instruments?*

As we have seen in the previous sections, the integration of climate change by central banks can rely on different objectives. This implies that green central banking may hide great divergences between institutions: some central banks may confine themselves to a minimalist and prudential integration of climate change, while others may take on a more promotional role, taking on the mantle of 'climate governors of last resort' (Langley & Morris, 2020). Similarly, green central banking could also mask a wide variety of instruments and policy designs to achieve such objectives: some institutions might rely on particularly interventionist instruments, modifying incentives or imposing quantitative limits to guide credit in a voluntary manner.

delay the transition, etc.

Others might be content with more hands-off measures that address informational asymmetries and imperfections and rely on market discipline to effectively redirect capital flows. Hence, one of the goal of this work will be to investigate the variety of green central banking regimes, instruments and goals.

Research Question 2 *What drives the variety of green central banking?*

Given that green central banking encompasses a diversity of objectives and instruments, it seems useful to study what may lead central banks to act in one way rather than another. This thesis will attempt to explore different explanatory hypotheses. Over the chapters, we will discuss structural factors (how institutional or legal frameworks shape central banks' actions), neorealist explanations (how outside pressures and insider power struggles define how climate change gets mainstreamed within institutions) and constructivist accounts (how new ideas diffuse through institutions). Indeed, while the institutional framework largely determines how central banks integrate climate-related dynamics in their practices, it remains insufficient in explaining the full variety of green central banking regimes as well as the timing and pace of climate change mainstreaming in different central banks. Moreover, we will argue that the relationship between institutional arrangements and green central banking is less unidirectional than it may seem, as the climate crisis could in turn foster institutional change.

Research Question 3 *How do central banks legitimize their incorporation of climate-related issues?*

Green central banking inevitably raises the question of legitimacy. This issue is a constant concern for central banks, especially when they benefit from a high level of independence from their political counterpart, as their mandate provides them with little guidance to conduct distributive choices. Yet, integrating climate change in their practices requires such decisions, in one form or another. Thus, we will attempt in this manuscript to explore the discursive strategies employed by central bankers to justify their integration of climate change, once again finding themselves in the uncomfortable position of 'institutional loneliness' (Mabbett

& Schelkle, 2019). In particular, we will try to study how they navigate between prudential and promotional rationales in the various accountability forums available to them, from top-down official communication to markets and citizens to written and spoken responses to parliamentarians and non-governmental organizations challenging their choices. We will highlight how they often attempt to mask the discretionary nature of their greening choices behind science-based expertise to neutralize and deny the political character of their new green interventions, but also how this may prove insufficient in the long run, as the past fifteen years have already greatly re-politicized monetary policy interventions.

Research Question 4 *What should be the central banking model of the 21stcentury?*

Although this question is more normative than positive and is not directly or definitively answered in the following chapters, its specter haunts this essay. We have therefore decided to acknowledge it here, despite our work not providing ready-made answers or any original proposal of new institutional design. Instead, we simply open the question for debate in our last two chapters. Indeed, it will quickly appear clear to the reader that our research on green central banking developments led us to believe that the current European institutional arrangement provides an ill-suited framework for central banks in the face of modern challenges such as climate change. Current level of independence and autonomy for institutions so remote from democratic control appear to be unsustainable - in every sense of the word. But, given the long history of wishful thinking regarding the demise of the neoliberal regime of accumulation and its remarkable resilience, it is possible that the present institutional setting will behave in a similar fashion, holding together despite the accumulating contradictions. We will therefore refrain from offering too definitive predictions in this regard, and we will content ourselves with raising a few scenarios of possible evolution that seem coherent with the underlying tensions of the current situation.

5.2 Theory: a political economy lens

To answer these research questions, we adopt a *political economy* perspective. Political economy can refer to several fields or literatures that sometimes have little in common.

First, it can have a substantive meaning. In that sense, political economy relates to the literature applying the tools and theories developed by the economic discipline (agents with well-defined utility functions and finite resources making rational choices in order to maximise their well-being) to new 'political' spheres (state interventions, interest groups, electoral logics, etc). In that acception, it is another form of economic imperialism *à la Becker* that applies to other fields the tools of economic analysis (Lazear, 2000). Although the topic of our thesis could call for such an approach (there is a rich literature considering the central bank as a maximizing agent whose missions are delegated by the government considered as a principal, some of which will be discussed in chapter V), this is not the reason why we consider this work as a work of political economy. We do not apply the usual modeling tools of economic analysis and do not propose a theory that can explain central bank behavior through constrained maximization, nor do we evaluate the economic consequences of green central banking through econometric evaluations.

Second, in a broader sense, political economy can refer to the study of economic phenomena with a focus on distributional issues. This view derives from the observation that Pareto improving policies are uncommon: most economic developments create winners and losers (that can be then offset with redistribution). In that sense, political economy posits that a detailed understanding of distributive consequences allows for a better understanding of economic evolution. Here again, our work could fit into this category. Green central banking does have distributive consequences that need to be accounted for to better understand the shape and form of climate-related financial policies. For example, embracing a political economy lens allows to understand why promotional policies that focus on supporting the phase-in are more widely implemented than policies that seek to accelerate the phase-out. The former expands profitable investment opportunities, creating winners, while the second

does the opposite.

But the most profound reason why we consider this work as belonging to political economy is of a more epistemological nature. In this sense, political economy consists in reconsidering the very relevance of distinguishing between the political and economic spheres. It leads to postulating that economic institutions are traversed by power relations, diffracting the question of conflict and power in the variety of institutions of capitalism (Braun, 2016a; Lordon, 2008). The aim of political economy is then, with a diversity of methods borrowing from the fields of economics, sociology, political science or history, to unfold these relationships in order to understand how the decisions of actors - and their macro-economic consequences - proceed from economic as well as political and socio-cultural logics. In short, it leads to affirm that disciplinary compartmentalizations can sometimes obscure rather than enlighten. In this sense, political economy is in line with the calls of Orléan (2013) on the necessity of a unified social science in the face of the impossibility of distinguishing between what is 'social' and what is 'economic' (see also Bourdieu, 2016 on the economic/social distinction). [14] For these reasons, our methodological approach also favors interdisciplinarity, and combines both qualitative and quantitative methods of investigation, that we will present in the subsequent sections. Indeed, as this thesis will illustrate, the (greening) decisions of central bankers are not only driven by rational considerations of optimality. The institutions of capitalism have a life of their own, and so do the agents that animate them, with their own purposes, praxis, and agency, which are impossible to factor in with functionalist approaches that see central banks as monolithic maximizing 'black boxes' alien to socio-political dynamics, ideological influences or power struggles.

Even in this more restrictive sense, political economy contains a wide range of competing theories offering sometimes contradictory analyses, and assigning varying explanatory weights to ideas, interests and institutions. Although this manuscript

[14] The interview of André Orléan in Revue Française de Socio-Économie (Benquet & Sobel, 2019, p19) is especially clear on that matter: 'social sciences, though currently fragmented because of their objects, methods or traditions, nevertheless all share the same terrain, the social facts, which gives reason to hope that they may also share, if not a common language, at least a conceptual frame of reference allowing for the inter-translation of disciplinary languages. In other words, the unidisciplinary position is based on the thesis of the unity of the social kingdom'

has not opted for a single theoretical approach, we have built on certain strands of political economy more than others. If one had to choose a school of thought to characterize this thesis, it would be that of Historical Institutionalism, taking institutions of modern capitalism as its pertinent unit of analysis (in our case, central banks) and giving prominence to structural path dependency and contingent power struggles as main explanatory variables to account for institutional change (as opposed to what Rationalist Institutionalism could do, see Blyth, 2002).

That being said, this theoretical statement should be taken a grain of salt. Indeed, the main chapters of this thesis have been initially conceived as independent pieces (which is standard in the economic discipline), have often more empirical than theoretical contributions, and are (for three of them) the fruit of co-authorship with different scholars. This means that although the analytical framework proposed in chapter II served as a heuristic in the entirety of the following chapters, the conceptual unity of this manuscript should not be exaggerated, and is certainly lower than what is usually expected in other disciplines.

Nonetheless, we figured it was important to draw some theoretical perspective - even rough ones - so that the reader knows what direction the rest of the thesis will be taking.

5.3 Materials: from policy documents to interviews

Now that the research questions and theoretical foundations have been laid, we introduce our empirical strategy. We first present our materials, from policy documents to interviews, and then discuss our methods in the subsequent section.

Our first empirical input consists in the bulk of public documents, press releases and official announcements available on central bank websites regarding their policy implementation. This source allowed us to track policy changes related to climate issues, which we followed over the course of this thesis in a systematic way for the Euro-system and in a more occasional fashion for other central banks. Although central banks are often opaque institutions with respect to their internal deliberations, they are particularly vocal when it comes to presenting their policy outcomes, and one can rapidly get overwhelmed by the official documents published at regu-

lar intervals on the websites of the various central banks. To try to find our way through this mass of documents, we combined web-scrapping methods (that allow to download data in bulk from central bank websites) with keyword search tools in order to collect and identify relevant documents. This allowed us to track policy changes even when they were not specifically highlighted by central bankers or debated by commentators. For example, the ECB's announcement in September 2020 that it would henceforth make an exception in the eligibility requirements for bonds accepted into its collateral framework to favor sustainability-linked bonds received little coverage despite its important promotional content. While the value of such a systemic collection of data on policy documents is quite clear, allowing for the identification and dating of successive changes in green central bank policies, it should not be overstated. Achieving an informed perspective on successive climate-related reforms for comparative study and historical insight is useful and a necessary first step, but it cannot achieve more.

A second very important material for our purpose is all public statements made by central bankers *explaining* and *commenting* on these policy changes rather than enacting them. Indeed, central banks benefit from a wide range of accountability forum in order to defend their decisions to their political counterpart, to the markets and to the people. These includes (i) central bankers' speeches (ii) central bankers' hearings in front of their parliaments and (iii) their public correspondence with non-governmental organizations, the financial industry and parliamentarians. Here again, the gathering of such material usually meant retrieving big amounts of data through webscrapping methods, that could then be aggregated in searchable datasets to identify relevant climate-related materials. Sometimes it also implied trying to access data that was no longer available online. In those cases, we used services such as *WayBackMachine* to access older versions of websites, but also reached out to several archives departments to get access to digital or physical archives. Sometimes, this material found a direct use in this manuscript (e.g. ECB climate-related letters in chapter III, Banque de Belgique or Banque de France digital archives in chapter IV). Sometimes, it didn't. For example, we gathered a full dataset of Banque de France Governor auditions at both *Assemblée Nationale* and *Sénat*, but found

little to no climate-related accountability requests. Similarly, we went to Banque de France archives department to digitalize older Jean-Claude Trichet speeches from 1993-2002 but did not make use of it in this manuscript.[15]

The relevance of such material to assess green central banking efforts might be less straightforward: it could be argued that central banks' communication is about talking rather than acting, that there may be a big gap between words and deeds, and that central bank communication might be too polished to convey meaningful insights. While these caveats are sensible, we believe they must be kept in perspective. First, central banking communication is now a part of their policy arsenal, having clear consequences on financial dynamics, something that is now both recognized and pursued by central bankers in what is referred to as 'forward guidance'. In that sense, talking is a *already a form of enacting*. Second, central bank communication is also a crucial element of central bankers' accountability, which make its study worthwhile on its own, as the potential discrepancy between words and deeds is *interesting for its own sake*. Finally, while it may seem central bank communication is too polished to give insights regarding internal dynamics, this is not entirely true. Indeed, central bankers sometimes clash with each other, and extend internal battles by promoting certain ideas or pushing back on those of their colleagues in external venues, as we will show in chapter III. Indeed, central bankers enjoy great freedom in their communication content, even in a setting such as the one of the ECB with collective decision-making, and even when talking about new uncharted topics such as climate change.[16] Thus, the heterogeneity in central bankers' communication can provide insights regarding insider dynamics and potential ideational struggles between opposite perspectives on green central banking, something that will be illustrated along this manuscript.

[15] Documents 1035200501 AR, boxes 126 to 130

[16] This was confirmed by interviewee 18: 'So the speeches of the board members are not necessarily reviewed by everyone. They are prepared with the staff, of course, and usually coordinated by the board member's advisor, a sort of chief of cabinet. [...] for the more important speeches, I held a brainstorming meeting with the staff on how we could structure them, what we would talk about. And then my advisor would guide the writing of the speech, send me a draft, which I would then rework to make my own [...] When it was a speech on monetary policy, I sometimes sent it to Draghi and Frank Smets - Draghi's advisor, who had a great deal of experience in monetary affairs and had Draghi's confidence. This time, as usual, I didn't.'

Our third main empirical material consists in semi-structured interviews. Semi-structured interviews aim at setting up an overall structure for the interview while allowing for an open discussion with the interviewee (Morin et al., 2021). Although this kind of qualitative approach has been side-lined in mainstream economics (Fourcade et al., 2015), we argue that it would have been very difficult to understand the internal dynamics of green central banking using only official documents, public communication and second-hand data such as academic literature or the financial press. Since September 2019, we have conducted 33 interviews. Ten were conducted in 2020 for another project that did not come to completion, with central bankers but also private financial actors involved in the green or sustainable finance niche. While they were not tapped in this thesis, they helped inform our analysis and provided a form of exploratory step for the design of the subsequent 23 semi-structured interviews that are explicitly mobilized in this manuscript. These interviews are presented in greater details in chapter III.

Central bankers are a tough crowd to approach and interview (Belorgey, 2011; Lebaron, 1997, 2008; Mudge & Vauchez, 2016; Vallet, 2019). Organizational charts and official email addresses are rarely public, and the approach must be based on identifying potential interviewees through other means. Therefore, initial contacts were usually made at the occasion of specialized real or virtual [17] events, or more rarely with contact information found online through social networks. Then, we relied on snowballing to progress, helped by the recommendations of previous respondents that sometimes put us in contact directly with new interviewees. While effective to gather new evidence, it is important to note that this method can lead to significant coverage gaps, especially in the most opaque central banks without an entry point. This can be problematic as this often concerns the most conservative central bankers regarding to climate change integration. For example, Bundesbank, Oesterreichische Nationalbank and Banque de Belgique central bankers were particularly hard to interview (with two, one and zero respondents respectively). For those central banks, our insights were mainly gathered through other interviewees

[17] The covid crisis may have increased the amount of European-scope events that could be attended from a distance

and secondary sources.

In general, many emails remained unanswered, and some planned interviews were moved several times before getting cancelled. But, overall, things could have been much worse, given the very contemporary nature of our questions regarding current balance of powers and internal dynamics and the fact that the interviewees were still active stakeholders with skin in the game. it is plausible that central bankers were more easily inclined to accept an interview on a topic on which they were willing to leave their mark than on more legacy topics such as the global financial crisis, sovereign debt management, or inflation. It is also true that 'central bankers are often proud of what they have achieved' (Wansleben, 2022, p19). That being said, approaching central bankers is not the only issue, and the actual interviews also proved challenging. As often with elite-interviews, interviewees have little time, strong knowledge of the field and can game researchers. The central bankers and Members of the European Parliament we interviewed were no different. In addition, central bankers are characterized by a supplementary secrecy ethos that makes interviews difficult, especially when dealing with policy and decision making issues (Lebaron, 2008; Mudge & Vauchez, 2016).

5.4 Methods: A social sciencist toolkit

We have presented our materials and the methods employed to collect them, but have not yet presented the methods used to exploit them. While we will come back to each of these points when the time comes in subsequent chapters, we provide a brief description of our empirical tools.

Semi-structured interviews were recorded, with the permission of the interviewees, based on a Chattam House procedure (no mention of the identity, the institution name, or even of a too-precise job description of interviewees to avoid risks of identification), and then transcribed and coded manually along themes to facilitate later exploitation. This transcription and coding work was carried as soon as the interviews progressed so as to be able to identify the points to be explored in future interviews. Thus, their 'semi-structure' evolved, and the questions became more precise as past experiences piled up and knowledge of the internal dynamics

increased. Of course, the questions were adapted to the different interlocutors as well as to their institution of origin in order to explore the reasons behind a given statement or to review the debates that presided over a climate-related decision. These interviews are mainly used in chapter III, but obvisouly inform the rest of the manuscript.

Second, we also relied on qualitative and comparative analysis of policy documents, crossing them with interviews and secondary data in an attempt to retrace the successive green central banking evolutions back to their various determinants, from internal struggles to external pressures and contingent developments. In doing so, our approach was similar to that of 'process tracing'. Process-tracing is 'a research method for tracing causal mechanisms using detailed, within-case empirical analysis of how a causal mechanism operated in real-world cases' (Beach & Pedersen, 2019, chapter 1). It involves 'observing the empirical fingerprints, or traces, left by the operation of a causal mechanism', and (iii) 'utiliz[ing] comparisons to select appropriate cases and to generalize to other causally similar cases' (Beach & Pedersen, 2019, p2). For example, our case study of the European Central Bank in chapter III, does not only simply provide a detailed description of the different steps of climate mainstreaming (outcomes) or of a list of its causes (e.g. parliamentarians pressure), but seeks to understand the causal mechanisms that have provoked this specific trajectory of greening (how did these external pressures translate in practice internally, e.g. how the responses to MEP had to go through 4 different levels of hierarchy, triggering discussions and forcing to launch internal work to develop expertise).[18] It also attempts at providing generalizations by looking at other national central banks trajectories, regarding the role of political pressures or internal dynamics.

[18]In that sense, process tracing may resemble how sociological fieldwork may complement epidemiological or econometric research by investigating on what may *in practice* link a cause and its consequence. For example, we know that women recover less from strokes than men, but it takes a sociological study to understand through what 'causal mechanisms' this macro-stylized fact is brought about (Darmon, 2021). Another example is Tom Duterme's dissertation (forthcoming), which seeks to lift the veil on the *actual practices* of trading rooms in the face of central bankers' speeches: while an abundant econometric literature explores their impact on asset prices, much less is known about the actual mechanisms, and the ways, routines, and heuristics on which traders rely on and actually process central bank communication.

Third, we relied on quantitative methods, especially to explore high dimensional textual data as we did with central banker speeches in chapter IV. To do so, natural langage processing techniques were used to explore the rise of climate-related communication in central bank speeches, from dictionary-based approaches to structural topic modeling. This method was very complementary with the more qualitative analysis described in the previous paragraphs, providing an 'augmented social scientist' toolkit (Do et al., 2022). On the one hand, detailed qualitative exploration and close knowledge of our corpus allowed us to inform our quantitative queries. On the other, quantitative exploration allowed to spot the relevant documents to be read, generating a virtuous circle. Last, we also implemented a few econometric regressions in chapter IV to try to explore the potential determinants of climate communication by central banks by testing three hypothesis on possible drivers.

Relying on a variety of empirical materials and on mixed methods was particularly useful for dealing with green central banking, whose contours evolved very swiftly on the course of this PhD. For example, the European Central Bank had just started talking in a few speeches about this topic in 2018. Three years later, it had conducted a strategy review, adopted a quadriennal climate-action plan and incorporated climate-criteria in all relevant departments, from supervision and asset purchases to the collateral framework, even considering offering banks preferential interest rates for green loans (a measure Christine Lagarde, President of the European Central Bank, has publicly supported, but which has met with too much pushback so far).

This *in media res* feature had important downsides. First, it implied a constant re-actualization with regard to an object in permanent recomposition, frequent redrafts and re-writes as announces piled up - sometimes faster than planned. This made journal submissions particularly stressful, as an article under review was likely to be outdated before it could be released. Second, it made the investigation on policy decision tricky because such decisions were just processed, had still many political consequences and people who made them were still in place. In the case of ECB, this contemporary character did not close any doors to potential archives, as the institution does not share minutes even after a time delay (contrary to the Federal

Reserve or to the Bank of England). But it did make access to interviews potentially more difficult, as most people still had skin in the game and appeared reluctant to give insider information to researchers. Last, studying an ongoing process can be tricky, as even research designed with positive goals may end up having tangible consequences on the dynamic it seeks to describe - especially when the job of interviewees includes reading academic literature. For example, early academic research on transition risk was heavily relied on by central bankers to support their climate-related risks prudential turn (see e.g. Battiston et al., 2017), while other research was weaponized against them to push for promotional action (see e.g. Matikainen et al., 2017). To a much lesser extent, I realized during my interviews that even an analytical distinction could have performative consequences. It is usually innocuous, as when an high level interviewee responsible for climate-related supervision informed me that he was now using the prudential/promotional dichotomy in his meetings.[19] But it can also have more significant repercussions, as when another member of the same institution warned me at the end of an interview that too much attention given to certain analytical dichotomies may hinder insiders' efforts to advance a more ambitious climate agendas. [20]

That said, *in media res* research on such a fast-moving topic had also valuable advantages. The dynamic of green central banking constantly increased the number of potential institutions to study, widened research questions, multiplied comparative insights and opened new puzzles as central bankers followed each other's lead in

[19]Interviewee 22, see chapter 4: 'The difference is this double materiality of climate risk. That is to say, we have a classic side which is the prudential side - *and I have to tell you that I use your words very often now in meetings* - and the promotional side.'

[20]Interviewee 12, see chapter 4: 'Final advice: don't make too mechanistic assumptions on how the ECB used to be promotional and now is only on a risk-based approach. There is still an ongoing dynamic, and we should avoid the impression that it's a settled game. It is still a game being planned, with the Executive Board trying to be more ambitious, and pushing; and the Governing Council resisting. And actually, I think that this dichotomy, risk/proactive, which has been a very good intellectual framing device; *if it becomes too entrenched, it constraints us more than it helps us.* Bank of England green stuff is done in a much less convoluted way because they don't have to get this distinctions too much. Of course, they have been given a mandate, which the ECB lacks, but also as I said before, if we want to do a green TLTRO, we will not be doing the distinction "we do it for climate" ; "we do it for risk". *I think we need to keep some ambiguity about what we are doing*, otherwise we get too hung up on this clear distinction. I can tell you the truth, many things that you do on risk-based narratives - like what the SSN is doing – eventually has real tangible impacts. The justifications might be different, but the outcome might not be very different at the end of the day.'

variegated ways. It also implied a lively new literature, mainly animated by young scholars and fellow PhD students. We hope that this manuscript will contribute to shed light on this nascent and fascinating phenomenon that is green central banking.

6 Outline and overview of the following chapters

As this was already noted, this PhD thesis is a collection of research articles that were initially written in order to be read independently. Three of those articles have been written in collaboration with other researchers, to which I'm indebted. Chapters are arranged thematically.[21] Indeed, chapter II is more theoretical, establishing an analytical framework that is then explored in chapter III and chapter IV, which have a more empirical flavor, while chapter V finishes on a more historical - and perhaps a more normative - note, having been informed by and drawing from the previous chapters. Despite their heterogeneous nature, we hope that the reader will appreciate their coherence, which we have tried to improve by rewriting, expanding, and sometimes adding certain sections that were not present in the initial drafts.

In chapter II, we look at how the institutional framework in which central banks are embedded determines the way they integrate climate-related issues. Indeed, delegated authorities (central banks and financial regulators) from western and high income countries tend to benefit from higher independence and narrower mandates which lead them to focus on informational instruments with prudential purposes. By contrast, financial governance in other institutional settings may allow for a broader range of instruments (based not only on information, but also on incentive- and quantity-based policies) and objectives (not only prudential but also promotional), which highlight the contingent nature of western climate-related financial policies. We explain this 'promotional gap' by two main factors: (i) a disengagement of political authorities from any responsibility or willingness to intervene in the al-

[21] Anecdotally, chapters also follow approximatively the chronological order in which they were written. Indeed, some of the arguments on prudential vs promotional approaches laid out in sections 3 and 4 of this chapter were explored at the very beginning of this thesis, in a draft that was never published. Chapter 2 was written during the 2020/2021 year. The last year and a half saw the next three chapters progressing head-on, while Chapter 6 was written in the final stretch.

location of private financial resources by acting directly in the financial sphere; and (ii) a stronger independence of delegated authorities supervising financial dynamics with narrow technical mandates. This financial governance configuration leads to an institutional deadlock in which only consensual measures fitting with both political and delegated authorities' objectives can be implemented. Finally, we identify and discuss the possible institutional scenarios that could originate from the current setting, and stress the need for close cooperation between political and delegated authorities. We highlight that political authorities' inaction and increasingly disruptive climate dynamics may well push delegated authorities to adopt new roles which may ultimately become a new normal. In this sense, institutional dynamics and climate-related policies are linked in a way that is less unidirectional than it may seem. This chapter was written with Moritz Baer and Emanuele Campiglio. It has been slightly modified to weave explicit connections with the rest of the manuscript, but remains essentially identical to the original piece published in *Ecological Economics* (Baer et al., 2021).

In chapter III, we examine the case of the European Central Bank (ECB) and its surprisingly swift integration of climate change. Indeed, after belatedly joining the green central banking debates and a few important public clashes on the topic, ECB Governing Council unanimously decided to make climate change a priority in its 2021 strategy review. It announced that in addition to conducting climate-related stress tests, its corporate sector purchase program (CSPP) and its collateral framework would now feature climate-related criteria. Through a combination of semi-structured interviews and qualitative study of the ECB's documents, speeches, and discussions with Members of the European Parliament, we retrace how this issue moved up the institution's agenda. We show that this shift resulted from the combination and hybridization of internal dynamics and external pressures. On the one hand, the renewal of the Executive Board and modifications in organizational dynamics secured a growing coalition for a change. On the other, pressures from politicians, NGOs, academics and citizens pushed the institution to develop its expertise and provided willing insiders with further argumentative resources to push their green agenda. While these two intertwined dynamics have allowed 'green

doves' to forge a consensus around the climate action plan, disagreements remain within the Governing Council on the scope and shape of future greening efforts. Indeed, if the Paris-alignment of the CSPP marks an important transformation, mobilizing an explicit promotional approach based on ECB's secondary mandate to depart from market neutrality, it remains confined to the margins of ECB operations, whose main instruments remain locked in the prudential paradigm. This chapter was written alone and was published in *New Political Economy* (Deyris, 2023), but an entire section that had to be deleted due to space constraints in the journal has been reinstated in the manuscript, also taking into account the latest developments.

In chapter IV, we depart from our European focus to investigate central banks' communication on climate-related matters on a global scale. To do so, we build an original database of 31,049 speeches retrieved through systematic web-scrapping and occasional archival work. This dataset represents a 80% improvement over the usual collection of speeches used in the literature. We then implement natural language processing techniques to identify 1,935 speeches that engage at least once with the climate topic inside our corpus. We highlight that the climate topic was already addressed in thorough ways before the speech of Mark Carney (2015). For example, David Carse (Governor of the Hong Kong Monetary Authority) already discussed fifteen years before the various channels through which climate change may translate into financial risks (Carse, 2000). Using structural topic modeling, this chapter highlights that the ways in which the climate issue is approached have also considerably changed over time. While it used to be commonly discussed with a strong promotional perspective until 2015, particularly in Southeast Asian central banks, prudential narratives centered around financial climate risks have gained traction in recent year. Although promotional narratives have not completely disappeared, they significantly evolved. As western central bankers have taken up the topic, the dominant narrative has shifted from a lexicon centered around state-driven sustainable development to a lexicon revolving primarily around green finance, financial innovations, and private actors. Finally, this chapter attempts to understand the determinants of climate-related communication through exploratory economet-

ric work. For example, we show that central banks with elevated responsibilities over financial stability tend to talk more about climate change than their counterparts. This chapter is based on an ongoing project with Emanuele Campiglio and Davide Romelli that has currently no draft paper, but that will follow the same structure and develop the same arguments.

In chapter V, we provide a discussion the suitability of the high level of independence that characterizes most modern central banks. Central bank independence (CBI) has often been presented as a superior institutional arrangement demonstrated by economists in the 1980s for achieving a common good in a non-partisan manner. In this chapter, we argue that this view must be challenged. First, research in the history of economic facts and thought shows that the idea of CBI is not new, and was adopted under peculiar socio-historical conditions, in response to particular interests. Rather than an indisputable progress in economic science, CBI is the foundation for a particular configuration of the monetary regime, perishable like its predecessors. Second, we argue that the simplistic case imagined by the CBI theory (the setting of a single interest rate shielded from political pressures) is long outdated. For nearly two decades, central banks have been increasing their footprint on the economy, embarking on large asset purchase programs and adopting macroprudential policies. This pro-activism forces independent central banks to constantly address new distributional - and therefore political - issues, leading to a growing number of criticisms of their actions with regard to inequality or climate change. This growing gap between theory and practices makes plausible a further shift of the institutional arrangement towards a democratization of monetary policy. Such a shift is finally discussed through the study of different shades of central bank repoliticization. This chapter is based on a paper written with Laurence Scialom and Gaëtan Le Quang, but was significantly extended to provide additional developments in sections 2 and 3.

In chapter VI, we conclude our thesis. After providing a quick summary of how the different chapters contributed in answering the various research questions elaborated in this introductory chapter, we attempt to reflect on the broader implications of green central banking. First, we provide a synthesis of the different political econ-

omy factors that may push central banks to incorporate climate-related concerns. For this purpose, we draw not only from our own research, but also leverage the very recent work of other young scholars to offer a panorama of sometimes conflicting, but often complementary accounts of what may drive green central banking. We then discuss the consequences of this shift. Green central banking may not only turn out to be a source of institutional change for central banks, but may also make a noticeable difference in the current policy efforts for climate stabilization. Drawing from past experiences of European credit guidance and present examples of South East Asian promotional policies, we reflect on the conditions under which central banks could participate in re-embedding finance within planetary boundaries.

CHAPTER II

It takes two to dance!

Institutional dynamics and climate-related financial policies[1]

[1]This chapter is a slightly edited version of a paper written with Moritz Baer and Emanuele Campiglio in 2020 and published in 2021 in *Ecological Economics* (see Baer et al., 2021).

1 Introduction

In 2017, the EU Commissioner Valdis Dombrovskis expressed his support to the idea of introducing a 'green supporting factor' in bank capital requirements - the amount of capital commercial banks are required to hold as a proportion of their risk-weighted assets - to incentivize lending to European sustainable activities (Dombrovskis, 2017). In principle, such a measure would allow banks lending to green activities to obtain higher profits by lowering their required regulatory capital. The following year, the European Commission included this idea in its sustainable finance action plan (European Commission, 2018). However, this position was greeted with skepticism by most central bankers and financial supervisors, who emphasized that the aim of prudential rules such as bank capital ratios is to mitigate financial risk, not to steer private credit in any particular direction (see, among others Dankert et al., 2018; Elderson, 2018; Rehn, 2018). According to them, financial policies should not discriminate between low- and high-carbon financial assets, unless clear evidence of risk differentials is available. In the same vein, European central banks in recent decades have aimed at intervening in financial markets in a 'neutral' manner. For instance, their 'quantitative easing' programs of purchasing financial assets, have been designed in a way not to distort the market, and more importantly, without taking into account the carbon intensity or sustainability credentials of the underlying issuers. This notion has been recently called into question by central bankers themselves, as conducive to a perpetuation of an unsustainable economy (Schnabel, 2020b), while others have explicitly looked into available options to 'green' monetary policy (Monnin, 2018; Schoenmaker, 2021).

These debates raise deeper questions. For what purposes should monetary policy and financial regulation be used? Could they be employed to support the low-carbon transition? And who should decide what the admissible purposes are? It appears that in Europe, at least up to 2021, financial regulation and monetary policy cannot be employed to actively reallocate private financial resources towards sustainable investments. However, it is considered appropriate to use them to nudge financial institution into assessing their exposure to climate-related risks and disclosing re-

sults to the rest of the market (NGFS, 2019; TCFD, 2017). Other high-income western economies (other European countries, US, Australia) exhibit similar institutional traits. In several emerging economies financial regulation and central banking policies are instead actively used to promote specific productive sectors, including renewable energy and other sustainable sectors (Barmes and Livingstone, 2021; D'Orazio and Popoyan, 2019). Financial risk is still monitored, but stronger weight is given to development (e.g. green) objectives.

The first objective of this chapter is thus to explain the observed heterogeneity in institutional behaviors in the field of climate-related financial policies.[2] To do so, we first develop a three-dimensional framework to distinguish: i) motives for policy implementation; ii) policy instruments; and iii) implementing authorities. Policy motives include the aim to tackle climate change by directly influencing the allocation of financial capital (promotional) and the desire to ensure the stability of the financial system in the face of climate-related challenges (prudential). Policy instruments can be categorized into tools aimed at expanding the climate-related information available to market actors (information-based), policies introducing monetary incentives to modify the risk-reward profiles of different investments (incentive-based) and direct controls on credit allocation (quantity-based). Implementing authorities can be distinguished between governments and other public institutions charged with defining societal development strategies (political) and public institutions with technical mandates and delimited objectives delegated to them by political authorities (delegated). Our taxonomy builds upon and improves previous categorizations (e.g. Mazzucato, 2016), and offers a consistent conceptual framework to study, interpret and compare the mechanisms and rationales behind ongoing policy efforts.

We then apply this framework to climate-related financial policies in Europe. We show that these policies are mostly – if not exclusively – based on informational

[2]In this chapter and in the rest of the manuscript, we define 'financial policies' as policies that modify the conditions in which private investment or lending decisions are taken. This broad definition includes both central bank policies (e.g. monetary policy) and banking/financial regulation. Climate-related financial policies refer to a subset of such policies linked to either climate change or the transition to a low-carbon economy. We therefore abstract from the debate about climate development subsidies from high to low income regions that is sometimes referred to as '(international) climate finance'.

measures, to achieve both prudential and promotional purposes. Incentive- and quantity-based policies with promotional purposes are absent, despite being widely used in other jurisdictions. We term this restricted usage of instruments for promotional purposes in Europe a 'promotional gap'. We explain this with two main institutional dynamics. First, European political authorities have progressively aimed to reduce their intervention in capital allocation, leaving more room for market mechanisms. Second, the supervision of these markets has been increasingly entrusted to delegated authorities with narrow technical mandates and strong independence from political pressures. The specific configurations these dimensions take in Europe only allow for the implementation of consensual informational policies and prevent the implementation of far-reaching policies with promotional, developmental and market shaping aims.

Our second objective is to explore the possible institutional evolution of the current promotional gridlock in Europe. We identify three main stylized scenarios. First, political authorities can step up their efforts to mitigate climate change and support the net-zero transition, allowing delegated authorities to stick to their prudential role. While this would respect current institutional boundaries, mandates, and missions, it requires significant action by political authorities in the fiscal and budgetary sphere and may not be sufficient. Alternatively, as climate pressures intensify, delegated authorities can gradually move towards more promotional measures without an underlying adjustment of their mandate. We observe signs of a similar promotional trend in recent documents and speeches by European financial regulators. If brought to its extreme, such a drift might eventually lead to a technocratic scenario characterized by an agency defining development objectives with weakened political control. Third, political authorities can decide to regain control of certain policy functions (e.g. banking regulation) and use them to achieve their development objectives (e.g. fostering the low-carbon transition). This might improve the effectiveness of climate financial action, but it also raises concerns regarding the credibility of delegated authorities. Instead, political authorities could preserve the independence of delegated authorities but adjust their mandates in order to provide them new input legitimacy and define clear limits to their promotional actions.

Our work contributes to two main strands of literature. First, we provide more solid institutional and governance foundations to the ongoing debate concerning the role of central banks and financial supervisors in addressing climate change and the low-carbon transition (Bolton et al., 2020; Campiglio et al., 2018; Krogstrup and Oman, 2019; NGFS, 2019). Second, we contribute to the literature on the evolving institutional nature of central banking and financial regulation in the aftermath of the global financial crisis (Baker, 2013; Fontan, 2016; Mabbett and Schelkle, 2019), by applying its concepts to the issue of climate change and environmental sustainability.

The remainder of the chapter is structured as follows. Section 2 presents our three-dimensional framework to categorize climate-related financial interventions. Section 3 examines existing approaches to climate-related financial policymaking and identifies a 'promotional gap' in Europe. Section 4 argues that two institutional features, namely a weaker control on financial dynamics and delegated authorities' stronger independence, can contribute to explaining the European setting. Section 5 examines the resulting policy gridlock and discusses how this prevents the implementation of more ambitious promotional policies. Section 6 explores possible institutional scenarios stemming from the present situation. Section 7 concludes.

2 Motives, instruments and authorities

In this section, we present our theoretical framework. This allows us to classify climate-related financial policies along three dimensions: motive, instrument and implementing authority. Table II.1 proposes a summary of our framework.

2.1 Promotional and prudential motives

We identify two main motives behind the implementation of climate-related financial policies. Such motives have already been widely discussed in chapter I.

First, public intervention could be motivated by the desire of tackling climate change by directly influencing the allocation of financial capital. This is what we define as the promotional motive. One of the objectives stated in the Paris Agree-

Table II.1 – A taxonomy of climate-related financial policies

Policy motives	
Promotional	Mitigate climate change by guiding credit and steering financial flows based on sustainability criteria
Prudential	Ensure the stability of the financial system in the face of climate-related risks
Policy instruments	
Information-based	Improve climate-related information available to financial actors and provide them with clear definitions, rules and instruments
Incentive-based	Introduce (monetary) incentives to make low-carbon strategies more attractive to financial actors
Quantity-based	Impose direct quantitative controls on financial flows
Implementing authority	
Political	Authorities in charge of defining and pursuing development strategies (e.g. governments)
Delegated	Institutions with specific mandates delegated to them by political authorities (e.g. central banks and financial supervisors)

ment is to 'make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development' (UNFCCC, 2016). Climate-related promotional financial policies can stimulate physical and financial investments in sustainable activities. They are therefore based on a 'market shaping' approach (Mazzucato, 2016) and usually respond to development strategies defined by political authorities.

Second, policies could be motivated by the desire to ensure the stability of the financial system in the face of climate-related dynamics. This is what we define as the prudential motive. Several climate-related risks (CRRs) could threaten financial systems and require the implementation of prudentially-motivated policies. Since Carney (2015), the literature traditionally distinguishes three categories of risks: i) direct and indirect effects of climate-induced events and trends (physical risks); ii) implications of shifting towards a low-carbon economy (transition risks); and iii) losses incurred as a result of legal actions against companies and regulators for

their inaction to tackle climate change (liability risks). CRRs could trigger ripple effects via production and financial networks (Roncoroni et al., 2021; Cahen-Fourot et al., 2021) and have larger macroeconomic impacts, possibly leading to systemic disruptions sometimes referred to as a 'Green Swan' (Bolton et al., 2020). Acknowledging this, prudential-motivated policies are aimed at identifying, monitoring and mitigating these climate-related risks to ensure financial stability.

To sum up, promotional policies are mainly aimed at protecting climate stability from finance-related dynamics (e.g. obstacles to low-carbon investing). Prudential policies are instead aimed at protecting financial stability from climate-related risks. The boundary between these two types of objectives is often porous. It is reasonable to expect prudential policies to have some kind of promotional consequence. Likewise, promotional policies will probably have some impact on individual and aggregate levels of financial risks. It is also possible to argue for actively steering credit towards low-carbon activities precisely to mitigate climate physical risks, based on a macroprudential forward-looking and system-based risk-assessment.

2.2 Information-, incentive- and quantity-based policies

Policymakers have multiple tools at their disposal to achieve promotional and prudential objectives. They can improve the information communicated to agents (e.g. awareness campaigns on carbon emissions), modify the incentives structure in which they make their decisions (e.g. fiscal policy with carbon taxes) or impose quantity constraints by rationing or even prohibiting certain practices (e.g. ban excessively polluting combustion engines). These levers can be activated at multiple levels, from production to consumption of final goods. In this thesis, we focus on policies intervening in the financial sphere, i.e. interventions that directly tackle the way private financial flows are distributed across economic activities. Since this allocation of capital takes place upstream of physical investment, production and final consumption, such measures allow to act *ex ante* on future greenhouse gas emissions.

First, regulators can act to improve the quantity and quality of climate-related information available to financial market players and to provide them with a clear

shared set of definitions, rules and instruments. We call these informational policies, as their goal is to bridge the market failures stemming from imperfect and asymmetric information. The informational policy toolkit includes the development of better methodologies to assess the exposure to CRRs, the introduction of disclosure incentives or requirements, the setting of standards and benchmarks, the creation of taxonomies, and others. These policies can be implemented for both prudential and promotional motives.

Second, regulators can modify the structure of incentives (e.g. the relative prices) that financial actors face when making investment decisions. We refer to these as incentive-based policies, as the allocation of capital remains a market prerogative and investors are free to invest in high-carbon or risky assets, although at a cost. Several policies in the financial regulation toolkits (e.g. capital requirements) can be calibrated so to differentiate the treatment of assets depending on the CRR-exposure of bank loan portfolios (D'Orazio and Popoyan, 2019). Monetary policy tools can also be adjusted by including CRRs in the evaluation of asset eligibility as part of collateral frameworks or asset purchase programs (Oustry et al., 2020). Such policies can be implemented either to encourage investors to reduce their exposures to CRR risks (prudential motive) or to increase sustainable investments (promotional motive).

Finally, public institutions can intervene directly on the quantity of financial resources allocated to specific productive activities. We call these quantity-based policies, as these policies impose direct quantitative controls on financial flows rather than adjusting the environment in which individual decisions are made. These include for example policies targeting directly the composition of bank loan portfolios (e.g. sectoral credit quotas), minimum credit floors or maximum credit ceilings for certain sectors (Bezemer et al., 2018). The aim of these policies is usually seen as predominantly promotional. However, they could also be used for a prudential motive (e.g. lowering exposure of banks to industries prone to transition risk by imposing maximum credit ceiling on coal financing).

Informational, incentive- and quantity-based policies form a gradient of public interventions ranging from the most diverted to the most direct ways of steering

private capital flows. These three shades of intervention can be used in conjunction with each other, offering policymakers a set of measures to be implemented in the financial sphere, whether for prudential or promotional reasons.

2.3 Political and delegated authorities

Policy objectives (promotional or prudential) as well as the instruments to achieve them (informational, incentive- and quantity-based policies) can fall under different authorities. We distinguish two main types of public institutions that can be involved in the design and implementation of climate-related financial policies.

First, we identify political authorities (PAs) as the public organisms in charge of determining the direction of economic development on behalf of their populations, deciding between competing interests. They include parliaments, governments, ministries and other public institutions able to contribute to the definition of development strategies. All of them enjoy some form of legitimacy, at least temporarily (Schmidt, 2016). PAs are typically in charge of designing and implementing policies with a promotional aim, as these often have distributional and other socio-economic implications. Depending on the underlying governance framework, they might also be more or less involved in designing prudential policies (D'Orazio and Popoyan, 2020).

Second, we identify delegated authorities (DAs) as autonomous or semi-autonomous institutions with specific mandates given to them by the PAs. Their legitimacy thus lies in the nature and limits of the delegation and specified mandate (input legitimacy) and in their ability to fulfil their mission (output legitimacy) (Scharpf, 1999). It also depends on their ability to adequately justify and explain their decisions through procedures of accountability (throughput legitimacy) (Schmidt, 2013). Two main DA categories interacting with financial systems can be identified: central banks and financial supervisors. Central banks are typically tasked with the mandate of achieving price stability, but their mandate can also include full employment, exchange rate management and others (Dikau and Volz, 2021a). In the aftermath of the global financial crisis (GFC) several central banks have also become

responsible of monitoring financial stability.[3] Financial supervisors are delegated authorities with diverse mandates and shapes across countries, tasked with protecting consumers, ensuring the solidity of individual institutions or the resilience of the financial system. They are sometimes in charge of supervising specific sectors of financial systems (e.g. banks, securities markets, insurance companies, etc.). DAs are usually involved in determining policies with prudential aims. They are often required to have a neutral impact on markets so not to distort financial asset pricing, which, in efficient markets, should already incorporate a correct consideration of risk.

The boundaries between PAs and DAs are not always well defined and vary across jurisdictions. In Europe, for instance, there is a relatively clear distinction of institutional responsibilities. The European Commission (European Parliament) and the governments of member states (national parliaments) are the political authorities with executive (legislative) power and legitimacy to carry out development policies. Monetary policy is delegated to national central banks and, for the 19 (20 since January 2023) countries belonging to the Eurozone, to the European Central Bank (ECB). National central banks retain a seat at the Governing Council and implement monetary policy decisions in their domestic market. Financial supervision is ensured by the existence of both European- and national-level supervisory authorities (e.g. the European Securities and Market Authorities at the European level acts in coordination with the Autorité des Marchés Financiers for France). Both central banks and financial supervisors in Europe enjoy a significant degree of freedom in achieving their mandates, and do not have to align to political objectives. In other regions the distinction between PAs and DAs is instead less clear, as the overall governance framework is designed to deliver on developmental objectives. In such contexts, central banks and financial supervisors are usually compliant with government's directives.

[3] This will be discussed further in chapter V.

3 The 'promotional gap' of European climate-related financial policies

In this section we examine a selection of climate-related financial policy approaches through the lens of our framework. In Europe, informational instruments have been the only tools used by political and delegated authorities, for either prudential or promotional reasons. By contrast, other jurisdictions, especially in emerging regions, have a more diversified promotional portfolio that also includes incentive- and quantity-based policies. This reveals what we call a European 'promotional gap', i.e. a restricted usage of the set of conceivable climate-related financial policies to be used for promotional purposes.

3.1 Climate-related financial policies in Europe

Most policy efforts on climate-related finance in high-income regions rely on informational measures. We can identify three main categories of instruments: i) clarification of concepts and standards; ii) development of risk assessment methodologies; and iii) disclosure of risk assessments.

First, several initiatives are attempting to create a transparent and common market understanding of what it means to be 'green' by providing new standardised information. For instance, the European Parliament and the EU Council agreed on a taxonomy stating which activities can be labelled as sustainable (EU Regulation 2020/852). According to European policymakers, such a taxonomy represents 'an essential step in supporting the flow of capital into sustainable sectors in need of financing' (European Commission, 2018). The EU Low Carbon Benchmarks Regulation enforces disclosure requirement for sustainable benchmarks regarding their integration of environmental, societal and governance (ESG) factors and sets out the conditions to be labelled as 'Climate Transition' or 'Paris-aligned' benchmarks (EU Regulation 2019/2089). The aim of this regulation is to improve the reliability of sustainable benchmarks by reducing greenwashing. Finally, the creation of an EU Green Bonds Standard represents the last step of the Commission's Action

Plan in order to 'facilitate channelling more investments into green projects' (European Commission, 2018). The presence of this label would give the information to potential investors that the project is indeed 'sustainable'.

Second, both private financial institutions and regulators are starting to develop and use methodologies aimed at assessing the exposure to climate-related risks. This applies to the operations of non-financial firms, to the portfolios of financial institutions, and to financial systems as a whole. French supervisors, for instance, developed a modelling framework focusing on the potential disruptions associated to 'disorderly' transition scenarios (Allen et al., 2020), and submitted it to a group of banks and insurance companies to perform a pilot bottom-up risk assessment (ACPR, 2020). Similar approaches are being adopted by De Nederlandsche Bank (Vermeulen et al., 2019), the Bank of England (Bank of England, 2019a) and the European Central Bank (ECB, 2020b).

Third, measures are being taken to facilitate the disclosure of information by financial and non-financial firms concerning their exposure to CRRs and their strategies to address them. For instance, the EU Disclosure Regulation lays down harmonised transparency rules for market participants and financial advisers regarding their integration of ESG risks, including CRRs (EU Regulation 2019/2088). The aim of the regulation is to 'reduce information asymmetries in principle-agent relationships with regard to the integration of sustainability risks'. Such efforts to promote transparency and disclosure of climate-related information have proliferated in recent years. In its newest Sustainable Finance Strategy, the EU Commission adopted a Delegated Act on sustainability-related information (European Commission, 2021). At the national level, France led the way in 2015, requiring listed companies and institutional investors to evaluate, report and address their exposure to CCRs on a comply or explain basis (Mason et al., 2016). At the global scale, the Taskforce on Climate-related Financial Disclosure (TCFD), created by the Financial Stability Board, supports the development of climate-related disclosure methods in order to improve the information available to financial investors and facilitate the inclusion of climate-related factors into decision making (TCFD, 2017).

It is worth noticing how these policy initiatives have been conducted by both po-

litical and delegated authorities, often in collaboration. For example, the European Banking Authority (EBA) was mandated by the European Commission to develop a technical standard for ESG disclosure and to assess how ESG risks (with a particular focus on CRR) could be included in the regulatory and supervisory framework for credit institutions and investment firms (EBA, 2019). The Commission also requested the European Insurance and Occupational Pension Authority (EIOPA) for an opinion on sustainability within Solvency II, relating in particular to those aspects that concern climate change mitigation. Finally, the three European Supervisory Authorities (ESAs) have also been requested to collect evidence of undue short-term pressure from the financial sector on corporations that may hinder the low-carbon transition (European Commission, 2019).

3.2 The European promotional gap

Based on our framework, all the climate-related financial interventions examined above can be considered as informational. Whether implemented for prudential or promotional reasons, either by political or delegated authorities, the main strategy is always to improve the information available to market players (standards, labels, disclosure requirements, etc.) in order to nudge capital reallocation without forcing behaviors or providing direct monetary incentives. Although these measures are widely used around the world, relying solely on information enhancement seems to be more the exception than the rule. Indeed, many authorities supplement informational policies with incentive- and/or quantity-based policies to reach their promotional objectives. The use of such instruments is particularly prominent in emerging regions, but also appear in some high-income countries such as Japan (Campiglio et al., 2018; Dikau and Ryan-Collins, 2017). For example, the Bank of Japan and the Bank of Lebanon have implemented incentive-based policies for banks, with the former offering more favourable refinancing terms to banks that lend to sustainable projects and the latter differentiating reserve requirements based on lending to green projects (Bank of Japan, 2019; Banque du Liban, 2010). Other countries have implemented quantity-based financial policies for promotional motives. For example, the Reserve Bank of India requires banks to allocate 40% of their credits to priority

sectors, including renewable energy, and Bank of Bangladesh's 'green floor' obliges its commercial banks to allocate 5% of their credits to green sectors (Reserve Bank of India, 2015; Monnin and Barkawi, 2015).

Yet, the most striking example of comprehensive financial policies with promotional purposes can be found in China. In addition to informational measures, China implements a combination of incentive- and quantity-based instruments. These measures are mainly incorporated into the Macro Prudential Assessment (MPA), a scoring system through which the People's Bank of China (PBoC) assesses the performance of banks. It is composed of seven categories, in turn defined by aggregating a large number of sub-dimensions (Zheng, 2018). While several of them are in line with policies being applied in western societies, such as risk-based capital adequacy ratios, some go well beyond what European regulators would consider as part of the macro-prudential policy toolkit, such as measures of loan portfolios alignment with the PBoC 'green' credit policy strategies (People's Bank of China, 2018). The interest rates on banks' deposits at the PBoC are then differentiated across performance categories, hence making it economically attractive for banks to align with top-down policy objectives, such as green lending. Additional promotional measures include the acceptance at favourable conditions (e.g. lower credit rating requirements) of green bonds as banks' collateral within the PBoC's medium-term loan facility since June 2018, as well as granting green bonds a 'first among equals' statute that lead for them to trade a significant discount, making it easier and cheaper for sustainable activities to access finance (Macaire and Naef, 2022). Last, but not least, Chinese policymakers rely highly on 'window guidance', e.g. informal 'benevolent compulsion to 'guide' financial institutions to extend credit and allocate lending in line with official (government) targets' (Dikau & Volz, 2021b).

This much more diverse policy-mix, both in instruments and in objectives is also reflected in central banks' communication. As we will show in chapter IV, central bankers from Japan, China, Bangladesh and others had not waited for Mark Carney's speech (2015) to think about the consequences of climate change on their actions. Their approach has been more open and ambitious, questioning the responsibility of finance and reflecting on their role as central bankers in facilitating the

transition to a low-carbon economy. In contrast, central bankers in Europe, USA or UK only really picked on the issue from 2018 onwards, focusing on the prudential side of things from the outset.

Europe appears well advanced in the implementation of informational financial policies. However, it uses neither incentive- nor quantity-based policies to actively reorient financial flows towards sustainable activities. This uncovers what we call a 'promotional gap', as promotional objectives of European authorities are only being pursued through a partial use of all the tools at their disposal. This promotional gap raises doubts on the ability of the European financial system to support a rapid low-carbon transition (Ameli et al., 2020).

4 Institutional drivers of the promotional gap

In this section, we examine the institutional characteristics that could explain the promotional gap observed in Europe, i.e. the reasons why informational policies are the only policies implemented for promotional purposes. We identify two main explanatory dimensions: i) the low level of control of EU political authorities over financial dynamics; and ii) the high level of independence and power of EU delegated authorities.

4.1 Limited public control on financial capital allocation

Political and delegated authorities have different levels of will and power to act on financial markets allocation. We observe in this area a stark divergence between high-income and emerging regions, consistent with the identified promotional gap.

European economic frameworks place a strong emphasis on market freedom and efficiency. This reflects the traditional framing of markets as the bottom-up institution that better allocates resources to the most productive uses. The process of economic and monetary European integration has contributed to gradually reducing the role of the 'interventionist' state and simultaneously expanding the 'regulatory' state (Majone, 1997). Public interventions, in this context, should be justified by the necessity to address specific 'market failures', rather than engaging in active 'mar-

ket shaping' activities steering economic activity in specific directions (Mazzucato, 2016). In Europe, as in other high-income economies, regulators are careful to avoid 'distortions' in financial markets, where interaction between market participants seeking profitable investment opportunities and 'market discipline' are expected to lead to the most efficient outcome.[4] Creation of credit can be restricted as a whole to mitigate excessive risks - as currently done via the Basel III rules (Basel Committee on Banking Supervision, 2010) - or to fight inflation by controlling the overall credit supply, but the allocation of credit across sectors and technologies should be left to the autonomous decisions of financial actors. This approach is well rooted in the European Union institutional framework. For instance, Article 127 of the Treaty on the Functioning of the European Union (TFEU) states that the European System of Central Banks 'shall act in accordance with the principle of an open market economy with free competition' (Consolidated version of the Treaty on the Functioning of the European Union, 2012). This free-market perspective logically leads to European regulators being inclined to finding solutions 'for the market, by the market' (Carney, 2016), entrusting financial markets to direct flows to low-carbon activities, once risks are properly understood. In this context, bridging informational gaps is crucial to restore market efficiency 'without the need for detailed or costly regulatory interventions' (Carney, 2015). An additional reason not to create market distortions in the EU as a transnational entity is given by the risk of inadvertently causing a reallocation of resources among member states without the necessary political processes in support. Monnet (2018) recalls that the demise of credit allocation policies in Europe was essential to achieve the convergence of central bank practices necessary for the European Monetary Union, an argument that is echoed in the ECB chief economist's account of European integration at the time (Issing, 2008, p119).

On the contrary, emerging economies' regulators usually maintain a higher systemic control of macro-financial dynamics, guiding capital allocation towards specific activities deemed as socially useful. This is particularly true for the governance of the banking system, in which central banks and financial regulators in emerging

[4]For a critique of European's focus on market discipline in macroprudential regulation, see the thesis of Le Quang (2019)

economies appear to be much more hands-on than high-income ones (Dikau and Ryan-Collins, 2017). Promotional interventions in financial dynamics represent the normal day-to-day functioning of 'state capitalism' shaping markets to achieve its development goals, rather than being perceived as distortive shocks to be avoided. For instance, the presence of the Chinese government in the financial network is systemic, as owner of companies and banks and as a top-down creator of new markets. Banks are run by the state, with deep entanglements of communist party hierarchies; financial markets and stock exchanges are politically embedded and ultimately subordinated to the Chinese government that guides financial allocation through various channels (Petry, 2020a, 2020b). More generally, East Asian financial systems are characterized with 'developmental characteristics', 'tak[ing] on an important role in facilitating national developmental objectives, thereby blurring the state-market boundary' at odds with the neoliberal logic of western financial systems (Pape & Petry, 2023). Policymakers leverage their power on the financial system to achieve extrinsic and developmental objectives (Rethel & Thurbon, 2020; Thurbon, 2016).

4.2 Independence and powers of delegated authorities

EU authorities are reluctant to influence financial dynamics for fear of causing distortions and inefficiencies. But they also have fewer levers to do so, having delegated both monetary policy and financial supervision to independent authorities with restricted mandates and, since the global financial crisis, increasing powers. While Central Bank Independence and its shortcomings in meeting the challenges of modern central banking will be further developed in chapter V, we briefly sketch in this subsection how this particular institutional arrangement constrains potential climate-related financial policies.

Central bank independence is a relatively recent phenomenon. The claim that delegating monetary policy functions to independent technical agencies would improve the ability of societies in keeping low and stable inflation was first put forward by academic economists (see for instance Kydland and Prescott, 1977). These contributions, originating from a period of prolonged high inflation, argued that

'rules', rather than 'discretion', would solve monetary policy time inconsistency issues and protect central banks from the undesired interference by governments and 'political business cycles' (Nordhaus, 1975). Despite the presence of counter-arguments (McNamara, 2002), the theory was successful in triggering the rapid diffusion of interventions aimed at making central banks independent during the '80s and '90s (Goodhart, 2010). This independence shift was particularly salient in market-friendly high-income countries. Most developing economies tend instead to preserve a higher level of political control over their central banks (Dikau and Volz, 2021a; Dincer and Eichengreen, 2014). The creation of independent specialized agencies in Europe fitted with the governance shift to a rule-making political authority framework (Majone, 1997).

As a counterpart to this greater independence, the mandate of central banks is generally defined narrowly to avoid institutional drift, i.e. to prevent the independent delegated authorities from claiming undue autonomy and powers from the elected political authorities. This is particularly true in high-income regions. Delegated authorities must respond to a precise mandate providing them with delimited objectives, the fulfillment of which is their sole source of output legitimacy. In high-income countries, price stability is central banks' predominant prerogative, although some development objectives may remain (the US Federal Reserve, for example, has a mandate for both price stability and unemployment). This tends to prevent promotional interventions. Financial supervisors are requested to adhere to their prudential mandate without distorting private capital allocation or 'picking winners' among economic activities. In emerging economies, the promotional dimension is often more prominent and central banks are granted less restrictive mandates, which is consistent with their higher level of political control. As a result, ambitious green financial policies and regulations are adopted mainly in jurisdictions characterized by low central bank independence (D'Orazio and Popoyan, 2020).

Finally, it should be stressed that recent developments in EU financial governance have exacerbated this prudential tendency. Indeed, the cascading effects triggered by the global financial crisis have led to a reshaping of the European institutional framework, placing greater emphasis on the prudential missions of delegated au-

thorities, giving them responsibility for new instruments to govern finance (Baker, 2013; Blinder et al., 2017). In addition to monetary policy and price stability, both the ECB and the Bank of England (re)gained explicit control of prudential missions after the global financial crisis. The Single Supervisory Mechanism and the Banking Union allowed the ECB and national CBs to expand their functions to include financial stability and macroprudential regulation, and even fostered the creation of new delegated authorities such as the European Systemic Risk Board and the three ESAs. With a prudential mandate, delegated authorities have been granted control over new unconventional policies such as quantitative easing or macroprudential discrete interventions, even though their distributional consequences are unclear (see chapter V). This expansion led to higher independence and a reinforced prudential side of policy interventions.

5 Europe's institutional gridlock and the need for consensus

As discussed in the previous section, European jurisdictions are characterized by a weak public control on private financial dynamics and strongly independent delegated authorities. In this section, we unfold how this institutional framework leads to an impasse, preventing the implementation of far-reaching promotional financial policies.

Table II.2 tracks two dimensions of the climate-related financial policy space: i) what fits (or does not fit) with the objectives of political authorities; and ii) what fits (or does not fit) with the objectives of delegated authorities. We identify four quadrants.

The top-left quadrant contains all the 'consensual' policies that simultaneously: i) mitigate (or at least do not worsen) exposure to financial risk; and ii) push the financial system in a direction compatible with the development objectives of political authorities. We find in this quadrant all the policies that we observed being implemented essentially in every jurisdiction: disclosure requirements, taxonomies, sustainability benchmarks, green bond standards, climate stress test exercises, data

sharing, etc. These informational measures do not meet with any resistance from either institution, as they fit with both promotional and prudential aims. From the prudential perspective, they are considered means to overcome issues related to imperfect and asymmetric information regarding the exposure to CRRs, which prevents financial market players to price assets appropriately and financial regulators to ensure adequate supervision. From the promotional perspective, informational policies are considered a means to encourage financial flows towards sustainable activities, while preventing green washing thanks to comparable and harmonised standards.

Table II.2 – Climate-related financial policy space in Europe

		Delegated authorities	
		Fits with objectives	*Does not fit with objective*
Political authorities	*Fits with objectives*	Disclosure standards Green and dirty taxonomies Green Benchmarks Climate stress-testing Green bond standards	Green monetary policy Green supporting factor
	Does not fit with objectives	Sectoral leverage ceilings Dirty-credit controls Dirty penalizing factor	

The top-right quadrant includes conflictual policies that are likely to have a positive impact on the reallocation of financial resources towards sustainable sectors, but do not fit with the prudential objectives of delegated authorities as they have uncertain or negative implications on the exposure to financial risk. We illustrate this scenario with two salient policy examples: a 'green supporting factor' and 'green' monetary policy:

As mentioned in the introduction of this chapter, a 'green supporting factor' (GSF) on capital requirements has been proposed by the European Parliament and

Commission to ease regulatory constraints for banks that are lending to sustainable activities (Dombrovskis, 2017). In principle, this measure would contribute to allocating larger amounts of credit to sustainable activities (although the evidence for the effectiveness of a similar policy implemented in favour of small and medium enterprises has been mixed, see EBA, 2016). However, since solid evidence of lower risks associated to green loans is currently missing, the proposal of introducing a GSF did not meet the favour of delegated authorities tasked with a prudential mandate, arguing that 'the essence of capital requirements is to safeguard financial solidity and stability' (Dankert et al., 2018). The European Commission decided to put the legislative proposal on hold and to mandate the EBA to carry out an expertise mission on the relevance of such an instrument (see the revised Capital Requirements Regulation (CRR 2); EBA, 2019). That is, a delegated authority with a prudential nature has been delegated to decide on the implementation of an instrument designed to serve promotional objectives. In 2022, the EBA gave its final answer in a report advising against the GSF, thereby nipping this promotional policy in the bud on prudential grounds (EBA, 2022).

A second relevant example of conflictual policy is the 'greening' of monetary policy tools such as the ongoing 'quantitative easing' programs of financial asset purchases. The standard approach taken by central banks in Europe has been guided by the principle of 'market neutrality'. This consists in buying assets in a way so not to distort the market-driven allocation of capital; for instance, by allocating purchases across sectors in the same proportion to the sectoral outstanding amounts in corporate bond markets (on market neutrality and its 'myth' character, see van 't Klooster and Fontan, 2020). However, the high carbon intensity and heavy impacts on biodiversity of modern financial markets lead central bank interventions to reinforce their unsustainability lock-in (Dafermos et al., 2020b; Kedward et al., 2022a). The *de jure* principle of not choosing leads to a *de facto* choice in favour of polluting activities. With these conclusions in mind, several contributions have argued for monetary policy to be 'greened' (see e.g. Monnin, 2018; Schoenmaker, 2021). This is generally not supported by delegated authorities, who see it as possibly negatively affecting their legitimacy as well as their ability to attain their primary objectives.

Weidmann (2020) epitomise such view, arguing that 'it is not the task of the Eurosystem to penalise or subsidise certain industries. Correcting market distortions often has intricate distributional implications. Such decisions need strong democratic legitimacy and are a matter for governments and parliaments.' The Governor of Bank of Belgium, Pierre Wunsch, has also backed his Bundesbank colleague (see e.g. Wunsch, 2021). So far, delegated authorities have resisted the implementation of such promotional-motivated policies that might hinder their mandate or objectives. However, this situation could change as climate-related issues become more pressing (see next section).

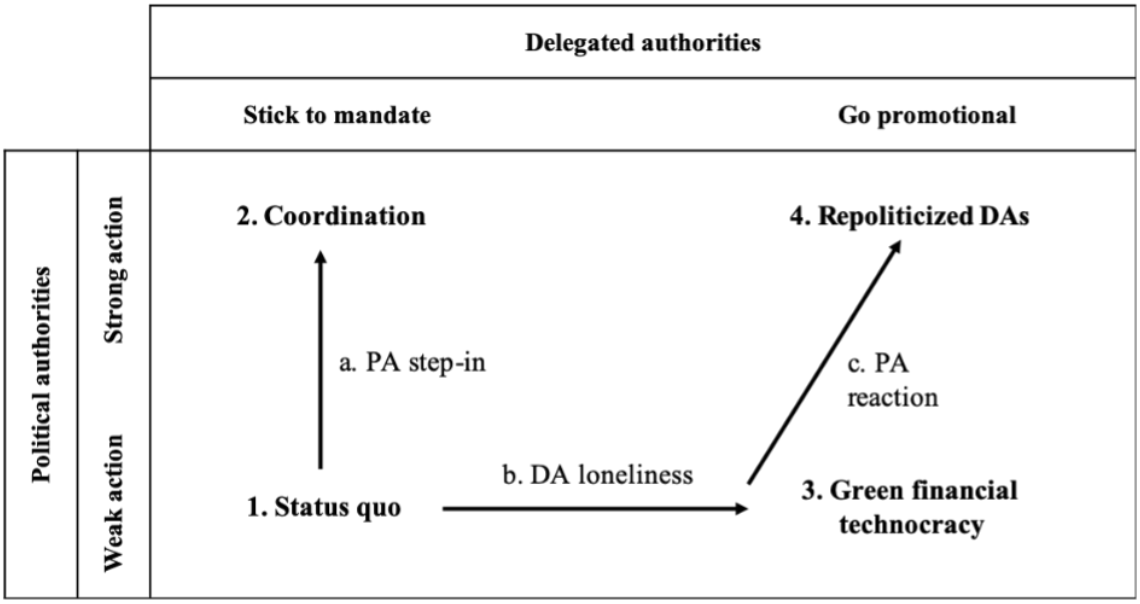
The bottom-left quadrant includes conflictual policies that would have a positive impact on the exposure to financial risk but might have contrasting effects on some development objective. For instance, using banking and financial regulation to introduce disincentives to high-carbon investments (e.g. a 'dirty-penalizing factor') might mitigate the exposure to financial risks, but could negatively affect bank credit volumes and economic growth. These measures naturally encounter the opposition of the banking sector, which can lobby policy-makers against them (Scialom, 2019). For this reason, the policies in this quadrant are generally supported by delegated authorities but not by political authorities, who tend to prefer green support policies that broaden the range of profitable activities rather than making losers in dirty sectors.

To sum up, the institutional setting present in Europe restrains the allowable policy space in green finance to consensual policies (top-left quadrant). Delegated authorities, in charge of preserving price and financial stability, possess the institutional strength and independence to push back conflictual policy initiatives that might put at risk the achievement of their objectives. Other jurisdictions have instead a wider green financial policy space, since the balance of powers between political and delegated authorities is different and development objectives are given more weight. Certain policies are admissible, and often carried out by delegated authorities themselves, even if they could potentially have distributive impacts and/or negative implications in terms of financial risks.

6 Future institutional scenarios

In this section we leverage on our proposed framework and adopt a forward-looking perspective to identify the possible evolutions stemming from the current institutional gridlock. Table 3 provides a schematic view. We assume political authorities to have two main strategies: i) take a strong action to mitigate climate change (e.g. implement a carbon pricing policy in line with climate stabilization objectives); and ii) take no or limited climate action. Delegated authorities also have two main strategies: i) continue adhering to market neutrality and prudential motives; and ii) adopt policies with promotional aims. These strategies represent extremums on a continuum of possible behaviors by both PAs and DAs. We identify four main scenarios (1. to 4.) and three main dynamics (a. to c.) that are summed up in table II.1. We note that the latter dynamic may already be at work at the European Central Bank, which will be discussed further in chapter III.

Figure II.1 – Stylized institutional scenarios



6.1 Status quo

We start by analyzing the equilibrium we have been experiencing in recent decades (Scenario 1. Status quo). In this setting, limited climate action is taken by

PAs, as evidenced by the insufficient adoption of carbon pricing initiatives (World Bank, 2020) and DAs limit themselves to the achievement of the objectives stated in their mandate, without overstepping. When they get involved in climate-related issues, they do so by respecting market neutrality and demanding evidence of financial risks before intervening in a 'market distortive' manner.

We argue this equilibrium to be ultimately unstable due to the increasing environmental constraints. As argued in Section 5, the only policies that can be implemented to shift financial resources towards sustainable investments are informational ones. However, these policies by themselves are unlikely to either fully capture inherently uncertain climate-related risks or to push financial resources towards sustainable activities with the sufficient strength (Ameli et al., 2020; Chenet et al., 2021; Christophers, 2017). A prolonged status quo may lead to a 'too late too sudden' scenario (NGFS, 2020a), where the sudden future realization of the necessity of a low-carbon transition, possibly driven by an unanticipated climate disruption, causes large repercussions to economic and financial stability. To avoid this undesirable scenario, either PAs or DAs need to adopt promotional measures to steer credit in the direction of low-carbon activities.

6.2 PA step-in and coordination

The first path out of the status quo would be for the political authorities to significantly step up their promotional efforts to mitigate climate change, relieving DAs from the necessity to go beyond their prudential objectives (dynamics a. PA step-in). This would lead to a scenario in which each authority separately contributes to a common coordinated objective, while respecting their respective fields of competence: PAs implement fiscal policies shifting the incentive of market players away from carbon-intensive activities, and DAs closely monitor the impacts of climate-related financial risks on price and financial stability (scenario 2. Coordination).

However, this scenario poses a number of challenges. First, it is uncertain that sole fiscal action would be enough to tackle climate change. Due to a number of market failures, action in the financial sphere could be needed in conjunction to fiscal policy in order to provide an orderly transition (Campiglio, 2016). Second, if

fiscal action were to represent all climate action, it would have to be far-reaching and effective. However, it is unclear how likely strong climate mitigation policies might be implemented in the near future. Ambitious carbon pricing policies have strong immediate economic and political costs making them unpopular (see for instance the gilets jaunes movement in France), leading to insufficient action from political authorities (Maestre-Andrés et al., 2019). This has not been a phenomenon unique to Europe: despite the decade-long discussion on how essential it would be to price carbon, policy initiatives implemented so far at the international level still do not live up to the stated ambitions (World Bank, 2020). For this reason, some argue for delegating the management of the carbon price path to a new independent authority free from political pressures such as a 'carbon council', or 'carbon central bank', so to improve the credibility and predictability of policy commitments (Delpla and Gollier, 2019; G30, 2020).

In addition, both European national governments and the European Union apparatus appear distracted by a vast range of persistent complex issues (e.g. the Eurozone crisis, Brexit, increasing inequality, migration flows), therefore paying insufficient attention to longer-term objectives as climate mitigation and adaptation. Further, the Covid-19 crisis and imminent fiscal recovery packages could slow down political progress on climate change (Hepburn et al., 2020). Finally, the European institutional framework is further complicated because of the presence of multiple veto players among which it is often cumbersome to find an agreement over ambitious climate policies (Tsebelis, 2002).

For these reasons, sufficient action by PAs in the fiscal area to stabilise the climate may seem difficult to achieve. Faced with weak or delayed action from PAs, pressure could build up to force DAs to step in. In fact, as we shall see, this move might have started for some delegated authorities.

6.3 DA loneliness and green financial technocracy

The second path out of the status-quo would be for DAs to adopt climate-related promotional policies. Whether and to what extent delegated authorities will go promotional without an explicit *ex ante* institutional agreement will depend on the

relative weight they attach to two sets of factors: i) input legitimacy, institutional credibility, and mandate constraints on one side; and ii) output legitimacy and environmental concerns on the other. Some DAs might consider their input institutional legitimacy more important and decide to stick to their prudential-oriented mandates. Other DAs might instead consider climate change likely to jeopardise their primary objectives: besides endangering financial stability with increased physical risks, climate change would disturb monetary policy transmission channels and limit the European central banks' ability to achieve their objective of price stability in the future (Andersson et al., 2020). ECB President Christine Lagarde seems to be of that opinion: 'I contend that price stability can be significantly affected by climate change, and that as a result of that, if we want to deliver on our mandate, we have to be not only mindful but also take action in order to prevent climate change from affecting that price stability that is our mandate' (Lagarde, 2020a).

In a context characterized by political authorities' inaction, this might force DAs to intervene to compensate for the lack of promotional effort in the face of thes unfolding climate crisis (dynamics b. DA loneliness). This situation mimics the 'loneliness' of central banks in the aftermath of the financial crisis, when the policy gridlock affecting governments' actions forced delegated authorities to unprecedented monetary interventions (Mabbett and Schelkle, 2019). The longer PAs delay sufficient action, the more likely it is that DAs will step in to compensate for the lack of political will and to avoid irreversible physical risks, using the 'authorization gaps' in their mandate (see below). Recent developments suggest that we are already experiencing a gradual move of independent DAs towards promotional policies. This move is especially prominent for the ECB, as will be discussed further in chapter III. In 2020, ECB set up a dedicated climate-related research group to inform policy decisions and started evoking the option of abandoning the market neutrality principle in asset purchase programs (Schnabel, 2020b). In 2021, it revealed its first strategy review since 2003 with a 4-year plan to concretely integrate climate in its actions. This includes modifying the collateral framework and introducing climate considerations in the corporate-sector purchase program (ECB, 2021b). This trend is justified by the concern that climate change might affect price

and financial stability, i.e. primary objectives. Promotional interventions to mitigate climate change could therefore be interpreted as an attempt to lean against the (climate) wind, in a same preventive way as macroprudential policies proactively counter the accumulation of risks during the build-up phase (D'Orazio and Popoyan, 2020).

Delegated authorities could also argue that going promotional is not only a way to achieve their primary objectives, but also part of their secondary objectives. For example, Article 127 of the Treaty on the Function of the European Union (TFEU) states that the European System of Central Banks (ESCB) 'shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union' (among which we find protecting and improving the quality of the environment), if this comes '[w]ithout prejudice to the objective of price stability' (EU, 2012). Solana (2019) argues that the central banks are also bound by the Article 11 of the TFEU, which states that '[e]nvironmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities'. The mandate of the ECB, and more in general those of delegated authorities, could thus leave some room to legitimise a certain greening of financial policy actions. In addition, DAs are sometimes explicitly pushed to be more proactive in the climate policy sphere by PAs themselves (see for instance EU Parliament motion 2018/2007(INI) that 'acknowledges the independence of the ECB and its primary mandate as being to preserve price stability but recalls that the ECB as an EU institution is also bound by the Paris Agreement').

Besides, reinterpretations of delegated authorities' mandate are possible, as shown by ECB's actions in the aftermath of the global financial crisis (GFC) (de Boer and van 't Klooster, 2020). Before the GFC and the sovereign bond crisis, the interdiction of monetary financing [5] of the EU states used to be interpreted in a narrow sense, preventing ECB from buying sovereign bonds to close spreads between national bonds. During the sovereign debts crisis, unconventional policies such as Securities Market Programme (SMP), Outright Monetary Transactions (OMT) and Public

[5] See Article 123 of the Consolidated version of the Treaty on the Functioning of the European Union

Sector Asset Purchase Programme (PSPP) led to large-scale buying of sovereign debts on secondary markets, therefore closing the spreads and *de facto* annihilating the disciplinary role of market pricing. Both OMT and PSPP were brought to court but confirmed *ex post* as legitimate (see Court of Justice of the European Union's judgments of June 16, 2015 (aff. C-62/14[6]) and October 08, 2018 (aff. C-493/17)). The past successes of the ECB in broadening its actions and reinterpreting its missions could set an important precedent, showing delegated authorities that they can enlarge the spectrum of their actions and engage in the promotional sphere, moving continuously towards a DAs loneliness' outcome, as there is room for safe 'stealth' institutional drift (Schmidt, 2016).

However, if brought to its extreme, this trend could lead to the establishment of a climate-friendly technocratic setting (scenario 3. Green financial technocracy), i.e. a situation characterized by independent technical agencies with the power of defining the features of economic and societal development with no or little political control and without an appropriate adjustment of their mandates (Climate Leviathan or Behemoth of sorts, see Fontan, 2016, and Wainwright and Mann, 2018). The entrance of delegated authorities in the fight against climate change would certainly help reorienting financial flows and facilitate the transition. However, letting delegated authorities fully use their authorization gaps without democratic input legitimacy might ultimately put at risk the credibility of these institutions and affect their ability to reach their primary goals (Cochrane, 2020a). In addition, promotional DAs may not properly address prudential concerns related to CRRs, possibly allowing or exacerbating a 'disorderly transition'.

6.4 PA reaction and re-politicisation of financial policies

We argue that the scenario of a green financial technocracy is also inherently unstable. An increasing disconnection between the *de jure* institutional arrangement based on central bank independence and the *de facto* distribution of financial

[6]Articles 72 to 76 of this judgment recognise the legitimacy of the ECB to intervene in an unbalanced way in its asset repurchase when i) the market pricing was unsatisfactory, imposing an 'excessive risk premia'; ii) this undermined the ESCB's monetary policy transmission mechanism.

governance powers is likely to eventually force a reaction from political authorities. Although this will be discussed further in chapter V, this section presents a brief and broad panorama of possible political authorities' reaction. PA could step in to disavow delegated authorities' promotional pushes and prevent further agency drift, or to offer its political support by legitimizing them *ex post* (dynamics c. PA reaction).

As delegations were designed and assigned in the past, they can be changed or revoked. In national jurisdictions this can usually be achieved by an act of the Parliament. Governments can thus decide to bring back certain monetary policy or financial governance functions under their control. This would allow them, for instance, to differentiate bank capital requirements according to the carbon intensity of lending for purely promotional motives, as the European Commission has already proposed. If such a change would represent a break in the historical trend of increased independence of central banks, Goodhart (2010) and Scialom (2022) argue this movement towards a new regime of central banking characterized by more intrusive regulations, greater government involvement and less confidence in market mechanisms, may have already started since the GFC. This setting would see DAs aligning their actions to PAs development objectives, even if they might have negative prudential implications (scenario 4. Re-politicized DAs). This might seem implausible in the European context, especially due to constitutional constraints. Yet, such an arrangement is not only very common in other jurisdictions (as we highlighted in section 3), but used to be also the default institutional setting in Europe for a long period in the past (Monnet, 2018) despite what 'institutional amnesia' often suggests (Braun & Downey, 2020). Thus, central banks could be taking the mantle of 'climate governors of last resort' (Langley & Morris, 2020).

Of course, PAs' reaction doesn't have to be that radical. Instead of regaining control of the delegated authorities and abandoning central bank independence, political authorities could grant DAs new input legitimacy to implement promotional policies. This would lead to an intermediate situation between scenario 2 (Green financial technocracy) and scenario 3 (Re-politicized DAs) as PAs react to the lonely drift of DAs to give them both clearer grounding and boundaries by democratically

clarifying the 'authorization gaps' of their mandates (de Boer and van 't Klooster, 2020). This would allow a new form of cooperation between political and delegated authorities, giving the latter a genuine role in climate change mitigation. We observe such a shift in the UK, where the BoE has received an updated remit to align regulatory monetary policies consistent with the government's economic strategy to reach net-zero (Sunak, 2021). The European case is more complex, as ECB's missions are enshrined in international treaties that require long processes to be modified. But even if a mandate change is preferable, it is not necessary. Indeed, ordinary legislative procedures (e.g. clarifying the ranking of the objectives or the statutes of the ECB) could prove sufficient to grant DAs adequate input legitimacy (van 't Klooster, 2021a and chapter V for a longer discussion). Another form of reaction could be a legal procedure (similar to the one that followed the programs of the OMT and the PSPP at the European Court) stating *ex post* on the legitimacy of green promotional policies conducted by DAs and providing them with legal ground. Nevertheless, such a procedure acting retrospectively and emanating from a magistrate, rather than from elected authorities, would not have the same force, as judicial review does not by itself provide democratic legitimacy (de Boer and van 't Klooster, 2020). Therefore, political authorities will need to intervene at some point, either to rein in delegated authorities or to provide them with enlarged input legitimacy as well as clear directions and boundaries for their promotional actions.

7 Conclusion

Using a novel conceptual framework distinguishing policy motives, instruments and implementing authorities, we have argued that the ability of European countries and similar jurisdictions to introduce promotional climate-related financial policies is limited by: i) a weak public control on private financial dynamics; and ii) the delegation of policy levers to independent and technocratic authorities with narrow mandates. These traits limit the European green promotional policy space to consensual informational policies aimed at bridging 'data gaps' and increasing transparency and disclosure in financial markets. Proposals of promotional financial

policies with uncertain prudential implications - such as a green supporting factor or a green monetary policy - have been pushed back by delegated authorities. This is less the case in emerging economies, where central banks and supervisors often align financial policies with governments' developmental and sustainable objectives, as will be developed in chapter IV.

Where could this 'promotional gap' lead to? Several scenarios of future institutional evolutions have been explored. First, governments could introduce ambitious mitigation policies (e.g. carbon pricing), allowing delegated authorities to focus uniquely on price and financial stability. This promotional-prudential coordination would be welcome; however, several hurdles currently exist that prevent strong government action on climate. Second, in the face of timid political action, delegated authorities concerned about their output legitimacy might decide to go promotional 'by stealth' and without an appropriate underlying change in mandate. Recent changes by some European delegated authorities hint that this change may have begun, which will be explored further in the following chapter. While scope for extending their actions within their current interpretation of mandates exist, this trend, if brought to its extreme, might result in a green technocratic setting or trigger a takeover of monetary policy functions by political authorities. Finally, political and delegated authorities could cooperate in making the necessary adjustments to achieve a new institutional setting, such as a revision of the mandate, or an ex-post validation of promotional drifts, as will be discussed in chapter V.

In a 2018 speech meaningfully titled '*Let's dance*', the chair of the '*Network for Greening the Financial System*' (NGFS)[7] Frank Elderson, outlined the contributions that central banks and supervisors could make in the societal effort to address climate change (Elderson, 2018). This chapter shows that central banks cannot and should not dance alone. Either through strong action in the fiscal sphere and/or through new clear delegations of climate missions to delegated authorities, political

[7]The NGFS is a network of central bankers and financial regulators across the globe that aims to mutualize expertise on climate-related topics to facilitate policy implementation and diffusion across its members. Frank Elderson has since been appointed to the ECB board. As will be discussed in the next chapter, both the NGFS and Frank Elderson were key actors in ECB's climate mainstreaming

authorities will have to step-in at some point, as central banks and other delegated authorities cannot do it all. It will take two to dance: only through strong cooperation from early stages will it be possible to simultaneously achieve effective climate action and continued high institutional legitimacy.

CHAPTER III

Too Green to be True?

Forging a climate consensus at the European Central Bank [1]

[1] This chapter is an extended version of a paper published in New Political Economy, see (Deyris, 2023). Section 5 is entirely new, while the rest of the article has only been marginally amended.

1 Introduction

In July 2021, the Governing Council of the European Central Bank (ECB) voted unanimously for a four-year action plan to integrate climate change into its policy-making (ECB, 2021b). A year later, it announced that its corporate sector purchase program (CSPP) and its collateral framework would now feature climate-related criteria. Moreover, the CSPP would progressively be tilted not only based on financial risk, but also be aligned with the Paris Agreement emission reduction targets (ECB, 2022b). This represents a clear break with the stances taken by European central bankers just a few years before, who saw climate change as a challenge to be tackled by political authorities alone (e.g. Mersch, 2018; Weidmann, 2020). More generally, this integration of climate concerns is puzzling, as it takes central bankers away from their usual focus and exposes them to reputational risks or attacks on their legitimacy (Dietsch et al., 2022; Van Doorslaer et al., 2022). How can this change be accounted for? Why has climate change become such an important part of the ECB's agenda? How was a consensus reached within the Governing Council on this previously divisive issue? To what extent may this climate shift represent a paradigm change?

In this chapter, we attempt to answer these questions using a mixed methodology and a variety of empirical materials. First, we study the speeches of ECB Executive members using textual analysis techniques to trace back the evolution of climate-related stances among the board. Second, we use the same approach to examine ECB responses to its political accountability counterpart (the European Parliament) regarding climate change. Third, we compare these words with ECB's deeds through a close reading of its official strategy, instrument implementation and policy stances regarding past and future climate efforts. Last, we conduct 23 semi-structured interviews with senior European central bankers, MEPs involved in ECB accountability and advocacy group representatives. The triangulation from the various empirical materials allows us to do three main contributions to the literature.

First, this chapter aims to provide a detailed account of the rapid changes underway within the ECB regarding the climate challenge. By carefully examining all

public speeches and interactions with the European Parliament, and by exploiting our interviews, we are able to trace the evolution of views on the topic inside the Executive Board. We show that prior to 2018, and despite some repeated parliamentary accountability requests, the issue of climate change was hardly discussed. When it was, climate change was only mentioned as a distant challenge unrelated to central banking issues. It was not until 2018 that climate change began to be framed in central banking coordinates. However, disagreements remained up to 2020 within the board about climate change's relevance and the extent to which it fell within the ECB's mandate. These tensions were gradually resolved, eventually resulting in a consensus within the Governing Council on the climate action plan adopted in mid-2021.

Second, we try to trace how this ideational change was made possible. Drawing from Schulz (2017) study of ideational changes within the ECB, we explore three explanatory avenues. First, the *persuasion* – or conversion – of some of the reluctant central bankers was possible due to the conjunction of external pressures from climate activists, parliamentarians, and, most importantly, other central bankers who pushed the issue onto the ECB's agenda. Second, the *appointment* of new central bankers, especially inside the Executive Board, was decisive in swinging the balance of power inside the Governing Council. Last, the evolution in *leadership* – the modification of routines and informal policymaking procedures – under Lagarde's Presidency helped structure a coalition of the willing inside the Euro-system and to give them greater prominence. The conjunction of external pressures and internal dynamics therefore helped anchoring climate change considerations more firmly within the institution, moving from a marginal non-issue to one of the new frontiers of central bank expertise.

Our final objective is to understand the extent to which this apparent ideational change might lead to a broader paradigmatic shift regarding the way central banks view their role in the economy, from their ideal of depoliticized neutrality to more distributive interventions. We stress that behind the facade consensus reached with the climate action plan, heated disagreements remain inside the Governing Council regarding to what extent the ECB should go beyond a risk-based prudential ap-

proach and embrace a more promotional greening of its action. While the ECB has overcome its internal gridlock as regards to climate change integration, it still faces disagreements regarding the extent to which it should proactively steer financial flows to facilitate the transition to a low-carbon economy.

The remainder of the chapter is organized as follows. Section 2 provides a short literature review and presents our methodology and materials. In section 3, we trace how climate change gradually emerged as a relevant issue at the ECB. Section 4 presents three channels through which this ideational change was facilitated, with *persuasion*, *appointment*, and *leadership* interacting and reinforcing each other. Section 5 examines the content of the resulting policies and shows that although the promotional agenda won an important battle, it struggles to deliver tangible impacts. We conclude in section 6.

2 Literature review, methodology and materials

2.1 Literature review

Unlike what 'institutional amnesia' might suggest, central banks were not so long ago active far beyond their price stability mission (Braun and Downey, 2020). For example, Banque de France used during the post-war era its credit policy instruments to fulfill a wide range of objectives, whether industrial policy, trade policy, financial policy, or even budgetary policy (Monnet, 2018). More generally, credit-guidance policies were widespread across the globe, and successfully contributed to steering credit towards non-financial firms and accelerating industrialization (Bezemer et al., 2018, 2021; Mikheeva and Ryan-Collins, 2022). These policies were then abandoned and Western central banks, endowed with institutional independence from their political counterparts, scaled back the scope of their actions to focus solely on inflation control, during a period known as the 'Great Moderation'.

After thirty years of central bank independence and 'neutralization' of credit policies, we may be entering a new era in which central banks regain some of their lost powers, re-entering more coordinative efforts with governments (see chapter V).

The global financial crisis has indeed triggered important changes in central banks' actions, paradigms and ideas, reflected, for example, in the emergence of counter-cyclical macroprudential policies (Baker, 2013, 2018), the normalization of quantitative easing practices (Ronkainen and Sorsa, 2018), and the increasing purchase of sovereign debt on secondary markets (Gabor, 2021). The global financial crisis – and the following sovereign debt crisis – have both provided the European Central Bank an opportunity to reinterpret 'by stealth' the rules of the game and to extend its sphere of influence (Schmidt, 2016). This move may have been in large measure forced, due to political authorities' inaction, translating into 'institutional loneliness' (Mabbett and Schelkle, 2019). In short, the ECB and other high-income country central banks have engaged in (or have returned to) broader and more far-reaching interventions since the global financial crisis, sometimes despite the lack of new formal powers.

In recent years, climate change has emerged as one of these new fields of action for central bankers, and a growing number of climate-related financial policies have been implemented all around the world (D'Orazio, 2022). The sizes and shapes of these policies vary as central banks are not created equal in regards with their 'green policy space'. On the one hand, emerging countries benefit from wider mandates allowing for more far-reaching policies (Dikau & Volz, 2021a, 2021b). On the other hand, the central banks of high-income countries, still bound by narrow mandates and political independence, are engaging in more timid greening. They generally refuse to intervene as directly in the allocation of capital and settle for more passive roles by implementing informational policies to foster climate-related risks disclosure. However, as with the management of the global financial crisis, the 'institutional loneliness' triggered by political authorities' inaction in the fiscal or regulatory sphere could push central banks to green their actions even without formal changes to their mandates, as suggested in the previous chapter.

For van't Klooster (2021), such a shift may be underway within the ECB. Without any new democratic input, ECB officials have abandoned the 'market liberal' ideas hard-wired in their mandate to embrace 'technocratic Keynesianism', relying on 'strategic ambiguity' to bridge the inconsistencies between the two. If the rebirth

of macroprudential policy and the reintroduction of public bond purchases at a massive scale represent important changes in central banking operations, there is still debate to what extent they truly entail an ideational shift (Gabor, 2021; Levingston, 2021). More importantly for the purpose of this chapter, it is still quite unclear what position climate-action entails in all of this, as most of the debate has focused on post-crisis transformations such as macroprudential policy or fiscal-monetary coordination. This is precisely the gap that this chapter tries to bridge, focusing on the fast-paced integration of climate considerations at the European Central Bank.

2.2 Methodology and materials

For the purpose of this chapter, we rely on a mixed-methodology in an attempt to escape the usual problems with ECB studies due to the opacity of this institution. Indeed, if general accounts of the monetary policy committee sessions are available since January 2015, precise minutes and votes within the Governing Council remain confidential, and archives will only be shared with a delay of 30 years.

First, we rely on public speeches and official communications to try to approach ECB officials' positions, which is usual in the political economy literature (see e.g. Braun et al., 2022; Diessner and Lisi, 2020; Dietsch et al., 2022). While still a second-best material, public discourses are valuable resources for scholars. Indeed, communication is seen as increasingly important by central bankers themselves for so-called 'forward guidance' purposes, leading to regular and polished communications that have the explicit goal of shaping agents perceptions and anticipations. The performativity of their discourses is therefore not only recognised, but also actively pursued by central bankers. To track climate-related stances by ECB Executive Board members, we relied on textual analysis methods, using a dictionary-based approach to spot climate-related speeches. We then carefully read the speeches and hand-coded qualitative variables to depict the evolution of stances over time. More details are provided in the Appendix A.1.

Second, we also investigated ECB's (climate-related) interactions with the Members of the European Parliament (MEPs), either through letter to the ECB President, or through questions at trimestral Monetary Hearings sessions. Using the

same dictionary-based methodology, we were able to map precisely, year by year and party by party, the accountability demands of parliamentarians to the ECB regarding the climate challenge, as well as ECB's answers. This gave us a more complete picture of the evolution of the ECB's official positions on the issue.

Third, we complemented the study of spoken words with a systematic review of regulations and policy documents concerning ECB's climate efforts. This includes monetary policy accounts, monetary policy decisions, as well as dedicated climate-related announcements, reports and in-house research.

Finally, we conducted semi-structured interviews with 14 European central bankers, 6 members of the European Parliament (MEPs) and 3 pressure group representatives (see Table III.1). This allowed us to obtain insider views on the current and past balance of power at the European Central Bank about climate-related issues. Central bankers interviewed are mainly senior executives, coming from the ECB and from national central banks to capture the diversity of opinions in the Council of Governors.[2] MEPs interviewed are members of the ECON commission that engaged regularly with the ECB on climate-related issues. NGO advocacy officers were selected due to their role within advocacy campaigns with the ECB and/or national central banks on climate change issues, giving them a strong sense of the different positions at stake. The interviewees were selected based on a snow-balling method: initial contacts were made on the basis of current or past positions of potential interviewees, who themselves recommended competent colleagues in their institution or in other European central banks. When explicitly mobilized, the interviewee(s) involved are indicated in parentheses.

[2]The Governing Council of the ECB is composed by 6 Executive Board members, nominated for a non renewable 8 years mandate by the European Council, and the 19 Governors of the national central bank member of the Eurosystem, nominated following national procedures, as explained in further detail in chapter V. Since January 2023, national central bank governors are actually 20, as Croatia entered the Eurozone.

Table III.1 – List of semi-structured interviews

	Interviewee	Date	Type
R1	Senior official from a national CB	12/2021	Video call
R2	Senior official from a national CB	12/2021	Video call
R3	Senior official from the ECB	12/2021	Video call
R4	Senior official from the ECB	02/2022	Video call
R5	Senior official from a national CB	03/2022	Video call
R6	MEP (Socio-Democrats)	04/2022	Video call
R7	Former MEP (Greens)	04/2022	Video call
R8	MEP (Greens)	05/2022	Video call
R9	MEP (Left)	06/2022	Written Q&A
R10	MEP (ECR)	06/2022	Video call
R11	MEP (Renew)	06/2022	Written Q&A
R12	Senior official from the ECB	06/2022	Video call
R13	Senior official from a national CB	09/2022	Video call
R14	Junior official from a national CB	09/2022	Video call
R15	NGO Advocacy Officer	09/2022	Video call
R16	Former senior official from a national CB	09/2022	Video call
R17	Former ECB accountability adviser	09/2022	Video call
R18	Board member of a national CB	09/2022	Video call
R19	Board member of a national CB	10/2022	Video call
R20	Think tank expert	10/2022	Video call
R21	Former member of the ECB Executive Board	10/2022	Video call
R22	Senior official from the ECB	10/2022	Video call
R23	NGO Advocacy Officer	10/2022	Video call

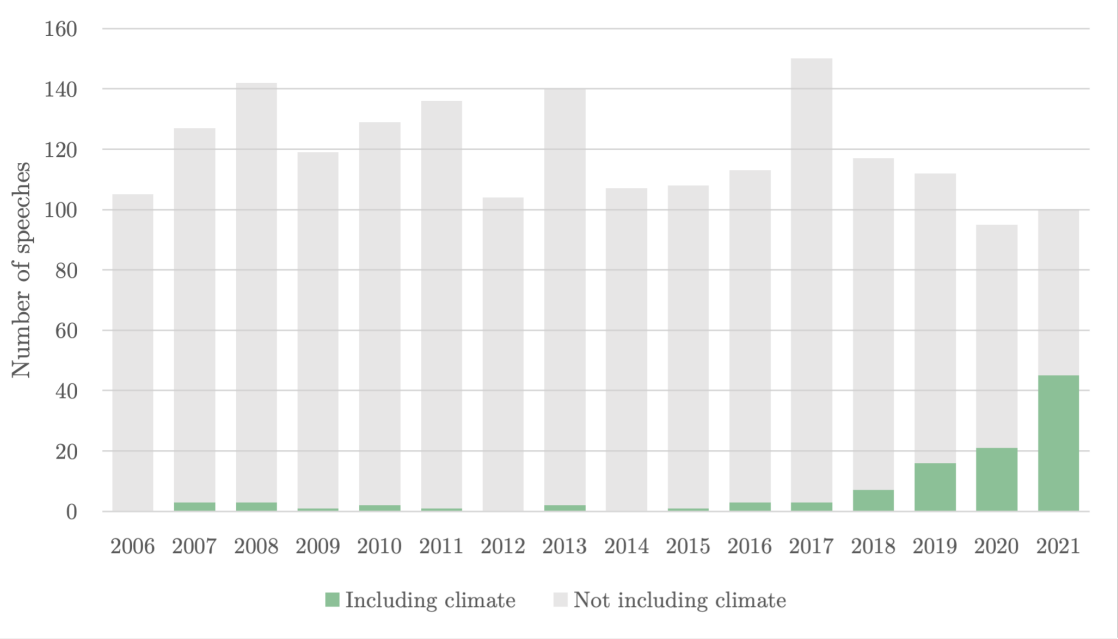
3 How climate change became mainstream

In this section, we highlight how climate change has come to the fore within the European Central Bank, taking an increasing share of its agenda. To do so, we provide a detailed account of the evolution of its public positions through the speeches of its Executive Board members and compare these words with the ECB's actions. We show how climate change has transformed from a distant challenge to a central bankers' problem in just a few years.

3.1 Warning words in a warming world

The first striking fact when studying the ECB's public communication on climate change is its impressive quantitative increase. This can be demonstrated in two ways. First, the proportion of speeches that address the climate topic at least once[3] has risen dramatically, to nearly one in two speeches in 2021 (see Figure III.1).

Figure III.1 – Number of climate-related speeches

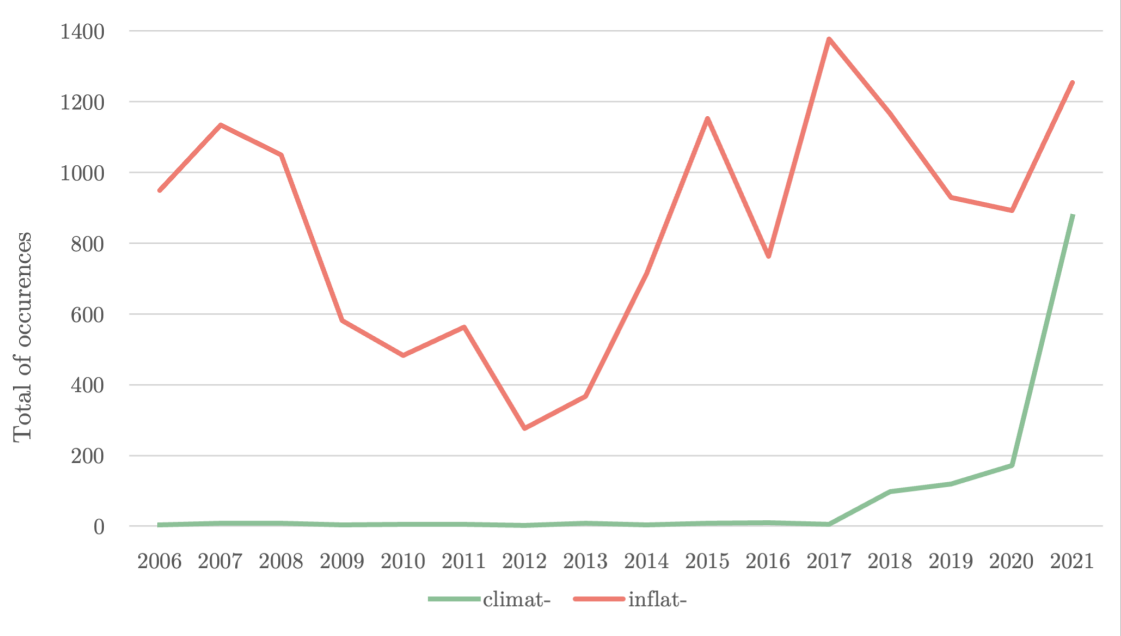


Second, the number of iterations of the word 'climate' (and its derivatives such

[3]See Appendix 1.1 fore more details on the methodology used to identify such speeches.

as 'climatic', etc.) have also skyrocketed, reaching in 2021 a level comparable to the mentions of the word 'inflation' (and its derivatives such as 'inflationary', etc.), as shown in Figure III.2.

Figure III.2 – Number of 'climat-' and 'inflat-' occurrences



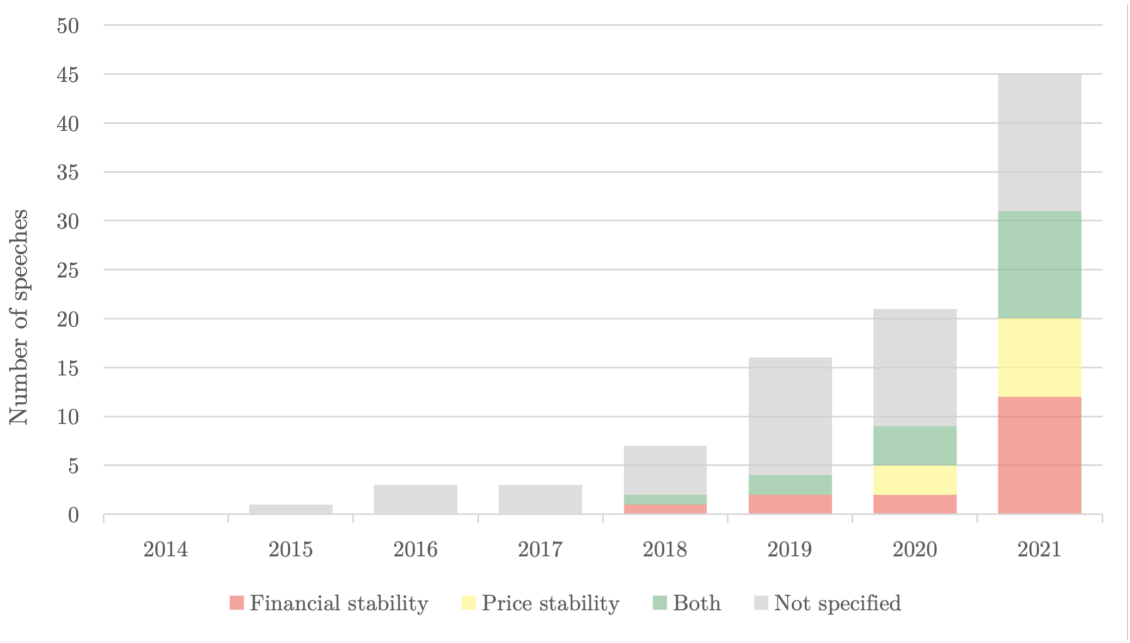
Alongside this quantitative development, climate change is above all increasingly pictured in these speeches as a relevant and legitimate central banking issue. To highlight this qualitative shift, we systematically review all the climate-related speeches identified above, and show how the issue of climate change was increasingly explicitly linked to the ECB's missions, mandate and instruments. [4]

First, we show in Figure III.3 how climate change was increasingly linked to the ECB's missions in its public speeches. The European Central Bank's main mission is to ensure price stability, keeping inflation 'around two percent in the medium term' (European Central Bank, 2021, p. 5). Since the 2007 financial crisis, it must also ensure financial stability through the supervision of systemic banks. As explained in the previous chapter, climate-related dynamics could pose a risk for both these missions, something that has been acknowledged since at least Mark Carney's (2015) speech. Yet, before 2018, ECB speeches touching upon climate change were

[4] See the Appendix 1.2 for more detail on how the qualitative coding was made.

usually mentioning it just in passing, as a 'great challenge' facing humanity, like digitalisation or demographic ageing. It is only with Lautenschläger (2018) and Benoît Cœuré (2018) that climate change began to be framed as an issue for central banker's missions. In the following years, the number of speeches making this link soared, and climate change even became the main focus of some speeches, whether to develop the links between climate and price stability (Schnabel, 2021c) or between climate-related risks and financial stability (Elderson, 2021b). In 2021, more than two thirds of the speeches mentioning climate change explicitly characterized it as a threat to all or part of the ECB's missions:

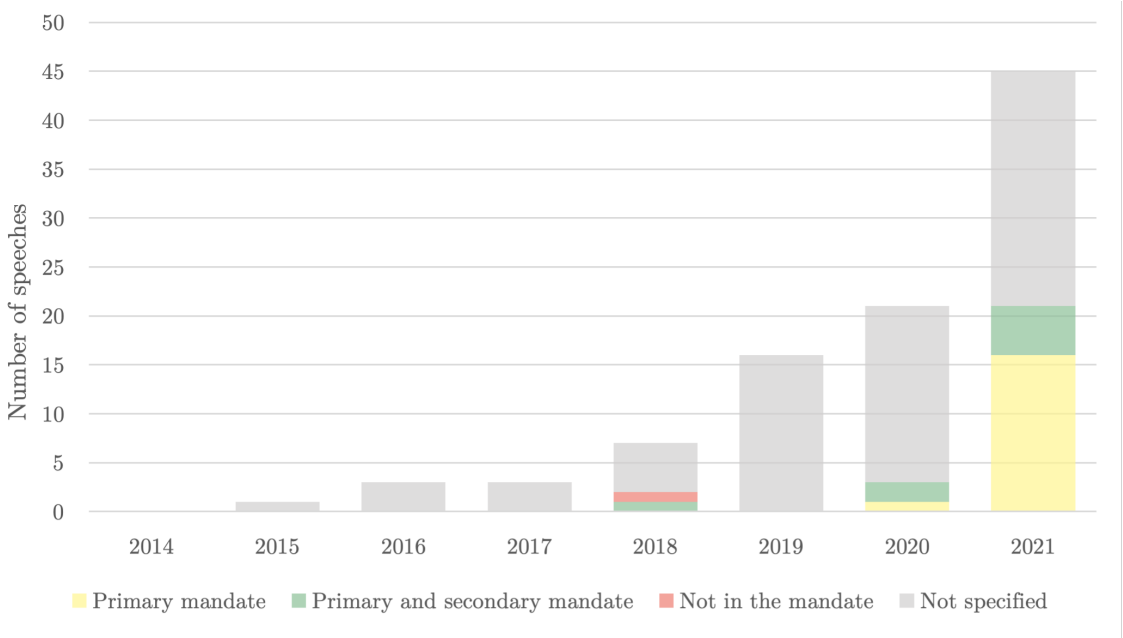
Figure III.3 – Climate change and ECB missions



Second, Figure III.4 shows how climate-related speeches increasingly referred explicitly to ECB's mandate in order to demonstrate (or refute) the legitimacy of the central bank to act. Again, no explicit link to the mandate was made until late 2018, when two members of the Executive Board, Benoît Coeuré and Yves Mersch, expressed opposing views on the matter.

Indeed, while it is clear that climate change represents a threat to the ECB's missions, its mandate lacks precise guidelines on how to address it. On the one hand, the 1992-drafted mandate states that 'the primary objective of the European

Figure III.4 – Climate change and ECB mandate



System of Central Banks (ESCB), shall be to maintain price stability', and that 'The ESCB shall act in accordance with the principle of an open market economy with free competition'. This led Yves Mersch to argue that the ECB should focus on inflation and not 'venture into a political agenda with distributional consequences', warning against undermined legitimacy and possible litigation if the ECB was to take any green action (Mersch, 2018).

On the other hand, the mandate also states that 'Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union', including 'working for the sustainable development of Europe [...] and a high level of protection and improvement of the quality of the environment'. This part of the Treaty is usually referred to as ECB's secondary mandate. This support constitutes an obligation ('shall'), and perhaps more importantly gives the ECB leverage to pursue *other missions than price stability* if they support EU objectives and do not hinder the maintenance of price stability (Ioannidis et al., 2021; van 't Klooster & de Boer, 2022). This led Benoît Cœuré to advocate for a much more ambitious role for the ECB, even discussing the opportunity of 'actively support the transition to a low carbon economy', referring to this 'secondary mandate' (Cœuré,

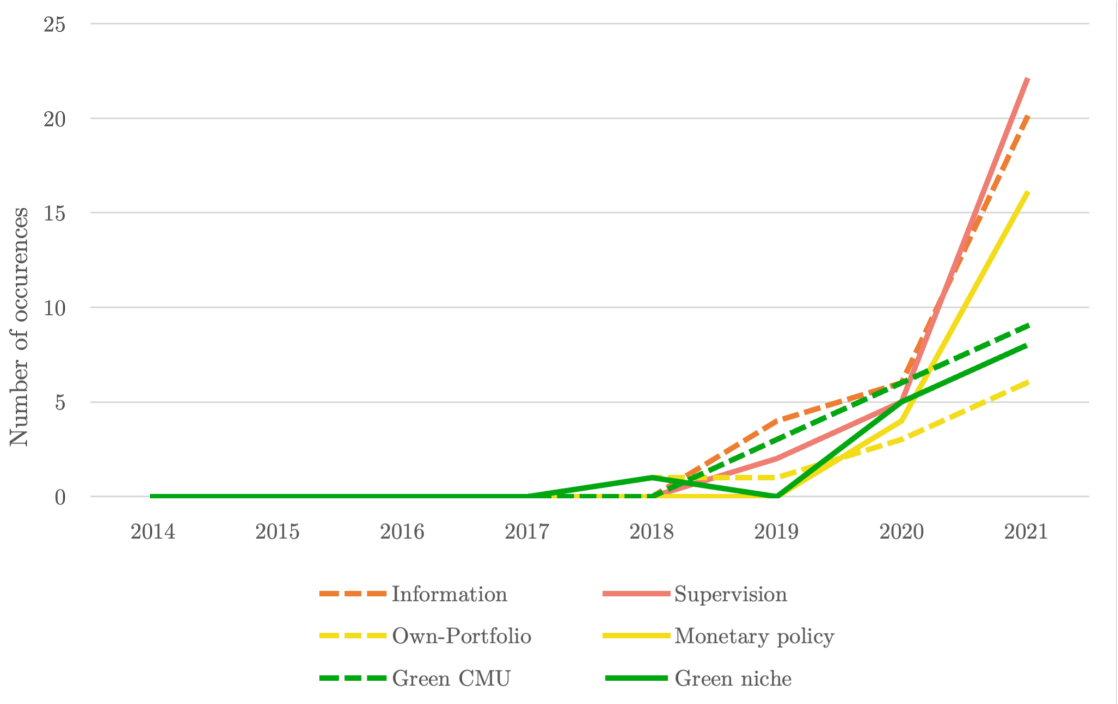
2018).

After this 2018 public clash between Mersch and Cœuré, no explicit positions were taken regarding how climate change should be interpreted within ECB's mandate for almost two years. Lagarde (2020b) and Schnabel (2020a, 2020b) were the first ones reassessing that climate was fully within the primary mandate, Schnabel even adding references to the secondary mandate. However, it was not until 2021 that the issue gained traction in the speeches, appearing in nearly half of the interventions, often with additional references to the secondary mandate. Far from the fears of mission creep evoked by Mersch (2018), climate inaction is now seen as the biggest risk to the ECB's legitimacy (Elderson, 2021c).

3.2 From words to deeds

As climate change began to be considered relevant for ECB's missions and mandate, European central bankers started to discuss how they should incorporate climate-related concerns in their policymaking. Figure III.5 illustrates how these policy proposals evolved in ECB's public speeches.

Figure III.5 – Climate change and ECB instruments



The first mention of greening ECB's instruments appeared in Coeuré's speech (2018). He pointed that (i) the ECB managed its employee pension fund following ESG criteria and was considering extending this sustainable investor behavior for its own-portfolio and (ii) he recalled that ECB's quantitative easing program led to significant green bond purchases. In 2019, three other instruments were mentioned in speeches: European central bankers started to discuss the need to improve information disclosure regarding climate-related risks, evoked the opportunity of conducting climate stress tests, and called for an accelerated green capital market union to foster the development of sustainable finance. It was only in 2020 that the possibility of tilting the monetary policy portfolio was first evoked, gaining momentum in 2021.

Words were not always followed by action, but the number of climate initiatives within the ECB significantly increased from mid-2020 onwards. First, the European Central Bank tried to build expertise. It joined the Network for Greening the Financial System (NGFS) in may 2018 and its steering committee in July 2020. It then launched an in-house climate change research centre in January 2021 in order to better understand the macroeconomic consequences of climate change on its missions and instruments. Second, it also engaged in climate-related policymaking. For example, it drafted a methodological guide on climate-related risks (ECB, 2020b), and launched a climate stress test program for the main European banks (Elderson, 2021d). It also decided in September 2020 to accept sustainability-linked bonds as collateral, hence supporting the development of this niche asset class (ECB, 2020a). But the pinnacle of its climate commitment was decided during its strategy review of July 2021. It led to a four-year climate action plan that was accepted unanimously by the Governing Council. First, the ECB announced that it would be pushing for more informational disclosure about climate-related risks. Second, it established climate stress-testing as a new routine, with possible future capital requirement consequences for banks that fail to pass them. Third, it stated its intention to explore how to integrate climate criteria into its monetary policy instruments. A year later, the European Central Bank confirmed that it would incorporate climate-related criteria both in its collateral framework and in its corporate purchase sector program (CSPP). Besides, the ECB announced the greening of the CSPP would not only be

based on risk-based metrics, but also actively tilted to be aligned with the Paris agreement, a decision motivated by ECB's secondary mandate of supporting the European Union's objectives (ECB, 2022b). The implications of these decisions will be critically discussed in section

Three periods can therefore be isolated in the short history of climate awareness at the ECB. Before 2018, climate change was not seen as a relevant topic, even though Carney (2015) had already launched the topic in the central banking sphere. Between 2018 and 2020, conflicting views were publicly expressed regarding its relevance, and most speeches did not problematise climate change in central banking coordinates. It was only from 2020 onwards that climate change gained traction and was put at the fore of its agenda. It was gradually incorporated in actual policy developments, and became a central part of ECB's 2021 strategy review. Although the guidance given to the ECB by its political counterpart - its mandate - did not change over the same period, it seems that European central bankers experienced an ideational shift. While they did not consider climate change a relevant issue a few years ago, European central bankers have now turned it into a policy priority. How can this change be accounted for?

4 Forging a climate consensus

In this section, we try to explain why and how the ECB flip-flopped on climate change issues. Mobilizing the theoretical framework of Schulz (2017) on ideational shifts at the ECB, we highlight how the climate shift was enabled through a conjunction of external pressures and internal dynamics. While we focus mainly on changes at the ECB and within its Executive Board, we also account for significant changes in European national central banks that led to shifts in the balance of power within the Governing Council, that takes part in the decision making process.

4.1 External pressures and the *persuasion* of central bankers

According to Schulz (2017), the first way in which an ideational change can occur within the ECB is through the *persuasion* of some of its Board members. Based on

our interviews, we highlight three sources of external pressure that had an impact on Governing Council members: civil society, political actors and other central bankers.

The first type of external pressure came from climate activists, NGOs and academics. As Kupzok (2022) points out, the external pressure from City financial activists in early 2010s who framed climate change as a systemic risk issue – and therefore a macroprudential problem - was key in catapulting the subject into central banking spheres (R20). Even before the seminal speech of Carney (2015), some central bankers staff members had already been tasked to look at what was emerging as 'climate-related risks' due to the momentum of the 'carbon bubble' idea pushed forward by the NGO Carbon Tracker (R13). As this prudential understanding of climate change became mainstream, the pressure from NGOs shifted towards monetary policy instruments shifted to promotional concerns, demanding more proactive action to steer financial flows to facilitate the low carbon transition. Civil society movements such as Positive Money, Greenpeace or Reclaim Finance started to lobby the ECB into a more proactive greening. Together with academics, NGOs launched reports attacking the carbon footprint of the ECB's monetary policy, pointing out that it was *de facto* favoring the most polluting sectors (Dafermos et al., 2020a, 2020b; Matikainen et al., 2017). The 2020 policy reports were accompanied by a petition signed by 170,000 European citizen, a comprehensive poll, protests in front of the ECB headquarters and open letters in the press. The NGO Greenpeace even delivered its report via paragliders landing unannounced on the roof of the ECB headquarters in Frankfurt.

This pressure had a very significative impact pushing the climate agenda internally, as the ECB was constantly under the spotlight for their lack of climate action (R12,15,20,21). In fact, this pressure may have been the main trigger for the tilting of the CSPP agreed in 2021 (R15). Indeed, one of the most vocal and influential opponents to this idea was Bundesbank Governor Jens Weidman. After responding to a letter that the ECB had to wait for all the relevant risk-based data before any action (Weidmann, 2021a), he opened the door a few weeks later to an alternative, 'limiting the maturities or the amount of corporate bonds of certain sectors' (Weidmann, 2021b) that was finally adopted after the 2021 strategic review (ECB,

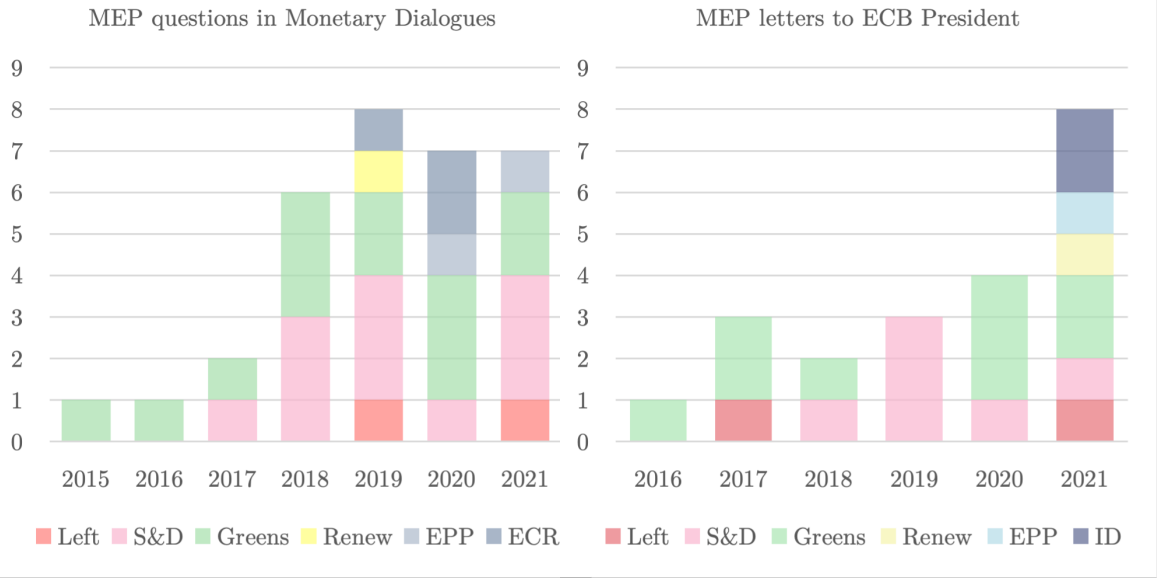
2021b).

However, activist pressure might not always be effective, as central bankers view themselves as independent, neutral technicians that should remain deaf to external pressures. If central bankers feel their independence under attack, such actions can in fact be counterproductive. According to R12, the legal action of the NGO ClientEarth (attacking the Banque Nationale de Belgique for its involvement in ECB's carbon-intensive monetary policy) and the subsequent happenings in Brussels (dumping of a car wreck from the deadly Belgian 2021 floods in front of the Banque Nationale de Belgique) may have participated in entrenching Governor Pierre Wunsch's opposition. Governors receive pressure from think tanks and NGOs very differently, and NGOs benefit from varying levels of access to national central bank staff and management (R10,15,16,20).

The second type of external pressure, which all central bankers must at least acknowledge, comes from their political counterparts. Although independent, the ECB must indeed respond to questions and letters from Members of the European Parliament by explaining its actions and accounting for its decisions. In the past years, MEPs have been increasingly vocal regarding ECB's climate (in)action (see Figure III.6). While this might not have triggered shifts in Governors ideational framework, this mounting pressure had two positive consequences. First, it forced the ECB to work on those issues, because they did not have the answer to what was asked by MEPs. According to R12 and R21, much of what was done at the ECB, especially at the beginning, was 'defensive', reacting to Parliament's pushes. Although MEPs often regret receiving pre-formatted answers (R6-8), climate-related letters actually forced the ECB to produce new studies and develop its expertise, bringing climate change even further into the realm of the central bank's ordinary and legitimate activities (R17,21). Indeed, draft answers to MEP letters are passed through four different layers of approval, each time provoking interdepartmental discussions at all levels of the hierarchy, leading to organizational consequences often unsuspected by the MEPs (R17).

Second, political pressure could be used as argumentative resources by green advocates within the Governing Council. This process became more and more efficient,

Figure III.6 – Climate-related accountability requests from MEPs



because there was a process of discursive convergence as MEPs (and NGOs) gradually adapted the way they framed their demands, leading to the formation of an effective - but precarious - coalition with 'green' central bankers (Massoc, 2022). For example, MEPs questioned ECB's monetary policy carbon footprint, using NGOs, think tank and academics work, increasing the pressure on the Governing Council (R6,15,17). Sometimes, 'green' central bankers even fetched new argumentative resources to push their climate agenda. For example, Christine Lagarde hinted in an answer to MEP Chris MacManus (Left) that the ECB could do more regarding the climate challenge if the European Parliament clarified how important climate change should be ranked in its secondary supporting objectives.[5] A few months later, the European Parliament included an entire section on climate change in its annual resolution on ECB action, stressing that the ECB is bound by the Paris Agreement, should recognize the relevance of its secondary mandate, and should not confine itself to a solely risk-based approach (European Parliament, 2022). This resolution was important to secure the July 2022 announcements of the ECB confirming the green tilting of the CSPP and the return of secondary mandate considerations (R6,12,17).

[5]Monetary Dialogue of November 2021: 'Clearly, those [secondary objectives] have to be taken into account, *particularly if those secondary objectives are stated very clearly by the other institutions, and in particular by the European Parliament*'.

More generally, the European Union's environmental action has been an important precondition for the integration of climate change into the ECB, giving proponents of the secondary mandate interpretation much more leeway than if the issue was neglected or politically contentious (R20,21).

Besides accountability mechanisms, political influence also came from more informal or situational channels. For example, the Banque de France had to expand its expertise on climate-related issues as early as 2014, after French Minister of the Economy sent a letter to the FSB asking to investigate on climate-related risk. It also had to raise its expertise in 2015 after the Parliament passed a law about climate-related disclosure for financial actors that involved oversight by the Banque de France (R13). Requests for legal opinions by European institutions on climate-related risks and on sustainable finance policies were also an important factor of ECB's internal expertise development (R4,12,17). Last, but not least, the Network for Greening the Financial System (NGFS) was also launched after a political request. In October 2017, the Banque de France was approached by the French Treasury to intervene in the One Planet Summit organized by French President Emmanuel Macron. As the participation was conditioned to the launch of climate-related multilateral initiatives after the US dropped from the Paris Agreement, two senior executives proposed the idea of what would become the NGFS. Although a last-minute announcement, with only 8 institutions, this network quickly took on a very important role in integrating climate change into central bankers' spheres (R13,16,19,20).

This brings us to the third type of external influence. In addition to external pressures from NGOs and political bodies, central bankers have also increasingly been influenced by their peers. Many interviewees stress the role of Carney (2015) speech in sparking momentum, forcing other central bankers to take a stand and launching a series of speeches on the topic (e.g. Knot, 2015, Villeroy de Galhau, 2015). This speech was mainly focused on introducing climate-related risks for private financial actors rather than on how central banks could green their policies. On that regard, peer pressure only started a few years later, thanks to the creation of the NGFS. The Banque de France, hosting its secretariat, became a climate-related pol-

icy entrepreneur. Its (deputy) governor(s) began touring formal and informal venues such as G20 summits, Financial Stability Board meetings and thematic conferences to incentivize other central bankers to join (R20). Soon, they network welcomed dozens of other central banks, and it became increasingly costly to central bankers' reputations not to jump on the climate bandwagon (Van Doorslaer et al., 2022). The newly converted central bankers in turn advocated for the topic, spreading the network and allowing the first movers to win reputational gains through their expertise. Central bankers began to see climate change issues as a new field in which they could pursue 'comparative advantage', either to reinforce the leadership of their institution in the Euro-system, or allowing them to find better career opportunities after the end of their short and non-renewable terms (R12,16).

After Banque de France, Bundesbank or the Netherlands central bank 'unexpected climate activism' (Siderius, 2022), the ECB also joined the NGFS mid-2018, and the remaining Euro-system central banks quickly followed. At first, joining the NGFS was mostly seen as a way of sending the signal that the ECB was 'doing something' without pre-committing too much, especially because the network focused in its early days on a more consensual risk-based approach (R12,21). But although ECB's involvement was at first small (R16), it triggered the first climate-focused speech from a ECB member, at a NGFS event organized by the Bundesbank in Berlin (Cœuré, 2018). Then, as new central banks with broader mandates joined the network, the NGFS began to expand its analysis on the possibility of utilizing monetary policy as a 'greening technology'. Ironically, the chairmanship of this promotional oriented working group was entrusted to the Bundesbank, because the other more prudential working groups had already been allocated (R16). Despite its initial lack of interest, this gradually shifted the Bundesbank's position from an outright rejection of any type of proactive greening policy to a more measured position. In fact, it even led the Bundesbank to show leadership regarding the greening of non-monetary portfolios at the European level, which was achieved shortly before the strategic review (ECB, 2021a). Since its inception, the NGFS acted as a catalyst for expertise, producing regular reports that helped climate change turn into a legitimate central banking issue, and providing 'green' central bankers with resources

to tap into. By expanding the scope of their analysis to include sustainable finance promotional issues, it also broadened the realm of acceptable green central banking policies by showing that (i) besides its prudential implications on financial stability climate change also impacted monetary policy portfolios and inflation dynamics, and that (ii) promotional policies were possible and already implemented in various institutions (NGFS, 2020b, 2021).

4.2 Board renewal and the *appointment* of 'green doves'

Another factor that can explain the change in central banking practices is the appointment of new board members with different ideas (Schulz, 2017). The political economy literature already aknowledges that monetary policy preferences of central bankers vary greatly depending on various factors such as country of origin (Bennani & Neuenkirch, 2017), past work experience (Mishra & Reshef, 2019), gender (Diouf & Pépin, 2017), or other social characteristics (Lebaron & Dogan, 2016). We argue that central bankers' preferences also vary significantly regarding climate issues, and that the appointment of new Board members was a key factor in climate mainstreaming at the ECB. Indeed, half of the Executive Board was renewed in the span of a year, from 2019 to 2020. This is an important and infrequent event, as the terms of office are 8 years long. If one views climate mainstreaming as the result of a struggle between 'climate doves' and 'climate hawks', the latest appointments have tipped the balance of power in favour of the former.

First, Sabine Lautenschläger resigned in September 2019 for a disagreement over ECB's Quantitative Easing and was replaced by Isabel Schnabel. Trained as a jurist and former Bundesbank vice-president, she had pretty conservative views regarding the greening of ECB's monetary policy. In fact she even considered the development of green finance as a potential third type of climate-related risk to be monitored rather than encouraged (Lautenschläger, 2018). Her replacement, Isabel Schnabel, came from academia and had no prior experience as a central banker. At first, her views were pretty much aligned with the position of her Bundesbank compatriot Jens Weidman on climate issues. But she was 'converted on the way' and became 'a strong advocate in a 'quite unexpected' manner (R12). This shift happened

during the lockdown, as covid crisis forced the ECB into more proactive action (Kupzok, 2022), and she eventually became the leading advocate of challenging market neutrality because of its climate implications (see e.g. Schnabel, 2021c). Not coming from a central banking background, her conversion was 'pragmatic', approaching the problem from all angles, without preconceptions, and taking care to weigh the pros and cons in each of her speeches. As a result, she quickly became one of the most prominent and respected voices on the Governing Council (R20). According to R12, the Paris-compliant greening of the CSPP was only made possible through her decisive support during the 2021 strategy review. In a very tense drafting process, she managed to secure a broad wording of CSPP adjustments ('incorporating climate change criteria, in line with its mandate') against a coalition of climate reluctant governors determined to rule this out by entrenching a more precise and prudential formulation.

The second important change was the replacement of Mario Draghi by Christine Lagarde in November 2019. Draghi, whose presidency was marked by the 'whatever it takes' moment, was not especially keen on exploring climate change (R12,16,17,20). And indeed, not much was done by the ECB regarding this issue under his presidency. First, Draghi was mainly preoccupied with the main missions of ECB and did not pay too much attention to topics he saw as secondary (R12,16). Second, he saw the integration of climate criteria into monetary policy as an undesirable constraint that would limit the effectiveness of monetary policy by restricting its firepower (R21). In contrast, Lagarde had a much more political profile. She was less constrained by the usual central banking routine ways of thinking (R6,12,20) and appeared since her first hearings as much more eager to push the climate topic (R6-11). She came from the IMF where she had already started to push climate change as one of the main priorities, playing a significant role in this institutions turning into an 'unexpected environmentalist' (Skovgaard, 2021). In the same way that the replacement of Jean-Claude Trichet by Mario Draghi brought about a remarkable change in ideas and policies (Schulz, 2017, p. 143), Lagarde replacing Draghi was an important step on the road to the mainstreaming of climate-related issues within ECB. She became a strong climate advocate, brought the secondary

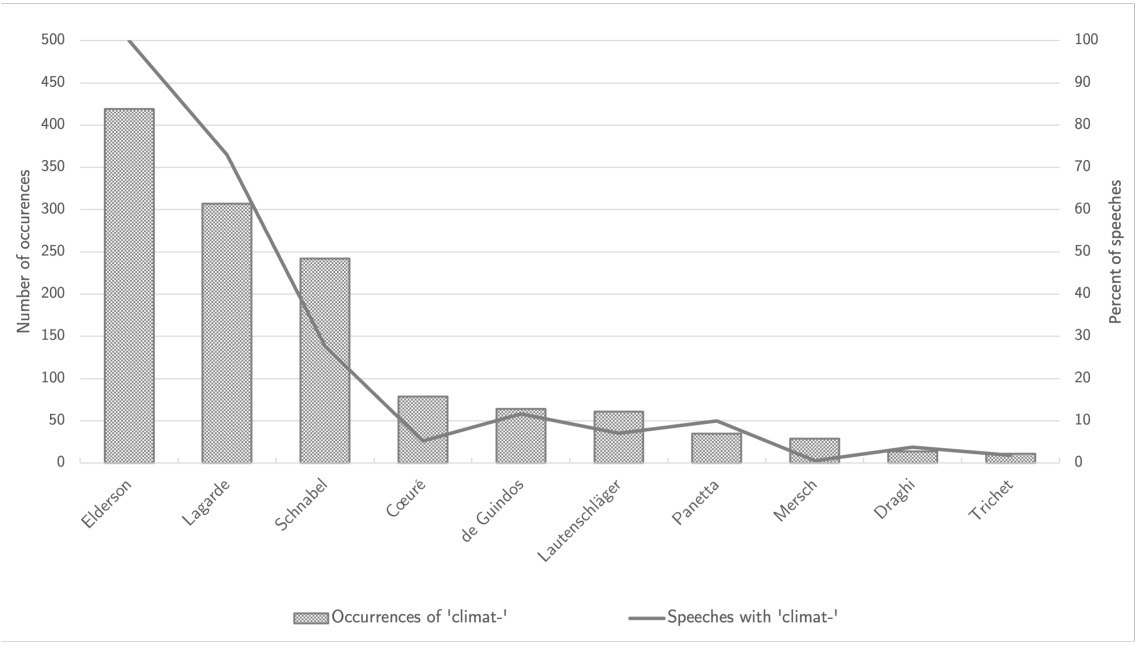
mandate back on the agenda, and even pushed for more ambitious green policies, as illustrated by her support for green TLTROs.[6]

Finally, Frank Elderson entered at the end of 2020 in the Executive Board of the ECB, replacing Yves Mersch. As chairman of the NGFS since its inception, his appointment was a clear signal and helped to establish the dominance of 'green doves' on the Governing Council (R12,20,21). Besides chairing the NGFS, he was prior to his nomination a prominent figure of the Dutch central banks' shift on climate change (Siderius, 2022) and was generally very involved and appreciated among central bankers dealing with climate issues (R16). Moreover, he came as a replacement of Mersch, who's fierce opposition inside the Executive Board was the only dragging force remaining.

These three newcomers quickly formed an effective climatic coalition within the Executive Board, which generally arrived with a common position at the Governing Council meetings, having met the day prior (R19). They could therefore rely on the Executive Board monopoly of initiative on the topics to be discussed to put climate change on the agenda (R21). Together with the Governor of the Banque de France, the three newcomers appear as the most vocal central bankers when it comes to climate mainstreaming, which transpires from their public statements (see Figure III.7). As a telling example, Frank Elderson had pronounced in the end of 2021 the word 'climate' (and its derivatives) more than 400 times since taking office, while not having mentioned inflation (and its derivatives) once. Not only newcomers talk more about the climate, but they also embrace completely different views about ECB's role. As previously discussed, Lagarde, Schnabel and Elderson all acknowledge the relevance of the 'secondary mandate' for the climate challenge and were driving forces behind the incorporation of climate criteria in monetary policy instruments, by repeatedly stressing that climate change was not only a financial stability challenge, but also a monetary policy issue.

[6]Green TLTROs (Targeted Longer Term Refinancing Operations) would be a way for the ECB to incentivize banks to lend more to green activities by providing them with preferential interest rates. This policy proposal came originally from two academics writing for the NGO Positive Money van 't Klooster and van Tilburg, 2020, which gives another example of academics and NGOs role in providing ideas and resources for green advocates within the Governing Council

Figure III.7 – Climate change and ECB's Executive Board



4.3 Changes in *leadership*, capacity building and path dependency

There is a last channel through which institutional ideational shifts can occur. Indeed, the decisions of the governing council are not only influenced by external factors (persuasion) or by the changing composition of its members (appointment), but also by changes in leadership. By this, Schulz (2017, p. 143) refers to the changes in internal organizational dynamics, when informal policymaking procedures get altered and 'certain groups of agents find themselves sidelined by new rules and routines of decision-making, [reducing] the significance of the ideas they hold'. We argue this dynamic has also been an important factor of climate mainstreaming at the ECB.

The most prominent example of that dynamic occurred with the change in leadership from Yves Mersch to Frank Elderson. During his term, Yves Mersch was the Board member responsible for legal affairs. He had a very narrow vision of ECB's mandate, centered around the primary mandate. In his view, controlling inflation should remain the sole purpose of the ECB, and achieving this goal was the only way to contribute to European Union prosperity. This led him to reject any form

of promotional climate action (Mersch, 2018). Despite the presence of alternative opinions among ECB staff and recurring internal discussions on the interpretation of the ECB's secondary mandate, these ideas were sidelined under Mersch's leadership (R21). When Elderson arrived at the Board, he made clear that his position was the exact opposite. In his first ever public stance, he explained in an ECB blog post entitled 'Greening monetary policy' that the ECB had to take into account its secondary mandate (stressing the 'shall' formulation present in the secondary mandate), calling for a more promotional approach to climate action (Elderson, 2021a). This allowed for opinions alike to emerge much more easily than before internally in the legal department, but also in the external communication, as mentions to the secondary mandate increased significantly in speeches (as shown previously in Figure III.4). A few months later, the legal department of the ECB released an Occasional Paper on the topic, concluding that the secondary mandate indeed provided a sound legal basis for ambitious and proactive climate action (Ioannidis et al., 2021). While it can be assumed that Frank Elderson did not persuade legal scholars from his department, his appointment at the top of the ladder allowed like-minded people to push their ideas further and into the mainstream.

The appointment of Christine Lagarde in a position of leadership also changed how climate policy entrepreneurs inside the ECB could defend their ideas and transform them into actual policies. When the request to join the NGFS was sent during Draghi's term, it was not a considered well thought-out policy decision by the Board, but the result of an unprompted request sent by a staff member (R12). At that time, the Executive Board was not eager to investigate further the topic, and only accepted to join the NGFS as a convenient way of showing they did something in the face of accountability requests and NGO pressures regarding climate action (R16). As of 2019, the ECB had still not really committed to any discussions or even recruited anyone to work on such topics. In fact, there was still only one identified 'climate expert' in the entire ECB institution who kept abreast of central bank's research and conferences on the topic (R21). It was only when Lagarde arrived in charge and announced that climate change would be on top of her agenda that things started to change. From bottom-up climate initiatives, much of what happened next came

top-down, as she requested more work on the topic to assess policy options and develop expertise (R12,21). She later established a Climate Change Center early in 2021 to strengthen and bring together ECB work on climate. This fast-paced structuring, together with her clear climate leadership led to increase the weight of climate advocate ideas' internally.

A similar dynamic happened at the Bank de France, although the change in leadership did not come from a new appointment, but from the ideational shift of his Governor François Villeroy de Galhau. After setting up the NGFS secretariat, the Governor of the Banque de France basically left this issue aside and neglected the three staff involved. But as the network developed, and the first comprehensive NGFS report came out in early 2019, he changed his view on the subject (R16). Indeed, the event rallied two to three hundred people at Bank de France, proving the momentum the topic had acquired in the past few months. It was only from that moment that internal climate expertise was pushed forward, being now understood as a competitive advantage to be leveraged to assert the position of France within the Governing Council (R12,16,21). This led to a series of organizational changes culminating in March 2021 as the Banque de France mimicked the ECB by creating its own climate change center. This new dedicated department, built around the NGFS secretariat, became responsible for coordinating all climate-related actions at the Banque de France (R13). The center is organized around a strategic committee led by a deputy governor, and more specialized working groups at the staff-level in which technical work is carried out in a transversal fashion, in relation with other departments (e.g. Monetary Policy, Market Operations, Risk Management). The establishment of this department allowed climate advocates to regroup and gain agency within the Bank, giving them greater prominence and direct access to (and requests from) governing executives.

5 Towards a promotional ECB?

Within a few years, climate change has been widely integrated into ECB's agenda, becoming a genuine central banking concern. What we in turn want to

understand now is if this incorporation of climate-related issues triggered some deep changes in ECB officials' views of their own role in the transition, or if it was a more limited addition to what one could call *central-banking-as-usual*. In this section, we argue that the green doves victory has been incomplete. Behind the facade of unanimity of the 2021 Strategy Review, there are still unresolved tensions about the legitimacy and appropriateness of implementing promotional policies, leading to their actual implementation being relegated to the margins of ECB arsenal.

5.1 Fake it until you make it

When the ECB first began to reflect and answer to parliamentarians regarding climate action, it did so with a mix of prudential and promotional narratives. But as we shall see in this section, the few promotional arguments utilized were generally made to deflect accountability claims by pointing to anecdotal changes in practice. Indeed, the only promotional policies defended in speeches and responses to parliamentarians by the Executive Board before 2020 were not *actual* policies.

First, the responsible management of the ECB's non-monetary portfolio has repeatedly been presented since 2018 as evidence of climate change integration by ECB members.[7] Yet, this decision only concerns its own funds and the pension plans of its employees, a negligible part of its balance sheet, separate from its monetary creation powers. This may be relevant to assess the greenness of the ECB *as an organization*, like any company or firm, but certainly not as a policymaker.

Second, Board members often praised how their private asset purchase programs (such as the CSPP) led to support the green financial niche by buying green bonds.[8] But this is again a fallacy. The ECB was still sticking to the principle of 'market neutrality', which means that their 'support' to green bonds was simply buying as many as them as any other type of bond (ECB, 2017). Presenting this as an active

[7] See for example Christine Lagarde (02/12/2019), answering to Stephanie Yon-Courtin (Renew) on how the ECB (fails to) act on its secondary mandate regarding climate change: 'Third, in its own-portfolio as well as in the management of the portfolio that supports the ECB's pension scheme, a policy is already implemented to favour « green » financial instruments.'

[8] See for example Christine Lagarde (02/12/2019), answering to Paul Tang (SD) on how the QE: 'actually the ECB, by financing in the way it did, has actually encouraged green bond issuance and favoured its financing.'

support is especially ironic considered how the ECB usually did the exact opposite, presenting their design choices of bond universe eligibility as neutral non-decisions with impacts beyond their reach (van 't Klooster & Fontan, 2020).

Third, ECB leaders have often been answering to pushes to green financial flows by pointing to the acceleration of the Capital Market Union (CMU).[9] Yet, central banking support for financial liberalization is not new and have little to do with climate-related objectives. It has been advocated by ECB members as a way to foster growth or resilience across the Euro area for years (Baudraz, 2021; Braun et al., 2018). It has only become recently presented as a way to foster the low-carbon transition, framing the fragmentation of capital markets and remaining national idiosyncratic regulations as a brake for the low-carbon transition (Lagarde, 2021b). Therefore, painting the CMU green is just a way of providing new arguments in favor of the same old mantra of macroeconomic stabilization through capital market integration.

In short, the 'promotional' instruments put forward by the ECB during this period to prove that it was doing something were quite simply greenwashing.

5.2 The great suspense

The two next year, between mid 2020 and mid 2022 were equivocal regarding promotional interventions. During the first year, the promotional approach gained momentum, only to recede following the 2021 Strategy Review.

As mentioned earlier, the secondary mandate (that stipulates that the ECB 'shall support the general economic policies in the Union') is the main legal basis for the ECB to engage in promotional action. While it was regularly acknowledged in climate-related discussions with MEPs, even by Mario Draghi as early as 2017, it had been completely absent from official communication and speeches since the Cœuré (2018) VS Mersch (2018) controversy. This is not surprising: since the 2003

[9]See e.g. the speech by Luis de Guindos (21/11/2019): 'So in order to successfully meet the aims of the Paris Agreement, we need to see changes in how funding flows to the real economy. In the EU, this adds a further environmental motivation to the already substantial merits of completing the capital markets union (CMU).

strategy review, the secondary mandate has been explicitly sidelined, considered as too vague, broad and subject to politicization of ECB's actions (van 't Klooster & de Boer, 2022). Its come back with the speeches of Schnabel (2020a), and later Lagarde (2021a), Panetta (2021), and Schnabel (2021a, 2021b, 2021c), marks therefore an important shift, not least because it was also accompanied with actions. In September 2020, the ECB decided to make sustainability-linked bonds [10] eligible in its collateral framework. Contrary to previous promotional greenwashing, this represents the first actual promotional policy [11] with tangible effects. By derogating to its collateral doctrine, the ECB transformed these niche illiquid assets into shadow money that can be exchanged for cash. This decision might explain the current overvaluation of these bonds and its 8-fold increase in issuance in 2021 (Berrada et al., 2022).

That said, this promotional offensive was short lived. While promotional narratives had gained traction up until June 2021, the Strategy Review decided in July marked a complete disappearance of the secondary mandate in speeches. Mentions to promotional instruments also halted: between September 2020 and July 2021, Lagarde had used the example of sustainability-linked bonds as a showcase for the ECB's voluntarism in 5 out of 7 responses to parliamentary letters addressing the issue of climate change, even when it had no clear link to the question. This policy was also put forward in 6 speeches during the period. But after the July 2021 Strategy Review, while political demands for stronger promotional efforts kept growing, sustainability-linked bonds never appeared again in public speeches or monetary hearing sessions and were only featured once in the 8 answer letters from Lagarde to MEPs asking about climate action. Thus, it seems that ECB's only actual pro-

[10] This new asset class allows corporate issuers to finance themselves at a lower cost if they meet a contractually agreed sustainability targets. Such bonds were not eligible because the ECB normally only accepts fixed coupon bonds, which is here by design not the case.

[11] This decision was openly recognized as overtly 'promotional' by Lagarde. See her answer to Eugen Jurzyca (ECR) in a Monetary Hearing session (19/11/2020) 'What I think you're referring to is a decision that has been made to actually accept a particular derogation in terms of the structure of the green bonds that we accept, which provides for a variable coupon as opposed to a fixed coupon, which was the rule previously. **And that will certainly help buying, or rather accepting as collaterals, some of those green bonds**, because quite a few of them are climate-related and therefore have an element of uncertainty about them' (emphasis added)

motional policy ceased suddenly to be considered as a good example of policy by its executives who, only a few weeks before, brandished it as the perfect token of climate action.

Although it is difficult to know exactly what might have happened behind closed doors, we argue that this might be the result of Governing Council backlash. While the six members of the Executive Board - supported by the Banque de France Governor - are willing to go further in proactive greening, other Governing Council members are pretty reluctant (R12,17,21). Most notably, central bankers in 'frugal' countries such as Belgium, Austria, and Germany disagree strongly with promotional action, and see the secondary mandate as a Pandora box that should remain unopened. They fear that utilizing the secondary mandate would mark a first step towards a dangerous drift away from the ECB's main mission, namely price stability, and dread anything that might propel the ECB onto the political stage. Our hypothesis is that the proponents of a promotional agenda within the Executive Board consented for the sake of the Strategy Review to tone down their position, leaving aside secondary mandate justifications and refocusing on more consensual risk-oriented perspectives. This bargain enabled the climate action plan to reach a consensus that would have appeared very unlikely only a few years prior. At the price of a very prudential-toned program, this allowed to entrench further climate change as a relevant central banking issue.

Based on this evidence, it seems that the unanimity around the strategy review and the climate action plan was not achieved without a counterpart. Contrary to the somewhat hasty conclusion of a steady progress towards a greener ECB, some of its promotional ambitions had to be scaled back to achieve a political balance within the Governing Council. The mainstreaming of the climate issue was achieved by abandoning promotional narratives, and dropping secondary mandate as a rationale for more proactive climate-related financial policies. This transpires from the monetary policy account of the meeting that voted the strategy review (08 July 2021), stressing that the rationale for action is based on the 'primary mandate' - which implies the existence of a 'secondary' mandate left untapped. Therefore, it appears that this meeting was a critical juncture, the Governing Council accepting

unanimously the climate action plan as long as it only seemed to embrace a single materiality and prudential approach to climate action.

5.3 Promotional strikes back

However, green doves were not satisfied with this initial success. After a few months of ceasefire regarding promotional narratives, they resumed their campaign.

As we saw in the previous section, Schnabel had insisted, in the Strategy Review, that the integration of climate change into monetary policy remain broadly formulated (i.e. not only centered around climate-related financial risks) in order to leave the door open for both prudential and promotional greening. When it came time to translate the action plan into practice in July 2022, green doves secured another victory: that of tilting the corporate sector purchase program (CSPP) not on the basis of a 'neutral' integration of climate-related financial risks but of an accelerated and proactive greening trajectory of the monetary portfolio based on the objectives of the Paris Agreement. This implies that bonds from non-financial firms that have good climate-scores (an internal ECB computed metrics factoring in for each company (i) their past emissions, (ii) their future emission targets as well as (iii) the quality and transparency of their emission disclosure) are now favored by the European Central Bank. This change is a very important one in that it marks the end of 'market neutrality' as the organizing and unsurpassable principle regarding direct interventions in financial markets. Perhaps more importantly, it does so not based on risk-based metrics or other sorts of 'intrinsic' rationales to the financial realm, but explicitly relies on 'extrinsic' objectives: that of climate stabilization.

This is truly a turn on the handbrake. Whereas the day before the strategy review, the ECB stated on its website that it was integrating climate change into its monetary policy 'taking into account the need to *avoid any market distorsions*', the following day it stated that it was 'supporting the green transition [by] promoting the development of sustainable finance and *creating incentives* for a greener financial system' (our emphasis). This overtly promotional objective of 'supporting the green transition' is now proudly displayed at the top of their climate change dedicated webpage, with the same prominence as its prudential mission of 'managing climate-

related risks'.[12]

Therefore, it appears that a second ratchet has been crossed. Not only does climate change consists in a legitimate concern for the ECB in an 'instrumental' way (i.e. to achieve its usual objectives of price and financial stability) but also for its own sake, as an 'extrinsic objective' in its own right, based on its secondary mandate. In this respect, it sets a crucial precedent for future policies with more ambitious consequences, and marks an important victory for green doves within the Governing Council. As highlighted by van 't Klooster and de Boer (2022), the ECB's official acknowledgement of its secondary mandate indeed marked a historic change compared to previous revisions of the strategy. Perhaps more importantly, its use for aligning the CSPP with the Paris climate goals marks, to our knowledge, the first time the secondary mandate is leveraged to justify an *actual* policy design, rather than only being acknowledged in general fashion. In that sense, it could even be considered as the mark of a '*third-order*' policy change in the sense of Hall (1993), i.e. a change in policy objectives. Indeed, the development of the ECB's climate action plan has led to the acceptance of a new motive for action: 'supporting the green transition'.

However, this victory so far remains more potential than tangible, more ideological than material. Indeed, if one can consider that a third-order policy change has been achieved, it has only been matched with very weak '*first-order*' policy change (i.e. changing the settings of existing instruments) and no '*second-order*' order policy change (i.e. adopting new instruments) (Hall, 1993). In terms of first-order policy change, the promotional agenda has so far materialized in only a tiny part of the ECB's arsenal. The CSPP, although symbolically and politically important due to its direct distributional and sectoral implications, is in reality a paltry part of ECB's quantitative easing programs (around two percent of its total asset purchases). Moreover, the inflationary pressures that already prevailed when this change was adopted have increased since then, which means that CSPP's impact is

[12]The webpage is entitled 'Climate change and the ECB and is available at the following link https://www.ecb.europa.eu/ecb/climate/html/index.en.html. The overnight comparison can be replicated using the web archive service provided by *WayBackMachine* which records the content of web pages at regular intervals (see https://archive.org/web/).

likely to decrease further as its scale is reduced.

In terms of second-order policy change, no new policies have been agreed upon to specifically reach this new objective of fostering the low-carbon transition. Despite the many ambitious policy proposals, some of which are known to have been explicitly discussed in the Strategy Review and following implementation negotiations, none have been actually implemented. The most prominent example is that of green TLTROs that would allow banks to access preferential refinancing rates proportionally to their amount of sustainable loans, in order to allow for cheaper funding conditions for sustainable projects while safeguarding banks' margins (van 't Klooster, 2022; van 't Klooster & van Tilburg, 2020). Pushed by Christine Lagarde, this proposal was discussed by the board members but never implemented. Interestingly, R12 indicates that this proposal was not only pushed back by conservative executives (i.e. national central bank governors), but also considerably slowed down and hampered by the unwillingness of the staff within the Monetary Policy Committee. This committee, 'full of economists [that] see the climate thing very negatively' (R12), is the one supposed to conduct internal assessments to gauge its feasibility, work on resolving any technical issues, and facilitate its actual implementation if the leadership so desires. Unfortunately, it appears Philip Lane lacks *leadership* in making sure that the Executive Board priorities are followed up at lower management levels.

It thus appears that it is not easy to escape the sedimentation of practices and routines - in short, to fight institution's own weight and inertia. While the ideological battle to gain recognition for the legitimacy of more proactive greening has been surprisingly successful within the Executive Board, its translation into actual practice has lagged behind. Far from having reached hegemony, the victory of the promotional ideas is a superficial and conciliatory success that has neither purged disagreements nor eliminated conflicts. It only crystalized the current balance of power into the four year climate action plan, allowing both parties to reach a compromise. Green doves have secured a symbolic but important victory, while the green hawks have been able to contain any promotional action at the margins of the ECB's action, in an unconventional instrument that they have been fighting to

eliminate for years. The struggle between different visions of what central banks can and should do regarding the climate challenge is therefore bound to reopen, at the end of the four years action plan - or before, as pressures and contradictions increase.

6 Conclusion

In this chapter, we shed light on the different phases through which climate change entered the ECB. After a delayed start compared to other central bankers before 2018, and two years of dithering, the ECB accelerated since 2020, pushing the issue to the top of its agenda. We also tried to unpack how this ideational shift came about, getting the European Central Bank from climate neglect to climate enthusiasm. We showed how the combination of internal dynamics and external pressure allowed the issue to gradually gain prominence within the Governing Council, through the *persuasion* of some of its members, new *appointments* shifting the balance of power, and changes in *leadership* allowing for organizational shifts.

This case study emphasizes two important points. First, the European Central Bank is independent *de jure*, but not autonomous *de facto*. It does not float outside society, and is subject to external pressures to which it often reacts more than it is willing to publicly admit. Second, the decisions that are made there are not simply the rational consequence of neutral and rational choices based on economic science for the greater good. Decisions are also the subject of struggles between different visions of what a central bank can and should do, navigating a broadly defined mandate that allows for very different positions to emerge regarding the climate change challenge.

While a consensus seems to have emerged on the relevance of climate change to the ECB's missions and on its legitimacy to respond to it, disagreements remain on the magnitude of the changes to be made. On the one hand, several Governing Council members – most notably Banque de France Governor and the Executive Board - push for an ambitious agenda, stressing ECB's secondary mandate and the need for proactive policies steering financial flows to facilitate the transition. This

call for promotional policies meets opposition from other members of the Governing Council – most notably the Governors of the Bundesbank, the Oesterreichische Nationalbank and the National Bank of Belgium – that claim that ECB should stick to prudential policies that only react defensively to climate-related risks. Behind this struggle hides deep ideational dissents on the interpretation of ECB's mandate and the role central banks should play in the economy.

Such disagreements have not been resolved by the new climate consensus. Indeed, the 2021 unanimity about the climate action plan comes less from a new harmony of positions inside the Governing Council than the patient building of a compromise between entrenched oppositions. The ECB opted for a strategy largely centered around a consensual risk-based approach, with a small ray of proactive greening on the CSPP. This concession, facilitated by the anecdotal importance of this program in the ECB monetary policy and its likely phase out due to soaring inflation, has mainly helped push back more ambitious and perennial proposals such as green TLTROs. Thus, the climate consensus forged at the ECB does not represent the end, but rather the beginning of new struggles. While the strategy review has closed this battlefield for now by crystallizing the balance of power in the four-year action plan, future developments are likely to reopen the divide over what role the ECB should play in the low-carbon transition.

CHAPTER IV

Warning words in a warming world

Central bank communication and climate change[1]

[1]This chapter draws from an ongoing project with Emanuele Campiglio and Davide Romelli.

1 Introduction

After the European case study presented in chapter III, this chapter aims to widen the geographical - and temporal - scope of the analysis of green central banking by returning to the comparative political economy perspective adopted in chapter II. In doing so, it examines how central banks around the world have integrated environmental and climate concerns into their communication at different paces, to different extents and in different ways.

Studying central bank communication is interesting for at least two reasons. First, because central banks' communication strategies are now widely recognized to be a key dimension in determining macro-financial dynamics (Blinder et al., 2008; Gürkaynak et al., 2005; Haldane & McMahon, 2018). Communication helps central banks to steer expectations, as their public speeches and announcements are immediately and thoroughly scrutinized by markets to capture indications of how the future might look like, with potentially significant effects on asset prices (Altavilla et al., 2019; Ehrmann & Talmi, 2020). Their influence on macroeconomic and financial dynamics has vastly strengthened in recent decades, making economies more dependent on their policies and how these are announced (Assenmacher et al., 2021; Issing, 2005). Second, because central bankers' communication is also an essential tool for establishing their legitimacy, by allowing them to explain their monetary policy decisions and by reinforcing their accountability, a necessary counterweight to their independence from political authorities (Braun, 2016b; Moschella & Pinto, 2019; Moschella et al., 2020; Moschella & Romelli, 2022). In fact, communication with the general public is now considered by central bankers 'at least as important' as communication to financial markets, if only to steer public's inflation expectations (Blinder et al., 2008)

In this context, it is interesting to note how a large number of central banks have greatly strengthened their communication on climate-related issues. The Bank for International Settlements (BIS), which compiles the speeches of central bankers on its website has even created a specific sub-collection of speeches dedicated to 'climate change and green finance', counting more than 400 entries. Yet, a systematic

analysis of this new and evolving wave of central bank communication is still missing. Sparse recent contributions (e.g. Arseneau et al., 2022; Deyris, 2023; Dietsch et al., 2022; Șimandan et al., 2023) have started to analyse climate-related speeches, but more work is needed to understand the scope, content and drivers of central bank communication on the topic. Why are central banks communicating on climate-related matters? Is communication homogeneous across jurisdictions, or do different central banks communicate differently about climate change? What accounts for these differences?

To address these research questions, we provide three main contributions. First, we build a new database containing 31,049 speeches from 131 central banks, over the period 1986-2021. This represents a significant improvement to the dataset traditionally used in the literature on central bank communication, i.e. the BIS one, which records 17,219 speeches from 108 institutions since 1997. Our dataset is aggregated via a systematic scrapping of central bank websites and occasional archival work for older documents, and includes a relevant proportion of speeches in original (non-English) language. While this project only leverages this dataset to study central bank communication on climate-related issues, it will be made open access in for other purposes.

Second, this paper advances our understanding of when, where, and how the topic of climate change appeared in central bank speeches, as well as how it evolved across time and institutions. To do so, we start by creating a novel dictionary of climate-related expressions to identify a sub-set of 1,935 speeches that address this issue at least once. We show that other central bankers had already extensively discussed the issue before Carney (2015), notably in Europe and in Southeast Asia, and that the degree of attention to the topic remains very heterogeneous across central banks, even after the creation of the Network for Greening the Financial System (NGFS) that rapidly expanded from the original eight founders in December 2017 to more than a hundred in less than five years. We then implement a structural topic model (STM) to shed light on the variety of ways this topic is addressed. We are able to identify three distinct climate-related topics, all directly related to climate change but relying on different lexicons: (i) 'Sustainable development'; (ii) 'Climate-related

risks'; (iii) 'Green and digital finance'. Before 2015, the 'Sustainable development' topic represented the main focus of speeches, driven by South-East Asian central bankers. After 2015, the prominence of this topic rapidly diminished in favor of 'Climate-related risks' and 'Green and digital finance' topics, driven by previously climate-silent high-income central banks taking up the issue with their own concerns and perspectives. While the main narratives have evolved over time in our corpus, they have therefore remained closely associated with certain institutions, making it possible to highlight three distinct models of green central banking communication, each linked to different varieties of capitalism and vulnerabilities to climate-related dynamics.

Third, we investigate what may be the main drivers of central banks' climate-related communication through the implementation of a simple econometric model. Interestingly, we find that the exposure of a country to both physical and transition risks is not associated with more climate-related central bank communication. On the contrary, institutional dimensions such as the degree of central bank involvement in financial sector supervision have a significant and positive effect on the central bank engagement in climate-related matters. This is especially true for what concerns the second of our climate-related topics, which focuses on climate-related financial risks. NGFS membership is also positively associated with both the overall climate attention of a central bank and its specific engagement with climate-related risk and green finance narratives. This suggests that the degree and type of attention to climate change is driven less by the intrinsic climate vulnerability of countries than by the institutional characteristics of their central banks and their position within their epistemic community.

Our research builds upon and contributes to two broad streams of research. First, the extensive literature which has investigated the impact of central bank communication on macroeconomic variables, such as exchange rates (Gürkaynak et al., 2021), interest rates (Gürkaynak et al., 2005; Lucca & Trebbi, 2009), asset prices (Altavilla et al., 2019; Cieslak & Schrimpf, 2019; Ehrmann & Talmi, 2020; Gorodnichenko et

al., 2023) and real economic variables (Hansen & McMahon, 2016). [2] This research area has benefited from the recent advances in natural language processing techniques to analyse 'text as data' (Gentzkow et al., 2019) that have been applied to a variety of different text sources (speeches, tweets, online queries, etc.). Ferrara et al. (2022) perform a similar analysis to ours (STM and econometric analysis of drivers), except using parliamentary hearings of the European Central Bank as their body of text and with a focus on central bank missions. On the other hand, text analysis has been applied to questions in environmental economics only to a limited extent so far (Dugoua et al., 2022).

Second, a concurrent debate has been developing on the role of central banks in addressing the climate challenge. While this focus may appear unexpected given central banks missions, climate change and the low-carbon transition have been rapidly acknowledged as relevant phenomena for both price and financial stability, and hence a new concern for central banks (Campiglio et al., 2018; NGFS, 2019). Baer et al. (2021) [3] discuss two motives for climate-related interventions by central banks and financial supervisors: 'prudential' policies aimed at protecting the financial systems in the face of climate-related risks; 'promotional' policies aimed at steering capital flows proactively to facilitate the low-carbon transition. The underlying institutional framework in which central banks are inserted influences the admissible motives for action, with western high-income central banks being more tied to prudential considerations than the ones in emerging economies (Dikau & Volz, 2021a). However, institutional frameworks evolve: the Bank of England has been given formal mission to incorporate climate change in its monetary policy in 2021, while the mandate of the Magyar Nemzeti Bank (the Central Bank of Hungary) has been changed the same year to incorporate the promotion of environmental sustainability in its statutory objectives. Besides, formal mandate change are not always necessary, provided that primary objectives of central banks are threatened by climate-related dynamics. As a result, a growing set of new 'green' central bank

[2] See (Masciandaro et al., 2023) for a survey of the large literature on central bank communication.

[3] As known here as chapter II.

policy interventions have been implemented or publicly discussed in recent years (see e.g. D'Orazio, 2022; D'Orazio & Popoyan, 2019).

So far, only a limited number of papers have tried to combine the two research questions. Arseneau et al. (2022) apply a score-based methodology to the BIS dataset and identify 555 climate-related speeches, mainly delivered in the last few years. They find that public communication by central banks on climate-related issues is mostly oriented towards financial stability matters and micro-prudential policy interventions, rather than on macro-prudential policies. Dietsch et al. (2022) employ a different methodology to isolate climate-related speeches in the same database, and show that South-East Asia central banks were the first to address the climate topic, while Western independent central banks were slower to pick up the subject due to their struggles to reconcile *input legitimacy*, i.e. their ability to follow closely their legal mandate, and *output legitimacy*, i.e. their ability to deliver on their objectives, regarding the climate challenge. Deyris (2023) [4] mobilizes a dictionary-based approach to study the European Central Bank speeches and interactions with members of the European Parliament in order to document how climate change issues have been mainstreamed within the organization. Finally, Șimandan et al. (2023) provide a qualitative analysis of the evolution of narratives in central bank speeches about climate change, using a post-pandemic subset of speeches from the European Central Bank and the Bank of England.

Against this background, our chapter provides several novel contributions. First, our original dataset allows to bring new insights compared to that used by Arseneau et al. (2022) and Dietsch et al. (2022). Second, we propose a new dictionary of climate-related expressions that can serve as a basis for future research. Third, we are the implement a structural topic model to study the evolution of climate-related central bank communication. Finally, we provide a novel analysis of what may drive climate communication, a research question that has so far remained unaddressed.

The remainder of the chapter is structured as follows. Section 2 presents the dataset, discusses the collection process and summarizes its main characteristics.

[4] As known here as chapter III

Section 3 presents our methodology to identify climate-related speeches Section 4 explores the evolving attention devoted to climate change, before running a structural topic model on the speeches that do engage with the topic. Section 5 employs econometric regressions to study the drivers of central bank communication on climate-related matters. Section 6 concludes and discusses new research directions.

2 A new dataset of central bank speeches

This section presents the materials we rely on for the rest of the paper. In section 2.1, we present the usual dataset used by the literature when it comes to central bank communication, and discuss its limitations. In 2.2 we present our methodology to construct a new original and more comprehensive collection of central banker speeches. Last, we present the main features of our dataset in section 2.3, highlighting how it enhances our knowledge of central bankers communication.

2.1 An overview of the BIS database

The most prominent and comprehensive international dataset of central bank speeches is maintained by the Bank of International Settlements (BIS). [5] This dataset includes a total of 17,219 speeches made by governors, deputy governors and board members of 108 central banks and 10 Federal Reserve Banks of the Federal Reserve System, over the period 1997-2021. Despite its importance and widespread use by researchers studying central bank speeches, the BIS dataset has three main weaknesses.

First, while the collection of speeches does not only include speeches from institutions that are members of the BIS network, many central banks are nonetheless either absent altogether - or present with a very limited number of speeches. For instance, no speeches are available for Bangladesh [6] or Venezuela and only a single

[5] The Bank for International Settlements database is available at the following link: https://www.bis.org/cbspeeches/index.htm. It was retrieved by the authors in February 2022

[6] As we will see in the subsequent sections, the absence of Bangladesh would have been par-

speech is present from Uruguay, Cambodia and Jordan.

Second, the collection of speeches has not been fully consistent across countries and time. Some significant gaps are present, especially for emerging economies. For example, the speeches delivered by the Central Bank of Argentina between October 2010 to June 2019 are entirely missing from the BIS dataset. Having discussed with a member of the BIS team in charge of the maintenance of the Central bankers' speeches dataset, it appears that their data collection process has evolved over time, leading to significant variability in the geographic coverage of speeches. While procedures have been established in recent years to facilitate the systematic transfer of speeches from certain central banks to the BIS website, this is not the case for all institutions. Active and discretionary hand-collection of speeches is still required for most institutions and has been the default practice for all central bank speech during most of the period, leading to inconsistencies and data gaps.

Third, the BIS only recently started to include speeches given in languages other than English. This leads to an under-representation of those central banks that may be more focused in communicating with their domestic audience or that might lack the resources to provide a systematic translation of their speeches in English. This shortcoming is not only important for small economies, but for all central banks whose national official language is not English. Indeed, most central banks have kept communicating in their official language despite the internalisation and globalisation of financial flows, without systematically providing a translation for such speeches. For example, the website of the Bank of Italy features 522 speeches in English (either delivered in English, or translated after their publication), but also 305 speeches delivered in Italian, for which no translation has been provided. Similarly, the Bundesbank website contains 737 speeches in English, but also 458 speeches that are in German only.

ticularly limiting for our research question, as its central bank is one of the early adopters of climate-related financial policies (see chapter II).

2.2 Methodology and data

Against this background, we compiles a new and more comprehensive dataset of central bank speeches. Figure ?? provides a general overview of our methodology.

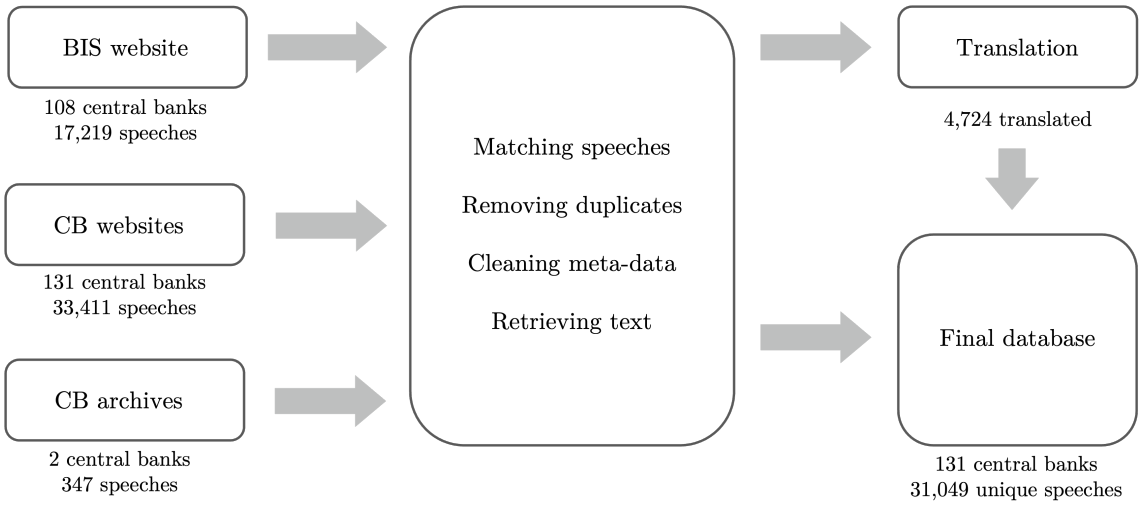


Figure IV.1 – Summary of the dataset construction

We start by aggregating central bankers' speeches, using three main types of sources. First, we retrieve the 17,405 speeches included in the BIS dataset, together with all the relevant meta-data (title, subtitle, date, speaker, language). We drop 186 observations, either because they are not speeches (e.g. Banque de France and Bank of Japan annual reports) or because they were not delivered by central bankers (e.g. speeches by BIS, IMF or World Bank senior executives, or even by the Queen of the Netherlands). This leaves us with 17,219 unique speeches from 118 different central banking institutions (108 central banks and 10 regional Federal Reserves), over the period going from January 1997 to December 2021.

Second, we look for all the central banks with a presence online. Whenever possible, we choose to access their website in the official language of the country in order to make sure we access speeches in both English and in national language. We identify 154 central bank websites, 143 of them containing speeches delivered by central banks' board members.[7] We then scrap these speeches together with their

[7] These 143 websites include 131 central bank plus the twelve Regional Federal Reserve websites

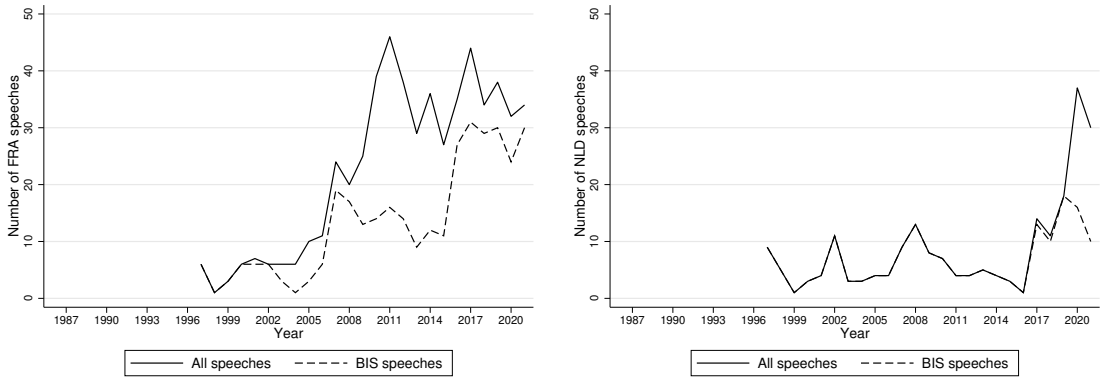
metadata using the *Octoparse* software. After cleaning the dataset by removing all instances in which the central bank website provided the slides but not the text of the speech, we are left with a corpus of 33,411 speeches, 13,630 of which were not already featured in the BIS dataset.

Third, we contacted all the central banks whose websites only provided speeches for recent years, with clear discontinuities. We obtained answers from Banque de France (no speeches before 2015), Banque de Belgique (no speeches before 2018) and De Nederlandsche Bank (no speeches before 2019). The Banque de France's Historical Archives Department and Communication Department granted us access to respectively 436 and 210 raw and unclassified documents (speeches and interviews) dating from 2002 to 2015. After cleaning and removing duplicates, we were able to retrieve 309 unique speeches, of which 179 were not present in the BIS dataset. With a similar process, we were able to retrieve 38 unique speeches from Banque de Belgique from 2003 to 2013, 21 of which were not present in the BIS dataset. Unfortunately, De Nederlandsche Bank lost access to the old speeches when it moved its website, because the archiving of the old version did not preserve the PDFs.

In total, we ended up with 347 archives-retrieved speeches, of which 200 were neither available on the BIS website nor on the concerned central bank's website. Those number may appear small, but represent a significant improvement for the countries that have them available, as illustrated by Figure IV.2. For the Banque de France, the presence of archives allowed us to significantly improve data coverage for the years prior to 2015, adding dozen of speeches that were no longer available online. In contrast, the 2019 discontinuity in the annual number of speeches for De Nederlandsche Bank suggests that a significant part of its communication has been permanently lost.

Last, we downloaded all PDFs (or HTML pages when PDFs were not available) and extracted the text of the speeches, relying on optical character recognition (OCR) to make the text machine-readable when necessary. For this purpose, we used *Adobe Acrobat* and *Wondershare PDF* on good quality documents for quick results, and relied on the machine learning algorithm *Tesseract* for the speeches with the lowest quality to ensure optimal recognition. Finally, we translated 4,724

Figure IV.2 – Importance of archival sources



(a) Banque de France (b) De Nederlandsche Bank

speeches from 34 non-English languages using *Microsoft Translator*, a multilingual machine translation cloud service. While the use of automated machine translation might lead some meaning to get 'lost in translation', the risk of this affecting the results is limited when using a bag-of-words approach as we do (de Vries et al., 2018; Shaikh et al., 2016).

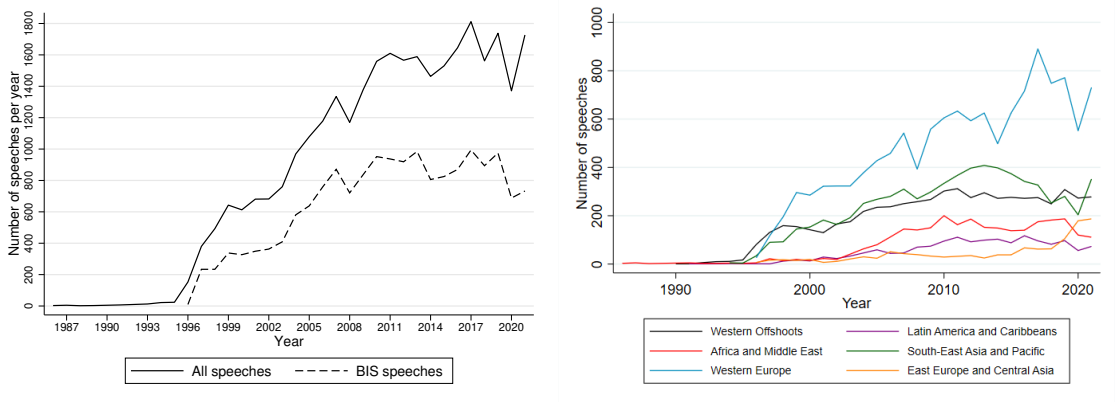
2.3 Our original dataset: 35 years of central bank communication

Our final dataset contains 31,049 speeches (including 13,830 original and 17,219 from the BIS), from 131 central banks from January 1986 to the end of December 2021. The Appendix Table VI.1 provides an overview of the number of speeches extracted for each country, together with information on the sources of data and on the language of the original extraction.

Figure IV.3a reports the temporal evolution of the number of speeches present in our dataset, comparing them to the BIS repository. The number of annual speeches delivered by central banks worldwide increased almost continuously since the 1990s and then stabilised to around 1600 speeches per year since 2010. This number only occasionally drops during years of crisis, such as the dotcom bubble of early 2000, the 2008 global financial crisis and the Covid-19 pandemic which started in 2020. Figure IV.3b highlights that global trends hide significant diversity. Some regions

experienced stagnation or even decline in their communication (e.g. Southeast Asia, Latin America and Caribbeans or Africa and Middle East), while European central banks seem to have continued to increase their communication over the years.

Figure IV.3 – Temporal evolution of speeches in our dataset.



(a) General trends

(b) Regional trends

Table IV.1 provides additional comparison between our database and the usual BIS dataset, using the IMF classification to split between advanced and emerging market economies. First, we note that while most of our new original speeches belong to advanced economies, all the additional central banks are located in emerging countries. Our dataset therefore lead to an upward re-estimation of the heterogeneity of central bank communication, as the average number of speeches per year is significantly higher than usually assumed for advanced economies (from 16 to 25), and only marginally for emerging economies (from 8 to 9).

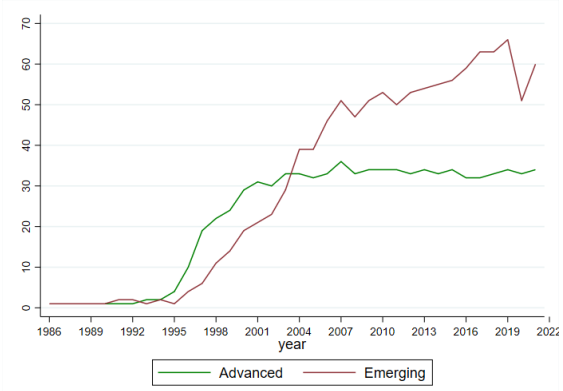
Table IV.1 – Summary statistics on both datasets

		Number of Central Banks	Number of Speeches	Speeches per year per CB	Words per Speech
Full database	Advanced	38	20,488	25.3	3471.8
	Emerging	92	10,265	9.4	2412.0
	Total	131	31,048	16.2	3110.4
of which BIS	Advanced	38	11,991	16.4	3578.8
	Emerging	69	5,138	7.8	2691.7
	Total	108	17,219	12.2	3309.9

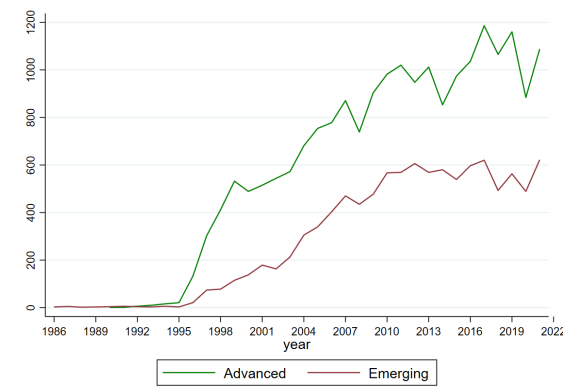
Figure IV.4 provides further insights on the evolution of central bank communication. On the one hand, central banks from advanced economies have been

communicating almost every year since 2000 (see Figure IV.4a). Over time, the number and frequency of their communication has increased, from a few speeches per year in 1995 to more than 30 in the latest years (see Figure IV.4b and Figure IV.4c). However, their speeches have become more concise, moving from an average of 4,600 words in 1995 to less than 3,400 in recent years IV.4d). On the other hand, the number of emerging market central banks' speeches in our corpus has increased constantly since 1995. As compared to advanced economies, central banks from emerging market economies communicate less often, with an average of 10 speeches a year, a number that has been stalling since the late 1990s. In addition, their speeches are significantly shorter than their advanced economies counterparts, and their average length has been decreasing faster. These trends are in line with the figures describing the BIS dataset provided by Arseneau et al. (2022).

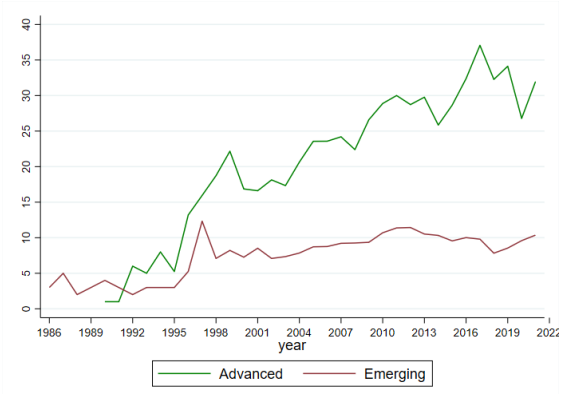
Figure IV.4 – Central bank speeches over time, 1986-2021



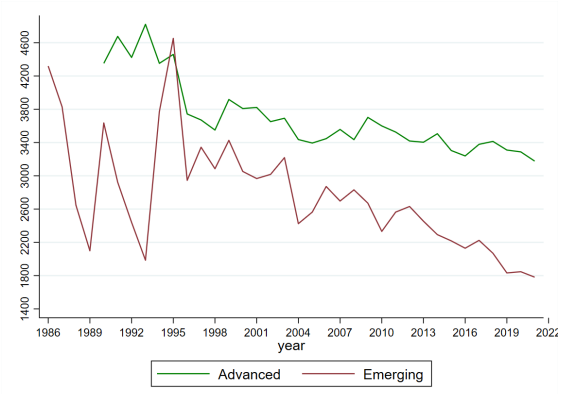
(a) Number of Central Banks



(b) Number of Speeches



(c) Avg. number of Speeches per Bank



(d) Avg. number of Words per Speech

Since we also collect speeches in national (non-English) language, we are able to explore how the language used by central bankers in their speeches has evolved over time. [8] While financial integration and the rise of forward guidance may lead to think suggest that central banks have increased their communication in English over the period, our dataset shows that this is not the case. The share of communication in untranslated original language remains relatively stable, and even increases slightly over the period, from an average of 13.8% in the 2000s to an average of 17.5% in the 2010s, with peaks over 20% in 2016 and 2017. Of course, this trend may be partly driven by issues of data availability, as central banks may maintain access to their English language speeches for longer on their website. However, it is interesting to see that a significant part of central bank communication still remains untranslated to this day.

After all, it seems that communicating 'to the markets' is not the only objective of central banks, which still often speaks 'to the people' - or at least in their native language - without necessarily providing translations for the foreign investors. This is consistent with the findings of Braun (2016b), Moschella and Pinto (2019) and Moschella et al. (2020) that highlight how central banks were pushed to communicate more towards the general public after the global financial crisis. Indeed, the subsequent unconventional monetary policies and macro-prudential policies led central bankers to face of increasing contestation, leading them to increase and diversify their communication. Future work using our dataset could try to assess whether the communication style and content tends to vary depending on the language - hence on the possible target - of central bankers.

3 Identification of climate-related speeches

This section deals with the identification of climate-related speeches. Section 3.1 reviews the different methods that could be used and explains our choice. Section

[8] Whenever a speech is available in both English and non-English, we only retrieve the English version. Therefore, the share of original languages discussed in this paragraph represents speeches for which no translation to English was provided.

3.2 presents our dictionary of climate-related keywords.

3.1 Reviewing the possible methods

Before being able to investigate how central bankers' communication has evolved around climate-related issues, we first need to find a systematic approach to identifying such speeches. One option might have been to rely on the collection of speeches assigned by the BIS to the group of 'climate change and green finance' speeches.[9] However, this set of speeches was selected manually by the BIS after reading speeches and selecting those who 'really address (not just in passing)' climate- or environment-related matters.[10] Despite its interest, we cannot build on this manual classification for three reasons. First, the tag 'climate change and green finance' was only created in 2015. Earlier speeches have therefore not been considered, whereas we want to explore the entire period. Second, the BIS selection only includes speeches that address climate change and green finance topics in depth. Although this is also our interest, we would also like to be able to consider a lower threshold, capturing all of the speeches that mention this subject even briefly. Indeed, we hypothesize that even *en passant* mentions of climate change are relevant, and do not happen randomly (in terms of time, location and main topic of speeches). Last, this tag was only manually applied to the database compiled by BIS and not on the additional 13,830 speeches we collected. Even assuming we had the capacity to read all of these speeches, it would be impossible to know with certainty whether we apply the same subjective criteria followed by the BIS team in tagging speeches which they considered sufficiently related to the climate theme. For all these reasons, we turn to supervised and unsupervised machine-assisted methods to try to identify climate-related speeches(see Gentzkow et al., 2019; Grimmer et al., 2022, for an overview).

In what follows, we present these two approaches in turn, by explaining the advantages and disadvantages of each approach for our case study, and conclude by presenting our selected solution. The mainstream machine-assisted unsupervised

[9] Available at https://www.bis.org/topic/green_finance/speeches.htm.
[10] This is according to an email exchange with the BIS team in charge of this dataset.

approach to discovering topics in a corpus of text consists in using a latent topic discovery technique such as Latent Dirichlet Allocation (LDA) or Structural Topic Modeling (STM). These techniques aim to identify the main themes treated in a corpus of text based on the joint probability of the appearance of words. Yet, topic modeling does not appear appropriate for our purpose. Indeed, being *unsupervised*, nothing guarantees that the climate topic will be identified as one of the topics. In fact, it is highly unlikely, since this topic is only featured in a low number of speeches. Although this problem could be overcome by choosing to compute a sufficiently large number of topics to ensure that the algorithmic-based partition results in the emergence of climate change as a separate category, this would imply, given the high number of speeches in our database, both a prohibitive computational time and a particularly poor fitting performance of the topic model (see subsection 4.2). These techniques would, however, offer promising results if performed on a smaller sample of documents with a higher proportion of climate-related discussions, which is precisely what we will discuss further below.

Second, we could rely on a *supervised* approach. This involves more hands-on research designs, but can be done in many ways. The most elaborated would involve training a machine learning algorithm with a random sample of speeches hand-classified as pertinent or non pertinent by the researchers, and letting the machine classify the rest of the text corpus. These methods are promising because they achieve a level of performance similar to that of trained research assistants, while considerably reducing the human time required (Do et al., 2022). Yet, training a machine learning algorithm on such a large body of text and such a recent topic would have been excessively complex and time-consuming, without ensuring a satisfactory results. Indeed, given the low concentration of the searched topic in the set of speeches, the proper training of the algorithm would imply manually tagging a very high number of speeches. Given the average length of the texts in our corpus, we don't consider this a feasible option.

Hence, our corpus and research question calls for a simpler - but nonetheless efficient, tractable and widely used in the literature - natural language processing method: the dictionary-based approach. This method requires researchers to build

(or a use a pre-built) list of keywords or key-expressions of interest, search them in the corpus, and decide on a threshold for a speech to be considered relevant. As pointed by Arseneau et al. (2022), no pre-built dictionary exists for our specific research question. To address this issue, they rely on a machine-assisted methodology starting from a *seed* expression ('climate change') and adding iteratively new key expressions that appear frequently in the same speeches without being featured in others. Although this method is promising, the authors themselves stress that their method also involves discretionary choices. Indeed, seeding is highly sensitive to the word chosen as a starting point (the *seed*), from which the rest of the dictionary is derived. Due to this feature, we argue that this method might be problematic for investigating corpus covering long periods of time during which the vocabulary used to discuss climate-related issues may evolve. Indeed, by choosing 'climate change' as the seed, Arseneau et al. (2022) may be biasing their search towards the most contemporary terminology of the climate crisis problem, and thus risk missing other dated lexicons such as 'global warming' that, although outmoded, could be important to explore the beginning of our corpus.

3.2 Our dictionary of climate-related expressions

Based on the considerations, we chose to build a dictionary of climate-related expressions, aiming at the creation of a list as complete, time-agnostic and transparent as possible. To do so, we complement the few relevant available dictionaries (i.e. the 'Environment' thesaurus of the World Bank and the one proposed by Arseneau et al. (2022), with our knowledge of the climate-related public debate, following an iterative process of corrections. Whenever possible, $n-grams$ (i.e. expressions composed by a number n of words) are favored over single words in order to deal with polysemy and avoid false positives. For instance, 'environment' was not included as it would lead to catch expressions such as 'an environment of price stability'. Instead $n-grams$ such as 'environmental risks' are included.

We obtain an initial dictionary of approximately 200 expressions. We then re-

duce the list of keywords[11] in successive iterations of close data examination by removing $n-grams$ that capture false positives. For example, we drop the expression 'smooth transition' because it appears in speeches about the democratization of authoritarian countries. We also drop keywords which returned zero hits from our corpus. Whenever a key expression could be present with two spellings (e.g. decarbonise/decarbonize), or in both singular and plural forms (e.g. tax/taxes), both spellings were included, and only the ones that gave zero results were dropped. Although this iterative process was time consuming and labour intensive, it allowed us to retain a large and comprehensive dictionary while avoiding false positives.

The final version of the dictionary comprises 104 n-grams. Table IV.2 presents the list of the keywords in our dictionary together with the number of speeches in which these keywords are present. Unsurprisingly, 'climate change' is the most salient expression, present in 1,319 speeches. Other very common keywords are 'climate related' (439 speeches), 'sustainable finance' (393), 'greening' (369), 'low carbon' (303), 'climate risks' (286), 'greenhouse' and 'global warming' (251).

As one may notice, a large number of key expressions centered on renewable energies, climate disasters or biodiversity issues are absent from our dictionary, despite being usually associated with climate change. This choice was made because these expressions were often employed by central bankers without direct reference to the climate crisis, especially in older speeches. Therefore, keeping them would have led to misidentifying speeches as 'climate-related' due to a logical link that may be anachronistic - or at least that was not explicitly made by some central bankers. These key expressions were therefore removed from our dictionary.

4 The differentiated rise of climate communication

This section leverages our original database and dictionary to identify and study climate-related speeches. In section 4.1, we investigate the evolution of climate

[11] For convenience, we use 'keywords' and 'key expressions' interchangeably, while most n-grams searched are in fact composed of several words

Table IV.2 – Dictionary of climate-relevant n-grams (in brackets: number of speeches using the n-gram)

abrupt transition (14)	brown penalising factors (1)	carbon emission (49)	carbon emissions (169)
carbon price (41)	carbon prices (26)	carbon pricing (57)	carbon tax (55)
carbon taxes (39)	climate action (100)	climate actions (8)	climate adaptation (14)
climate aligned (7)	climate change (1319)	climate changes (26)	climate crisis (63)
climate damage (1)	climate data (20)	climate economics (5)	climate event (1)
climate events (30)	climate exposure (1)	climate exposures (4)	climate extremes (6)
climate finance (33)	climate friendly (42)	climate goals (39)	climate harm (1)
climate hazard (1)	climate hazards (2)	climate impact (30)	climate impacts (9)
climate metrics (3)	climate minsky moment (14)	climate policies (78)	climate policy (104)
climate protection (46)	climate related (439)	climate relevant (4)	climate risk (243)
climate risks (286)	climate scenario (21)	climate scenarios (58)	climate science (15)
climate sensitivity (3)	climate shock (1)	climate shocks (12)	climate stability (6)
climate stress test (36)	climate stress tests (24)	climatologist (2)	climatologists (7)
climatology (1)	cotwo (109)	decarbonise (6)	decarbonised (8)
decarbonising (8)	decarbonization (11)	decarbonize (4)	decarbonized (4)
decarbonizing (6)	disorderly transition (28)	disorderly transitions (2)	environment risk (3)
environment risks (3)	environmental risk (90)	environmental risks (164)	global warming (251)
green bond (190)	green bonds (223)	green economy (72)	green finance (307)
green finances (2)	green investment (73)	green investments (80)	green monetary (5)
green policies (4)	green policy (13)	green qe (5)	green quantitative easing (4)
green supporting factor (9)	green supporting factors (4)	green swan (23)	green swans (3)
green technologies (42)	green technology (43)	green transition (70)	green transitions (3)
greener (212)	greenhouse (262)	greening (369)	low carbon (303)
ngfs (237)	paris agreement (179)	physical risk (53)	physical risks (150)
stranded asset (3)	stranded assets (52)	sustainable finance (393)	sustainable finances (8)
sustainable investing (33)	tcfd (103)	transition risk (68)	transition risks (195)

attention across time and institutions from a quantitative perspective. In section 4.2, we implement a structural topic modeling to explore how climate narratives evolved from a qualitative perspective. Finally, section 4.3 provides a discussion of the variety of green central banking (communication).

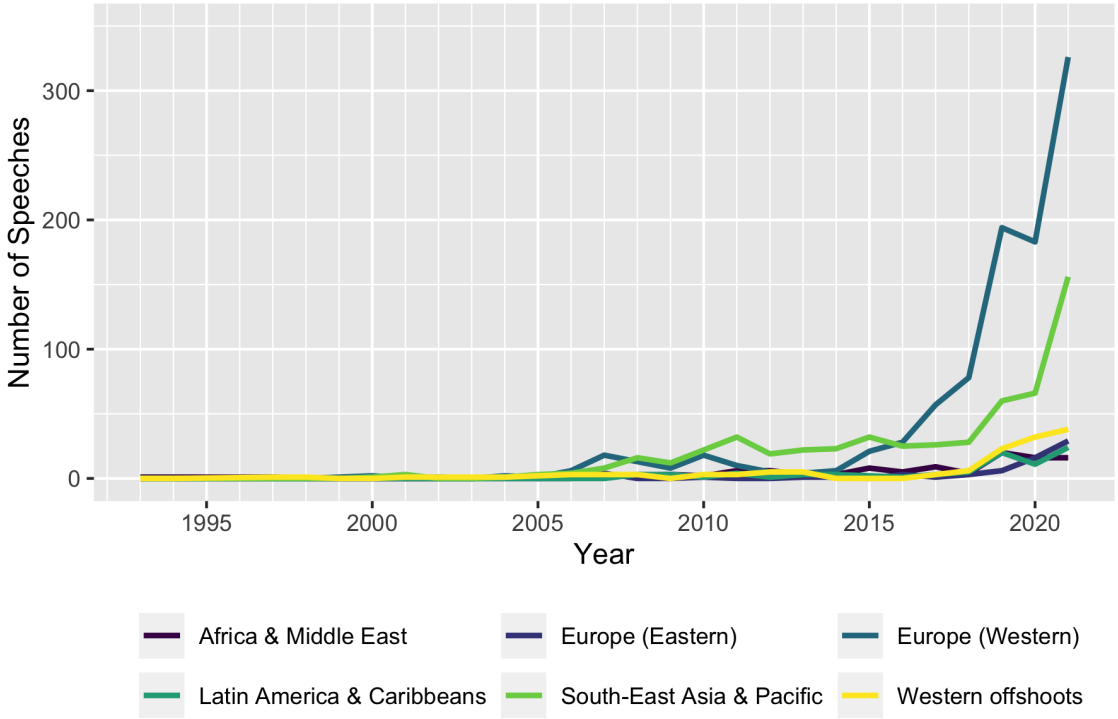
4.1 Climate-related speeches: an overview

Our dictionary allows us to identify 1,935 speeches that mention the theme of climate change at least once, a significant proportion of which (801) are not present in the BIS database, and 304 originally in a non English language. [12] These speeches come from 91 different institutions, with very important disparities. Most central banks (52) have only one speech touching upon climate-related issues, while the top

[12] This identification is done after standard pre-processing steps in order to make sure we don't miss climate related key expressions. For instance, we replace all '-' by ' ' and transform all (special) characters (replacement of ligatures, accentuated, uppercase and special characters) into standard lower case characters. Before removing numbers, we also identify and transform all possible spellings of CO2 into 'cotwo'.

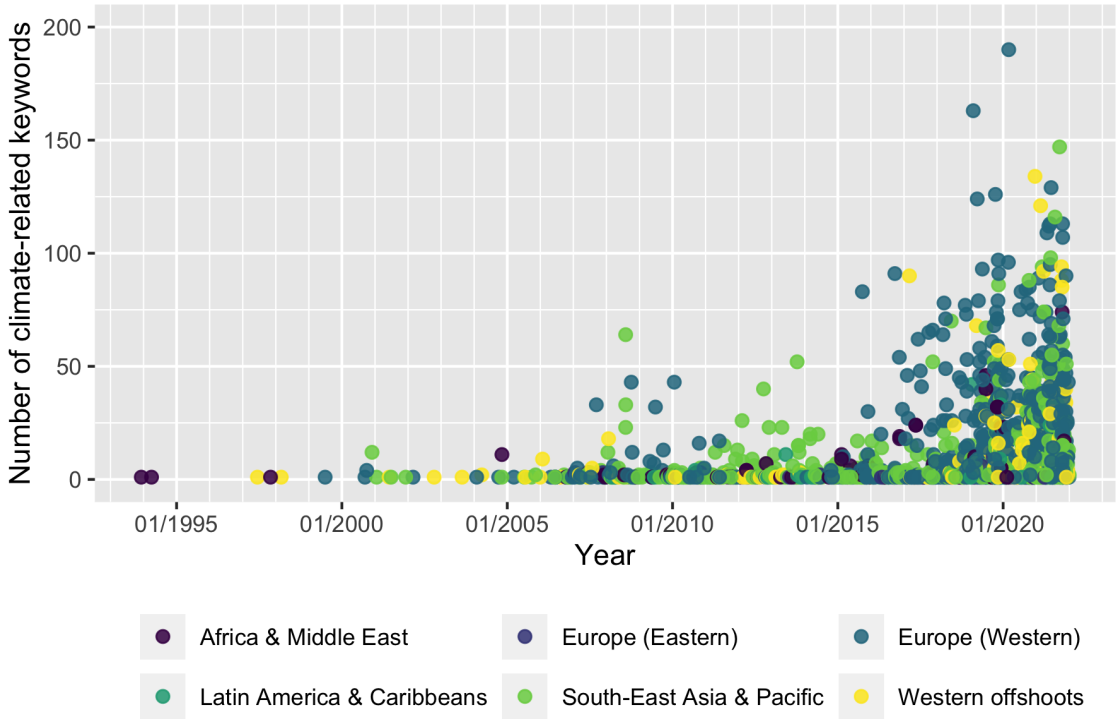
11 institutions delivered more than half of the total of climate-related speeches. The number of climate-related keywords per speech is also very heterogeneous. Indeed, more than half of the speeches contain only one, two or three climate-related keywords, while the top hundred speeches contain more than 50. Figure IV.5 shows the annual number of climate-related speeches by world regions, while IV.6 plots speeches based on their date, provenance and the number of climate-related keywords they include.

Figure IV.5 – Climate speeches per year and region



analyzing the main features of our climate-related speeches dataset offers several interesting insights. First, climate-related communication by central bankers started taking place well before the speech by Mark Carney (governor of the Bank of England from 2013 to 2020) in 2015. While it is true that most speeches delivered before the second half of the 2000s usually only briefly touched upon the topic, with only one or two mentions of climate-related keywords, many speeches after the mid-2000s engage in deeper and thorough ways with the issue. In particular, central banks of South East Asian countries steadily engaged with the topic already since 2008, with

Figure IV.6 – Climate-related keywords per speech



roughly 30 speeches per year addressing climate-related issues. Central bankers from Bangladesh, Indonesia, India, Malaysia and Thailand have been particularly vocals, and were quickly joined by Western European central bankers. Speeches also began to be more and more exclusively centered around sustainability and environmental issues, as shown by the increase in the number of climate-related keywords per speech in that period.

Second, the seminal speeches of early 2000s were also thematically diversified, and sometimes already anticipated issues that would become mainstream a few years later. For example, the 2000 speech by David Carse of the Hong Kong Monetary Authority was already linking the issue of climate change to that of financial risks for banks and investors. The former Governor of the Reserve Bank of New Zealand, Alan Bollard, had already discussed inflationary dynamics of carbon pricing in 2008, while the impacts of climate change for monetary policy was discussed by Hernán Lacunza (Bank of Argentina) the same year.[13] Climate physical impacts and their

[13]Unfortunately, this speech is not included in our dataset. We know of its existence because it

implications for central bankers were also discussed by Atiur Rahman (Bank of Bangladesh) on multiple occasions in the early 2010s. In addition, these speeches also touched on topics that have since been side-lined, such as international climate justice. Table IV.3 provides a selection of speeches that addressed the topic of climate in depth prior to 2015.

Table IV.3 – Speeches with high frequency of climate-related keywords prior to 2015

Year	Speaker	Title	Country
2000	David Carse	Environmental issues and their implications for financial institutions in Hong Kong	Hong Kong
2007	Erkki Liikanen	Climate change, economy and investment (translated)	Finland
2008	Alan Bollard	Coping with shocks: a New Zealand perspective	New Zealand
2008	Bandid Nijathaworn	Is climate change a big deal for the financial system?	Thailand
2008	Miranda S. Goeltom	Macroeconomic impact of climate change - opportunities and challenges	Indonesia
2008	Boediono	Macroeconomic impact of climate change - opportunities and challenges	Indonesia
2008	Sinikka Salo	Environmental challenges and financial markets	Finland
2009	Anna Maria Tarantola	Solidarity economy and sustainable development in the post-globalization era	Italy
2010	Anna Maria Tarantola	Economic growth, well-being and sustainability of energy demand	Italy
2012	Atiur Rahman	Climate Change and Banking Sector of Bangladesh	Bangladesh
2013	Kamalesh C. Chakrabarty	Environmental and social sustainability - key issues and concerns	India
2012	Muhammad bin Ibrahim	Role and opportunities of the financial system in supporting green technology	Malaysia
2012	Atiur Rahman	Financing Adaptation	Bangladesh
2013	Muhammad bin Ibrahim	Role of the Islamic financial system in supporting green technology	Malaysia
2015	Ravi Menon	An economic history of Singapore - 1965-2065	Singapore

The third interesting insight is how the geographic provenance of speeches evolved over time. From 2005 to 2010, central bankers from Western Europe and South-

is briefly mentioned by the concluding remarks of another speaker at the same conference, and was confirmed by Hernán Lacunza himself. Unfortunately, the full-text of the speech has never been available online, and only appears in a collective book edited by the Bank of Indonesia (organizer of this climate-focused 2008 conference) that we haven't been able to recover so-far.

East-Asia were virtually the only ones to address the issue. Between 2010 and 2015, South-East Asian central banks further strengthened their focus on climate, increasing both the number of speeches and the amount of climate-related keywords per speech, while Western European Central bankers reverted to silence, barely touching on the issue. It was only in 2015 that they picked up the issue again, overtaking their Asian counterparts as early as 2016 in number of speeches, but also strongly increasing the intensity of their climate focus.

This leads us to the last interesting finding, which is the boom in climate interest since the second half of the 2010s, both in terms of quantity of speeches and in the number of climate-related keywords per speech. While the average number of climate-related speeches remained relatively stable at around 30-50 speeches per year in the 2007-2017 period, in 2021 we recorded close to 500 speeches. Hence, it appears that not only Carney's 2015 speech but also the creation of the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) in late 2017 may have given an important impulse to central bank communication on climate-related matters. This overall upward trend, however, conceals very significant regional disparities. For example, the central banks of France, Greece and Spain mention climate-related issues in around 15% of their total speeches. De Nederlandsche Bank even reaches 23%, almost as much as the Bank of Bangladesh or as the Bank of Morocco, that both surpass 25%. In contrast, other central banks did not yet experience such a surge of interest. For example, the Bulgarian National Bank, the Central Bank of Turkey or the Board of the Federal Reserve mentioned the topic in less than 1% of their speeches, while 40 other institutions didn't even mention any climate-related words in any of their speeches (e.g. Bank of Israel, State Bank of Pakistan or Bank of Jamaica).

4.2 Structural Topic Modelling

In the previous section, we have developed a clearer picture of *when* central banks started communicating about climate change and of *which* central banks have been particularly active in this regard. However, we still do not know *how* central banks have been communicating on the topic. To answer this research question, we run a

Structural Topic Model (STM) on our corpus of 1,935 climate-related speeches.[14]

The aim of topic models is to discover latent topics in a corpus, based on the co-occurrence of words. The intuition is that if two words appear frequently together (in the same sentence, paragraph, or speech, depending on the unit of analysis), there is a high chance that they are thematically related. In this respect, topic models are conceptually close to clustering algorithms, which seek to find the best partition of k categories/topics in a given corpus. However, while clustering models would assign any given speech to only one topic, topic models are able to assign each document to multiple topics in different proportions (what is referred to as mixed-membership). This approach is thus more suited to study central bankers' speeches, which tend to address multiple themes in a single speech. More specifically, we choose to implement a Structural Topic Model (Roberts et al., 2013; Roberts et al., 2014), an amended version of the Latent Dirichlet Allocation (LDA) algorithm proposed by Blei et al. (2003), which allows to include document-level covariates to account for the fact that topics in central bankers' speeches might not be evenly distributed across time and institutions, especially for what concerns climate- and environment-linked themes.

STMs, like LDAs, need to be implemented on a pre-processed corpus (Grimmer et al., 2022). First, we need to define the units of analysis: 'documents' and 'tokens'. In our case, documents can take the form of speeches, paragraphs or even single sentences. Traditionally, central bank speeches are studied at the speech level, as this is considered the most coherent unit of communication. We also follow this approach. As standard in the literature, we use single words as tokens, as using bigrams did not lead to any significant difference in topic identification despite the longer processing time. Second, the dataset has to be cleaned. This involves not only transforming all text into lowercase letters, but also removing special characters, numbers and punctuation, and 'stop-words', i.e. frequent terms carrying low meaning content such as 'and', 'that', 'the', 'be' and many others. We also removed URLs, frequent

[14]We also successfully conducted various sensitivity analysis to make sure that our results still hold when excluding the 304 machine-translated speeches of this corpus, or the 729 speeches with only one iteration of climate-related expressions.

footers, central bank names and abbreviations (e.g. ECB), country names and adjectives, as well as mentions of the months of the year. Finally, we lemmatize all remaining words, which means we replace them with their neutral form. This allows to treat words such as 'bank', 'banks' or 'banking' as one. [15]

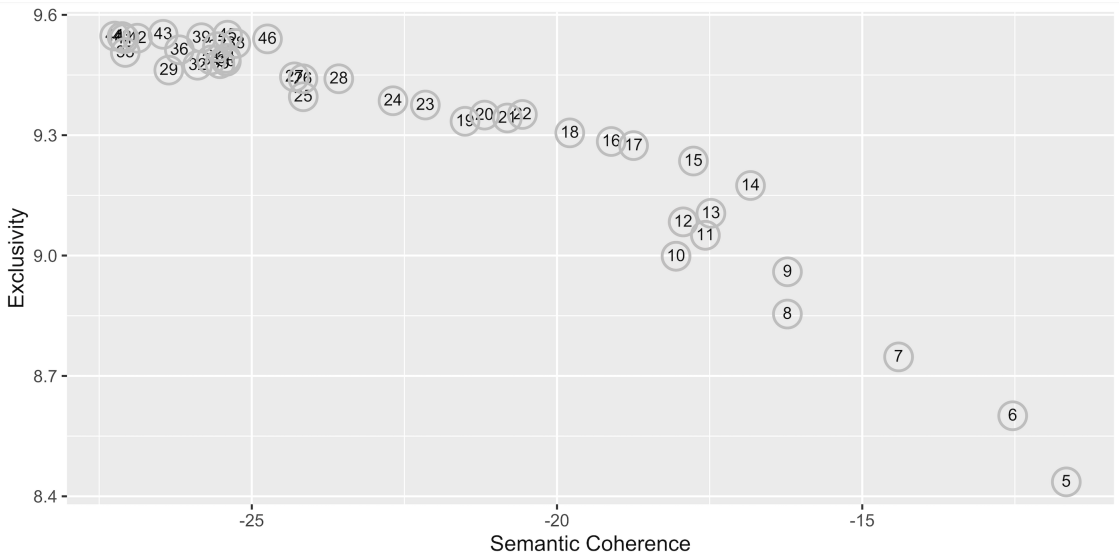
We then run the STM on our cleaned dataset using the stm R package by Roberts et al. (2019) and controlling for covariates for both the institution of origin and the year in which the speech was given. The STM takes as input both the pre-processed corpus and a number of topics set by the researcher. As recalled in Grimmer et al. (2022), there is no predefined or 'right' number of topics. Increasing the number of topics will increase the level of granularity of the view into the data, and vice versa. The choice is up to the modeler and has to be set depending on both the size and type of corpus and the research question. For example, a collection of several thousands of newspaper articles is likely to be more thematically diverse than a collection of a few dozen of monetary policy press releases, which may call for a higher number of topics. Likewise, within the same corpus, the number of topics should be set at a higher level if the aim is, for instance, to differentiate between 'football' and 'rugby' rather than to separate 'sports' from 'politics'.

That said, some models perform better than others regarding their fit of the data, which can help the modeler to pick between competing specifications. We follow Roberts et al. (2014) by running the STM algorithm several times, each time with a different number of topics (from 5 to 50) in order to find the specifications offering the best performance in terms of (i) semantic coherence; and (ii) exclusivity. Indeed, there is a trade-off between those two measures. On the one hand, a high semantic coherence means that frequent words for a topic tend to co-occur within documents. This indicator is strongly correlated with human judgement: models with high semantic coherence tend to provide easily interpretable topics. On the other hand, a high exclusivity results in the most frequent words of a topic being less

[15] We also tested stemming the corpus, i.e. reducing all words to their root. Stemming allows to reduce computing time by reducing the dimensionality of the corpus even further. For example, it treats 'economic' and 'economics' or 'economy' as the same 'econ' root. We decided to stick to lemmatization as the computational gains from stemming were not significant enough to justify the loss of interpretability of the results.

likely to appear in other topics. The results of our STM estimations are reported in Figure IV.7. As can be seen, there is a trad-off between those two indicators. Models with fewer topics offer a strong semantic coherence but low exclusivity, as top words for each topic are likely to be present together, but also often featured in other topics. On the contrary, models with large number of topics usually offer higher exclusivity, as having more topics means they are more narrowly defined, raising their exclusivity, but lowering their semantic coherence.

Figure IV.7 – Model selection based on Exclusivity and Semantic Coherence



The idea is to select a model on the semantic coherence-exclusivity frontier, that is 'where no model strictly dominates another in terms of semantic coherence and exclusivity' (Roberts et al., 2014). We then manually examine the different outputs (topic clusters) of the remaining models and select the most appropriate ones taking into account the size of our dataset and the granularity of our particular research question. Among the several alternative models, we decided to use the one with 14 topics due to its high coherence and exclusivity scores as well as its salient and straightforward interpretability. We also performed sensitivity analysis with models 17, 22 and 48, leading to similar results, with some topics simply being separated into more granular categories without switchs in topic identification.

Table IV.4 presents the 14 topics emerging from our analysis. For each we report the ten most frequent words, as well as a topic label assigned by us after studying

Table IV.4 – Labelled topics and their most frequent words

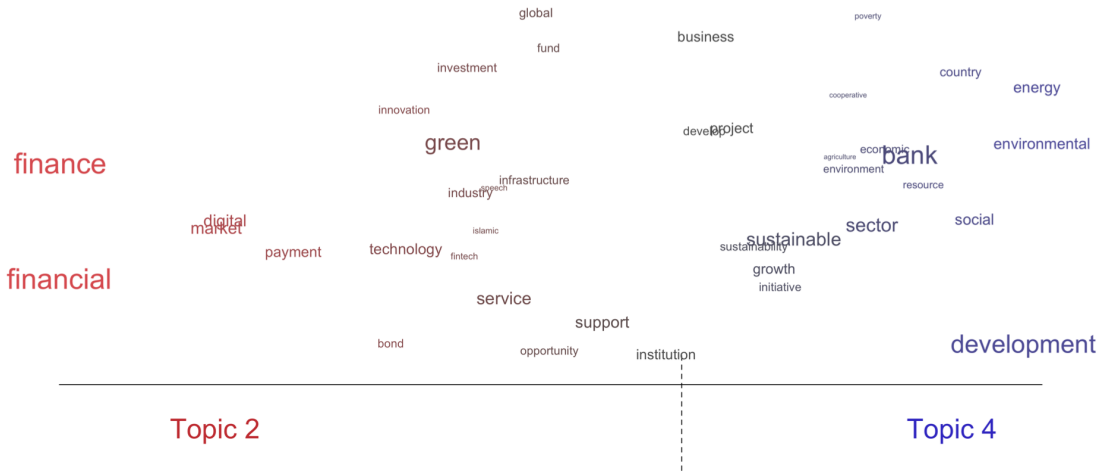
N.	Topic label	Most frequent words
1	Economic analysis	economic, economics, time, income, people, example, datum, research, public, gap
2	**Green and digital finance**	**finance, financial, green, market, digital, payment, bank, technology, service, development**
3	Euro Area	euro, union, economic, area, policy, monetary, bank, market, central, country
4	**Sustainable development**	**development, bank, environmental, energy, sector, social, sustainable, country, finance, financial**
5	Financial industry	bank, risk, financial, firm, business, capital, system, asset, sector, insurance
6	**Climate-related risks**	**climate, risk, change, financial, bank, green, transition, relate, carbon, central**
7	Insurance industry	insurance, risk, financial, challenge, change, bank, economic, industry, conference, world
8	Crisis and recovery	crisis, pandemic, increase, economic, economy, measure, public, debt, high, sector
9	Financial stability	financial, bank, risk, system, stability, central, policy, market, institution, crisis
10	Financial policymaking	bank, financial, percent, policy, economic, growth, government, economy, sector, central,
11	Prices and inflation	price, economy, economic, rate, growth, increase, policy, demand, percent, firm
12	Business outlook	business, economy, change, sector, time, people, company, fund, long, investment
13	Global trends and trade	market, global, growth, country, economy, trade, financial, economic, world, capital
14	Monetary policy	policy, inflation, monetary, rate, bank, price, interest, low, central, target

(i) their top 50 most frequent words, (ii) their top 50 words according to the FREX metrics (penalizing words that are frequent but common in all topics in order to give more weight to exclusivity), and (iii) reading the top-rated speeches for each topic. The order of topics does not convey meaning, and is only the result of the algorithmic sorting.

Three of those topics are directly related to climate change and the environment, and reported in bold in the table. [16] First, topic 2 (*Green and digital finance*) appears to be focused on green finance and the business opportunities arising from it. In addition to the words presented in Table IV.4 the list of most frequent words for this topic includes 'sustainable', 'industry', 'bond', but also terms related to financial

[16] The interested reader wishing to know more about the actual content of these climate-oriented topics can find in Appendix Table ?? information about the speeches that ranked the highest for each topic, as well as paragraph samples.

Figure IV.8 – Lexical comparison of the two 'promotional' topics



innovation and Fin-Tech ('digital', 'innovation', 'service' and others). These words bring this topic closer to the promotional than prudential narratives in that they point to private market solutions and financial innovation as a solution to accelerate the low-carbon transition via increased green investments.

Second, topic 4 (*Sustainable development*) revolves around sustainable development ('social', 'sustainable', 'green', 'poverty', 'environment' and others). This topic also features an important focus on public policy and State intervention, with words such as 'development', 'support', 'government', 'promote' and others. This lexicon is also promotional, but from a very different perspective, encompassing a broad understanding of sustainable development and emphasizing the need for public support to drive the transition to a low carbon economy in conjunction with broad developmental objectives such as fighting against poverty and fostering education. This appears clear in Figure IV.8, that plots the most frequent words on a left/right axis depending on how often they appear in both topics. Words such as 'financial' or 'financ', 'market' or 'innovation' are frequent in topic 2 (*Green and digital finance*) but do not appear often in topic 4 (*Sustainable development*), whereas the opposite is true for 'development', 'environmental', 'energy' or 'bank'.

Third, topic 6 (*Climate-related risks*) is heavily rooted in the public debate on climate-related financial risks, and more specifically around what is referred to as transition risks ('climate', 'risk', 'green', 'transition', 'carbon', 'emiss', 'impact' and

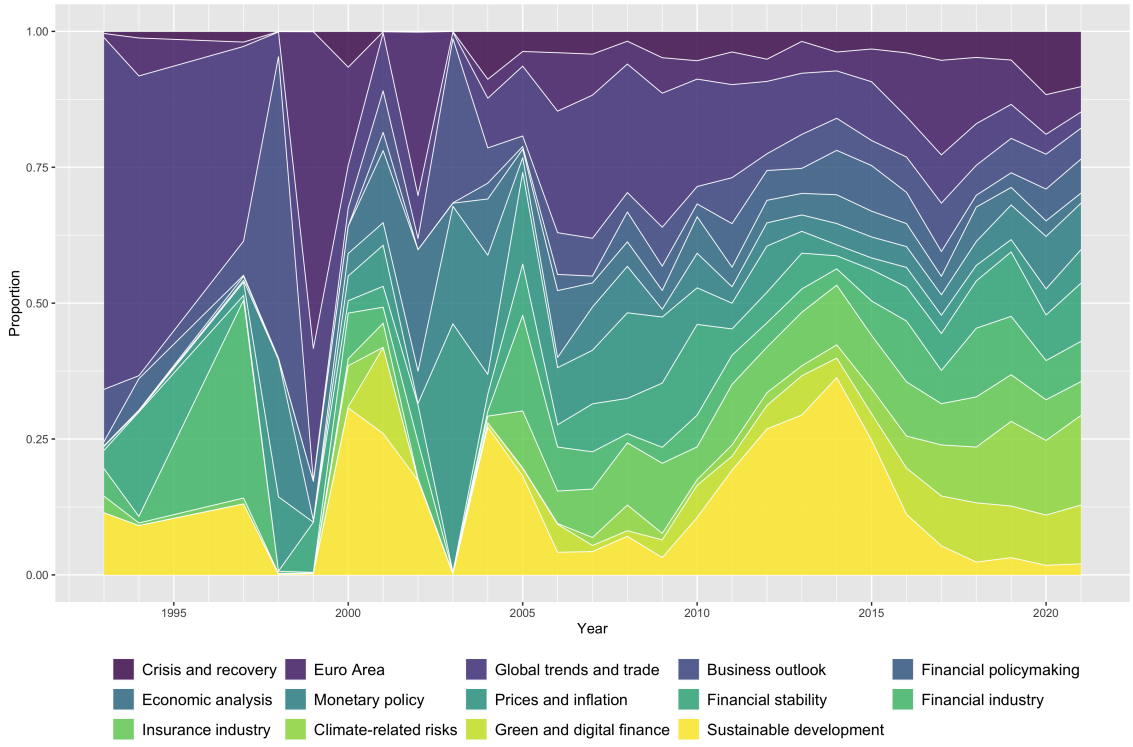
others). This topic is clearly prudential, in the sense that it focuses on how climate-related dynamics might have disruptive impacts on financial stability, and focuses mainly on transition risk. It also features discussions around the role of central banks in reacting to this threat, mainly through financial disclosure and transparency, climate stress testing and scenario analysis ('policy', 'disclosur', 'scenario', 'supervisor' or 'ngfs').

The other topics appear to be of less direct interest to our study. Yet, their diversity highlights that climate-related topics emerge in speeches focusing on very different issues. Despite the fact that some topics appear to be quite close to each other (which suggests that we've reached a high enough number of topics), there is still a high diversity of themes, ranging from Covid-19 and the post-pandemic recovery to European policy-making or international trade.

Figure IV.9 shows how the different topics evolved over time within our corpus of climate related speeches. For the sake of readability, we rearranged the order of topics thematically, and placed the three climate-related topics stacked at the bottom of the figure. What is immediately apparent is the high volatility of the topics before 2005. This is due to the scarcity of climate-related speeches before that date, when even a single speech could heavily influence our results. For example, the topic of '*Global trends and trade*' is especially prominent for the years 1993 and 1994, but this is due to our corpus only having one speech for each of these years. Both speeches were made by the Governor of the Bank of Kuwait during conferences with his Japanese counterparts on international trade between the two countries, calling for more FDIs to invest in oil and for a joint effort against the European proposal to implement a carbon tax. After 2005, the number of speeches per year increased to over 10 per year, leading to more stable proportions of topics over time and more interpretable evolution, with clearer patterns at stake. For what concerns our three climate-related topics, we observe an interesting evolution.

From 2010 to 2015, the most prominent topic was '*Sustainable development*'. During those years, speeches addressing climate change tended to do so by focusing on how to mitigate and adapt to its impacts through sustainable development and proactive developmentalist policies. During these years, speeches ranking high in

Figure IV.9 – Temporal evolution of topics in climate-related speeches



this topic mainly originated from Bangladesh,[17] as well as from India and China. After 2015, this promotional topic quickly declined in the corpus, as other topics grew in relative importance. First, the '*Climate-related risks*' topic greatly expanded after 2015, as narratives on climate-related risks gained traction and central bankers started to wonder how financial actors and policymakers should react to this threat. Second, the '*Green and digital finance*' topic also increased, as central bankers started to talk about the emergence of sustainable finance, how it could help meet climate objectives, and may represent new growth or business opportunities. Therefore, if the prudential '*Climate-related risks*' topic did become the most prominent narrative in the corpus in just a few years, promotional narratives have not been completely crowded out. The discussions around how to deliver the

[17]The importance of the Bank of Bangladesh communication in the corpus for this period coincides with the appointment of Atiur Rahman, an economist who served as governor of the central bank from 2009 to 2016. He considered it legitimate for the central bank to use its financial system governance instruments to help achieve sustainable development goals including poverty reduction and environmental stability (Monnin & Barkawi, 2015). This led Bank of Bangladesh to become one of the first central banks to incorporate green lending policies with preferential rediscounting rates at the central bank in 2009 (Dikau & Ryan-Collins, 2017, p19).

low-carbon transition only switched from '*Sustainable development*' narratives (centered around how to deliver on climate mitigation and adaptation through state-led policy action and developmental banking) towards '*Green and digital finance*' narratives (centered around how market-led initiatives and financial innovation could be scaled-up to bridge the 'green investment gap').

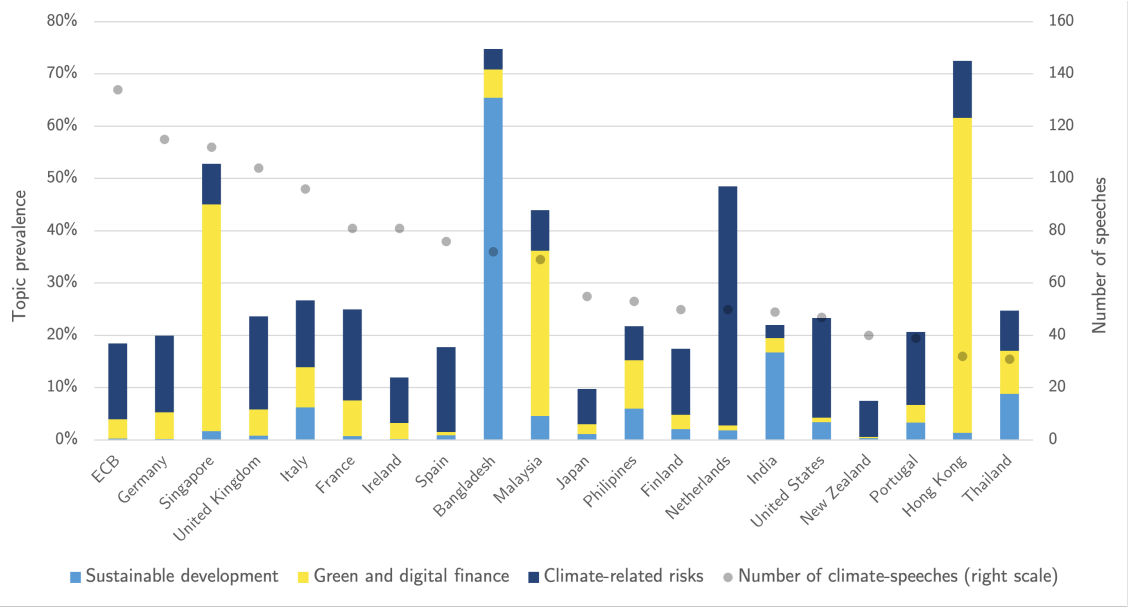
In addition to this evolution on climate-centered topics, a few important trends deserve attention. Although their overall size is smaller in the corpus, both the '*Monetary policy*' and the '*Prices and inflation*' topics increased significantly in more recent years, which is consistent with the increasing focus of central bankers on the impacts of climate change on inflationary dynamics and on how monetary policy instruments could incorporate climate-related data. Logically, the '*Crisis and recovery*' also increased since 2020, as speeches around the Covid-19 pandemic bloomed, often with references to climate change as an example of big potential driver of economic and financial disruptions in the future. Last, it is important to note that the overall variety of topics and the diversity of narratives increased over time as the total number of climate-related speeches also increased exponentially, leading central bankers to touch upon environmental issues when talking about very different subjects.

4.3 Discussion: varieties of green central banking

Given the developments described above, one might think that the epistemic community of central bankers has reached a consensus, with the prudential concerns championed by Carney and the Network for Greening the Financial System becoming dominant globally. However, this is not the case. If the perspectives on environmental and climate-related change issues have evolved over time within the corpus, it is mainly because their provenance have shifted. Central banks have in fact maintained distinct types of communication, and strong heterogeneity remains across institutions. Figure IV.10 illustrates this claim by showing the share of the three climate-related topics for the 20 central banks with the highest number of climate-related speeches.

Three ideal types of central banks emerge. First, Western European and Western

Figure IV.10 – Variety of climate narratives in the top 20 central banks



offshoots central banks stand out for their focus on the topic labelled as '*Climate-related risks*'. Their communication on climate change is only very recent, and from the beginning has been anchored in the risk-based analytical framework introduced by Mark Carney in 2015. With a high degree of independence from their political counterparts and greater prudential responsibilities since the 2008 global financial crisis, these central banks have integrated climate change in an instrumental way, seeking to address how it might threaten their financial and price stability objectives, as discussed in chapter II. Interestingly, they tend to focus on transition risk rather than physical risk.[18] Indeed, their vulnerability to climate change impacts is relatively low, but their financial sector is packed with assets that may be stranded by the low-carbon transition, as their domestic financial institutions finance large amounts of cross-border fossil fuel investments (Semieniuk et al., 2022).

In contrast, South East Asian central banks have focused their communication on a more 'promotional' approach. This is not surprising when one considers the

[18]Indeed, the most frequent words of this topic suggest a prominence of transition risk in the discussion of climate-related dynamics. De Nederlandsche Bank provides a notable exception, including long discussions about physical risks in its speeches and in its prudential policymaking, as exemplified by the title of their first climate-related stress test '*Waterproof? An exploration of climate-related risks for the Dutch financial sector*' (Regelink et al., 2017)

literature in International and Comparative Political Economy regarding the characteristics of East Asian financial governance. Indeed, East Asian financial policymakers tend to leverage their power on the financial system to achieve extrinsic and 'developmentalist' objectives (Pape & Petry, 2023; Rethel & Thurbon, 2020; Thurbon, 2016), which leads central banks from these jurisdictions to rely on much more interventionist instruments for promotional objectives. This tendency to financial interventionism has been translated in green credit guidance in these countries for more than a decade, with instruments ranging from preferential interest rates to credit floors or window guidance (Dikau & Ryan-Collins, 2017; Dikau & Volz, 2021b). However, this group is not itself so homogeneous.

On the one hand, the speeches of the central banks of Bangladesh and India are mainly based on the '*Sustainable development*' topic, which emphasizes the need for mitigate and adapt to climate change while reaching other broad developmental objectives such as fighting against poverty and fostering education. Their strong vulnerability to the physical impacts of climate change may explain why they favor this promotional perspective. Indeed, other countries with the same profile in climate-related discussion (but that are not included in Figure IV.10 due to their low number of speeches) are Haiti, Zambia, Nigeria, Cambodia, Ghana and Kenya. These countries are characterized by a high share of their GDP coming from rural areas or agricultural sector, high levels of poverty, and maximal climate vulnerability. In their case development and sustainability must go hand in hand. By contrast, financial stability implications of the transition to a low-carbon economy appear less relevant, having small and domestic bank-led financial systems.

On the other hand, the central banks of Singapore, Malaysia and Hong Kong rely more on the lexicon we labelled as '*Green and digital finance*'. These countries are much richer and have more diversified economies. Above all, they are characterized by large and open financial centers of regional and even global importance. Singapore and Hong Kong, on the one hand, are explicitly seeking to become leading centers for sustainable finance. Malaysia, on the other hand, seeks to attract foreign capital through its comparative advantage in Islamic finance. Generally speaking, the amount of government, financial supervisors and central banks attention to-

wards green and sustainable finance has exploded in South-East Asian countries in the past years (Durrani et al., 2020; Volz, 2018). First, central banks of the region joined forces to agree on a common set of criteria for bonds to be considered green (ASEAN, 2017). Second, certain central banks went further by actively promoting the mainstreaming of this new financial niche. For example, the Central Banks of Malaysia and Singapore both implemented green bond grant schemes to boost green bond issuance by covering up to 70.000 USD to cover the cost of external review (Azhgaliyeva et al., 2020). [19] It is therefore no surprise if a high share of climate-related speeches of these central banks revolve around green financial instruments, market innovations and more generally sustainable finance as economic opportunities allowing to increase the financial attractiveness of their country and foster growth. The People's Bank of China (that ranks 22nd in climate-related speeches and hence does not appear in the graph) and Bank of Indonesia (with only 13 climate-related speeches) also rely predominantly on this topic, which is also not surprising. On the one hand, China has had a role as originator of green financial policy norms (Larsen, 2023) and is the largest issuer of green bonds globally (Azhgaliyeva & Liddle, 2020). On the other hand, Indonesia has pushed for the development of green (Islamic law compliant) 'sukuk' bonds, developing guidelines in 2017 and issuing increasing amounts of green sovereign bonds since then, becoming the second largest issuer in the region after China (Azhgaliyeva et al., 2020; Guild, 2020).

Thus, it appears that the variety of green central banking narratives is firmly rooted in the institutional contexts and modes of regulation of very different varieties of capitalism, which stand in different positions in relation to the climate crisis. While rich economies are trying to manage the threats posed by the low-carbon transition to the profitability and stability of their large financial sectors, emerging market economies hosting financial centres are seeking to leverage sustainable finance into a growth opportunity and a way to attract FDIs to fund private and governmental deficits, and low-income countries in the Global South are focusing on how to adapt to the concrete consequences that climate change will have on

[19] Hong Kong has implemented a similar policy but grants are delivered by the Treasury instead of the Central Bank

their agricultural economies in particularly vulnerable regions of the world.

5 Climate-related communication drivers

This section investigates the drivers of central bank communication on climate change. Section 5.1 presents our theoretical assumptions about what may push climate-related communication. Section 5.2 presents our data and the specification of our models. Section 5.3 shows and discusses our results.

5.1 Theoretical assumptions

This section presents our theoretical assumptions about the factors that might drive central bankers to increase their climate communication, both in general and in relation with certain climate topics in particular.

First, one might expect central banks operating in countries that are more vulnerable to climate-related dynamics to be more likely to communicate about climate change. Indeed, there has been a growing awareness than climate-related dynamics may have repercussions on central banks' missions. These dynamics could cause financial instability, due to either the direct adverse impacts of climate change or to societal reactions to this phenomenon, as the transition to a low carbon economy would trigger 'capital stranding' in carbon intensive sectors (Cahen-Fourot et al., 2021). Besides, climate dynamics could create challenges for monetary policy transmission and for price stability (Faccia et al., 2021).

Therefore, we posit that climate-related communication could increase with the climate vulnerability of a country. In addition, one could expect that central banks vulnerable to the direct physical impacts of climate change may employ promotional narratives (centered around climate mitigation and adaptation), whereas their counterparts subject to transition risk may engage with the topic from more prudential-oriented lexicon. Thus, we hypothesize that both the type and degree of domestic vulnerabilities to climate-related dynamics matter for central bankers' communication, and formulate the following hypothesis:

Hypothesis 1 *Central banks in climate-vulnerable countries engage more with (relevant) climate-related topics.*

The second factor that might explain the differentiated attention granted by central banks to climate-related issues is linked to their institutional responsibilities. Indeed, not all central banks are created equal regarding their mandate and hence to their climate-related policy space (Baer et al., 2021). First, not all central banks share the same responsibilities in terms of financial supervision (Masciandaro & Romelli, 2018). If climate-related dynamics pose a threat to the stability of the financial system, central banks involved in the supervision of banks and insurance companies are therefore likely to devote more attention to climate-related topics than central banks without such responsibilities, both in general and regarding the prudential topic in particular.

Second, some central banks have a broader mandate that incorporates considerations beyond price and financial stability, including supportive objectives that could cover the active promotion or mainstreaming of green finance (Dikau & Volz, 2021a). In general, independent central banks enjoy a narrower mandate focused on price stability, while less independent central banks enjoy broader missions, which may lead them not only to address climate change for its prudential implications, but also to undertake promotional policies to steer financial flows toward the transition to a low-carbon economy. As a result, central banks with broader objectives may engage more with climate issues in general, and with promotional topics in particular. These factors lead to the following hypothesis:

Hypothesis 2 *Central banks with broader institutional responsibilities engage more with (relevant) climate topics.*

The third factor that might influence the mainstreaming of climate-related issues into central bankers' speeches is through peer pressure. Central bankers are indeed part of an epistemic community that cooperates and coordinates closely. Previous studies have already shown how peer effects among central bankers can boost institutional changes (Horvath, 2020). Once a change is triggered, and a topic appears to become entrenched as relevant for central banks, bandwagon effects come in play,

which helps to diffuse the topic across professional networks. As noted in the literature, the most important platform in the diffusion of climate-related concerns among central bankers has been the Network for Greening the Financial System (Deyris, 2023; Thiemann et al., 2023). We therefore hypothesise that membership in this network has a positive effect on climate-related communication, as central banks having joined the network might be more likely to engage on the topic.

Moreover, the NGFS could have a guiding influence on the type of climate-related communication. Indeed, the NGFS has a capacity-building role on a variety of topics, but works primarily on financial climate-related risks, and only marginally tackles promotional issues, mainly with a green finance mainstreaming perspective. [20] Central banks that join the NGFS may therefore engage more with the 'Climate-related risks' topic than their counterparts, and, to a lesser extent, also rely more on the 'Green and digital finance' lexicons. This leads to our last hypothesis:

Hypothesis 3 *Central banks increase (certain types of) climate-related communication when they enter the Network for Greening the Financial System.*

5.2 Data and Empirical methods

The dictionary of climate-related words and the Structural Topic Model presented in sections 3.2 and 4.2 allow us to create different variables providing information on the degree of engagement of central bankers with climate issues. First, we build two measures of general climate-attention using the dictionary of climate-related keywords. On the one hand, *Climate mentions* captures the total number of climate-related words mentioned in a speech. On the other, *Climate share* is computed as the ratio between the *Climate mentions* measure and the total number of words used in a speech, multiplied by 100 (percentage points). It therefore reflects the relative importance of climate-related issues in each speech. Second, we build on the STM to extract measures of attention dedicated by central bankers to the three

[20] Three out of six work streams are targeted at climate-related risks: 'Supervision', 'Scenario design and analysis' and 'nature-related risks'. Only one work stream is promotional: 'Net-zero for green finance', which aims at aligning the central banks' own-portfolios to a Paris-compatible transition pathway through sustainable and responsible investments.

different types of climate-related topics. For each speech we extract the prevalence of the '*Green and digital finance*', '*Sustainable development*', and '*Climate-related risks*' topics.[21] We end up with five climate focus metrics at the speech level. We then aggregate them at the year and central bank level using mean values, leading to a yearly indicator of the climate attention of each central bank.

In order to test the hypothesis discussed in the previous section, we identify three sets of variable able to capture information on: (i) vulnerability to climate-related dynamics, (ii) central bank responsibilities, and (iii) NGFS membership. First, we consider the use of two variables to approximate countries' vulnerability to climate-related dynamics. On the one hand, we define *Climate vulnerability* as the total number of persons affected by climate-related disasters (i.e. droughts, extreme temperatures, floods, landslides, storms and wildfires) scaled by the total population of the country. This variable acts as a proxy for exposure to climate physical impacts. We take this variable from the Emergency Events Database (EM-DAT).[22] On the other hand, we rely on *Carbon intensity*, defined as the level of CO2 emissions per GDP. This acts as a proxy for countries' exposure to transition risks, as a country whose economy is more reliant on CO2 emissions would suffer more while transitioning away from fossil fuels. We use the CO2 intensity values of the CO2 and Greenhouse Gas Emissions data from the Global Carbon Project, and GDP from the World Bank.[23]

Next, we focus on institutional variables able to capture central banks' objectives and responsibilities. First, the range of a central bank's objectives might influence its ability to focus on issues not strictly related to price stability. To this hand, we use the (*CB Objectives*) sub-component of the CBIE (Central Bank Independence Extended) index of central bank independence created by Romelli (2022). *CB Objectives* represents five increasing levels of central bank focus on price stability, taking a value from 0 (if price stability does not even appear in the list of objectives) to

[21] For speeches with 0 iteration of any climate-related word, we set these values at 0.

[22] EM-DAT is maintained by CRED / UCLouvain and is available at https://public.emdat.be.

[23] The CO2 emissions data are compiled by Our World In Data based on the Global Carbon Project and available at https://github.com/owid/co2-data. The GDP variables are available on the World Bank Website https://data.worldbank.org/indicator/NY.GDP.MKTP.CD.

1 (if price stability is the single or primary objective of the central bank).[24] The second variable that we use to capture central bank institutional responsibilities is represented by the CBIS index (Central Bank Involvement in Supervision, *CB Supervision* hereafter) proposed in Masciandaro and Romelli (2018). This *CB Supervision* indicator characterizes six increasing levels of central bank involvement in supervision of the financial sector. To facilitate interpretation and comparison with other variables, we normalise this index from 0 to 1.[25]

Last, we rely on NGFS annual reports and press releases to code a dummy variable that takes the value of one if a country is a member of the NGFS network and 0 otherwise. As this network was created in 2017, this variable takes the value of 0 for all years prior to 2017. Summary statistics for NGFS membership as well as the other dependent and independent variables are provided in Appendix Table VI.3, while the Appendix Table VI.4 provides the variance covariance matrix of all our variables, highlighting the low correlation across the various variables of interest.

Our empirical analysis aims at investigating the drivers of central bank communication on climate related topics. As only 1,935 out of the 31,049 speeches in our dataset contain climate related words, 75% of our country-year observations do not include climate-related speech, with the consequence that the five measures of climate focus described above take values different from 0 in only 25% of the cases. Given the structure of our data, we decide to rely on a Poisson Pseudo-Maximum Likelihood (PPML) regression in the spirit of Silva and Tenreyro (2006). In particular, we estimate the following PPML model:

[24] Intermediate values are: 0.25 if the objectives focus on economic growth and/or development, 0.50 if price stability appears with other conflicting objectives such as financial stability; and 0.75 if there are other but non conflicting objectives.

[25] Therefore, the levels of central bank involvement in supervision are classified as: no involvement in supervision (0); shared banking supervision between the central bank and another authority (0.2); supervision by the central bank over the banking sector only (0.4); supervision by the central bank over the banking and insurance sectors (0.6); supervision by the central bank over the banking and securities markets sectors (0.8); and supervision by the central bank over the entire financial sector (1).

$$\begin{aligned}\text{Climate Focus}_{i,t} = exp(&\beta_0 + \beta_1 \text{Climate vulnerability}_{i,t} + \beta_3 \text{Carbon intensity}_{i,t} \\ &+ \beta_4 \text{CB Objectives}_{i,t} + \beta_4 \text{CB Supervision}_{i,t} \\ &+ \beta_5 \text{NGFS Membership}_{i,t} + \gamma_i + \mu_t) + \epsilon_{i,t}.\end{aligned} \tag{IV.1}$$

where Climate Focus$_{i,t}$ is the measure of focus on climate related matters by central bank i in year t. This measure captures one of the five indicators of central bank attention to climate topics described above. Climate vulnerability$_{i,t}$ is the share of the population of country i in year t that has been affected by a climate disaster. Carbon intensity$_{i,t}$ is an indicator of the level of CO2 emissions per GDP of country i in year t. CB Objective$_{i,t}$ is the index capturing the breadth of the objectives of central bank i in year t, while CB Supervision$_{i,t}$ represents the level of central bank i involvement in supervision in year t.

Besides, we introduce two types of fixed effects in our analysis. First, γ_i indicates country fixed effects, which allows us to control for time-invariant economic and institutional factors at the country level such as the tendency of central bankers of certain countries to dedicate a higher attention to climate related topics. Second, we include year fixed effects (μ_t) to account for time-variant factors common to all countries, such as tendency of increasing the attention dedicated by central bankers to climate-related matters.

5.3 Results and discussion

Table IV.5 presents the results of our baseline estimations. Our results indicate that the variables linked to the vulnerability to climate-related dynamics, i.e. Climate vulnerability and Carbon intensity, are not associated with the level of attention dedicated by central bankers to climate-related issues in their communication. Hence, it appears that our first hypothesis cannot be verified. This may be due to the poor quality of the proxy variables that we used to capture physical and transition risks, but also to the fact that climate attention by central bankers may

instead be less influenced by the vulnerability of their domestic economy than by the vulnerability of their financial sector, which may not be closely related due to the tendency of financial actors to seek (geographic) diversification.

Table IV.5 – Drivers of climate-related communication (PPML)

VARIABLES	(1) Green and digital finance	(2) Sustainable development	(3) Climate-related risks	(4) Climate frequency	(5) Climate share
Climate vulnerability	-3.056	0.014	1.729	-0.761	-1.228
	(4.721)	(1.815)	(2.855)	(2.730)	(3.742)
Carbon intensity	-1.796	0.089	-0.251	-0.697	-0.453
	(1.331)	(0.618)	(1.405)	(0.959)	(0.948)
CB Supervision	0.901	0.952	7.290***	5.430*	6.648***
	(1.185)	(1.537)	(2.806)	(2.964)	(2.217)
CB Objectives	-0.119	0.342	-1.468	0.009	-0.578
	(1.272)	(0.971)	(1.032)	(0.394)	(1.013)
NGFS membership	0.973**	-0.299	0.736*	0.705**	0.617**
	(0.479)	(0.240)	(0.386)	(0.290)	(0.293)
Constant	-3.292***	-4.297***	-5.978***	-1.622	-4.735***
	(1.234)	(0.943)	(1.747)	(1.325)	(1.292)
Observations	1,154	1,154	1,154	1,154	1,154
Pseudo R2	0.439	0.299	0.354	0.636	0.396

Central bank and year fixed effects are included. Robust standard errors in parenthesis.
*, **, *** represent significance at 10%, 5%, and 1%, respectively.

On the contrary, the degree of central bank involvement in supervision is positively associated with the degree of overall climate attention, as well as to the prominence of the topic 'climate-related risks'. This appears consistent with our second hypothesis. Indeed, we expected central bankers with financial supervisory responsibilities to engage more in the climate-related issues both generally and in relation to prudential concerns, rather than with promotional lexicons. By contrast, the CB Objectives variable is not associated with the overall nor with any type of central bank attention to climate-related issues.

Last, it appears that belonging to the Network for Greening the Financial System is positively and significantly associated with higher attention to climate change in central bankers' communication, both in general and related to the topics associated with green finance and climate-related risks. Hence, it appears that our third hypothesis is verified.

Next, we test the robustness of our results along several dimensions. First, we check if the results hold when removing all speeches delivered before 2005. Indeed, as shown in section 4.2, the topics extracted from the STM estimations are very

volatile before that date due to the low number of climate-related speeches at that period. Using the same PPML specification, Table IV.6 shows that the significance and magnitude of the coefficients associated with both CB Supervision and NGFS Membership is robust to the exclusion of pre-2005 speeches.

Table IV.6 – Drivers of climate-related communication (PPML post 2005)

VARIABLES	(1) Green and digital finance	(2) Sustainable development	(3) Climate-related risks	(4) Climate frequency	(5) Climate share
Climate vulnerability	-3.082	-0.127	1.723	-0.835	-1.283
	(4.839)	(1.856)	(2.859)	(2.835)	(3.812)
Carbon intensity	-2.106	-0.009	-0.248	-0.695	-0.403
	(1.861)	(0.719)	(1.411)	(1.083)	(1.054)
CB Supervision	0.804	1.378	7.294***	5.520*	6.749***
	(1.295)	(1.534)	(2.807)	(2.985)	(2.228)
CB Objectives	1.364	-0.072	-1.478	-0.119	-0.781
	(1.426)	(0.982)	(1.037)	(0.429)	(1.128)
NGFS membership	0.983**	-0.322	0.736*	0.706**	0.619**
	(0.479)	(0.246)	(0.386)	(0.291)	(0.293)
Constant	-4.081***	-4.048***	-5.972***	-1.559	-4.634***
	(1.387)	(0.980)	(1.751)	(1.339)	(1.359)
Observations	903	903	903	903	903
Pseudo R2	0.416	0.280	0.324	0.602	0.361

Central bank and year fixed effects are included. Robust standard errors in parenthesis.
*, **, *** represent significance at 10%, 5%, and 1%, respectively.

Second, we test whether our results are robust to the addition of the dependent lagged variable among regressors, as climate attention could be path-dependent. Table IV.7 points that CB Supervision is still significant and positively associated with central bankers' overall and prudential climate attention, while being negatively associated with the prominence of the promotional 'Green and digital finance' topic. The coefficient estimates for NGFS membership are all positive and statistically significant with the exception of the 'Sustainable development' topic, which supports our hypothesis. Finally, CB Objective is negatively associated with the 'Climate-related risk' topic, which is also consistent with our second hypothesis, as broader mandates are associated with lower values of CB Objective.

Finally, we test whether our results are robust to the use of an alternative specification by running an OLS estimation on the same set of variables. Table IV.8 shows that NGFS membership and CB supervision both remain positively associated with both the Climate-related risks and Climate mentions indicators. In addition, CO2 per GDP becomes significant and is positively associated with the 'Climate-related

Table IV.7 – Drivers of climate-related communication (PPML with lagged dependent variable)

VARIABLES	(1) Green and digital finance	(2) Sustainable development	(3) Climate-related risks	(4) Climate frequency	(5) Climate share
Climate Focus$_{t-1}$	-0.447	1.419	-7.188***	-0.078***	-1.690**
	(0.586)	(5.476)	(1.686)	(0.028)	(0.798)
Climate vulnerability	-3.406	-0.079	3.271	0.481	0.461
	(4.850)	(1.859)	(2.844)	(2.659)	(3.098)
Carbon intensity	-1.741	0.025	-0.055	-0.714	-0.723
	(1.314)	(0.556)	(1.757)	(1.039)	(1.026)
CB Supervision	0.978	1.366	7.977**	5.682*	6.994***
	(1.376)	(1.621)	(3.419)	(3.164)	(2.403)
CB Objectives	-0.234	0.599	-1.941*	-0.303	-0.934
	(1.442)	(0.996)	(1.106)	(0.395)	(1.045)
NGFS membership	1.014**	-0.265	0.631*	0.660**	0.588**
	(0.490)	(0.191)	(0.336)	(0.282)	(0.269)
Constant	-3.251**	-4.770***	-5.529***	-1.229	-4.291***
	(1.280)	(1.072)	(2.103)	(1.388)	(1.353)
Observations	1,075	1,075	1,075	1,075	1,075
Pseudo R2	0.434	0.284	0.352	0.637	0.392

Central bank and year fixed effects are included. Robust standard errors in parenthesis.
*, **, *** represent significance at 10%, 5%, and 1%, respectively.

risks' topic as well as with the Climate mentions. This is consistent with our first hypothesis. Like the previous robustness check, CB Objectives becomes significant and negatively associated with the attention to climate-related risks as well as with Climate share, suggesting that central banks with broader mandates are more likely to discuss climate-related issues in their speeches.

Table IV.8 – Drivers of climate-related communication (OLS)

VARIABLES	(1) Green and digital finance	(2) Sustainable development	(3) Climate-related risks	(4) Climate frequency	(5) Climate share
Climate vulnerability	-0.004	-0.001	0.001	-0.178	-0.005
	(0.005)	(0.002)	(0.003)	(0.252)	(0.013)
Carbon intensity	-0.006	-0.002	0.005**	0.291*	0.007
	(0.004)	(0.001)	(0.002)	(0.157)	(0.009)
CB Supervision	-0.007*	-0.000	0.016**	1.132***	0.036
	(0.004)	(0.002)	(0.007)	(0.353)	(0.022)
CB Objectives	0.001	0.003	-0.006***	-0.145	-0.014*
	(0.005)	(0.002)	(0.002)	(0.154)	(0.008)
NGFS membership	0.022**	-0.000	0.028***	2.344***	0.085***
	(0.010)	(0.001)	(0.008)	(0.435)	(0.021)
Constant	0.007	0.003*	-0.001	-0.138	0.009
	(0.004)	(0.002)	(0.003)	(0.172)	(0.010)
Observations	1,362	1,362	1,362	1,362	1,362
Adjusted R-squared	0.275	0.675	0.378	0.411	0.392

Central bank and year fixed effects are included. Robust standard errors in parenthesis.
*, **, *** represent significance at 10%, 5%, and 1%, respectively.

Overall, it therefore appears that the exposure to climate related-risks of a country, approximated by (i) the share of the population affected by climate disasters

and (ii) the carbon intensity of a country, is not a significant driver of climate-related communication by central banks. In contrast, institutional variables as well as the diffusion network effects play a positive role in the mainstreaming climate-related discussions among central bankers. Indeed, our results show that the involvement of a central bank in supervision is positively associated with the degree of climate attention of central bankers as well as their propensity to rely on 'climate-related risks' narratives to address the issue. The NGFS membership is also associated with an increase in climate-related communication in general, as well as a greater share of speeches relying on 'Green and digital finance' and 'Climate-related risks' lexicon.

6 Conclusion

In this paper, we provided a novel analysis of how central banks communicate publicly on climate change and related matters. In doing so, we made three contributions to the literature.

First, we created the largest existing dataset of central bank speeches, through systematic web-scrapping and occasional archival work. This new set of 31,049 speeches spans over 131 central banks and 35 years. This is significantly more extensive than the dataset traditionally used in the literature, i.e. the one provided by the Bank of International Settlements. Although we leveraged this material to study a narrow and specific question, we hope that this database will allow future research to further expand our understanding of central bank communication. For this purpose, the dataset will be made open access shortly.

Second, our paper allowed to advance the understanding of the variegated and recent phenomenon of green central banking. To do so, we created a novel dictionary of climate-related keywords, which we used to identify a subset of 1,935 climate-related speeches. We then explored this data-set, shedding light on new empirical evidence that central bankers had been engaging with the climate for longer than what is usually assumed, especially in South East Asian and European countries. Studying this corpus via a Structural Topic Model also allowed us to highlight the variety of climate-related communication. Before 2015, the predom-

inant climate-related narrative in central banker speeches was revolving around a proactive and promotional lexicon centered around the 'Sustainable development' topic. This topic was particularly common among South East Asian central banks. After 2015, and especially from 2017 onward, this topic was progressively replaced by two new emerging topics. The first focuses on 'Climate-related risks' for the financial system, and gained traction after Carney proposed his discussion of physical and transition risk. The second is centered around 'Green and digital finance', discussing green finance and niche market innovations as growth opportunities to be supported and promoted to foster growth. This shift in narrative is primarily due to new institutions entering the corpus and introducing their own concerns and perspectives. Indeed, heterogeneity remains, uncovering a variety of green central banking communication models.

Third, our paper attempts to understand what may be the drivers of central bank communication on climate change. We find that a country's exposure to climate-related risks (both physical and transition) does not have a significant impact on its central bank's attention to the climate crisis. By contrast, the degree of involvement of central banks in financial supervision has a positive and significant effect on central bank engagement with this issue, especially on the use of the lexicon associated with the prudential oriented 'Climate-related risks' topic identified above. The membership of the central bank in the recently created 'Network for Greening the Financial System' is also positively associated with higher attention to climate-related issues, especially regarding the 'Climate-related risks' and 'Green and digital finance' topics. This suggests that, rather than being the consequence of country-specific climate-vulnerability concerns, climate-related communication is mainly the outcome of the underlying institutional framework in which the central bank is inserted as well as its embeddedness in the epistemic community of central bankers.

Future research may build on this work to explore new avenues. First, we have highlighted the heterogeneity in the timing, intensity and focus of central banks' communication regarding climate-related issues, but have not compared this diversity to that of their actual practices. Yet, some of the most climate vocal central

banks could paradoxically be less policy proactive than certain climate silent institutions. Second, while we have investigated the drivers of the differentiated attention of central bankers to climate issues, we have not studied its consequences. Indeed, central banks' climate communication could have measurable effects on economic dynamics, for example by fostering market participants' attention to financial climate risks, or by anchoring agents' expectations regarding the transition. Thus, our measure of climate attention could be leveraged to evaluate the effects of 'climate forward guidance' on specific market segments, such as green bonds or the shares of the most carbon-intensive companies. Finally, future research could try to investigate how and why central banks with similar institutional frameworks may nevertheless exhibit heterogeneous attitudes towards the climate issue. For example, a more targeted look at the national central banks of the Euro Areas would allow to document the different communication strategies of 'climate doves' and 'climate hawks' central bankers, complementing the insights brought by chapter III.

CHAPTER V

Shaky Foundations

Central Bank Independence in the 21st century[1]

[1]This chapter is an amended and extended version of a paper written with Gaëtan Le Quang and Laurence Scialom. A first draft was published as an EconomiX working paper (see Deyris et al., 2022)

1 Introduction

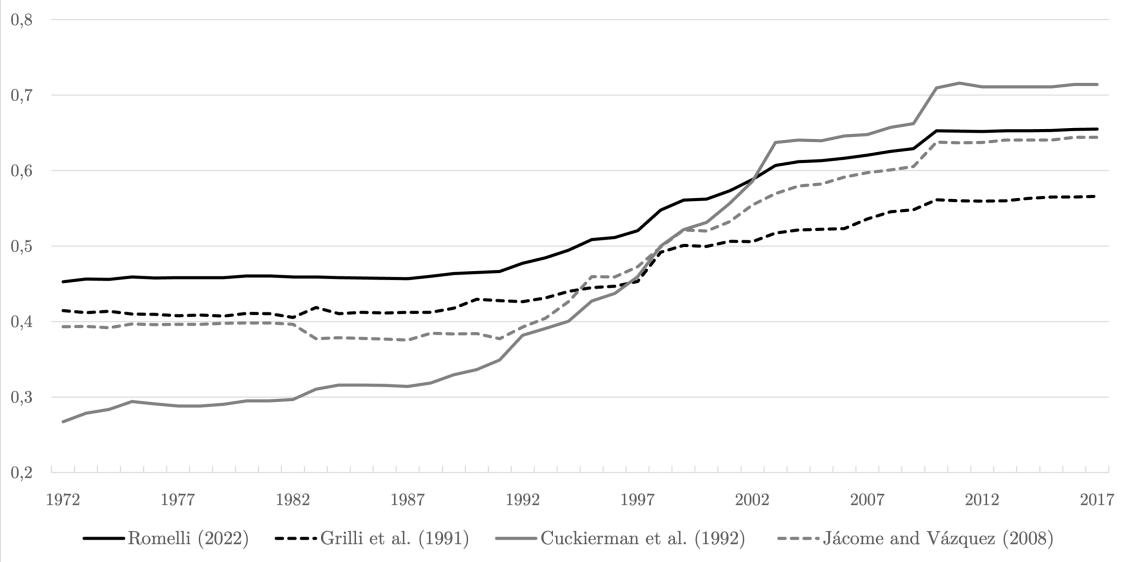
In previous chapters, we highlighted the importance of the institutional framework in explaining the differences in green central banking policies. In chapter II we pointed out that central banks with high levels of independence from their governments tended to favor prudential policies, but that the climate inaction of their political counterparts could well push them towards increasingly promotional actions. In chapter III, we examined how the European Central Bank had gradually taken on a more overtly distributive and proactive promotional role, albeit still very timid. Finally, chapter IV explored the attention of central banks around the world to the issue of climate change, examining how institutional features may influence the level and type of attention given to this topic in official communication.

Yet, with the exception of a brief subsection in chapter II, we have not devoted much attention to Central Bank Independence (CBI) as an institutional arrangement with its own history and characteristics. This chapter aims to fill this gap and, in doing so, adopts a more normative perspective. Indeed, in addition to presenting a detailed account of the contingent historical roots as well as the latest developments characterizing the current institutional arrangement, we aim with this chapter to question its relevance to the challenges of the 21st century. Particular attention will be paid to the issues of inequality and climate change, as well as to the European Central Bank. Indeed, the latter provides an interesting case study, being considered by many as the most independent central bank in the world, turning it into a perfect example to study CBI.

Of course, central bank independence has never meant that central banks are completely remote from their governments. Independence is less a question of nature than of degree. Central banks have always enjoyed a certain degree of autonomy from their governments, and even the most independent central banks remain attached to their political authority, which generally defines the missions they are given, the range of instruments they can use to achieve them, and renews their leaders regularly. Indeed, while some central banks enjoy both operational and objective independence, the latter are generally defined in a precise manner by the government,

which only delegates its operational implementation. If levels of independence vary greatly according to the country and the legislation, sometimes experiencing brief and localized downturns (Bodea and Garriga, 2023), it is undeniable that the last 40 years have seen a strong trend towards increasing CBI. Figure V.1 highlights that central bank independence has never been so high, no matter the index chosen (Cukierman et al., 1992; Grilli et al., 1991; Jácome & Vázquez, 2008; Romelli, 2022).

Figure V.1 – Central Bank Independence indices



This movement towards greater independence was made possible by two concomitant transformations that took place in the 1970s and 1980s, one theoretical, the other practical. First, academic research in economics led to the idea that the CBI is a superior institutional arrangement. Denouncing the supposed tendency of governments to pressure the central bank to roll the printing press in order to stimulate the economy in the short term, researchers highlighted the inefficiency of such policies, leading to inflation without growth when anticipations are rational (Barro and Gordon, 1983; Kydland and Prescott, 1977). The verticality of the Phillips curve and the neutrality of money therefore justify entrusting monetary policy to an independent and conservative central banker (Rogoff, 1985), as it is increasingly considered as a depoliticized science that can be implemented independently of any political decision-making (Clarida et al., 1999).

The second transformation echoes the first: in addition to the *theoretical* rise

of monetary neutrality, the actual *practices* of monetary policy moved away from discretionary, distributive interventions in favor of market mechanisms deemed more neutral and less distorting for the allocation of capital. Whereas, in the post-war European context, monetary policy mobilized a wide range of selective instruments, multiplying exemptions, subsidies and rationing according to the development priorities set by the political authorities, the turn of the 1970s and 1980s marked a convergence of European monetary policies on the Anglo-Saxon model, giving more prominence to market mechanisms and open market operations (Singleton, 2010, chapter 8). The demise of credit policies in this period was justified by its supposed tendency to distort capital allocation, leading to inefficiencies. For example, the credit policy of Banque de France, that was for thirty years seen as an asset for domestic growth and national development began to be criticized, its 'selectivity' being increasingly framed as discretionary and inefficient 'heterogeneity' to be eliminated (Monnet, 2015, p164-165). This transformation towards giving more weight to open market operations to 'neutralize' monetary policy was the precondition for the generalization of central bank independence, reducing the distributive character of monetary policy, making it appear less political and therefore more easily delegable.

Yet we argue in this chapter that these two foundation stones of the CBI - theoretical and practical - provide it with an unstable foothold. Indeed, recent developments question the ability of these building blocks to provide an adequate framework for twenty-first century central banking. Our argument is as follows.

In section 2, we turn to the history of central bank independence, both in theory and practice. The goal of this section is to recall that this institutional arrangement should not be considered as unsurpassable, and to relativize the character of scientific revolution often attributed to its 'discovery'. Indeed, CBI as both an idea and a practice is not new. There are many historical precedents for CBI dating back to the 1920s, and if one wants to speak of a revolution, it should be in the etymological sense of a cyclical return to old ideas. Second, the scientific nature of this revolution must be questioned. While the economic research of the 1980s undeniably played an important role in legitimizing CBI, its translation into reality must be seen less as a definitive victory of science than as the result of a conjunctural alignment of

interests between different social groups. In sum, CBI is the recycling of old ideas and practices, not the end of history. It is therefore a situated configuration that, like all institutional arrangements, is bound to evolve and be replaced as it loses its relevance overtime.

In this perspective, section 3 attempts to show that the practices of independent central banks have largely deviated from the recommendations formulated by the CBI theory. While the CBI assumes a neutral and unobtrusive central bank, we recall how, over the last fifteen years, central banks have considerably diversified their modes of intervention to deal with the financial crisis, the sovereign debt crisis, the covid-19 epidemic and climate change. By increasing their weight in the economy, endorsing macroprudential responsibilities or implementing asset purchase programs, central banks' footprint has grew considerably on on the economy. This in turn led to a repoliticization of central banking, as the consequences of this new interventionism on inequalities or climate change became clearer and as citizens and parliamentarians increased their pressure to make their central banks accountable. Yet the current institutional framework - designed for the period of great moderation in which it was forged - has held up so far.

This leads us to outline in the third section how the CBI framework could succumb to its own contradictions as the rift between *de jure* and *de facto* central banking widens. Focusing on the ECB, we discuss the contours of a movement of repoliticization and democratization that could readjust the current outdated institutional framework to the new practices of contemporary central banking. A minimal solution to mitigate - but not resolve - the tension between *de jure* framework and *de facto* practices would be to improve the mechanisms of delegation and deliberation in order to strengthen the accountability of the ECB, without relinquishing its independence altogether. Yet, we argue it is necessary to open the discussion on a more radical re-politicization and democratization of monetary policy. Although highly unlikely because of European institutional barriers, this debate deserves to be raised, if only to reflect on other ways of sharing responsibilities between political authorities and central banks or to raise the question of the independence of central banks vis-à-vis financial actors.

2 Central bank independence: scientific revolution or ideological recycling?

In 1988, Alberto Alesina wrote that 'independent central banks have been associated with a lower average inflation rate and may have been responsible for reducing politically induced volatility policy and inflation' (Alesina, 1988, p 17). Ten years later, this declaration had became a consensus and had led to a wave of adoption of the CBI around the world, from New Zealand to Japan, from England to the ECB. Some have suggested that the rapid appropriation of this idea and its institutional translation was simply a reflection of a scientific revolution in economic theory (Goodfriend, 2007). However, this interpretation is false.

2.1 The 1920s: Historical and theoretical precursors

First, the idea that central bank independence was a desirable institutional arrangement did not emerge in the 1990s, but as early as the 1920s (do Vale, 2021, 2022, chapter 2), a period in which 'pet banks' (from which Governments could borrow at will) turned into actual central banks with elevated autonomy from Treasury departments (Singleton, 2010, p36-38). The financing of the war and the post-war boom had generated inflationary pressures that had brought about the collapse of the international monetary system centered on the gold standard and floating exchange rates. In this context, the League of Nations made central bank independence an international prescription that it advocated notably the international financial conferences of Brussels (1920) and Genoa (1922) (see Singleton, 2010, p93-94 and do Vale, 2022, pp. 41–46). Indeed, CBI was already considered by many to be a desirable institutional arrangement for combating inflation in a fiat currency regime, and for pursuing the necessary deflationary policies that would allow a return to the gold standard. Adherence to this prescription involved not only practitioners but also policy makers and economic and financial 'experts' (Capie et al., 1994). In the absence of a unified theory of central banking at the time, Montagu Norman, the Governor of the Bank of England, played a decisive role in formulating a doc-

trine justifying greater central bank independence (do Vale, 2021, p46-64). This recommendation for higher independence was motivated by the desire to provide a sound basis for many nascent central banks, especially in the British Empire and the Dominions (Singleton, 2010, p61-65). Drafting the blueprints of the newly created Reserve Bank of India as an independent institution was also a way for the British Empire to make sure that it would stay insulated from nationalist control, with a board that would remain 'white and sensible and not black and political' (Balachandren, 1994, p638, cited by Singleton, 2010, p67). The idea of CBI played a key role in structuring the community of central bankers, supporting each other in reforms to the legal statutes of their respective institutions. This was notably the case for Austria in 1923 and Hungary in 1924.

If this early shift towards more central bank independence was coming from mainly policymakers and experts and not academics, the idea of a 'scientific revolution' within the economic discipline is also highly questionable, as empirical work very similar to that of Alesina preceded it, without having revolutionized mainstream thinking (Parkin and Bade, 1978). Forder (2005) shows very convincingly, by listing a number of works, that the idea of CBI was perfectly understood before 1988. Among other precursors, Kisch and Elkin (1928) proposed a balanced argument of the advantages of an independent central bank, already pointing out the risks of inflationary political interference and the need to entrust monetary policy to impartial technocrats (see Singleton, 2010 p36,94 for a brief description and do Vale, 2022, chapter 2 for an in depth analysis). However, it was not until the 1980s that these ideas were revived, and then in the 1990s that they were translated into practice.

2.2 From the 1930s to the 1970s: The reflux of CBI

Indeed, the 1930s was rather the decade of a loss of central bank independence. A wind of central bank nationalization blew through many economies, providing these institutions with elevated roles to stimulate and support their economies after the crisis of the 1930s and during the Second World War. Described as the first revolution in central banking by Singleton (2010, p110-127), this was also the pe-

riod of the rise of Keynesian ideas, of the principle of aggregate demand and of the need to support activity through stimulus.[2] Central banks were characterized by the multiplicity of their distributive interventions in the economy through credit control policies, directing and promoting monetary creation in certain sectors according to the reconstruction and development priorities set by their political authorities. The ideal typical example of this period is that of the Bank of France and its selective monetary policy of credit control (Monnet, 2018), but one can also think of Italy (Lupi, 2022) and other European and non-European countries such as Norway, Japan, Canada or Mexico (Mikheeva & Ryan-Collins, 2022). Beyond interventionist instruments, central banks could rely on informal moral suasion (especially in Western economies) or formal window guidance (e.g., for the Bank of Japan) to try to coax banks to follow government development objectives (Singleton, 2010, p132-133). In sum, the Golden Age of post-war growth was marked in many cases by an institutional arrangement in which the central bank planned and directed credit, in close cooperation with their Governments, which legitimized and influenced these distributive choices. CBI seemed a thing of the past.

2.3 The 1980s: Theory without practice

It was not until the end of this period that the idea of central bank independence re-emerged, initially in a theoretical manner. While the question of institutional arrangements and the links between political authorities and delegated authority had been abandoned to other disciplines by economists during the *Trente Glorieuses* (Panico and Rizza, 2003), it returned with the onset of stagflation. In a context in which Keynesian ideas were on the wane and monetarist ideas were making headway, the contributions of new classical economists such as Barro and Gordon (1983) and Kydland and Prescott (1977) on the subject of time inconsistency brought the question of CBI back into the realm of economic discipline. These works first pointed out,

[2]The adjective 'Keynesian' to describe the practices of central banks at the time is both an anachronistic overstatement and a convenient label for the interventionist ethos at stake during this period. For a longer elaboration of this point, see Congdon (2007) or Monnet (2018, p13 and 76-78)

in line with Lucas (1976), that rational economic agents could anticipate expansionary monetary policies, calling into question the Phillips curve, and microeconomically establishing the possibility of inflation without growth. Discretionary policies were thus discredited in favor of monetary policy rules that ensure the credibility of the central bank. At the same time, research pointed to the supposed tendency of governments to put pressure on the central bank in an attempt to exploit the 'monetary illusion' of economic agents for electoral purposes (Nordhaus, 1975). To deal with this problem, Rogoff (1985) suggested that monetary policy should be taken out of the hands of democratically elected political authorities and entrusted to an independent central banker - if possible a conservative one - in order to ensure low inflation and anchor the expectations of economic agents. Since expansionary monetary policies generate only disadvantages (inflation) without advantages (due to rational expectations), it seemed desirable for governments to relinquish their monetary policy levers, like a modern-day Ulysses tying his hands to the sirens of an ineffective inflationary expansionary monetary policy. [3]

However, it was not until the 1990s that this research really began to gain influence. Indeed, Goutsmedt (2021) shows that explanations of stagflation as a monetary policy error and lack of central bank independence were in fact in the minority in the 1970s and 1980s, as their contemporaries favored explanations in terms of supply shocks. It is an *a posteriori* re-reading that frames the rational anticipation works as a discovery and scientific breakthrough, presenting their conclusions as self-evident, without seeing that they merely mathematize and micro-found arguments that were already old do Vale (2021, p225). It was thus only after a significant delay that this literature resurfaced to legitimize the deployment of CBI, benefiting above all from a window of opportunity and an alignment of interest between policy makers and economists.

[3] This metaphor appears in van 't Klooster and Fontan (2020).

2.4 The 1990s: Alignment of interests and window of opportunity

Indeed, the shift to CBI took place in a particular context. First, as previously discussed, an important pre-condition was that policy levers of central banks had harmonized considerably around market-based instruments in general and open market operations in particular (Singleton, 2010, chapter 8). With the disappearance of quantitative credit controls and selective credit policies, the political and distributive character of central bank interventions seemed negligible, making independence from political authorities more conceivable.

Second, another pre-condition was that the level of public sector debt in many developed countries had reached its lowest level since the end of the Second World War. This made easier to dissociate public debt management from the central bank, as possible interest rate hikes decided by an independent authority to control inflation were perceived as less problematic for political authorities (Goodhart & Lastra, 2018). Third, CBI might had appear at that time appealing for other reasons than that of fulfilling economics recommandations. For example, It could have been the result of successful pressure by financial interests groups to reduce inflation, a pressure increasing with financial liberalization (Posen, 1995), or to send a signal to international capital markets that mitigating inflation was a policy priority in order to try to attract capital flows and access easier financing, especially in developing countries (Maxfield, 1998).

Finally, one should not neglect the search for symbolic gains, which may explain how the idea of CBI spread so easily among economists as well as among policy makers. Forder (2005) emphasizes the collective interest of the profession of economists, whose prestige had been eroded by economic policies perceived by the public as failures, particularly in terms of inflation, but also their objective individual interest. Indeed, central banks offered economists opportunities for research funding as well as career opportunities (research positions, appointment to boards of directors or monetary policy committees). To explain the popularity of the idea among policy makers, (McNamara, 2002, p59) argues that governments choose to

delegate not because of narrow functional advantages, but rather because delegation has important legitimate and symbolic properties that make it attractive in times of uncertainty or economic distress'. Granting independence to its central bank can thus be a way for a government that wants to be progressive to give pledges of its fiscal seriousness, in the manner of the Blair government, which in 1997 granted independence to the Bank of England to the surprise of everyone, without the measure having been announced in its political program (King, 2005). It could also be a way for Governments to leave unpopular decisions such as raising interest rates to autonomous agencies while gaining the possibility of shifting the blame to central banks in times of crisis (Havrilesky, 1995). Finally, it could be a way to constrain the decisions of future governments in power by limiting their financial and monetary levers (Boylan, 2001).

2.5 The life and death of central banking regimes

Historical hindsight leads to emphasize the contingent nature of the high level of central bank independence observed in most economies - especially in high-income economies. The wave of adoption of the CBI concept in the 1990s is better understood as a contingent alignment of interests between economists and politicians, in a very particular socio-economic context. Moreover, it appears less a 'scientific revolution' than a recycling of much older ideas.

Whatever the multiple and converging reasons for the rapid adoption of this idea of central bank independence among economists and policy makers, the lesson to be learned is that central banking regimes are mortal, whether the death is slow or quick (Scialom, 2022). Indeed, central banks' functions, operational practices, and doctrines have been highly plastic across time and space, constantly adapting to the macroeconomic, institutional, and political context (Bordo et al., 2016; Collins, 1993). These adaptations concern both the operational modalities of monetary policy and the evolutions of central bank doctrine, i.e. what is considered at a given moment as the duty to be and the duty to act of central banks. Central banking does not obey to any predefined principles. Its contours evolve in response to periods of crisis (wars, economic and financial crisis, and today's climate emergency), to

financial innovations and monetary regime transformations. In his famous paper, Goodhart (2010) identifies three historical periods of relative stability in the central banking regime and more troubled intermediate periods of trial and error before a new consensus is established:

— The Victorian era, which began around 1840 and ended in 1914,

— The period of strong government control from the 1930s to the late 1960s,

— The era of market triumph from the 1980s to 2007.

Despite their differences, the gold standard era (1840-1914) and the period defined by inflation targeting (1980s to 2007) were both characterized by a strong confidence in market mechanisms and by a large degree of autonomy of central banks. As we have shown, the latter was already explicitly promoted in the 1920s as an institutional arrangement favorable to the fight against inflation and a return to the gold standard, and then revived in the 1980s after half a century of neglect. Thus, central banking regimes are not mortal in the ultimate sense, but subject to long periods of hibernation and reconfiguration according to the needs of policymakers and the challenges they face. They undergo 'revolutions' in the etymological sense (Singleton, 2010), and are subject to 'great transformations' that succeed each other (Blyth, 2002) as the pendulum between market liberalization movements swings back to societal and political re-embedding counter-mouvements (Polanyi, 1944).

The question that arises is therefore to assess whether we are at the end of a cycle, i.e. at the dawn of a new shift in the central banking regime. Indeed, it appears that central banks have, over the last fifteen years, greatly broadened the spectrum of their interventions, engaging in a process of repoliticization that distances them from the neutrality required by their independence.

3 The current contradiction: independence without neutrality

In this section, we show how independent central banks - and especially the European Central Bank (ECB) - have largely pushed back the limits of their pol-

icy actions in the last fifteen years. Despite the multiplication of their distributive interventions, this process has not been accompanied by a questioning of their independence. Thus, rather than a return to a central banking regime similar to that of the post-war period, we have instead entered a new regime combining weak democratic control and major technocratic powers. This led to a re-politicization of central banking - in the sense that the direction and the boundaries of central banks interventions have increasingly became an object of political struggle and criticism from different social groups seeking to influence the direction of monetary policy.

3.1 A growing footprint on financial dynamics...

> The financial crisis and politicians' indecisiveness have pushed us into a new role, and we allowed it to happen. As a result, we intervene ever more deeply in individual markets and now have a problematic proximity to financial policy

This quote from Jens Weidmann[4] in 2016 highlights the paradoxical situation in which central banks in developed countries were placed by the crisis of the late 2000s. While they had acquired during the 1990s an independence supposed to isolate them from politics, they found themselves forced to intervene massively - and in a distributive manner - to prevent the economic system from collapsing (Schmidt, 2016). From independent, central banks thus found themselves lonely to deal with a crisis that would have required an explicitly coordinated response between monetary and fiscal policy (Mabbett and Schelkle, 2019), and became the 'only game in town' (Rajan, 2012). What appeared at the time to be a circumstantial emergency response to the crisis ultimately remained to last, emerging over time as a new normal. With respect to monetary policy, three recent developments shifted central bank practices away from the neutrality and self-effacement assumed by their independence (Monnet, 2021a; van 't Klooster, 2021).

First, sovereign bond purchases normalized. Decided in the midst of the sovereign crisis in Europe, such programs were never discontinued. In fact, their number and

[4]Deutsche Bundesbank President between 2011 and 2021

size grew in the subsequent years. While the first 'Securities Markets Programme' (SMP) program only led to €220 billions of purchases with stringent eligibility criteria, it was later replaced by the 'Outright Monetary Transactions' (OMT) decided following Draghi's 'whatever it takes' speech in July 2012. This program was much more open and provided the ECB with almost unlimited discretionary powers regarding the nature and scope of sovereign bonds purchases. Although not utilized, this 'monetary bazooka' was then replaced in 2015 by the €2700 billions 'Public Sector Purchase Programme' (PSPP), joined by the €1,850 billion 'Pandemic Emergency Purchase Programme' PEPP launched in 2020 following the covid crisis. This last program allowed to buy back almost the totality of the debt issued by the governments during the pandemic *'Quoi qu'il en coûte'*. This new modality of intervention represents a 'revolution without revolutionaries' in the sense that it signs a return to central banks support to governments funding without a change in paradigm or institutional framework (Gabor, 2021). The great scarecrow of monetary funding of public deficits, which left through the front door with CBI, has thus returned through the window.

Second, the last few years saw the birth of corporate sector purchase programs (CSPPs). Although such programs are very small in size compared to public asset purchases, they appear symbolically important, as it turns central banks from liquidity providers to direct actual investors in private businesses. Although supposedly following a 'market neutrality', i.e. replicating the structure of the market without favoring certain securities over others, this neutrality is a myth (van 't Klooster & Fontan, 2020). By comparing the Swiss National Bank and the European Central Bank asset purchase programs, van 't Klooster and Fontan (2020) showed that, although both institutions claimed to follow the same 'market neutrality' principle to try to depoliticize the distributional consequences of their actual design choices, they were in fact engaging in very different operations chasing very different objectives. The former was targeting private assets labelled in Swiss francs to support its currency, while the other preferred to buy public debts to mitigate the risk of a eurozone break-up.

Third, by fear of a post-crisis credit crunch, and to circumvent the zero lower

bound, central banks launched new refinancing instruments to incentivize their banks to continue lending to the real economy, especially at long maturities. In the European case, *Targeted Longer-Term Refinancing Operations* (TLTROs) were born in 2014, initially designed as a temporary 2 year boost. But a second series was launched on 10 March 2016, and a third on 07 March 2019. Instead of providing liquidity in an indiscriminate manner and at a unique rate, these programs incentivize banks to grant long maturity loans to non-financial corporations and households, offering lower rates (up to -50bps) depending on their lending patterns (European Central Bank, 2022). The definition of eligible loans was entirely up to the ECB, that enjoyed total freedom to decide on what types of lenders, what sectors, and what maturities could benefit from such advantages, based on their own internal assessment of what could best support 'the economy'.

These new instruments are not the only levers pushing the ECB into political and distributive realm. For example, the ECB decided amidst the sovereign bank crisis to reform its collateral framework rules in order to allow Greece bonds to be refinanced despite their low ranking by notation agencies. This contributed in shedding light on the inherently political character of collateral framework designs.[5] Another less graceful example of this tendency to venture into a political realm can be found in the ECB's weaponisation of its unlimited monetary powers and lender of last resort responsibilities to impose a partisan agenda through confidential letters and official demands as part of the Troika (see Tooze, 2018, chapter 17, van't Klooster, 2021b, p226 and Fontan, 2018). One could also mention ECB's prolonged tendency to staunchly support in official speeches an acceleration of structural reforms - especially within labour markets, despite its total lack of remit in this area (Braun et al., 2022).

Finally, the implementation of macroprudential policy in the last decade also came at odds with the CBI frame. Although prudential responsibilities are often shared with autonomous authorities separate from central banks (Masciandaro and Volpicella, 2016), our previous points apply as the latter are usually also indepen-

[5]For more on the political economy of collateral frameworks, see Jens van't Klooster's second PhD (van't Klooster, 2021b)

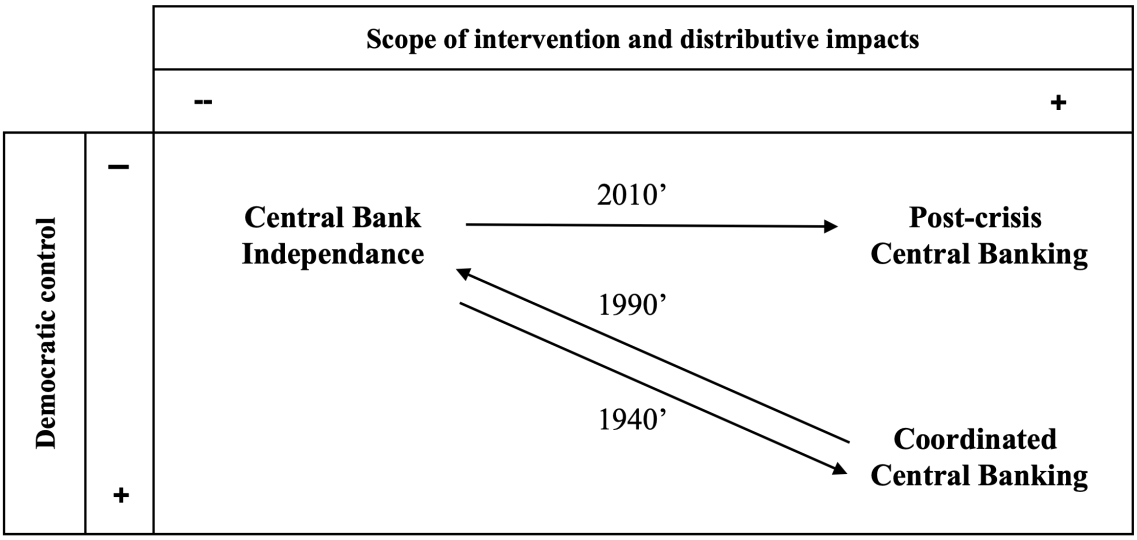
dent. While there may be many reasons for delegating macroprudential policies to such agencies (Lombardi and Moschella, 2017), the same dynamic is at stake. Through loan-to-ratio, discretionary buffers such as the Systemic Risk Buffer, or even control over stress-testing scenarios, central banks and supervisors dispose of new instruments to yield 'structural power' over banks (Coombs, 2022), actually being in the position of co-shaping the credit dynamics and modifying their sectoral repartition by e.g. implementing constraints for housing loans only when they fear a bubble. Whether or not one regrets the restriction of the decision-making autonomy of private banks in the name of financial stability, the democratic problem remains. Once again, central banks are in a position to decide independently where to place the cursor between credit growth and financial risk minimization. Once again, they are alone in charge for a *political* decision.

3.2 ... Without institutional reform

Levers of central bank intervention have accumulated, increasing the scope and reach of their distributive choices. However, this growing influence of central banks on economic dynamics has not been accompanied by any reform of the institutional framework governing their action. We are thus plunged into an increasingly unbalanced institutional framework in which the functioning of central banks is increasingly similar to the omnipotent central banks of the *Trente Glorieuses* described in the previous section, while benefiting from an unprecedented independence from the political authorities. Indeed, the legal and institutional framework is still the 30 years old CBI gold standard forged for the period of the Great Moderation and its parsimonious central banking model. Figure V.2 illustrates this situation.

To draw on Braun (2021b)'s metaphor, we are in the situation in which political authorities carefully designed a framework for how central banks should use their only tool (the 'hammer' of inflation targeting) but central banks just proceeded to build their own Swiss Army Knife to play with unguarded. To return to the one presented in the previous section, it is as if Ulysses had asked his sailors to tie his hands and gag him to escape the sirens of monetary deficit, but thirty years later they still have not untied him, deciding that in the absence of new guidance, their

Figure V.2 – The institutional contradiction of 21st century central banking



Source: author's elaboration

mission is to stay on course forever - plus they have also completely modified the boat with V8 engines and a new integrated waffle machine.

How is this situation possible? First, because central banks mandate are always sufficiently blurry to be interpreted in different ways. This is by design to make sure such institutions are capable of responding to new challenges that were not necessarily planned as the mandate was drafted. This is what de Boer and van 't Klooster (2020) call the 'authorization gaps' of central banks' mandates. Thus, despite the constant and real threat of legal disavowal,[6] which always hangs in the balance and constrains the range of possible policies, central banks can practically leverage this indeterminacy. In order to maintain their legitimacy, and to protect themselves from legal risks, central banks tend to do so in a particular way, by playing on 'strategic ambiguity' (van 't Klooster, 2021). Thus, while they increasingly engage with credit guidance policies, gradually moving away from the market liberal paradigm hard-wired into their mandate, they nonetheless still try to legitimize and justify their new interventions in reference to the old goals of its market liberal paradigm, and through an extensive recourse to expertise and scientization in order to depoliticize their interventions by presenting them as as neutral and scientific as possible.

[6]Indeed, the ECB has already been sued for having undertaken actions that some ultimately deemed contrary to its mandate, so far unsuccessfully (Fontan and De Cabanes, 2019; Tesche, 2023).

This leads to 'technocratic keynesianism' setting in which increasingly interventionist policies in the monetary and financial regime are implemented by technocrats in independent agencies (van 't Klooster, 2021). Although this new activism may be welcomed, its technocratic foothold is problematic for two reasons. The first is one of economic efficiency, which will be briefly presented in this section. The second is one of democratic legitimacy, which will be elaborated in the next section.

Indeed, the systematic need to base decisions on expertise in order to depoliticize them can lead to the design of poor performing policies. Taking the previous example of European sovereign debt management, we can recall here the ECB's decision to revise its collateral framework in 2005 to include ratings from rating agencies as an eligibility criterion. This decision, aimed at depoliticizing its action by subtracting part of its discretionary power and entrusting it to market forces in order to shield itself from criticism in order to protect its independence, led to the Greek sovereign bond crisis (van't Klooster, 2021b, p220-236). Regarding private asset purchases, ECB's search for neutrality leads it to follow the structure of the bond market, which favors large companies, thereby favoring the most carbon-intensive firms and hampering the low-carbon transition (Dafermos et al., 2020a; Matikainen et al., 2017). Last, the lack of legitimacy for distributive interventions also led to the dilution of macroprudential ideas into a set of measurable metrics, sidelining the more radical implications of systemic risk (Kranke & Yarrow, 2019) in favor of more 'objective' and micro-focused justifications with interesting depoliticization properties (Thiemann et al., 2021).

Perhaps more importantly, this increased recourse to expertise to depoliticize its policy choices appears insufficient to respond to the growing social demands regarding the way the monetary and financial regime is governed.

3.3 Central banking boundaries and democratic contestation

Despite central bankers efforts to justify their new interventionism in the most technocratic and expert way possible, the last few years have been marked by an

undeniable repoliticization of financial and monetary policy. By repoliticization we mean that the direction and limits of central bank interventions have increasingly turned into an object of political struggle originating from different social groups seeking to influence the direction of monetary policy. Indeed, the last decade has seen the shattering of what seemed to be a naturalized truth by force of habit: the form and nature of central bank interventions is no longer taken as immutable, and increasingly considered as a legitimate subject to political deliberation.

This should not come as a surprise: under certain conditions, entrusting an independent institution with tasks in order to depoliticize them sometimes leads to the opposite result, especially when losses imposed by such independent agencies become visible (Onoda, 2023). This is exactly what happened for central banks. The distributive nature of their new interventions have became increasingly discussed and challenged, most notably for increasing inequalities (in the United States) and for fueling climate change (in Europe).

First, sovereign debt purchase programs have big consequences on inter- and intra-country inequalities (Dietsch et al., 2019, p30). Not only do they not help European countries to the same extent, but they also boost asset and housing prices with important consequences for household inequality (Adam & Tzamourani, 2016; Luigi et al., 2019). Even the most seemingly innocuous and technical design choices have important distributional consequences. For example, Bundesbank's push to prevent risk pooling between ESCB members by requesting that each national central bank should only buy sovereign debt of their respective fiscal counterparts led it to suffer by far the greatest losses to its capital due to the raising interest rates of 2022-2023. These losses underlined the discretionary nature of the initial design choice, and led to strong criticism regarding the cost of such a technocratic decision for public finance in Germany, as the country was deprived of any seigniorage revenues. Public asset purchases programs also led to an even broader and more profound debate on how should States finance themselves, raising many questions on how central banks instrument designs impact citizen through their consequences on public finances. If central bank purchase programs allow governments to refinance themselves at zero cost, why not develop this type of financing and stop turning

to the private markets (Lemoine, 2016, 2022; Théret & Lemoine, 2020)? Central banks being ultimately a branch of government, why not lift the taboo on monetary financing entirely through debt-cancelations (Bridonneau, 2022; Bridonneau & Scialom, 2020)?

Public bond purchase of government bonds is not the only new instrument to foster debates and repoliticization. The private bond-buying programs have been criticized even more strongly because they do not benefit European sovereigns, but private companies with a massive presence in the bond markets. As argued in the previous section, such programs necessarily imply distributional choices in their design (van 't Klooster & Fontan, 2020), and were heavily criticized for their carbon bias (Dafermos et al., 2020a; Matikainen et al., 2017). As recalled by Dietsch et al. (2019, p35), such heavy presence in bond markets facilitated Volkswagen's return to the bond market after the 'dieselgate', but also helped companies such as Total, Shell or RyanAir refinance at lower costs. Yet, it would have been possible to design these purchase programs to align them with a decarbonization trajectory compatible with the Paris agreements, as were proposed many times in the literature and finally implemented within the ECB as of 2023 (see chapter III).

Third, TLTRO programs have also attracted increasing criticism for benefiting banks too much and European development priorities too little. Indeed, as interest rates rose, the TLTRO programs resulted in a massive net transfer of wealth to banks, which were able to benefit from low or negative short-term refinancing rates while enjoying higher returns on their overnight deposits at the central bank facility, thereby earning tens of billions of euros risk-free (Financial Times, 2022). In fact, total net transfer could reach 1 trillion euros in the next ten years, which triggered a number of propositions to reform ECB's by going back to the previous reserve scarcity regime (De Grauwe, 2023; De Grauwe & Ji, 2023). In addition to being criticized for its distributional impact in favor of banks, TLTROs have also been challenged for their lack of climate ambition. 'Green TLTROs' would indeed have been a way to condition preferential interest rates for banks to minimum amounts of long-term loans to facilitate the energy transition and the deployment of capital-intensive renewable energies (van 't Klooster, 2022; van 't Klooster & van Tilburg,

2020). The fact that the Bank of China and the Bank of Japan have already implemented such provisions has again contributed to underline the feasability of such policies and therefore the contingent and questionable nature of ECB's refusal (Bank of Japan, 2019; People's Bank of China, 2018).

Finally, macroprudential policies have been criticized both for their unequal impact on households and their shortcomings in the face of climate-related risks. First, the introduction of constraints on credit, such as loan-to-value and loan-to-income ratios in Ireland had the direct effect of making it more difficult for first-time buyers to buy property. In response, the Irish called for 'a little understanding' (The Irish Times, 2020) from their central bank in the face of measures whose social impact was seen as violent and discriminating against vulnerable people. Second, macroprudential policies have also been criticized for their negative effects on transition. On the one hand, macroprudential policies make long-term lending more difficult, with Basel III requiring banks to hold more capital for longer periods, lowering the profitability of sustainable investments with negative effects on credit dynamics and the availability of patient capital, important for the transition to low-carbon economy (D'Orazio & Popoyan, 2019). By contrast, macroprudential regulation has also been increasingly contested for being toothless with regard to climate-related financial risks, and particularly for stranded assets. Some advocate 1-to-1 capital ratios for banks that lend to fossil fuel companies, others call on financial supervisors to mobilize the buffers at their disposal to increase the capital requirements of banks financing the most carbon-intensive activities, and some propose new instruments such as leverage ratios to deal with this new type of risk marked with radical uncertainty (Finance Watch, 2021; Le Quang & Scialom, 2022; Monnin, 2021).

In short, there is growing awareness that current interventions are in fact credit policy without democratic control. In view of the inevitably distributive nature of modern central banking, there is mounting pressure to weaponize monetary and macroprudential policies to achieve not only intrinsic (price and financial stability), but also extrinsic objectives, such as combating climate change or inequalities. In the face of this repoliticization, it is not certain that the Central Bank Independence setting will hold. Torn between a narrow *de jure* mandate and broadening *de*

facto interventions, central banks are helplessly witnessing the deepening of current institutional arrangement's contradictions.

4 Where is European central banking heading to?

The distributional consequences of modern central banking are becoming more visible and are increasingly acknowledged by central bankers themselves. At the same time, demands for taking environmental issues and inequalities into account are being carried out by an increasing number of actors. It thus seems that the very ideological ground on which rests the current central banking regime is shaking. This section focuses on the European institutional setting and discusses the possible developments for the years to come. Envisioned scenarios draw a gradient from a continuation of expertise-led legitimation in an untouched CBI framework to a complete overhaul leading to the re-embedding of monetary policy into the political sphere.

4.1 Institutional loneliness, strategic ambiguity and technocratic expertise

First, we should not be too quick to announce the death of the CBI framework: this would risk being normative wishful thinking. Just because the current situation is democratically problematic does not mean that it cannot be perpetuated.

Indeed, the European Central Bank could very well reduce discontent and mitigate contestation by going further in its integration of climate-change and inequalities factors, while still remaining institutionally independent. The ECB is not condemned to replicate the biases that are currently being denounced, whether they concern carbon-related activities or inequalities. The letter of the law gives the central bank considerable leeway - or 'legal permissibility' - to interpret its mandate so as to take other objectives into consideration (van 't Klooster, 2021). For instance, to the extent that inequalities or climate risks threaten price stability and financial stability, the ECB may legitimately take these into account in order to fulfill its objectives. In other words, if financial markets are shown to systematically

misevaluate financial climate risks, it is in the interest of financial stability that the ECB reconsiders its operational principle of market neutrality and seeks to modify the composition of its asset portfolio in order to penalize the most climate-risky assets. Doing so, the ECB seems to square the circle: it keeps its independence while influencing, at the very same time, the allocation of capital.

In addition, according to what is often referred to as its 'secondary mandate' , the ECB is expected to support the economy of the European Union provided that such a support does not contravene to the price stability objective. A narrow interpretation of this secondary objective implies that, between two instruments equally efficient at ensuring price stability, the ECB must choose the one that best supports the objectives of the EU. A broader interpretation, which is considered as 'more plausible' by ECB lawyers, suggests that the ECB could implement measures only meant to support the objectives of the Union, provided that these measures do not jeopardize price stability (Ioannidis et al., 2021). Therefore, the ECB could thus go much further in taking climate or inequalities into account, mobilizing both its primary and secondary mandate. Thanks to the activism of some of its board members, this strategy has actually allowed the ECB to advance timidly regarding a more ambitious agenda of reaching not only for prudential objectives, but also for promotional action by proactively tilting its collateral framework and purchase programs to steer the low-carbon transition (see chapter III).

However, this 'solo dancing' strategy remains problematic - and perhaps unsustainable - for at least two reasons. First, because the ECB cannot indefinitely twist a 30-year mandate without endangering its credibility, which effectively limits the scope of extrinsic objectives integration. So far, the ECB has escaped constitutional disapproval, making 'unconventional' policies a new norm. This victory, however, was largely based on the fact that the ECB's response was deemed proportionate in the face of the acute risk of the break-up of the eurozone. Faced with the chronic and hitherto latent risks of climate change and rising inequality, it may be difficult for the ECB to justify such assertive activism. These institutional boundaries and limited input legitimacy may push the institution to stick to a predominantly prudential agenda grounded in technocratic reason and risk-based rationales in order

to keep its decisions as seemingly depoliticized and neutral as possible. If 'strategic ambiguity' can go a long way, it nonetheless has limitations in terms of what it can accomplish.

Second, because any attempt at going beyond this limited prudential agenda only further underlines the problem of the legitimacy of ECB's distributive choices. Any modification of its action, even meant to better take externalities into account, indeed remains at least partly arbitrary as long as it is insulated from the political power and its explicit delegation. The unilateral exploitation of the 'authorization gaps' (de Boer and van 't Klooster, 2020) by non-elected technocrats, even if they seemingly follow 'democratic' political pressures, cannot be considered as a satisfactory way to justify the distributive choices it makes. It leaves the central bank free to interpret its mandate and thus decide on the secondary objectives it wishes to pursue, depending on internal and opaque bureaucratic struggles between different visions of what central banks should and should not do, without political authorities having a say. Besides, it only pushes the contradictions of the current institutional setting further, as it *de facto* destabilizes its independence (as outsiders' contestation finally gets factored in) without designing proper institutional mechanisms to make sure these selected and strategically endorsed pressures by central bankers actually reflect the democratic will of the people.

4.2 Democratization, institutional coordination and reformed independence

In the face of increasing pressure, we might witness a minimal reform of the institutional framework. The problem with the ECB is that a lot of the parameters are hard-wired in its mandate that requires a treaty change to be amended. Such a change requires unanimity of all 20 members, which seems highly implausible given the very conservative views of some on what central banks should do. However, second best institutional solutions are possible, such as inter-institutional arrangements (Klooster & Grünewald, 2022).

Broadly speaking, the legitimacy of ECB's distributive interventions could be

strengthened through two channels: either by improving the *delegation* or the *deliberation* (Monnet, 2021a, p79-80). Table V.1 summarizes the possible reforms this could entail.

Table V.1 – Toward a more democratic but still independent ECB

Delegation	Designation	Designating members of the ECB Governing Council in a more democratic manner
	Objectives	Establishing and monitoring the mandate and the secondary objectives of the ECB in a more democratic manner
Deliberation	Transparency	Disclosing the votes of the Governing Council meetings; Allowing the Chair of the ECON Committee to attend the meetings of the Governing Council
	Expertise	Promoting non-partisan technical reports to better inform members of the European Parliament; Creating a sub-committee dedicated to monetary issues
	Coordination	Strengthening the ECON Committee to allow for a more balanced dialogue between the ECB and the Parliament

To strengthen the legitimacy of the *delegation* process, two main avenues have been suggested. First, the process of designation of central bankers could be democratized. Currently, the designation of the governor of each national central bank follows national procedures, some of which appear to be more democratic than others (see Table V.2). For the members of the ECB Executive Board, the European Council suggests a single candidate to the European Parliament, whose role is therefore limited to accepting or rejecting this candidate. Besides, the only time the Parliament had formally voted against the candidate presented by the European Council (in 2012, for the nomination of Yves Mersch, among criticism regarding gender balance led by Sylvie Goulard and Sven Giegold), Governments decided to nominate him anyway. Jourdan and Diessner (2019) suggest that the European Council should instead propose a list of candidates to allow members of the European Parliament to weigh more when choosing the governor. This reform, which could be extended to all Eurozone countries, seems all the more important that the profile of central bankers has a significant impact on the policies implemented, not

least regarding climate change (see chapter III).

Table V.2 – Designation processes for European central bank governors

Executive + Central Bank committee	Estonia, Germany, Greece, Italy
Executive	Austria, Belgium, Cyprus, Ireland, Luxembourg, Malta, Netherlands, Spain
Executive + Parliament	Finland, France, Lithuania, Portugal, Slovakia, Slovenia, European Central Bank
Parliament	Latvia

Second, 'authorization gaps' could be filled in a more democratic way (de Boer & van 't Klooster, 2021). The European Central Bank is one of the only central banks in the world to benefit from a sort of *objective independence*, deciding alone and freely how to interpret it is mandate and the primary and secondary objectives attached to it.[7] Instead, a democratic institution could provide guidance on a regular basis on how to interpret and rank its different objectives.[8] Such guidance could be provided via the European council or the European Parliament [9] (de Boer and van 't Klooster, 2021), its ECON committee (Claeys and Domínguez-Jiménez, 2020), or a newly created European Credit Council (Monnet, 2021a, 2021b). In such a system, the authorization gaps are dealt with in a democratic manner without necessarily implying an unlikely revision of Treaties, as provisions already allow some level of inter-institutional coordination (van 't Klooster & de Boer, 2022).

The second channel to improve the legitimacy of the ECB would be to strengthen the mechanisms of *deliberation* between the independent authority and the political

[7]Indeed, contrary to what Otmar Issing (ECB's first chief economist and one of its main architects) claims in his account of the European Monetary Union, the mandate of the ECB is quite vague, as even 'price stability' is not defined. Besides, as already discussed, it is not clear how the ECB should factor in its secondary mandate. For the record, Issing (2008, p61) dismissed the very relevance of the secondary mandate, which led him years later to turn into a vocal opponent to green central banking (Issing, 2019).

[8]This could actually be supported by ECB Governors. For example, former Executive Board member Benoît Coeuré once said in the French National Assembly in response to a related question: 'Setting priorities between different objectives is the definition of policy [...] and that is what parliaments do.'

[9]On May 25, 2023, a day before this thesis was handed, the ECB acknowledged the role and legitimacy of the European Parliament in setting what should be the priorities of the ECB regarding its secondary mandate (European Central Bank, 2023)

authority. This consists, for instance, in improving the transparency and accountability of the ECB. In this respect, the ECB has been asked to disclose the minutes of its meetings (as the Federal Reserve and the Bank of England already do) as well as their votes (Kraemer, 2022; Vallée & Sander, 2022). In fact, the call to disclose votes in order to show the distribution of opinions within the Governing Council was discussed at the beginning of the EMU (Issing, 2008, p31;160-163) and was then regularly put on the table internally,[10] so far without success. If minutes and votes are not made public, at least the chair of the ECON committee of the European Parliament could be allowed to attend meetings as an observer, as is already the case for the president of the European Council and (at most) one member of the European Commission (Jourdan and Diessner, 2019).

More generally, the idea to strengthen the position of the ECON Committee in its relation to the ECB has often been put forward. On the one hand, the former could benefit from the creation of a European Credit Council offering expert knowledge to members of the European Parliament (Monnet, 2021a, 2021b). For the time being, it is indeed the central banks that hold the bulk of the technical firepower. This leads to a biased expertise that often concludes more favorably than academics on central banks policies efficiency (Dietsch et al., 2019; Fabo et al., 2021). On the other hand, the ECON committee could be strengthened by the creation of a smaller subcommittee specialized in monetary policy. This would allow for a greater degree of expertise and better coordination during the quarterly Monetary Dialogues. Finally, Monetary Dialogues could be improved by allowing parliamentarians to ask additional questions and engage trully in a dialogue rather than only listening to the unilateral explanations provided by the ECB (Claeys et al., 2014; Claeys and Domínguez-Jiménez, 2020; de Boer and van 't Klooster, 2021).

Taken together, these reforms could improve the ECB's legitimacy while maintaining its independence, since the ECB would still decide autonomously on the policies implemented. On the one hand, improving *delegation* by granting more power to Parliaments in the nommination of ECB's decision-makers as well as deal-

[10]For example, by Benoît Cœuré and Joerg Assumssen in 2013, see this tweet of the former: https://twitter.com/BCoeure/status/1605274068801953793

ing with the authorization gaps through democratic processes would increase the input legitimacy of the ECB. On the other hand, improving *deliberation* by enhancing political supervision, balancing the expertise and refining the accountability mechanisms could increase its througput legitimacy.

4.3 Politicization, Strategic State and institutional overhaul

The previous two sections have not questioned what could be considered the root of ECB legitimacy issues with respect to its increasingly distributive interventionism: its considerable level of independence. This last section goes one step forward by reflecting on the very relevance of CBI in regards of modern central banking challenges. Several arguments indeed call for reconsidering this paradigm, and to repoliticize central banks through a 'de-delegation' process. [11] We briefly go through these arguments in this section.

First, monetary policy intrinsically consists in making distributive, and therefore political, choices. In that perspective, even though it is most often presented as a mere procedural solution to the lack of credibility of time-inconsistent policymakers, CBI in fact contains a substantive choice that sets the balance of power between debtors and creditors (McNamara, 2002; Stiglitz, 1998). As Kirshner (2001) puts it:

> 'The inflation rate is best seen as a variable like the exchange rate, with winners and losers from different levels. The inflation rate and the exchange rate only become pathologies at extreme values. At other times, the principal effects are political'.

Thus, the setting of a price stability objective, and above all its operational translation by the ECB itself due to the broad 'price stability' definition set in its mandate necessarily leads to a decision between contradictory interests, which appears difficult to reconcile with its insularity from political power. This critique of central bank independence in the face of its unavoidably distributive consequences is all the more valid at a time when central banking is moving away from the Tinbergen

[11] Such a 'de-delegation' is indeed possible, and happened recently in Latin America (Bodea & Garriga, 2023).

principle to intervene in multiple domains, ranging from direct intervention in the market for sovereign bonds (OMT program, etc.), to private bonds (CSPP program, etc.), to the setting of preferential interest rates for banks' lending on a long-term basis (TLTROs, etc.). This abundance of instruments only increases the number of distributional dilemmas that quarterly dialogues with a part of the European Parliament will hardly be enough to legitimize.

In any case, no matter what form the central bank's auditing bodies take, Parliament and other political authorities remain constitutionally prohibited from issuing instructions to the ECB because of its very independence. The ECB remains entirely free to pursue its monetary policy as it sees fit, without any disciplinary mechanism to check if its actions deviate too far from political expectations. In the European context, the members of the Executive Board, appointed for a single term of eight years, have no incentive to submit to the demands of Parliament, and cannot be called to order during their term, let alone dismissed. Although sought after, this dimension is surprising when put in perspective with the economic literature on delegation, since it consists in exacerbating by design the agent's tendency to drift from the missions entrusted to him by his principal (McNamara, 2002). In the end, only the threat of legal proceedings remains, but this is conservative in nature, pushing the ECB to favor a rigid interpretation of its mandate rather than to push for extra-monetary criteria to be taken into account.

Besides, the reasons that justified the adoption of CBI now seem largely outdated. For instance, the prohibition of monetary financing, which is one of the pillars of CBI, has been repeatedly circumvented by the numerous purchases of sovereign bonds on secondary markets that have defined the policy led by the ECB over the last decade. In fact, the *de facto* coordination between fiscal and monetary policies, which has proved to be the only solution to go through the Covid crisis, is likely to become the new norm to deal with crises – a 'revolution without revolutionaries' (Gabor, 2021).

Furthermore, it is even possible that CBI proves to be a significant disadvantage in order to fulfill its intrinsic objectives. Recently, inflation has been driven by bottlenecks of global supply chains, energy prices, and the Ukraine war, against which

the ECB could do nothing. In the years to come, it is very likely that the transition toward a low-carbon economy will fuel inflation even more (Schnabel, 2022a, 2022b). In both cases, an independent ECB is powerless. Indeed, in order to fight this type of inflation, it appears more necessary than ever to carry out targeted policies, such as differentiated interest rates to continue to support the phase-in of low-carbon technologies (van 't Klooster & van Tilburg, 2020) or credit and price controls (Weber, 2021). These measures, which are explicitly discretionary and distributive, are largely incompatible with CBI, and require instead a strong coordination with political institutions. Hence, sacrificing input legitimacy by delegating monetary policy to technocratic independent authorities for the sake of better chances of attaining output legitimacy is not only useless (as de facto governmental funding re-appeared): it is also counter-productive, as coordinated central banks may be more needed than ever to face contemporary pandemic-, war- and transition-led inflationary pressures.

Finally, questioning CBI may be an opportunity to tackle a problem that is very often neglected: the dependence of central banks vis-à-vis financial markets (do Vale, 2022, pp. 301–305). Rather than focusing on the risk of 'fiscal dominance', many studies indeed warn on the risk of a 'financial dominance', which would subject central banks to the power of the markets, making the latter the 'masters of the masters of the universe' (Diessner and Lisi, 2020). Financial markets indeed benefit from an 'infrastructural power' since they are key to the transmission of the monetary policy, especially in extremely financialized economies. This interdependence between the soundness, depth and liquidity of the markets and the effectiveness of monetary policy has led the ECB to oppose some reforms that aimed at taxing financial transactions or more strictly regulating these markets (Braun, 2020). In general, it has led central banks to align their own interests with those of the financialization agenda, leading them to support market liberalization and development of new fragile financial structures (Walter & Wansleben, 2020). It may therefore be desirable to (re)inject some democracy into the governance of central banks in order to decide politically on the channels through which monetary policy should be transmitted, and on the degree of political or private interference tolerated in the pursuit of price stability.

5 Conclusion

Following the 2007 financial crisis, a process of repoliticization of central banking has began, with an increasing number of contested distributional policies being made by independent central banks. In the case of the ECB, these new interventions have taken very different forms: the setting of preferential refinancing conditions for banks, new macroprudential supervision powers, the participation to the troika during the European sovereign debt crisis, and large-scale public and private asset purchase programs. Thus, central banks' recent actions taken during the pandemic and, more recently, as part of the European sanctions against Russia (Quaglia & Verdun, 2023), are simply the continuation of this movement that began fifteen years ago.

This shift is problematic in that it drives independent central banks further and further away from their narrow mandates of neutral technocrats. The CBI framework was indeed shaped and rapidly deployed in a short time window, when central banks had reduced the scope of their distributive interventions in the real economy to focus on inflation targeting through neutralized open market operations, abandoning their post-war credit guidance policies. With the return of interventionist and distributive central banking, a gap has been quickly growing between what central banks are mandated to do, and what they actually do. The *de facto* interventions of these powerful institutions have largely escaped the explicit *de jure* delegation mandated by political authorities, which calls into question to what extent central banks may actually still 'serve the people' (Dietsch et al., 2018).

This situation is not only undesirable from a democratic perspective, but may also prove hard to maintain, which raises the question of a possible shift towards a new central banking regime. Indeed, the current institutional arrangement may not be sustainable in the long run, as political contestation grow and legitimacy erodes. New challenges such as climate change or inequalities lead central banking practices to be criticized not only for their unaddressed side consequences, but also for the extrinsic objectives they do not actively pursue. The plasticity of the institutional framework has so far made it possible to cope with these contradictions and

growing contestation, thanks to timid internal shifts pushing for progressive agendas that have filled some of the distance between societal demands and central banking practices (see chapter III). However, it does not seem likely that this situation is tenable in the long run, as contradictions of this particular setting remain essentially unaddressed, and clashes between input and output legitimacy escalate in an outdated CBI setting. We may therefore be at a critical juncture regarding the institutional arrangement of the monetary regime, as the free-market pendulum loses momentum in the face of growing demands for more State-led intervention. As the counter-movement to re-embed finance and money in the social (and environmental) spheres unfolds in the face of the environmental crisis, a third 'great transformation' may occur (Blyth, 2002). Let's hope, for the sake of climate stability, that if this change does occur, it will be sooner rather than later.

CHAPTER VI

Concluding remarks

Main findings and future research avenues

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1 A look back

Howard S. Becker (2004) argues in the classic '*Writing for Social Scientists*' that any activity needing to deliver an output inevitably leads to tension between two conflicting needs: 'making it better' and 'getting it done'. He also argues that, all too often, postponing the moment of *'getting out the door'* a research work can be the easy strategy, not the best one. For all the desire to expand and refine this manuscript, now is the time to deliver.

1.1 On our research questions

At the beginning of this manuscript, we posed four research questions. First, let us start this conclusion by briefly reviewing them in turn to recall how some chapters helped provides elements of answer.

Research Question 1 *How diverse are green central banking objectives and instruments?*

Chapter I exposed the tension between single and double materiality, leading to a differentiation between two types of justifications for policy action. On the one hand, the prudential approach aims at ensuring financial and monetary stability in the face of adverse climate-related dynamics. This approach is defensive in that it attempts to prepare and shield the financial sphere from developments considered as exogenous. On the other hand, the promotional approach seeks to facilitate climate stabilization by steering capital flows to accelerate the low-carbon transition. This approach is instead proactive and 'extrinsic' in that it preemptively acts on financial flows in order to achieve objectives outside of the financial realm.

Chapter II highlighted that in addition to the variety of objectives, green central banking also encompasses a wide range of instruments, mobilized in mixed ways by the different institutions. Often, central banks confining themselves to prudential interventions tend to stick to informational policies that seek to fix asymmetric or imperfect information, and leave to the market the role of redirecting capital according to the relative profitability of the different investments. On the contrary,

incentive and coercive instruments, operating in a discretionary manner directly on prices and quantities respectively, are often deployed by central banks that explicitly pursue promotional objectives.

The range of possible green central banking practices is therefore wide. Policymakers can implement taxonomies, disclosure norms, standards, and so on to foster transparency regarding both the exposure to climate-related risks and the actual level sustainability of investments. But they can also shift the structure of incentives by implementing capital buffers, leverage ratios, preferential refunding conditions or lower capital constraints for green loans. Last, but not least, central banks and financial supervisors can and have been relying in certain jurisdictions on quantitative coercive instruments such as credit floors and ceilings for reducing carbon intensive finance or to push sustainable investments. These different objective/instrument combinations are deployed in a very large number of configurations, difracting the integration of climate change by central banks into a very heterogeneous set of practices.

Research Question 2 *What drives the variety of green central banking?*

Chapter II identified a 'promotional gap' between two models of green central banking. In so doing, it pointed to a determining factor explaining the varieties of green central banking: the institutional setting of the monetary regime. This led to schematically differenciate two models. On the one hand, regimes in which central banks are independent from their political authorities tend to focus on prudential and informational climate-related financial policies, constrained by narrow technical mandates and limited political legitimacy to make distributional choices. On the other hand, jurisdictions with politically embedded central banks deploy a much more comprehensive arsenal of policies, weaponizing financial governance instruments for developmental - and environmental - purposes.

Chapter III then allowed to refine our understanding of what may drive green central banking practices. Adopting a micro-perspective by diving into a single case-study, it highlighted how central bankers, although restricted by the institutional setting, do retain some agency in the interpretation of their mandate. This leeway

allows willing insider to marginally reshape the role of their institution in financial governance. Such developments imply bureaucratic struggles to shift the boundaries of conceivable central banking practices and require coalition building as well as the strategic instrumentalization of external pressures to overcome internal blockages. However, this kind of technocratic self-imposed greening appears limited both in the scope of possible promotional instruments and in the durability of such alliances.

Both chapters are not contradictory: in fact, we had hypothesized that the ECB may be moving towards promotional policymaking despite its institutional setting when drafting our Baer et al. (2021) paper. Faced with political authorities inaction and threats for its output legitimacy, delegated authorities may indeed be pushed into more ambitious climate action. However, the in-depth case study was needed to provide a better understanding of the mechanisms and channels allowing this change, highlighting its conjectural and bureaucratic nature. This illustrates the value of using economic sociology to *zoom in* on broader political economy developments.

Research Question 3 *How do central banks legitimize their incorporation of climate-related issues?*

Chapter III and chapter V both highlighted why prudential narratives were initially favored by the ECB, providing the perfect lever for a technocratic integration of climate change based on expert and neutralizing risk metrics rather than on overtly discretionary promotional narratives that threatened to repoliticize monetary interventions. However, chapter III also showed that within a given institutional framework, the contours of green central banking are never definitively fixed. Bureaucratic struggles between divergent interpretations of the mandate and antagonistic visions of the right strategy to ensure the legitimacy of the central bank can allow more promotional agendas to advance within the central bank.

Chapter IV shifted the focus on how central banks communicate around these issues world-wide. It allowed to highlighted the multitude of ways in which the climate challenge have been addressed and discussed by central bankers, sometimes several years before financial risk-based narratives emerged. This work also led to highlight once again the relevance of the analytical distinction proposed between the two main

possible approaches to green central banking (prudential and promotional), as well as the robustness of institutional factors in explaining its heterogeneous distribution. Different varieties of (financialized) capitalism, with different monetary regime arrangements and climate vulnerabilities lead to different rationales and justifications from central bankers regarding their integration of climate-related dynamics. The variety of central bank legitimization strategies can only be grasped as a function of the structures in which they are embedded.

Research Question 4 *What should be the central banking model of the 21stcentury?*

If the normative question of the 'right' model of central banking to face the climate crisis was never at the center of the thesis, the institutional framework centered around central bank independence appears to suffer from important flaws. In contrast, the models of interventionist central banks coordinated with their political authorities - reminiscent of the outlived post-war models of western European countries - appears as paradoxically better equipped to deal with the challenges of modern central banking. Thus, it is no coincidence if our chapter IV demonstrated that the first central banks to seriously consider the issue of climate change were located in countries where financial governance is not cut off from politics.

Chapter V developed this idea further by showing the contradictions and dead ends of the current central banking setting and discussing the forces pushing for its overcoming. Heightened contestation over increasingly overtly distributive interventions, growing challenges to ensure price and financial stability in the face of new dynamics, and increasing internal struggles to promote greater coordination with political authorities all contribute to questioning the sustainability of the current situation. Again, if institutional arrangement go a long way in explaining varieties of green central banking, the climate crisis could in turn be a driver of institutional change in the monetary regime. The CBI framework, like its predecessors, is a contingent institutional arrangement that will only last until it can no longer accommodate its internal contradictions.

1.2 On our title

Beyond these four research questions, the title of our thesis wondered: *are central banks moving from price stability to climate stabilization?* The answer, as is often the case in social sciences, is quite simply that it depends. It depends on a variety of (political economy) factors, leading to very different shades and degrees of green central banking interventions, obeying to very different logics and objectives. In the end, only a subset of these new interventions could indeed be understood as a counter-movement of re-embedding capital claims within planetary limits. The rest remain *central banking as usual* practices that instrumentally translate and re-interpret external developments such as climate-dynamics as exogenous shocks having consequences on the intrinsic objectives of financial and monetary stability.

Our subtitle, for its part, may have seemed to herald the enunciation of a general political economy theory of green central banking. Instead, we may have disappointed by offering a disparate collection of independent chapters exploring different explanatory avenues, on various institutions, in varying time frames, with materials, methods and research questions ranging from the most macro-institutional (i.e. varieties of capitalism) to the most micro-organizational (i.e. bureaucratic struggles). Although we hope that an overall coherence has emerged from this thesis, despite its patchwork character, we propose in this conclusion to go beyond the traditional thematic summary provided above, and to spell out a brief but articulated *political economy (account) of green central banking* to answer two questions: (i) what are the drivers of green central banking? and (ii) what are its consequences?

In doing so, we do not aim to provide a complete, polished and ready-made theoretical framework that could be applied 'as is' for future research. Instead, the primary interest of the next sections will be in exposing the theoretical links that sometimes remained implicit but have nonetheless permeated this manuscript. This will hopefully facilitate an open critical discussion of the blind spots of this essay, that will need to be addressed by future research. Delivering a 'definitive book' (Becker, 2004, p129) on a subject is probably not the purpose of a PhD thesis anyway, which is at least as much about training, learning and improving in the

process of research as it is about advancing the frontier of knowledge. This doctoral research only represents a first step in a research program that will hopefully extend, and therefore can only present tentative conclusions. With this background in mind - and hoping that it does not sound too much like a cry for mercy from the reader - the main purpose of this chapter will be of *getting this thesis out the door*. Having done so, the ideas it contains will be formally launched into scholarly debate, calling for future work to discuss, critique, and relate to its arguments to advance the collective understanding of green central banking.

2 The political economy drivers of green central banking

Throughout this thesis, we have emphasized that green central banking encompasses a wide variety of practices and objectives under one umbrella. In an attempt to explain what might cause this diversity, we have looked at different factors on different scales, from global macro-social developments to micro-organizational and ideological struggles. In this section, we attempt to present a synthesis of how these different political economy drivers can diffract the integration of climate change by central bankers into such a diverse set of green central banking practices. To do so, we not only rely on previous chapters, but also leverage the recent work of other scholars in order to propose a panorama of sometimes conflicting, but often complementary accounts of what may drive this phenomenon. Although factors are presented separately and in turn according to a macro- to micro- order, they obviously intertwine, combine and hybridize, reinforcing or offsetting each other.

2.1 The macro-drivers: vulnerability and awareness to climate dynamics in heterogeneous financial systems

The first drivers of green central banking are macro-level factors within a country. We highlight three of them: objective vulnerability to climate dynamics, level of attention to these dynamics, and characteristics of the financial system.

First, the type and extent of exposure to climate-related dynamics is likely to influence the timing and nature of green central banking developments. While climate change is a global phenomenon, and while the low-carbon transition will need to be world-wide to enable stabilization within planetary limits, both these phenomena will nonetheless have very heterogeneous impacts on populations, territories, and economies. On the one hand, countries that will be more affected by the *direct and physical impacts* of climate change, whether in terms of aridification, rising sea levels or the increased frequency and violence of natural disasters are more likely to engage with climate-related issues, both in general and in promotional terms. This is especially the case for Global South (or 'periphery') countries that are characterized by resource-based economies with a high proportion of economic activity in vulnerable sectors such as agriculture, and by low quality infrastructure, making them particularly fragile, both economically and humanely. This vulnerability forces them in seizing any policy lever available to try to mitigate and adapt to climate change physical impacts on their economy. This factor may explain why Bangladesh, India, Indonesia, and many sub-Saharan African countries were early movers to incorporate climate change and environmental concerns in both their central bank policies (chapter II) and communication (chapter IV), whereas Global North countries with less climate vulnerabilities have been laggards.

On the other hand, countries that will be mostly affected by the indirect effects of climate change due to the *transition to a low-carbon economy* stranding entire chunks of their economy may enter later in the green central banking debate, as transition impacts are unfortunately still largely fictional and forward-looking, leading to a delayed identification by policymakers. Besides, they may embrace a more prudential perspective. The re-embedding of human activity within planetary boundaries is likely to impact Global North hardest, as their domestic investors, businesses and consumers largely profit from the off-shoring a large proportion of emissions abroad and have the most to lose from the stranding of carbon-locked value chains. This factor helps understand the puzzle raised at the beginning of this manuscript. If the rise of the climate change issue in financial circles and European central banks was based first on the issue of stranded assets and the carbon bubble

(i.e. on transition risks) and not on the physical consequences of climate change, it is precisely because the former was seen as a closer threat to Western financial systems.

This leads us to the second macro-level factor that we want to highlight, which is the level of attention and awareness to climate dynamics. Indeed, although objective vulnerabilities do matter, they do not directly affect central banks, but are instead mediated by ideas, representations and political priorities, according to transmission channels that vary according to institutional contexts (see next section). Therefore, for the same degree of exposure to transition or physical risk, some countries and jurisdictions may attach more weight and importance to sustainability and climate issues than others, which will have an impact on central banks' attention in this area. Let us give three examples. First, the Federal Reserve has been very slow to take climate-related issues seriously, and remains far behind in green central banking practices, despite its similar vulnerability to climate-related dynamics to European countries. This can probably be explained by a low level of attention and political consensus on such issues, as argued by (Kupzok, 2022; Van Doorslaer et al., 2022). President Trump withdrew the USA from the Paris Agreement in 2017, and still today, the strong resistance from the Republican camp to the roll-out of the IRA and its climate policy package marks a strong difference from European policymaking. Second, that Mark Carney's reversal on the materiality of climate-related financial risks took place at the same time as COP21 and the high level of attention and consensus that it helped to impose (see chapter chapter I) is probably no coincidence. In fact, during interviews with financial actors and central bankers conducted throughout this thesis, the Paris agreement was often cited as one of the key levers for mainstreaming the environmental issue, giving it the heightened visibility it needed to finally reach financial circles that had been reluctant to take an interest. Third, this factor may contribute to account for De Nederlandsche Bank 'unexpected climate activism' (Siderius, 2022). Despite its reputation as one of the most conservative central banks in Europe, the central bank of Netherlands has indeed been one of the first movers in the second wave of green central banking. We argue that this may very well be due to its elevated objective vulnerability

to physical (flooding) risks as well as the countries elevated attention and level of political consensus around this issue.

The third macro-level factor relates to the characteristics of the financial system as well as the degree of infrastructural entanglement between central banks and financial markets. Since a country's financial system is not necessarily exposed to the same risks as its real economy, the characteristics of the former will have an impact on the degree and type of greening pursued by its policymakers in general, and by its central bank in particular. Besides, the characteristics of the financial system (e.g. market or bank-based) will also influence the instrument design of green central banking policies, relying on very different transmission mechanisms. Both these features lead to different incentives regarding green central banking implementation. On the one hand, hypertrophied and highly interconnected financial systems in high-income countries represent a clear push to implement prudential risk-oriented policies. This is for two reasons. First, simply because their sheer size and interconnectedness amplifies the risks and costs of a 'Climate Minsky moment' or a 'Green swan', i.e. a climate-related financial crisis, while a growing number of central banks have responsibilities for the supervision of the financial system. Second, because the infrastructural entanglement between central banks and developed financial markets is likely to matter, with the former needing the well-functioning of the latter to deliver on other objectives such as price-stability (Braun, 2020; Walter & Wansleben, 2020; Wansleben, 2022). As monetary policy operations in financialized economies are now increasingly delivered through direct market interventions, significant chunks of central banks' portfolios are directly invested in financial assets which forces them to try to better assess their relative risk profiles. In contrast, central banks in low-income countries in South-East Asia or sub-Saharan Africa in which financial functions are performed by small, highly banked and domestically oriented financial sectors are less likely to be concerned with climate-related *financial* risks and its systemic repercussions, and more likely to be concerned with the direct *economic* impacts of climate change, which will have much more direct and material implications on their missions. More generally, smaller and more tightly regulated financial systems in which central banks benefit from more control on credit dy-

namics and in which infrastructural entanglements are less prominent will put less pressure on central banks to develop prudential risk-based policies, simply because instability is both less likely and less critical to achieve their other objectives.

2.2 The meso-drivers: legitimacy and reputation in variegated institutional frameworks

Central banks are not only immersed in very different macro-financial contexts, but also do not enjoy the same room for action to incorporate climate change. As this section will argue, the institutional setting in which they operate exposes them to different incentives and constraints. As a result, their reputation and legitimacy cannot be pursued in the same way.

One of the main arguments put forward throughout this thesis is that the type of governance of the financial system and the institutional arrangement surrounding central banks actions are crucial factors to explain the variety of green central banking practices. Two broad models of financial governance can be identified, organized around very different institutional arrangements. On the one hand, high-income 'developed' countries - or 'liberal market economies' (Hall & Soskice, 2001) – rely on a market-fixing, technical and neoliberal model of financial governance. Direct interventions by the State to steer credit dynamics and capital flows are limited, as distributive policies are considered to belong to 'real sphere' interventions (e.g. through taxes of certain sectors or subsidies of technologies). It follows that the 'financial sphere' is managed in isolation, with targeted and parsimonious market-establishing and market-fixing policies to create a level playing field, leaving the final allocation of capital as unconstrained as possible. Indeed, competition between private profit-seeking agents is considered the most efficient way to allocate scarce resources (due inter alia to the market efficiency hypothesis), and policymakers aim to minimize or even eliminate any distributive interventions that would introduce unwelcome 'distortions' from market allocation. In this type of financial governance arrangements, central banks have increasingly neutralized the distributive impacts of their monetary policy operations by abandoning their credit control policies in favor

of open market operations. They endorsed inflation targeting, and gained greater independence from their political counterparts, supposed to further protect them from any temptation of (re)deploying far-reaching distributive interventions (see chapter V). This type of financial governance and related institutional arrangements calls for an instrumental, defensive integration of climate change, following that we have proposed to label a 'prudential' approach. Instrumental, because climate-related dynamics only matter for the central bank insofar as they impact on the financial and monetary sphere and the intrinsic objectives associated with it (financial and price stability). Defensive, because the central bank must react to these dynamics considered as exogenous rather than trying to influence them through active steering financial policies. Prudential, because the rationales for action all boil down from the translation of climate-related dynamics as a source of financial risk, granting central banks with supervisory responsibilities and monetary portfolios the legitimacy to tackle the issue.

In contrast, low-income 'developing' countries - or coordinated market economies (Hall & Soskice, 2001) - are characterized by a more proactive, voluntarist and developmental mode of financial governance. Finance is not thought of as an autonomous sphere in which distributive state-interventions should be discarded in favor of market allocation mechanisms. On the contrary, direct interventions on capital flows and credit are part of the standard governance of the economy, being utilized to attain developmental and sectoral policy objectives. This view is reflected in institutional arrangements, where central banks have a much lower level of independence from their political authorities and broader mandates to support the (potentially environmental) objectives of their governments. Thus, central banks are actively involved in non-market coordination. This type of institutional arrangement encourages the integration of climate change beyond a prudential perspective, following more extrinsic and proactive objectives that we have proposed to label a 'promotional' approach. Extrinsic, because climate dynamics are not understood solely in an instrumental way, through the prism of their impacts on the financial sphere, but also for themselves. Proactive, because these dynamics are not understood as being exogenous to the financial sphere, but as being in large part endogenous to capital allocation

decisions. Promotional, because the active reorientation of capital flows then takes the form of interventions to promote the low-carbon transition, facilitating climate mitigation and adaptation. In sum, whereas the institutional frameworks of high-income countries with highly independent central banks lead them to spontaneously address the climate finance nexus through the prism of simple materiality, less independent central banks with broader development objectives integrate both ends of dual materiality.

How does these institutional features 'translate' into practices? If institutional frameworks matter, it's because it grants central banks with different incentives and constraints to ensure their *legitimacy* as institutions. On the one hand, central banks in which the institutional framework confers on them a distributive role in financial governance enjoy more room for maneuver and fewer dilemmas - in short, they have it easier. They can readily conciliate their input legitimacy (i.e. the legitimacy they derive from respecting their mandate and the institutional boundaries set for them by the political authorities) with their output legitimacy (i.e. the legitimacy they derive from achieving their objectives), since their mandate de facto obliges them to support the (environmental) objectives of their political authorities. In contrast, independent central banks with narrow mandates are to a large extent faced with a trade-off. Indeed, strictly respecting the constraints of their mandate by limiting themselves to a minimal integration of climate dynamics in order to ensure maximum input legitimacy paradoxically risks condemning them to fail in the long term to achieve financial and price stability on which their output legitimacy is based (see chapter II).

A similar point can be made by mobilizing a framework centered around the *reputation* of organizations, as developed by Carpenter (2010) and adapted to green central banking issues by Van Doorslaer et al. (2022). In the case of independent depoliticized central banks, the pursuit of one type of reputation (e.g. legal-procedural reputation: *is the central bank doing what it is legally mandated to do?*) may sometimes conflict with the pursuit of another type of reputation (e.g. moral reputation: *is the central bank doing what is right?*). Thus, the institutional framework provides central banks with constraints - and therefore associated operating margins -

of varying degrees to integrate climate change into actions. Above all, it forces these institutions, particularly in high-income countries, to make trade-offs with regard to the type of legitimacy and reputation they wish to pursue, as the institutional framework puts them 'between a rock and a hard place' (Dietsch et al., 2022).

2.3 Micro-perspective: bureaucratic struggles and the instrumentalization of external pressures

Faced with a macroeconomic context (objective and subjective vulnerabilities to climate change and characteristics of the financial system) and institutional constraints (mandates and role in financial governance) that are beyond their control, central banks still retain some agency. In order to understand how central banks leverage this agency, one has to open the 'black box' of central banks as organizations. This leads to highlight two points. First, that the contours of a central bank's practices and the boundaries of what it can do are never definitively and precisely circumscribed *ex ante* but arise from internal bureaucratic struggles between competing understanding of how legitimacy and reputation should be achieved. Second, that even highly independent central banks are not completely impervious to external pressures, which are strategically leveraged by insiders to push alternative agendas.

Indeed, although the above arguments on the importance of the institutional framework and the differentiated room for maneuver granted by central banks' mandates are crucial, they are not sufficient to provide precise and definitive guidelines regarding an issue as specific as climate change. Central bank mandates always remain partly underdetermined, even for highly independent central banks whose power needs to be restricted. This is a feature, not a bug: an incompressible level of vagueness is necessary to allow central banks to react to transformations, developments or crises that had not been foreseen when their mandate was written. It follows that mandates have to be interpreted by central bankers, and that this interpretation is subject to conflict and controversy. Therefore, the type of climate-related policies will depend on how factions within central banks interpret these

boundaries, interpret the role their institution should play in financial governance, and what strategy they believe will best ensure their legitimacy and reputation as an organization.

Thus, the same set of macro- and meso- factors can lead to very different outcomes in terms of green central banking, depending on the state of the internal balance of power between supporters of a purely prudential integration of climate change, putting emphasis on input legitimacy (as well as legal-procedural and technical reputations), versus central bankers with a broader understanding of their mandate, valuing more output legitimacy (as well as moral and performative reputations) the most. In the same way that the mainstream political economy literature has long established the distinction between central bankers advocating for a maximalist understanding of the primacy of price stability ('hawks') and central bankers giving more weight to growth and employment considerations ('doves'), we argued in this thesis that there are also climate-doves and climate-hawks. It follows that the *appointment* of new central bankers can have a very significant impact on the greening trajectory of a central bank, even if the formal delegation has not changed and the vulnerabilities related to climate dynamics have remained the same. This was particularly visible in the case of Lagarde, Schnabel and Elderson for the ECB (see chapter III). In addition to mechanically shifting the balance of power within the decision-making body, new appointments also allow climate-related issues to be advanced throughout the organization. Indeed, new *leadership* can help integrate climate concerns into the daily and usual practices of the central bank, both vertically (at all hierarchical levels) and horizontally (within the different departments, from monetary policy and risk management to legal affairs, etc.). Thus, even after the departure of these 'climate-doves' governors, there will remain a trace of their passage in the bureaucratic practices and sedimented routines, entrenching further the issue of climate change within the institution.

The second important observation is that bureaucratic struggle does not develop in a bubble. Although highly independent, central banks are not completely hermetic organizations. There are channels through which external pressures can produce internal effects (*persuasion*), and interfaces through which internal strug-

gles can find external relays. The role of these external-internal interactions should not be underestimated, as they can have very important repercussions by providing argumentative resources and greater clout to certain internal actors, thus modifying the state of the internal balance of power. In this thesis, we have highlighted interactions with three important types of actors. First, an important source of pressure comes from academic, think tank and NGOs. As we have seen, these were key to translate the issue of the low-carbon transition into a macroprudential issue thanks to the idea of stranded assets (see chapter I as well as Kupzok, 2022 and Quorning, 2023), or to pressure central banks such as the ECB or the Bank of England into accounting for the carbon content of their monetary policy portfolios (see chapter III and chapter V). Second, political authorities' demands have also proven to be key factors in mainstreaming climate change within Western central banks. From official opinion requests to repeated demands in accountability forums, political demands have had more impact than generally admitted (see chapter III and Massoc, 2022). Last, peer pressure from other central banking institutions has probably been a crucial factor in legitimizing the fast climate shift in laggard institutions after 2015 (see chapter III and chapter IV). The rise of the NGFS, the desire to fit in and the fear of losing symbolic capital in the epistemic community of central bankers by falling behind the new frontier of contemporary central banking debates probably deserves future research.[1]

These pressures don't have any actual intrinsic power in pushing independent central banks actions into one direction or another. If they succeed to alter internal decision making, it's only because outsiders' pressures and requests are strategically leveraged by insiders in order to advance their preferred agenda. Although we have during this thesis put the accent on how climate doves have instrumentalized progressive requests for more climate action, climate hawks also do instrumentalize (different sorts of) external pressures, such as the legal litigation threats from German and European courts, or the conservative concerns of right-wing members of the European parliament to resist further promotional action. Future research

[1] I call dibs on the title 'Laggards on Lagarde'.

could therefore try to explore the strategies of climate-hawks to successfully stall progressive policy changes in climate laggards central banks, as most of the literature has so far focused on the strategies of climate-doves (Deyris, 2023; Massoc, 2022; Quorning, 2023; Siderius, 2022).

3 The political economy consequences of green central banking

Having reviewed the political economy drivers of green central banking, and highlighted how these variegated factors lead to a wide range of actual policy developments, we now turn to its political economy consequences.

3.1 The climate crisis as a driver of institutional change

As argued as early as chapter 2, the climate crisis may be a driver of institutional change. It is too soon to know to what extent this may unfold into a new mode of regulation with some central banks taking on political and environmental goals, or if this will only be a 'thermostatic' shift (DiLeo, 2023) with these independent institutions sticking to an instrumental incorporation of climate-related issues to go on *central banking as usual*. One of the insights of *Régulation* Theory is that such questions are better answered ex post, once the game of path dependence and institutional bricolage has been played out (Boyer, 2015).

That said, such an extension of central banks' functions, which may appear at first sight as farfetched, is not entirely unreasonable given historical precedents. If central banks are today more independent from their political counterparts, this should not make us forget that they remain an integral part of public power. As recalled by Monnet (2021a), the mid-20th century nationalization of central banks led on these institutions to take on important roles within the 'welfare state', re-embedding in a Polanyian sense the fictious commodity of money in the social and political spheres. In the French context, one needs to remember that credit policy instruments could be deployed 'for purposes of monetary policy (attempting to

limit the credit level through better allocation), industrial or social policy (helping key economic sectors), budgetary policy (giving priority to government financing), trade policy (favoring credit for exporting sectors), capital controls (favoring domestic loans), financial stability (preventing an excess of credit that is potentially disconnected from real activity in particular sectors) and so on' (Monnet, 2018, p3). Today, the gap between the financial ante-validation provided by profit-seeking private actors and the achievement of climate goals calls for a separate, but similar, re-embedding movement to address the inability of free (financial) market forces to manage the fictitious commodity that is nature. It is therefore not unreasonable to imagine a regime in which central banks would act to reduce the misalignment between financial allocation and climate or environmental objectives.

However, we must avoid both (normative) wishful thinking and (positive) functionalism. Central banks will not re-embed finance within planetary limits just because this would be *nice* from a climate stability nor from an accumulation regime perspective. To put it differently, trust in technocratic environmental epiphany cannot be a relevant policy strategy for dealing with the climate emergency.

First, the conservatism of these institutions should not be underestimated. Institutional structures are in general strongly path-dependent, making paradigmatic shifts difficult. Such inertia lies in the very definition of institutions – what are they but sedimented practices? – and is what allows them to hold on through time. Central banks, perhaps more than other institutions, are particularly prone to these *status quo* tendencies, not least because they must operate within the legal confines of vague and unchanging mandate, which often lead to the erection of wariness as a cardinal value. Hence, most central bankers are - reasonably so - reluctant to go beyond a prudential understanding of their own role regarding climate change, as this implies considerable risk for little institutional reward. In fact, our focus on the activism of a few European climate-doves should not obscure that globally many central banks with significant clout (e.g. the Federal Reserve) have not shown any sign of interest in supporting the transition – and have sometimes even explicitly denied the very relevance of climate-related risks narratives. Central bankers are not charitable do-gooders but are egoist agents searching to ensure their legitimacy

and reputation according to the incentives laid out in their institutional framework, aiming at preserving their independence and operational autonomy. This also implies that, even in the most 'climate woke' central banks, [2] attention to climate issues may remain talk without action (Tesche, 2023), and more generally prove to be a convenient and temporary diversion from their difficulties in achieving their other objectives (Moschella et al., 2020).

If actual ambitious promotional efforts are to be deployed, the incentive framework surrounding central bankers will have to change. This can be done either by modifying their mandates [3] and objectives in an explicit way, or by increasing reputational challenges and political contestation to implicitly shift the risk and reward profiles of climate neglect strategies. Indeed, even independent central bankers cannot be totally deaf to the social and political pressures in order to retain legitimacy and safeguard their autonomy in the long run. Therefore, the building of an hegemonic social block in favor of pursuing climate stabilization through financial means appears ultimately as the only way to ensure ambitious and proactive promotional action from central banks, whether they remain formally independent or get re-embedded themselves in the political sphere (see Amable and Palombarini, 2005, 2009 on the neorealist approach of social blocks in general, Simon Baudraz forthcoming thesis for an application of this theory to green central banking issues).

What is certain is that engaging in promotional green central banking amounts to taking a stand in the 'contest between owners of assets that accelerate climate change, such as fossil fuel plants, and owners of assets vulnerable to climate change, such as coastal property between the owners of assets causing climate change and those who are its victims' (Colgan et al., 2021). For this reason, it seems difficult to imagine such a change in objectives and practices that is not part of a broader institutional change to ground it with more input legitimacy and democratic political

[2] Here, we ironically refer to the words of MEP Gunnar Beck (ID), who asked whether the ECB was 'masking its failure as a central bank by diverting public attention from its mandate to issues such as gender mainstreaming and climate awareness' in a letter entitled 'Woke ECB' (see letter Z-000039/2021).

[3] As noted in chapter IV, this has actually already happened. The Bank of England has been given formal mission to incorporate climate change in its monetary policy in 2021, while the mandate of the Magyar Nemzeti Bank (the Central Bank of Hungary) has been changed the same year to incorporate the promotion of environmental sustainability in its statutory objectives.

backing. Ecological economists argue that the economic sphere is not only embedded in the social sphere (as in the Polanyian perspective), but that the social is itself embedded in the natural sphere. Following a similar logic of imbrication, it seems reasonable to argue that central bank led re-embedding of finance into planetary boundaries will only be possible if central banks are first themselves re-embedded into the political and social spheres.

3.2 The climate stabilization potential of promotional policies

> 'The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.'
>
> (Hans-Otto Pörtner,[4] 2022)

What about the consequences of green central banking for the decarbonization pathways and climate stabilization? Can promotional interventions actually make any difference? A first caveat is that no matter their scale, climate-related financial policies will not be sufficient, and that 'real sphere' interventions will be needed. On the one hand, large scale economic policies to support the phase-in of new sustainable capital will be important to mainstream and develop 'sunrise' industries, from massive public investments in renewable energies, building isolation and public transportation infrastructures. On the other, far-reaching policies will be needed to downscale for good 'sunset' industries, from imposing carbon quotas or taxes to regulating on pollution and banning certain technologies and activities (On 'sunrise' vs 'sunset' industries, building from the work of Carlota Perez, see Semieniuk et al., 2021).

That said, there is growing recognition that the most efficient and appreciated Pigouvian instruments, such as carbon pricing, will not be sufficient. Faced with

[4]Co-chair of the IPCC working group on climate mitigation and adaptation. Quote from the February 28 2022 press release of the 'Climate Change 2022: Impacts, Adaptation and Vulnerability' report

radical uncertainty, tipping points and positive retroaction loops, climate mitigation policies may have to aim at *satisficing* options (rather than *optimum* first best policies), following a principle of precaution. Policymakers may need to rest climate action on a plurality of instruments in all climate-relevant policy sectors in order to deliver on the low carbon transition, drawing not only from neo-classical insights (carbon pricing and subsidies) but also factoring in (post)Keynesian and (post)Schumpeterian insights (Meckling and Allan, 2020). This implies harnessing a 'money view' of the low-carbon transition, as argued in chapter I.

Indeed, promotional financial policies, for all their shortcomings - and the undisputed need to mobilize them in tandem with other types of interventions – offer interesting characteristics for securing the transition to a low-carbon economy. First, because they target financial investments, they allow to tackle carbon intensive capital before it is built. This not only reduces the overall costs of the transition by minimizing the stock of assets to be stranded, but also facilitates the political acceptability of the transition by avoiding further carbon lock-in. In short, such policies allows to act preventively and proactively against the creation of new stranded assets, in the same fashion as macroprudential policy can 'lean against the wind' in the boom phases of the financial cycle.

Second, promotional financial policies allow for extra-territorial reach. If a policymaker wants to achieve climate targets, then the location of emissions do not matter, as climate change is a global externality. Therefore, countries that do not emit large quantities of CO_2 at the national level, but whose financial actors have strong offshore financial power, can benefit from unsuspected policy levers to curb global emissions, while avoiding regulatory arbitrage by their own national entities. Indeed, research indicates that banks simply increase their cross-border lending abroad in carbon-intensive activities when stringent climate policy is implemented in their home country (Benincasa et al., 2022; Laeven & Popov, 2022).

Last, promotional financial policies are a lever for climate justice. As already discussed at the beginning of this essay, carbon intensive capital claims are predominantly held by final investors from high income Global North countries that already benefited historically from the biggest share of the carbon budget (Semieniuk et al.,

2022). Tackling the ability of advanced economies with low domestic emissions to benefit from carbon-backed securities abroad would be a way to foster a just transition. This would end the current hypocrisy of requesting the Global South to reduce their emissions, while simultaneously providing the financial underpinnings for these activities as well as profiting from them.

That said, future work is needed to trace the contours of what contemporary green credit guidance and carbon-intensive financial repression may look like to effectively help reaching climate objectives. Drawing from past experiences in European credit guidance as well as current climate-related financial policies from climate-activist central banks in South-East Asia, a few broad principles can nonetheless be laid out to close this thesis.

First, better information is needed, but policymakers should not wait for the perfect data to act. For too long, data availability has been put forward as an excuse to delay action. To break this deadlock, the shift to politically and democratically backed promotional policies will be crucial. This will circumvent the need to achieve perfect information and escape the impossible design of neutral and optimal policies currently sought by technocrats seeking to avoid making overt distributional decisions that would subject them to political contestation. This shouldn't stop policymakers from doubling down on both disclosure and transparency efforts as well as research and expertise to treat this information. The point is only that data and informational policies are a necessary tool, but a non-sufficient one. There is a certain amount of magical thinking in the idea that transparency and awareness around transition risks will be performative enough to shift financial decisions on a Paris-compatible transition pathway. Self-fulfilling prophecies alone cannot produce such an outcome, and effective promotional policymaking will require active distributional interventions, ranging from incentives to coercive measures.

Second, the current misconception that promotional policies can focus solely on supporting the development of green activities must be challenged. The fact that prudential policies addressing transition risks have the positive consequence of making carbon-based activities more difficult to finance is a welcome feature. But this should not prevent policymakers from designing promotional policies aimed at

curbing the new financing of carbon-intensive activities incompatible with climate objectives, as discussed in chapter I. Banque de France credit guidance of the *Trente Glorieuses* (Monnet, 2018), as well as People's Bank of China current environmental credit guidance policies (C. Zhang & Zhou, 2023) both exemplify this point. These policies did (or do) not aim only at only facilitating the financing of what are considered by political authorities as productive sectors or green activities (a 'carrot' approach). They also seek to actively discourage and control the volumes of credit judged to be unproductive or excessively dirty (a 'stick' approach). While prudential policies must ensure a smooth and well-anticipated devaluation of the total *stock* of carbon assets to avoid a climate crisis, repressive promotional policies can focus on new financing *flows* only. In doing so, repressive promotional policies can and should be much stricter, for example by requiring that all new funding for fossil fuel extraction projects be financed without any leverage, by limiting their number or by banning certain types of project financing altogether. Climate goals will not be met through accelerated phase-in, which could end up in energy addition rather than energy transition. What is needed is accelerated phase-out, and that's why policymakers need to start thinking seriously about how to effectively design and develop 'repressive' promotional policies.

Third, these repressive promotional interventions can only be effective if they are deployed as a coherent set, targeted at all types of financial actors to avoid regulatory arbitrage. Otherwise, the risk is simply to shift the financing of the most polluting projects to shadow banking, i.e. to entities that are not (or hardly) regulated and that will continue to finance carbon emissions while evading the regulators' oversight. Without a carefully designed package of policies, policymakers could end up with the worst of both worlds: exacerbated climate-induced financial instability without carbon finance reduction. This implies to decenter regulatory and policy action by not only targeting 'legacy actors' such as banks and insurance companies (O'Connell & Elliott, 2023), but also be mindful of new nodes of power in the contemporary financial industry. This includes inter alia exchanges (Petry, 2020b, 2021), index providers (Petry et al., 2021; Robertson, 2019) and asset managers (Braun, 2016a, 2021a; Fichtner et al., 2017) that all benefit from strong (infra-)structural power

due to their strategic position in the investment chain, that could be leveraged in order to help facilitate the low-carbon transition. Of course, a perfect policy design that would effectively manage to halt fossil fuel funding without financial 'carbon leakage' will never quite be met. We know from Minsky that financial innovation always finds ways to circumvent regulations that attempt to limit private risk taking. But this should not be used as an excuse for inaction. Given the state of the climate emergency, even an imperfect reduction in the flow of fossil finance would be a welcome one.

Last, history of past socio-technical transition stress the need for a careful thinking around compensations. In order to accelerate the low-carbon transition and discard stranded assets in time, policymakers need to have a clear view of the political economy choice they want to defend, acknowledging the trade off it entails. On the one hand, full or partial compensation could be proposed to the owners of (financial) stranded assets, provided that carefully designed conditionality are added to prevent further financing of projects incompatible with the climate targets. These policies could take the form of a 'climate bad bank', a policy solution that has received little attention in the literature to date, but which benefits from a wealth of experience in the past, providing valuable insights into how best to design them (Daumas & Salin, 2021). This appears as an effective way to speed up the transition by lifting the political economy blockage, while ensuring financial stability. But it also means socializing the losses of investors that willingly profited from climate destruction. On the other hand, policymakers may want the transition risk losses to be, at least partially, assumed by the final holders of carbon intensive claims.

An alternative way of dealing with the losses generated by the low-carbon transition would be through (controlled) inflation. This is a particular type of socialization of losses that consists in transforming the validation crisis of stranded assets by extending their private costs both over time and between agents, through what regulationnists and marxists of money refer to as 'pseudo-validation' (Aglietta, 1976; De Brunhoff & Cartelier, 1974). In addition to potentially smoothing out the costs of the transition, this way of dealing with the *phase-out* losses has also important co-benefits regarding the *phase-in* dynamic. Indeed, the current regime of low-inflation

growth supported by independent central banks raising interest rates when inflation exceeds two percent may not be appropriate for the low-carbon transition. A significant share of the necessary investments in renewable energies, housing insulation, public transport and infrastructures are characterized by high upfront costs and long term benefits. This implies that such investments are highly vulnerable to increases in interest rates. Thus, the title of our thesis - from price stability to climate stabilization - may in fact involve a policy trade-off, as the latter appears at odds with a maximalist interpretation of the former. This choice can only be made democratically, and one cannot expect everything from central banks. These institutions remain, whether they like it or not, tied to their current mandate. But even if this inflation pseudo-validation route is not taken, a discussion on how to deal with the consequences of the *phase out* dynamic must take place preemptively. Otherwise, central banks will have to make this decision on their own, amidst the threat of 'climate Minsky moment', and the solution will undoubtedly be one of maximalist and ex post socialization of losses.

Harnessing finance to accelerate the low carbon transition represents a daunting tasks, and central banks should not, can not and will not do it alone. Any meaningful promotional action need to be backed by political decisions, as it is not far from a technocratic and 'neutral' issue. Leaving central banks remain 'the only game in town' in the face of 21^{st} century challenge with outdated mandates and constant threats to the legitimacy of their interventions is bound to be ineffective. A democratic discussion must take place to redefine the role of central banks in relation to political authorities, and more broadly to rethink the boundary between the State and the market in the management of the low-carbon transition. We hope that this thesis has contributed to shedding light on this issue, and that a large body of future research will complement, pursue and engage with its findings to reach a better collective understanding of green central banking.

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Appendix

A.1 Appendix for chapter III

1.1 Collecting and identifying relevant ECB material

In this chapter, we rely on ECB speeches, ECB letters and Monetary Hearings, retrieved from different sources.

For speeches, we rely on the speech database provided by the ECB (2019), downloaded in early January 2022, that contains all speeches by members of the ECB's Executive Board from its inception until 31 December 2021, for a total of 2,633 speeches. For letters, we web-scrapped the website of the European Parliament for questions, and the website of the European Central Bank for answers, for a total of 881 letters. For Monetary Hearings, we gathered the 111 opening statements of the ECB President from the European Central Bank website, and the transcripts of the Q&A from the European Parliament website.

Then, we cleaned and pre-processed the different corpus. We first remove punctuation, stop words (words that are very frequent and don't convey meaning, such as 'the', 'a', etc.), and then stemmatize words, keeping only the root of the word. This allows us to avoid missing words derived from those we are interested in ('climatic', or 'inflationary' for example).

Using a dictionary approach, we then search in the corpus the speeches, letters and questions that mention the word-stems 'climat-', 'sustain-', 'carbon-', 'green-', or 'fossil-' at least once. We then manually remove false positives (e.g. 'economic climate', 'political climate', 'sustainable market conditions', etc.). This leaves us with 108 climate-related speeches, 21 letters, and 32 Monetary Hearing questions.

1.2 Qualitative coding

All identified material was then carefully read, and a second formal step was undertaken to provide figures summarizing the evolution of stances in speeches. To do so, qualitative variables were coded manually for each speech by answering those questions:

1. Is climate change presented as a direct problem for central bank missions, or only in general terms? If so, does the speaker mention financial stability, price stability or both?
2. Is the ECB's mandate explicitly mentioned? If so, is it only the primary mandate or also the secondary mandate?
3. What are the possible policy instruments mentioned by the ECB to meet this climate challenge?

Coding was done independently by two people, the author and a research intern, and then compared to reduce the subjectivity of the exercise. The database of the 108 speeches enriched with these qualitative variables is available from the author upon request.

A.2 Appendix for chapter IV

2.1 Details on the composition of the dataset

Table VI.1 – Summary of the data-sources

Region and/or Country name	Total	BIS	Non-BIS	English	Non-English
Western Offshoots	**6037**	**3277**	**2760**	**6037**	**0**
Australia	591	511	80	591	0
Canada	621	521	100	621	0
New Zealand	244	184	60	244	0
United States of America	4581	2061	2520	4581	0
| Board of Governors of the Fed	1823	1556	267	1823	0
| Fed of San Francisco	267	3	264	267	0
| Fed of Atlanta	240	2	238	240	0
| Fed of Chicago	208	10	198	208	0
| Fed of Philadelphia	208	32	176	208	0
| Fed of Boston	219	5	214	219	0
| Fed of Dallas	176	19	157	176	0
| Fed of St Louis	136	0	136	136	0
| Fed of Cleveland	184	0	184	184	0
| Fed of Kansas City	160	18	142	160	0
| Fed of Minneapolis	157	23	134	157	0
| Fed of New York	564	391	173	564	0
| Fed of Richmond	239	2	237	239	0
Latin America and Caribbeans	**1580**	**530**	**1050**	**1041**	**539**
Aruba	18	1	17	16	2
Argentina	55	34	21	55	0
Bahamas	31	17	14	31	0
Belize	7	1	6	7	0
Bolivia	1	1	0	1	0
Brazil	27	11	16	27	0
Barbados	159	89	70	159	0
Cayman Islands	3	3	0	3	0
Chile	300	115	185	149	151
Colombia	43	6	37	42	1

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Table VI.1: Summary of the data-sources (continued)

Country name	Total	BIS	Non-BIS	English	Non-English
Costa Rica	7	0	7	0	7
Curacao	110	34	76	69	21
Dominican Republic	23	0	23	0	23
Ecuador	1	1	0	1	0
Guatemala	1	1	0	1	0
Guyana	3	2	1	3	0
Haiti	28	0	28	0	28
Jamaica	127	19	108	127	0
Mexico	295	90	205	116	179
Nicaragua	59	0	59	0	59
NA-ECCB	63	17	46	63	0
Paraguay	13	0	13	0	13
El Salvador	3	0	3	0	3
Suriname	10	0	10	9	1
Trinidad and Tobago	161	107	54	161	0
Uruguay	51	1	50	1	50
Venezuela	1	0	1	0	1
Africa and middle East	**2811**	**1521**	**1290**	**2408**	**403**
Angola	67	0	67	0	67
United Arab Emirates	32	10	22	29	3
Burundi	1	0	1	0	1
Bahrain	54	51	3	54	0
Botswana	76	44	32	76	0
Comoros	6	0	6	0	6
Cabo Verde	67	0	67	0	67
Algeria	46	6	40	8	38
Ghana	126	57	69	126	0
Papa New Guinea	86	60	26	86	0
Gambia	1	1	0	1	0
Israel	155	107	48	110	45
Jordan	1	1	0	1	0
Kenya	270	181	89	270	0
Kuwait	100	5	95	92	8
Liberia	1	0	1	1	0
Lesotho	4	0	4	4	0

Continued on next page

Table VI.1: Summary of the data-sources (continued)

Country name	Total	BIS	Non-BIS	English	Non-English
Morocco	78	6	72	20	58
Mozambique	79	5	74	5	74
Mauritania	1	0	1	0	1
Mauritius	224	151	73	212	12
Malawi	37	25	12	37	0
Namibia	82	33	49	82	0
Nigeria	55	32	23	55	0
Qatar	4	0	4	4	0
Rwanda	11	0	11	11	0
Saudi Arabia	63	28	35	63	0
Sierra Leone	25	12	13	25	0
Sao Tome and Principe	16	0	16	0	16
Eswatini	15	0	15	15	0
Seychelles	61	13	48	53	8
Tanzania	1	1	0	1	0
Uganda	337	155	182	337	0
South Africa	430	382	48	430	0
Zambia	189	155	34	189	0
Zimbabwe	11	0	11	11	0
South-East Asia and the Pacific	**6775**	**3924**	**2851**	**6386**	**389**
Bangladesh	254	0	254	254	0
China	201	136	65	201	0
Fiji	177	133	44	177	0
Hong Kong	480	246	234	420	60
Indonesia	194	63	131	124	70
India	1025	837	188	1025	0
Japan	879	696	183	878	1
Cambodia	41	1	40	40	1
Korea	179	82	97	120	59
Sri Lanka	71	67	4	71	0
Macao	29	29	0	29	0
Maldives	10	5	5	10	0
Malaysia	666	485	181	665	1
Nepal	38	14	24	38	0
Pakistan	262	133	129	262	0

Continued on next page

Table VI.1: Summary of the data-sources (continued)

Country name	Total	BIS	Non-BIS	English	Non-English
Philippines	866	484	382	864	2
Singapore	858	268	590	858	0
Solomon Islands	40	18	22	40	0
Thailand	480	219	261	287	193
Vanuatu	2	2	0	2	0
Samoa	22	6	16	20	2
Western Europe	**12631**	**7605**	**5026**	**9421**	**3210**
Albania	589	281	308	281	308
Austria	98	80	18	89	9
Belgium	67	36	31	40	27
Bosnia and Herzegovina	48	15	33	45	3
Switzerland	619	377	242	619	0
Switzerland	619	377	242	619	0
Cyprus	101	3	98	53	48
Germany	1269	754	515	811	458
Denmark	199	102	97	115	84
Spain	532	308	224	338	194
Estonia	49	20	29	49	0
Finland	584	162	422	267	317
France	563	337	226	407	156
United Kingdom	1224	703	521	1224	0
Greece	179	144	35	177	2
Croatia	62	8	54	8	54
Ireland	663	296	367	663	0
Iceland	218	88	130	107	111
Italy	907	326	581	363	544
Kosovo	33	19	14	32	1
Lithuania	97	26	71	60	37
Luxembourg	87	39	48	58	29
Latvia	14	11	3	14	0
North Macedonia	155	87	68	100	55
Malta	58	55	3	58	0
Montenegro	6	0	6	6	0
Euro-zone	2223	2223	0	2093	130
Netherlands	214	171	43	194	20

Continued on next page

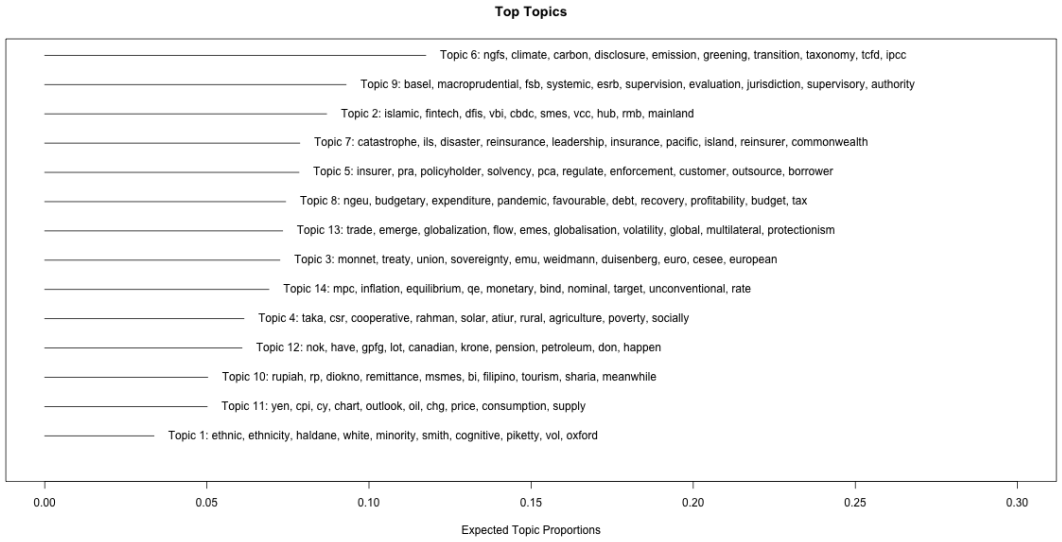
Table VI.1: Summary of the data-sources (continued)

Country name	Total	BIS	Non-BIS	English	Non-English
Norway	374	271	103	287	87
Portugal	467	74	393	188	279
Serbia	152	101	51	152	0
Slovenia	26	4	22	23	3
Sweden	754	484	270	500	254
Eastern Europe and Central Asia	**1194**	**342**	**852**	**1012**	**182**
Armenia	10	1	9	1	9
Bulgaria	226	36	190	166	60
Czechia	78	51	27	78	0
Hungary	231	11	220	231	0
Kazakistan	28	0	28	28	0
Poland	32	20	12	23	9
Romania	104	64	40	104	0
Russia	126	39	87	98	28
Slovakia	6	5	1	5	1
Turkey	265	96	169	190	75
Ukraine	88	19	69	88	0
Total	**31049**	**17219**	**13830**	**26304**	**4724**

2.2 Structural Topic Modelling

The FREX metrics was proposed by Bischof and Airoldi (2012). It 'attempts to find words which are both frequent in and exclusive to a topic of interest. Balancing these two traits is important as frequent words are often by themselves simply functional words necessary to discuss any topic. While completely exclusive words can be so rare as to not be informative.' Topics are displayed in order of prevalence in the corpus.

Figure VI.1 – Top FREX words for Model 14



At first glance, some of these 'words' seem to have no meaning. In fact, they are often acronyms. For example, in Topic 6 (*Climate-related risks*), 'tcfd' refers to the Task-force for Climate-related Financial Disclosure created by the Financial Stability Board in December 2015, and 'ipcc' refers to the Intergovernmental Panel on Climate Change. For Topic 2 (*Green and digital finance*), the expression 'dfis' means Developmental Financial Institutions, the expression 'vbi' means Value-Based Intermediation, and the expression 'cbdc' means Central Bank Digital Currency. For Topic 4 (*Sustainable finance*), the expression 'taka' means that a fiancial product is islamic law compliant, the expression 'csr' means Corporate Social Responsibility, while 'rahman' and 'atiur' are the last and first name of the 10th central banker of Bangladesh (2009-2016).

2.3 On topic labels

Table VI.2 – Top ranked speeches for each topic with text samples

Green and Digital Finance	**Sustainable development**	**Climate-related risks**
Ravi Menon, **Monetary Authority of Singapore**, 18 June 2020, *Shanghai and Singapore - financial centre partnership* Singapore launched a Green Finance Action Plan last year, built on three core pillars: building the financial industry's resilience against environmental risks; developing green financial products and solutions; and leveraging technology to support the development of green finance. As we stimulate our economies to bounce back from the Covid-19 crisis, there is a good opportunity for Shanghai and Singapore to collaborate on promoting green finance in the region.	Atiur Rahman, **Bangladesh Bank**, 31 May, 2014, *Eradicate Extreme Poverty Day* To transform the banking services into a more humane one, BB has also given directives to banks to expand financial allocations and services in various underserved segments of the society like physically challenged people, disabled freedom fighters and their families, poor and helpless people facing climate change disasters and scholarship programs for the sons and daughters of the extreme poor.	Mark Carney Governor, **Bank of England**, 10 December 2019, *America's Pledge report, at the 25th Conference of the Parties* Changes in climate policies, new technologies and growing physical risks will prompt reassessments of the values of virtually every financial asset. Firms that align their business models with the transition to net zero will be rewarded handsomely. Those that fail to adapt will cease to exist. Now is the time to ensure that every financial decision takes climate change into account. For that change to happen, we need to focus on the three Rs – reporting, risk management and return.
Eddie Yue, **Hong Kong Monetary Authority**, 18 December 2017, *New and important frontiers of financial development reached in 2017* If I am asked to predict what will be an emerging theme for the financial services sector in 2018, green finance looks like a safe bet. Green finance is growing rapidly and Mainland China has become one of the major markets for green bonds. Hong Kong is also keen on tapping into the green finance opportunities.	Atiur Rahman, **Bangladesh Bank**, 10 November 2012, *Common Vision from "The Future We Want"* Poverty eradication and promoting sustainable patterns of consumption and production, and protecting and managing the natural resource base of economic and social development are the essential requirements for sustainable development. This needs to be achieved by promoting sustained, inclusive and equitable economic growth; fostering equitable social and human development while promoting ecosystem conservation, regeneration and resilience in the face of current and emerging challenges.	Marja Nykänen, **Bank of Finland**, 31 October 2019, *Problems in embedding climate risks into the traditional financial risk framework* Instead of supporting or penalising certain types of investments, supervisory expectations would be a convenient way of guidance. Some supervisors, the Bank of England for example, have set out supervisory expectations for financial institutions on how they should manage climate risks. The supervisory expectations of the Bank of England cover governance frameworks, risk management, the use of scenario analysis and appropriate disclosure.

Green and Digital Finance	Sustainable development	Climate-related risks
Benny Chey, **Monetary Authority of Singapore**, 04 June 2019, *Nurturing the Growth of Green, Social and Sustainability Bonds* These huge green financing needs cannot be borne alone by the public sector or bank lending. There is a pressing need, and an opportunity, to diversify sources of green financing, and to unlock and crowd in private capital. Capital market solutions like green bonds have the potential to play a more central role in financing green investments as the depth and liquidity in this market grows.	Yuba Raj Khatiwada, **Nepal Rastra Bank**, 27 March 2014, *Cooperatives, Economic Democracy and Human Security: Perspectives from Nepal* As access to finance and green investment is vital for the successful implementation of green initiatives, this is high time for the financial institutions in general and saving and credit cooperatives in particular to move forward with green financing modality along with promoting green enterprises. As green banking has been identified as one of the major drivers of sustainable economic growth in developing countries with the issuance of guidelines and instructions on sustainable banking issues like green banking, environmental risk management, corporate social responsibilities, cooperatives need to issue such guidelines as well.	Lael Brainard, **Federal Reserve**, 07 October 2021, *Building Climate Scenario Analysis on the Foundations of Economic Research* As we are learning from the pandemic, risks emanating from outside the economy can have devastating financial consequences. As part of our prudential and financial stability responsibilities, we are developing scenario analysis to model the possible financial risks associated with climate change and assess the resilience of individual financial institutions and the financial system to these risks.
Yi Gang, **People's Bank of China**, 9 December 2021, *Hong Kong's positioning and prospect as an international financial centre* Fourth, Hong Kong can actively explore Fintech. One of first Innovation Hub Centres of the BIS is located in Hong Kong. [...] Going forward, we can beef up cooperation in CBDC and Regtech to tap the potentials of Fintech. Fifth, Hong Kong can vigorously develop green finance. Both the PBOC and the HKMA are members of the Network for Greening the Financial System (NGFS) and the International Platform on Sustainable Finance (IPSF). We will continue to support Hong Kong in developing its green finance system.	Rafael Buenaventura, **Bangko Sentral ng Pilipinas**, 28 June 2001, *The Role of the Philippine Banking Sector in the Promotion of Sustainable Development* Beyond these company-specific environmental objectives, banks - as intermediaries of financial resources - are actually in a distinct position to influence businesses to play a major role in promoting sustainable development. Bankers can do this by including environmental criteria in their overall lending and investment strategy. Banks can, therefore, be more pro-active in supporting projects that are environmentally sound. There are new and expanding opportunities in environmental markets and services including those in cleaner technologies and eco-tourism which can yield both environmental and financial dividends.	Frank Elderson, **European Central Bank**, 2 November 2021, *Forests and finance* The work of the NGFS has decisively contributed to the insight that climate and environmental risks are a source of financial risk, bringing them squarely within the mandates of central banks and supervisors. And to the understanding that the financial sector needs to be part of the solution to the ongoing climate and environmental crises. With our large and committed membership, our leverage on the financial sector can hardly be overestimated. Together we supervise all global systemically relevant banks and over two-thirds of systemically relevant insurers.

2.4 Descriptive statistics

Table VI.3 provides summary statistics for the dependent and independent variables.

Table VI.3 – Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Green and digital finance	1919	0	.03	0	.51
Sustainable development	1919	0	.02	0	.37
Climate-related risks	1919	.01	.03	0	.62
Climate frequency	1919	.48	1.95	0	27.5
Climate share	1919	.02	.1	0	1.74
Climate vulnerability	1870	.02	.07	0	1.86
Carbon intensity	1855	.56	1.15	.02	44.77
CB Supervision	1516	.33	.29	0	1
CB Objectives	1572	.68	.32	0	1
NGFS membership	1919	.09	.28	0	1

Table VI.3 provides the variance covariance matrix of all our variables. It highlights that there is an absence of multicolinearity among regressors.

Table VI.4 – Cross-correlation table

Variables	Climate vulnerability	Carbon intensity	CB Supervision	CB Objectives	NGFS membership
Climate vulnerability	1.000				
Carbon intensity	0.022	1.000			
CB Supervision	0.046	0.093	1.000		
CB Objectives	-0.048	-0.078	0.016	1.000	
NGFS membership	-0.054	-0.070	0.070	0.062	1.000