FACULTEIT POLITIEKE EN SOCIALE WETENSCHAPPEN

A CRITICAL MACRO-FINANCE THEORY ACCOUNT OF ECB CLIMATE POLICY

Wetenschappelijke verhandeling
Aantal woorden: 22454

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Masterproef voorgelegd voor het behalen van de graad master in de richting Politieke Wetenschappen afstudeerrichting Internationale Politiek

Academiejaar: 2022-2023

UNIVERSITEIT GENT

Abstract

(NL) Naarmate de inspanningen om de ergste effecten van klimaatverandering te beperken toenemen, houden regeringen en hun instellingen in hun beleid steeds meer rekening met het klimaat. Doorheen de financialisering van de economie hebben centrale banken een steeds centralere rol gespeeld in economisch bestuur, en onder druk komen te staan om een bijdrage te leveren aan de vergroenings-inspanningen. De vergroening van bestuur kent een verscheidenheid aan benaderingen en nadrukken (Campiglio et al., 2018; Fernández-Albertos, 2015). Doorheen de verscheidenheid aan vergroeningsbenaderingen onderscheidt de literatuur in grote lijnen een centraal onderscheid tussen passieve, *risk-based* vergroening en een actievere, allocatieve benadering (Gabor, 2022a; Kedward et al., 2022b). Binnen deze literatuur publiceerde de *Critical Macro-Finance* (CMF) theorie - een heterogene groep theorieën en benaderingen die bekendheid kreeg in de nasleep van de grote financiële crisis - veel ideeën en kritieken over de (in)actie van centrale banken in de strijd tegen klimaatverandering, de negatieve effecten van het beleid van centrale banken op klimaatverandering en ideeën voor verbetering. De onthulling van de 2021 strategische revisie van ECB-beleid beloofde klimaatveranderingsoverwegingen op te nemen in het beleid van de ECB, als ondersteuning voor de plannen van de EU om te decarboniseren tegen 2050. Het plan werd verwelkomd, maar kreeg al snel kritiek (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022). De ECB is verder gegaan in het vergroenen van sommige programma's dan andere, en heeft een onderscheid gemaakt tussen programma's, waar sommigen een *risk-based*, en andere een actievere vergroeningsbehandeling kregen. Met behulp van inzichten en kaders uit de CMF-theorie, meer specifiek over infrastructurele macht en macro-financiële regimes, wil dit artikel de kloof evalueren en verklaren hoe deze gevormd is binnen de vergroeningsinspanningen van de ECB.

(EN) As the efforts to mitigate and adapt to climate change ramp up, governments and their institutions are increasingly considering climate change in their policies. Throughout financialisation of modern capitalism, central banks have progressively been central to economic governance, and have thus been pressured to contribute to the endeavour. The greening of governance offers a host of different approaches, emphases, and interests (Campiglio et al., 2018; Fernández-Albertos, 2015). Throughout the variety of greening approaches, the literature broadly distinguishes a central cleavage of passive, risk-based greening, versus a more active, allocative approach (Gabor, 2022a; Kedward et al., 2022b). Within this literature, Critical Macro-Finance (CMF) theory – a heterogeneous group of theories and approaches that gained prominence in the aftermath of the great financial crisis – published many ideas and critiques on central bank (in)action on climate change, the negative effects of central bank policy on climate change, and ideas for improvement. After the ECB revealed that, as part of their 2021 strategic review, climate change would be a consideration for further policy and aiming to aid the EU's goal to decarbonise by 2050, the plan was welcomed, but soon critiques surfaced (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022). The ECB has gone further in the greening of some programs than others, discriminating which would receive a risk based or a passive greening treatment. Using CMF theory insights and frameworks, more specifically on infrastructural power and macro-financial regimes, this paper aims to evaluate and explain the cleavage that has formed within ECBs greening efforts.

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1. Introduction

If we wish to decarbonise the EU economy by 2050, this will require redirecting €23 trillion away from carbon-intensive investments, and investing over €28 trillion into renewable energy-sources to transition industries towards a green mode of production (D'Aprile et al., 2020). Throughout the past couple of years, voices from academia, civil society, and (somewhat surprisingly) finance have increasingly called upon central banks to do their part in the facilitation of these investments (Bourgin & Sol, 2021; Gabor, 2021c; Massoc, 2022; NGFS, 2019). Consequently, central banks and financial actors worldwide have been responding, with initiatives such as the NGFS (Network for Greening the Financial System(NGFS, 2019)), or by making pledges to green their policies (e.g. Bank of England (Bank of England, 2021)).

Meanwhile, the Critical Macro-Finance (CMF) approach to political economy gained prominence in the wake of the Great Financial Crisis. Going against conventional explanations of the crisis, with an iconoclastic mix of neo-Minskyan approaches and post-Keynesian beliefs, CMF-theory filled an explanatory lacuna; revealing the importance of shadow banking and market-based banking, repo-markets and sovereign bonds, and time-critical liquidity in the advanced economies of the 21st century (Gabor, 2020a; Petry et al., 2020). Throughout a decade of crisis, the climate crisis loomed. Its ever-growing pressures lead CMF-scholars to theorise on the role of the state, private finance and central banks in exacerbating and counteracting the climate crisis (Braun, 2022; Gabor, 2010; Tooze, 2018; Vestergaard & Gabor, 2021). The conceptualisations of these institutions and their interactions, how they formed and evolved through the history of capitalism, has profound implications for their contemporary design, and the regimes of tomorrow (Gabor & Braun, 2021). To understand what role the central bank plays in climate policy then, we can harness the insights of CMF-theory to understand financialisation, the changing role of central banks, their relation to finance, macro-financial regimes, and why the ECB is in such a unique position.

Financialisation is a common thread running through this analysis. It has some profound links with our understanding of how the contemporary constellation of economic governance came to be. Under the regime of financial capitalism, keeping inflation low has been a pillar of modern central banking (Gabor, 2021a). There are many compounding reasons why this has been crucial to facilitate financialisation. Mainly, price-stability is essential for the smooth operation of price-signalling, low inflation favours creditors, and keeps a lid on transaction prices; all contributions to financialisation (Borio, 2019; Knafo, 2020). As we will see, financialisation entails a self-reinforcing process of entanglement, where finance becomes critical to the operation of European markets and the transmission of monetary policy, giving it infrastructural power (Braun, 2020; Walter & Wansleben, 2021).

As part of their 2021 strategy review, the European Central Bank (ECB) made it clear that they would be addressing that "climate change requires urgent action" (ECB, 2021d). This was followed by a climate action plan, explained in more detail in the summer of 2022 (ECB, 2022b). Although the climate roadmap suggests that governments should take the lead on tackling climate change, the central banks plan was received with some excitement over the possibilities of green central banking in the Eurosystem (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022). The ECB is unique in a variety of ways, which makes it especially interesting to try and understand how their climate policies came about, how far they go and why, and what this means for the future of the ECB. Besides this, we can ask the question why central banks should be concerned with climate change at all? What is the current narrative, and where is the value in the new approach?

This thesis starts by linking climate change to central banking, probing for climate change risks and approaches to central bank greening policies. This is followed by an exploration of Critical Macro-Finance

theory, its origins, and possibly enlightening theories. In chapter three, we examine how the ECB has done harm, how central can do to combat climate change, and what the ECB has done. This is followed by an inquiry of the ECB plans on climate change, an evaluation and analysis of the policies, before chapter five dives deeper into specific questions on the greening of the ECBs corporate asset purchasing programs and the Eurosystem Collateral Framework (ESCF). This all results in an analysis, based on our insights from Critical Macro-Finance theory and discoveries from the later chapters. The paper ends with conclusions and final thoughts.

2. Climate change and central banking

2.1. Climate risk

Change is at the horizon. It is now the consensus that in every future scenario, from business-as-usual to complete carbon neutrality, climate change will and does have great economic impact (Carney, 2015b; IPCC, 2022a, 2022b). This view is shared among academics, state- and non-state actors (Dikau & Volz, 2021; IPCC, 2022b; NGFS, 2019).

These impacts are largely categorised as either (1) *physical* or (2) *transitional* effects. Physical effects can be described in economic terms, as the costs and losses, both economic and financial, that result from a changing climate (NGFS, 2019). On the mid- to short-term, this includes damages created by increasingly frequent extreme weather events and natural disasters such as floods and droughts (IPCC, 2022a). On the longer term, rising sea levels and global temperature shifts will fundamentally impact all countries and their economies. Researchers found that besides market, political and commercial risk, risk of banking crises, volatility in energy prices and sovereign debt growth rise significantly as the global temperature rises (Polzin & Sanders, 2020). The severity of these impacts can be mitigated by a transformation of the global economy towards a carbon neutral system. In the 2014 Paris Agreement, 192 countries pledged to "substantially reduce global greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees" (United Nations, 2015). These damage-control efforts notwithstanding, economic restructuring comes with its own, transformative impacts. These include adaptation and mitigation risks, stability risks caused by the loss of investor confidence, run for liquidity, "*longevity risk (i.e. long-term performance"* of green investments) (Polzin & Sanders, 2020, p22) and mass devaluation of financial assets, as well as others.

Thus, it has apparently become clear for central banks, and the ECB in particular, that the climate crisis pertains to them deeply. Central banks now increasingly throw their weight around, both in climate mitigation efforts and economic governance (Campiglio et al., 2018; Fernández-Albertos, 2015). In fact, central banks over the whole world have planned to develop guidelines and programmes, in an effort to green their policies, deploying their institutional and financial resources to influence the financial sector and the flow of investments and loans (Campiglio et al., 2018; NGFS, 2019; Schoenmaker, 2021; van 't Klooster & Fontan, 2020). Even if most central banks have yet to implement these decisive policies, we can thus see an increase in awareness and responsibility among central bankers (NGFS, 2019). In the following section, we explore the interlinkages of central banking and climate change; on financial stability, inflation and central banking policy transmission.

The efforts to minimise climate change effects present a delicate balance: on the one hand, rapid action is needed to mitigate rising temperature impacts. This would involve a social, economic and technological transformation, through the adoption of low-carbon technologies and lifestyles (Carney, 2015b; Dafermos et al., 2018). On the other, a disorderly and abrupt transition could trigger transitional effects that create a heap of stranded assets. On the short term, the depreciation of assets such as fossil fuel reserves, financial assets and carbon-intensive capital would mean that companies holding these assets face heavy losses. Meinhousen et. Al (2009) estimates the carbon budget to be about 1440 Gigatons of CO2. This means that, for the "well under 2°C"-goal to be plausible (50% chance of success, with carbon capture and sequesterisation), large reserves of fossil fuels are to be left untouched. Of all coal reserves, for example, 85 percent would have to remain in the ground, and 35 percent of oil cannot be extracted. The abrupt loss of use and thus monetary value of these resources could lead to sustained economic damage and, as

banks face rising defaults and exposed equity portfolios are affected, risk severe financial instability in the mid to long term (McGlade & Ekins, 2015; Meinshausen et al., 2009).
The risk consists of a "climate Minsky moment". Named after 20th century economist Hyman Minsky, this describes a climactic crisis event, that ends a bullish period. During this period, investors take on credit to finance increased speculation. In the context of climate change, this expresses *"a wholesale reassessment of prospects, as climate-related risks are re-evaluated, could destabilise markets, spark a pro-cyclical crystallisation of losses and lead to a persistent tightening of financial conditions: a climate Minsky moment"* (Barrowclough, 2020; Carney, 2015a). This would be the economic climate crisis. Thereby, it is overwhelmingly preferable for a stable and controlled transition to occur, letting these reserves devalue over time, instead of crash-landing (Battiston et al., 2017). The goal is a rapid yet orderly structural change.

These aforementioned scenarios already hint at a certain interplay between financial risk and the risks to economic activity (economic risk), which are fuelled by both each other and climate risk. With climate risk, we refer to physical effects of climate change, such as an increase in frequency and severity of natural disasters, and how they translate into negative economic outcomes. For instance, climate risk can negatively influence productivity, health, housing, etc. This may then bring about (1) economic risk (e.g. loss of demand and unemployment) and (2) financial risk (e.g. insurers taking losses, assets and collateral depreciation) (Brunetti et al., 2021; Giuzio et al., 2019). Importantly, financial risk or economic risk do not necessarily translate into financial instability. For systemic stability to be endangered, financial and economic risks must interact and affect vulnerabilities in the financial system in the right way. This can happen in a multitude of ways, such as the sudden adjustment of prices to new information, or the disruption of investor-expectations or -confidence (Brunetti et al., 2021). To prevent these shocks, research into and disclosure of climate-related risk is often proposed, to ensure correct pricing from the beginning. Yet, both climate change-developments and transitional effects are diffused over space and time, complex to model, and insufficiently mapped (Delis et al., 2018; Giuzio et al., 2019).

In a report by the Dutch central bank (Regelink et al., 2017), the Netherlands aptly exemplify this multi-layered and interacting web of risks and effects: as the climate changes, Dutch people and their economy will face damages by increased flooding, Dutch insurers are likely to be financially affected by physical damages, Dutch fossil-fuel intensive companies will probably see slinking profits under transition-policies, and Dutch banks invested in carbon-intensive companies will be exposed to their losses.

The risk of climate-induced financial instability is thus keenly understood by both academia and central banks around the world. Where governments must likely play a role in ensuring a (favourably stable) green transition, central banks are increasingly called upon to take a more active role. Mostly, CB's are seen as mediators for climate-related financial risks (CRFR's) (Campiglio et al., 2018). To this end, certain policies have been proposed, such as the development of indicators, tools, and methods to assess CRFR's. Subsequent disclosure of these risks on the balance sheets of financial institutions, could enhance correct pricing, both by private investors and public institutions. Finally, central banks are to consider CRFR's in the fulfilment of their mandates. This includes greening monetary policy (from research and good practice stimulation to monetary financing for the transitioning and green QE) and more importantly macro-prudential policy (Campiglio et al., 2018; Dafermos, Kriwoluzky, et al., 2021; Giuzio et al., 2019).

Although this includes a wide range of possible options, some possibly seeming more politically realistic than others, all of these options have been applied in some form by central banks throughout the world. In general, developing countries seem more willing to have their central bank play a prominent role, e.g. the Bangladesh bank, using targeted refinancing lines to finance renewable energy (Campiglio et al., 2018;

Monnin & Barkawi, 2015). Central banks in North America and Europe have proven somewhat more guarded.

We can thus conclude that climate change will produce financial stability risks that will pose unforeseen challenges to central banks. Financial regulators have grown increasingly aware of this (Bank of England, 2015; Batten et al., 2017; Battiston et al., 2017, 2021; European Systemic Risk Board (ESRB), 2020; Giuzio et al., 2019; NGFS, 2019; Regelink et al., 2017). Besides this, central banks have experienced rising public pressure to act (Massoc, 2022). As a result, central banks and regulators have taken steps toward green-brown investment taxonomy development, disclosure promotion in the public and private sector, and the incorporation of climate related risks in prudential frameworks, such as stress-tests. These will be further explored and explained in the third section.
Among these more climate-ambitious institutions is the ECB, typified by its strategic review and climate action plan discussed below. Yet it does set some strong boundaries for itself, particularly by stressing its own restraint within the ECB mandate. Illustrative of this, the ECBs climate change webpage addresses visitors by proclaiming that they *"[…] are firmly committed to doing [their] part to address climate change, within [their] mandate."* The ECBs relation to its mandate has been a source of critique, though, as in 2020 the central bank was questioned by a German court. The reality remains that the ECB's mandate is hopelessly under-equipped to be an effective guide to the challenges the ECB has faced in the last decades, and the challenges that rising global temperatures will present (Van 't Klooster & De Boer, 2020).

Yet, it seems that a common understanding of the central banks role, to "*preserve monetary stability and promote financial stability*" (Central Bank Governance Group, 2009), proves to be rather narrow. Why then, does the ECB concern itself with an issue as gargantuan as global climate change?

The ECB's primary mandate (to maintain price stability) may give the ECB a legal prerogative to actively take anti-inflationary measures, as climate change disasters are likely to create upwards price pressures. Dafermos et al. (2021) conclude that extreme weather events, that are to become more likely as global temperatures rise, significantly increase euro-system-wide inflation rates. Specifically, food and beverage prices are to see a higher-than-average jump in prices. Financial stability is similarly mentioned in the ECB's mandate, although extent of the central banks' legal authority in this is still debated (*Consolidated version of the treaty on the functioning of the European Union*, 2012; Schinasi, 2004). Besides their formal policy goals, the central banks interest lays firmly in the effective transmission of monetary policy (Braun, 2020). Recent research by the NGFS (2020) shows that a *"majority of central banks think that climate change could affect monetary policy transmission".* Although most have not yet been faced with climate change effects, central banks are thus likely to experience troubled policymaking when natural disasters strike.

Mainstream consensus thus seems to indicate that climate change pertains to central banks (and the ECB in particular) as their primary policy goals are at stake. Through climate risks, both physical and transitional, the central bank's interests will be affected by climate change. As these risks are translated into inflation, financial instability, and disruptions in policy transmission, we could presume it will be in the ECB's interest to act decisively and aid climate change mitigation efforts. Yet the ECB has, at least until recently, quite possibly done more to harm these efforts than it has helped, as will be clarified later.

This can all prove that central banks have *something to lose* in the challenges that climate change presents. It fails to explain, though, why central banks are increasingly called upon to deal with climate change mitigation. Why are these, inflation-managing and stability-promoting, rather technical institutions addressed to secure financing for an economy-wide green transition? Why are central banks in this unique

position? We shelf this question for further inquiry, as we first explore and understand climate change related central bank policy.

In the context of green economic policy, central bank governance can be understood as either active or passive. Passive greening policies are typically prudential and market-fixing, as they try to incorporate CRFRs into market mechanisms via information and disclosure channels. As such, they hope to have a greening effect through price signalling and voluntary greening of private balance sheets (Van Doorslaer, 2022). Active greening policies are market-shaping, pertain mostly to monetary policy, and are less likely implemented.

Table 1. Typology of green central bank policies[1]

	Macro-prudential and financial supervisory policy	**Monetary policy**
Passive greening	Data gathering, model adaptation, climate risk exposure testing and disclosure, credit rating review	ECB balance sheets climate risk reduction
Active greening	Climate impact-conditional reserve and capital requirements	APP greening (Green QE, Green TLTRO's, …), collateral framework adjustment, credit guidance, monetary financing

Before its 2021 Strategic Review, ECB climate-related policy has been typified as mostly prudential, market-driven and market-fixing (Van Doorslaer, 2022). While this will be explained further in chapter 4, we can conclude that central bank action has, as it pertains to climate change mitigation, mostly been focussed on mitigating financial risk associated with climate change and environmental disasters. Yet, besides these more conventional policy proposals, more ambitious policies have been proposed, promoting an approach of active greening (Eliet-Doillet & Maino, 2022; Flaherty, 2020; Gabor, 2020b; Schoenmaker, 2021; Vestergaard & Gabor, 2021).

This begs the question: why central banks? Why is it precisely these institutions that we look to in times of severe economic crisis? We see some division in possible explanations. Firstly, ever since the Great Financial Crisis, central banks have been called upon to act as a crisis manager. Throughout the crises of the past decades, their array of instruments has thoroughly grown, along with their (informal) duties (Gabor, 2020a, 2021a; Tooze, 2018). Secondly, both intra- and inter-institutional pressures have contributed to central bank activism, specifically on climate change. Where central bankers were first hesitant to support central bank climate action, citing problems of policy overreach, market neutrality and "potential conflicts with the operational ability of a central bank to pursue its conventional monetary policy targets" (Van Doorslaer, 2022, p. 12), anti-action arguments seems to have been suppressed.

Massoc (2020) finds that the European Parliament (EP) has drastically ramped up their efforts to pressure the ECB into taking a more active role in combatting climate change. Besides this, a "discursive convergence" has formed between the two institutions on topics as market neutrality, price stability and

[1] Based on Hielke Van Doorslaer. (2022). Walking a Thin Line: A Reputational Account of Green Central Banking. In *Review of International Studies*, and Emanuele Campiglio, Yannis Dafermos, Pierre Monnin, Josh Ryan-Collins, Guido Schotten, and Misa Tanaka. 'Climate change challenges for central banks and financial regulators', Nature Climate Change, 8 (2018), pp. 462-468; Baer et al., 'It takes two'

green central banking. Massoc (2022) finds this convergence has proven effective in suppressing voices within the ECB that would not have the central bank take such a role in climate action. Third, as some CMF scholars have pointed out, financialisaton has positioned central banks in a unique position to handle these problems, which we explore further below.

The literature seems divided on explanatory approaches to changes in central bank policy in two ways. First, some scholars approach the shift within the central bank from inside out, explaining central bank shifts through changes pushed by internal-individual goals or internal-organisational concerns. Siderius (2022) shows how motivated individuals within de Nederlandsche bank pushed climate action on the foreground, promoting climate related financial risk as a problem that pertained to the Dutch central bank. Others approach shifts by analysing how intra-institutional disagreements interact with external pressures. In an effort to explain the appearance of ECB's climate ambitions, Van Doorslaer (2022) proposes a shift pushed by a fear of public accountability and a concern over the reputation of the central bank and its agents on the longer term. Secondly, varying studies emphasise different actors: some, like Siderius (2022) focus on individuals, whereas others (Braun, 2020; Gabor, 2021a; van 't Klooster, 2021; Van Doorslaer, 2022) focus on interactions and expectations between central banks and governments, financial markets, other institutions and the public.

In chapter three, we present a cursory overview of theory on this topic. We'll also explore the role of central banks in financialisation theory before we delve deeper into Critical Macro-Finance, the theoretical framework we will be using in our analysis of the ECB climate action plan.

3. Critical Macro-Finance, and the (in)action of central banks

This thesis seeks to explain the degree of (in)action the ECB has set out to take on climate change, following their 2021 strategic review. The next section is an exploration of Critical Macro-Finance theories and how these may contribute to an understanding of this phenomenon. Along the way, we ask ourselves why, when talking about climate mitigation, adaptation, and financing, we look towards central banks, and how financialisation has formed contemporary central banks to be in this position.

3.1. Critical Macro-Finance

Although Critical Macro-Finance (CMF) has known a surge in interest over the last decade, it is difficult to comprehensively define and delineate these approaches. It thus remains to be seen if CMF can provide additional value to an account of the ECBs green (in)action. In this chapter, we try to define and delineate Critical Macro-Finance theory, followed by a short cursory overview of the different theories used to explain the green turn within the ECB's strategic review.

The critical macro-finance lens, knowing its genesis in Minskyan and post-Keynesian approaches, came to the fore in the aftermath of the 2008 financial crisis. The conventional analysis of the crisis concentrated its attention on state-centric accounting and real-economy spill over effects, conceptualising financial instability in the West as a result of "excess savings in the East" (Petry et al., 2020, p35). Opposing this "trade imbalance" explanation, CMF provides insights on the role of wholesale interbank markets as a critical facilitator of the crisis (Petry et al., 2020) (Claessens & Kose, 2018; Petry et al., 2020; Tooze, 2018). Even further, this discord rekindled debates on most fundamental conceptualisations of money (Borio, 2019; Gabor, 2020a; Moutot, 2018), central banking (Pozsar, 2018), and the state (Braun, 2020; Walter & Wansleben, 2021). Claesens & Kose's (2018) work on macro-financial linkages explored the dis- and reconnect of theory on macroeconomics and finance, laying the groundwork for the development of theoretical models and frameworks to understand the relation between finance and the real economy, and linkages that connect policy to the financial sector. These *linkages* are interactions going two ways over cleavages such as financial world-real economy, public-private sector, etc. Their ramifications for economic policy outcomes are a recurring subject of study in CMF research. Fundamental to understanding CMF theory is work on liquidity and the 'money view', also building on Minsky's work (Knafo, 2020). This describes how, throughout the process of financialisation, the importance of loans, profits and liquidity have shifted. Minsky argues that modern banks do not go bankrupt due to solvency problems, but liquidity problems: '*their inability to make payments and meet their liabilities*' (Knafo, 2020, p89; Minsky, 1975). So, where a loan's profitability used to be the central interest of a banker, modern bankers have cared less about solvency than they do about liquidity.

It remains difficult to define and delineate Critical Macro-Finance theory clearly, as it is a rather heterogeneous group of scholars and theories. Amongst these scholars is Daniela Gabor, providing a set of 4 propositions that bridge CMF's heterogeneous nature (Gabor, 2020a). All of these connect studies of financialisation, market-based finance and the historic structural power of the US. Analytically, CMF theory conceptualizes global finance as a set of balance sheets, sometimes referred to as a "plumbing-type analysis". Other than the standard macroeconomic approach, that focused on models of national monetary flows (international economic interaction) and international trade deficits, scholars adapted the Minskyan view of the economy as a set of balance sheets, with payments flowing in and out, interconnecting them to each other and to the state. These are modelled differently depending on the theory (Petry et al., 2020). This new 'Macro-Finance' view was *'an ambition to renovate an antiquated macroeconomic policy*

framework and bring it up to date with an evolving economy that is increasingly shaped by global finance and the dominant transnational banks at its centre' (Knafo, 2020, p 87).

This framework enabled scholars to look beyond the "excess savings-theory" and discern an alternative explanation for the '07-'08 financial crash that considered the increased role of repo-markets, liquidity and mark-to-market balance sheets. A decade after the fall of Lehman, Tooze's (2018) retrospective on the Great Recession echoes the same dynamic, both for the GFC and the Eurozone crisis that followed. According to Tooze, the Eurozone was a direct result of the Great Recession that started in the US. Where more narrow analyses would picture the crisis as a result of excesses on the German current account, recycled in Southern Europe, the macro-finance view focuses on the scope and speed of contemporary financial crises, that "for all the pressure that classic "macroeconomic imbalances"—in budgets and trade—can exert, a modern global bank run moves far more money far more abruptly" (Tooze, 2018, p.10).

Being a historian, Tooze frames this evolution within a changing international economic landscape. Starting from the decline of the Bretton-Woods institutional framework, he paints a picture of thorough financialisation: the privatisation of the creation of money, the growth of international financial flows (no longer constrained by capital controls, decoupled from international trade). Many CMF scholars seem to share this interest in the study of financialisation since the second half of the 20th century (Gabor, 2020a; Tooze, 2018).

The lessons of 2008 continue to resonate through our understanding of climate risk and financial risk. Minsky's understanding of financial crises, typified by his financial instability-hypothesis, was popularized in our understanding of the 'Minsky moment'. Coined by Paul McCulley, the term describes a moment of panic in the cycle of boom-and-bust, as theorized by Minsky. As he proposed, economies go through a cycle of "displacement" (exciting investors by e.g. lowering of the interest rate and an influx of Chinese funds), "boom" and then "euphoria", tempting banks into riskier loans and investors into riskier investments. This is followed by a period of "profit taking": some investors decide to cash-out, and solidify their profits. This is when the market peaks (Cassidy, 2008; Vercelli, 2011). What follows is the "Minskyan process" (Vercelli, 2011), kicked off by the Minsky moment. As investors sell off their investments, an event or trend can trigger a state of panic. The Minskyan process is where turns "mania into panic", and financial actors see solvency and liquidity problems rise (Vercelli, 2011; Wolf, 2008).

In a thoroughly globalized and financialised world economy, it is the speed, volume and reach with which this panic spreads that makes it so destructive. It was a flawed understanding of this economic reality that made it so that economists were looking for "the wrong crisis" (Tooze, 2018). As models still suggested that most of the capital was spread, over an economy dominated by middle-large enterprises that compete with each other on the free market. In reality, financial consolidation had taken hold, and only a small array of banks and companies mattered globally. The crisis could explain how this small group was capable of destabilizing the global financial crisis through something of a reverse bank-run (severe illiquidity on the interbank market). This allowed the FED to take unprecedented action and, against all guidelines of then accepted crisis-management theory, pump trillions of dollars. The model of the economy with small corporations in a competitive free market could not (Cassidy, 2008; Tooze, 2018).

This 'mainstream' version of Macro-Finance was then further debated. Scholars showed that the macro-finance lens taken by central bankers was still very flawed, as it insufficiently addressed power relations, risking to further the financialisation process through the de-politicization of economic policy (Gabor, 2020a; Knafo, 2020; Pape, 2020; Petry et al., 2020). Yet, some state that the 'critical' in CMF seems to underdeliver. As Critical Macro-Finance scholars enjoy an audience with economic elites and policymakers

through their use of economic language and theories, they risk to silently accept the bias and interests of these elites (Petry et al., 2020).

3.2. Financialisation and Central Banks

Critical to our analysis is what this CMF view means for the central bank, which in 2008 acted as the primary intervening state-institution, repeated this during the pandemic, and is now seemingly expected to act again on climate change. Central banks were not always so central to crisis management, they have evolved, with the economies in which they are embedded. CMF theory suggests that, through and during the process of financialisation, we have arrived at the first crisis of the Anthropocene, with the central bank as its defining institution.

With the ECB this is especially true, as the central bank hold a unique position. From the start of the European Monetary Union, it was clear that the CB was entrenched in hawkish guardrails, pushing it along a path of further financialisation (Gabor, 2010).The workings and specifics of the EMU were negotiated as part of the Maastricht Treaty in the early nineties. As a result, the then conventional (and thus neo- and ordoliberal) ideas on sound monetary policy and state interventionism were codified into the mandate and policy goals of the ECB. This meant that the new central bank would be tightly self-constrained to ensure price stability, leaving it, and the rest of the EMU, without many instruments to battle a European recession or crisis. The main problem was a lack of redistributive mechanisms to absorb shocks, especially asymmetric ones (Tooze, 2018). As Europe's labour market was insufficiently flexible to take on any real pressures, this would have to be ensured through a system of taxes and spending (e.g. through unemployment insurance and benefits) (Denvir & Lewis, 2022). When crisis struck in 2008, it became increasingly clear that the eurozone was severely underequipped to deal with the shock, and the ECB would have to free itself of these self-bound constraints to enact a series of interventionist policies, or risk immeasurable damage.
In a sense, this ECB interventionism had to make up for this lacuna of policy options in the eurozone. To achieve this, the central bank used a mix of conventional (mainly interest rate) and unconventional policies, like quantitative easing (to provide interbank liquidity and lower real interest rates) and Outright Monetary Transactions (to stabilise government debt). Besides this, the ECB was faced by further challenges created by the unwillingness of northern-European states to bail-out southern eurozone members, or their own banks.

The ECB is thus a unique institution and central bank, as it was moulded over decades of intergovernmental pulling and pushing, with successive crises as pivotal points. Throughout this uneven development, we can nevertheless distinguish the red line of financialisation. One such development, that later proved quite impactful, was the advancement of European repo-markets on government bonds (Gabor, 2012; Tooze, 2018).

It is important to define the term financialisation a bit further, as it is a common research subject in CMF theory, and is foundational to its view on the role of central banks, and their role in climate change. Broadly speaking, financialisation is the growth of finance, in importance in and impact on domestic and international economies and politics (Sawyer, 2013). This means that financial actors and institutions play an increasingly greater role, and financial motives and markets. Aside from being too broad a definition for our purpose, it fails to include information that contextualises the phenomenon in time and space, as well as specifics on the economies in which the financialisation takes place (Krippner, 2005; Sawyer, 2013).

Doing such, it could describe both contemporary financialisation as the thousand-year-old phenomenon that David Graeber (2011) describes in his history of debt.

Alternatively, Dafermos et al (2020) contextualizes modern financialisation within a framework of supercycles. Within this framework, institutional and ideational struggles are reflected in measures of financial stability (encompassing economic growth, unemployment, inflation, etc). Dafermos et al. (2020) posits that the ebb and flow of this measure delineates the rise, crisis, and fall of a "supercycle", starting with industrial capitalism in the post-war period. Each supercycle is subject to different pressures that threaten financial instability, against which regimes try to formulate sets of "thwarting mechanisms". Thwarting mechanisms are institutional structures that aim to stabilize the macro-financial system by putting a lower boundary on contractionary tendencies, a ceiling on expansionary tendencies, or both. These mechanisms are the result of conflicts between social classes, interests, and opposing sets of ideas. Their effectiveness waxes and wanes over long-term cycles of institutional and political change. They are intended to constrain key macro-financial variables such as economic growth, employment, asset prices, current account balances, credit volumes, and inflation. A period of crisis in the macro-financial system is expected to lead to the emergence of new thwarting mechanisms.

It is thus surprising that, after decades of successive crises, the mechanisms of the old linger. No new regime has come to the fore to replace the supercycle of financial capitalism. In parallel, related and overlapping movements and phenomena have yet to find their successor, be it financial capitalism (supercycle or regime) or neoliberalism. Years after the declaration of the death of the Washington Consensus (in e.g. development politics) we are yet to agree on what would take its place (Gabor, 2021b). For the purpose of this thesis, we have to understand financialisation a bit further, as it is pivotal to the CMF understanding of current macro-economics. Doing so, we further specify what we mean by financialisation, and contextualise the term in time and space.

From the 1970's onwards, global finance has been growing at an astonishing rate, faster than the real economy (Madouros & Haldane, 2011). As Krippner eloquently explains, financialisation can thus be understood as "a pattern of accumulation in which profits accrue primarily through financial channels rather than through trade and commodity production" (Krippner 2005: 174). However, an the time many considered this growth fruitful, as the explosion of the financial sector was believed to aid real economic growth overall, on a global scale (Zingales & Rajan, 2005). Yet, most important were the American and European financial markets that, although already highly developed, grew rapidly in size and speed.

By the time of the 2008 financial crisis, this rose-tinted view met the reality of a financial sector that had not only grown, but changed profoundly. Most of the financial sector was not anymore involved in the supply of credit and investment for the business sector or the processing of household savings. Rather, most activity has become intra-financial (Perillo & Battiston, 2020). An added complication is that these intra-financial linkages have a propagating effect on financial distress, and can thus contribute to higher financial instability (Battiston et al., 2016; Perillo & Battiston, 2020). More fundamentally, contemporary capitalism had moved on from a banked-based towards a market-based financial system.

In a bank-based financial system, banks fund investments and loans through a combination of deposits from customers, sometimes borrowing from other banks and financial institutions, and issuing new debt instruments. When people deposit money into their bank account, the bank uses that money to make loans to other customers or to invest in financial assets (*Assessing the resilience of market-based finance*, 2021). This is the conventional story of credit supply and money creation. Importantly, the bank can also borrow money from other banks or financial institutions to fund its operations, or it can issue new debt or equity

instruments to raise capital (Levine, 2002). By the time the 2008 crisis struck, European and American finance had shifted away from old-school bank deposits, and were incredibly reliant on funding from the interbank markets. In short, they were fuelled by shadow money, rather than bank deposits.

Here our CMF-focus on liquidity returns, as shadow money is somewhat of a collective term for non-cash financial assets that can nevertheless be "traded at par on demand" (Gabor & Vestergaard, 2016). Importantly, and fitting for its name, shadow money is hard to track, highly liquid and uninsured. Besides this, shadow money is not subject to the same regulations and oversight as regular cash (Pozsar, 2018). One problem with the term stems from disagreements on the term's scope and definition, as some scholars include more assets than other (Vestergaard & Gabor, 2021). Similarly, the terms market-based banking, shadow-banking and securitized-banking are used to describe, barring some nuances, the same evolution (Gabor & Vestergaard, 2016; Gorton & Metrick, 2012; Perillo & Battiston, 2020; Pozsar, 2018).

The construction of the European Monetary Union (EMU) is historically linked with the rise of financialisation in the European economy. Since the 1992 Maastricht treaty, the European Central Bank (ECB) has pushed for the expansion of repo markets and the liberalization of European bond markets in order to make the European markets and currency more attractive to financial actors, besides general securitization of the European single market (Braun, 2020; Walter & Wansleben, 2021). This has led to policy battles, where the central bank has been opposed by the European Commission, but has ultimately come out on top (Braun, 2020). To explain why the ECB (and other central banks around the world) have been proponents of this marketisation, securitisation and financialisation, we must further understand central banks and their position, according to CMF theory.

The conventional view of central banks, as articulated in neoliberal discourse, is that they serve as institutional mechanisms for preserving the ability of private markets to allocate capital according to price signals. This is accomplished through inflation targeting regimes, which aim to maintain low levels of inflation in order to avoid disturbing these price signals. From this perspective, the role of central banks is to restrain government spending and debt issuance, and to ensure that the financial sector does not engage in excessive risk-taking (Gabor & Braun, 2021).

In contrast, critical macro-finance emphasizes the evolving nature of the financial system and the role of central banks in shaping and responding to changes in finance (Braun, 2020; Walter & Wansleben, 2021). In this view, central banks play a critical role in monetary and financial stability policy, particularly through repo markets. As such, they are seen as key players in the macroeconomic institutional arrangements that support the financial capitalist macro financial regime (Braun, 2020; Tooze, 2018).

3.3. The special case of the ECB

"It was designed — by the ECB and the European Commission — to mainly rely on eurozone sovereign bonds as repo collateral. In turning European states into a collateral factory for private finance, the founding fathers did not consider the financial stability implications for the ECB. Yet we know from the eurozone sovereign debt crisis that repo collateral valuation means cyclical market liquidity in eurozone sovereigns except Germany, threatening liquidity spirals that only the ECB can prevent" (Gabor, 2022b).

As we discussed earlier, the ECB is in a unique position. This is critical to understanding the importance of the central bank within European economic governance. As described throughout macro-financial literature (Dafermos et al., 2019; Gabor, 2021a; Knafo, 2020; Tooze, 2018, 2021; van 't Klooster, 2021) the age of financial capitalism, from the 1970's onwards, has changed central banking worldwide.

This position is in part the result of financialization: the importance of price signalling, a fear of hyperinflation and the distributional effects of inflation lead to the implementation of a low-inflation regime throughout most advanced economies. This meant that, to break the wage-price-spiral that neoliberal economics feared, they favoured a weakened labour power over strong unions that could push for higher wage increases (Harvey, 2005). According to this regime, governments should cut back on spending, as this would be inefficient, only fuelling inflation in the long run and crowding-out investment from the private sector in the short-term (Knafo, 2020). As a result, direct government intervention is (at least rhetorically) shunned, leaving the central bank's monetary policy as the economic policy channel of choice. The age of financial capitalism thus places the central bank in this unique position. The institutional setup of the ECB within the EU, being created on a background of ordo-liberalism, makes fiscal cooperation between governments extra difficult, and monetary financing illegal (Gabor, 2022b, 2023; Tooze, 2018).

Besides this, the central bank for an amalgamation of different economies, sharing the same currency without a shared fiscal policy, or way to reroute funding from one economy to the other (Tooze, 2018). As a result of this much of its policies are aimed at preventing fragmentation on European government bond markets. Similarly, the constraints of the shared currency that bind sovereign government bonds together can makes it so that government bond markets can find themselves in a liquidity spiral, with very little policies that can aid their situation. The logical conclusion of this bind is that governments default on their debt (Gabor, 2022b).

A defining problem of the eurozone comes at the result of a lack of control that governments face as it pertains to the currency that they borrow in. When Italy issues new bonds, it is effectively loaning in a currency it has very little control over. This raises a difficult, twofold problem of trust. First of all, in an economy where the government does control their currency, currencies must still trust their government to keep everything running: credit and investments must be distributed, inflation kept under control, etc. In the post-Bretton Woods era of fiat money, what the value of currencies represent is no longer that of any real commodity. It is the trust that holders of this valuta have in the capabilities of the governments that back that currency that is represented (Chohan, 2020; De Grauwe, 2022; Pozsar, 2018). This means that if the government fails to keep the trust of people holding their currency, the trust to keep everything running, this should be reflected in the value of their currency. Secondly, European member-states, having little to no control over their central bank and thus currency, can simply run out of cash. In fact, in the absence of Eurobonds, and the illegality of monetary financing by the ECB, the central bank should be unable to provide governments with cash euros (De Grauwe, 2022; Gabor, 2021a, 2022b).

This means that government bond markets can devolve into liquidity spirals, where the markets trust in governments to pay back their debt falls, driving up interest rates, and thus cost of borrowing for governments (Gabor & Ban, 2016). This of course means that the government's ability to pay their debt is hampered once more, thus restarting the cycle. It's a self-fulfilling prophecy: as markets grow afraid of a government going broke, they panic-sell their bonds, forcing their fear into a reality, as the government defaults on its debt (De Grauwe, 2022). As a measure of instability, spreads thus reflect the trust of financial markets in governments, the price of borrowing for these governments, and indicates stresses that this will put on the shared currency.
To recapitulate, the architecture of the EMU is built around the liquidity that repo-markets can provide. These need a steady supply of government bonds. Because of the instability in these markets, their fundamental importance in the Union, and the inability of national governments to stabilize them, the ECB must intervene to secure stability within the EMU. The reality, that we saw in the eurocrisis of the past decade, is that the ECB is thus forced to step in. As we will see, this can create entanglements that have

serious implications for the position of the central bank. Below we further discuss infrastructural power theory.

3.4. Infrastructural power

The macro-finance money view has other implications. As of now, we have yet to really distinguish between what organisations different balance sheets represent. Whilst the plumbing view has the tendency to make analysis more complex, it also seems to strip some information away (Knafo, 2020; Petry et al., 2020). Honouring the 'critical' in CMF, the position and power relations between these represented actors and institutions must be taken into account. Here we focus on the distinction between public and private actors within the economy, and how their relative positioning is hugely influential. These different constellations of public-private relations, their respective institutions, positions and power dynamics are encapsulated in so-called regimes (Gabor & Braun, 2021). CMF scholars are typically concerned with this juncture of the public and the private sphere, how they interact, what power relations this creates, and how this influences policy outcomes and effectiveness. (e.g. asset-manager and monetary authority cross-influence) (Braun, 2020; Gabor, 2012, 2020a; Gabor & Braun, 2021; Petry et al., 2020). As states have increasingly used market-based governance to reach goals, this intersection becomes progressively important to understand.

Benjamin Braun's work on asset-manager capitalism and central banking describes the linkages between public and private actors within the European economy, and what power relations this creates and maintains. Focussing on central banking and the power of finance, Braun (2020) hypothesises that the ECBs dependency on financial markets to transmit monetary policy is a source of *infrastructural power* for finance.
Originally conceptualised by Michael Mann (Braun, 2020; Mann, Michael, z.d.), infrastructural power captures the power derived not only from position, but *entanglements*. In Mann's view, the state has infrastructural power *through* civil society, as the latter requires the state to achieve its policy goals. The power of finance has mostly been described as either structural (derived from its position) or instrumental (derived from lobbying). Braun expands on this concept by switching it around: states must now often *go through* financial markets to enact economic governance. The ECB, for example, increasingly started leaning on repo markets in open market operations (OMO). As Eurosystem central banks increasingly used repo as their primary OMO-instrument, the state's dependency on repo-markets grew, and the EMU now houses the biggest repo market globally. In this sense, the ECB endows power onto finance, as market-based central banking ties the ECB's interests (*"maximising steering capacity"* (Braun, 2020, p141) to reach policy goals) to the survival and success of certain financial sectors. Thus, more broadly, finance derives infrastructural power from this constellation, as the state must come onto "their turf" to reach policy goals.

Infrastructural power thus describes a two-way street within the financial system. *"Public actors provide the backstop infrastructure for the creation and trading of private credit, and conversely, private actors provide the infrastructure through which public monetary governance operates"* (Gabor & Braun, 2021, 29:50).There is thus a strong entanglement between the public and private spheres, at the centre of the financial system. Central bankers manage these infrastructures through the operation of their respective policy instruments, and aim to maximise their policy impact, flexibility and broadly governability.

Infrastructural power is not to be confused with regulatory capture, and other forms of instrumental power, as the latter implies a greater and more active role of finance in regulatory institutions, mostly through lobbying. Yet, an approach of structural power, where power is derived from position, also misses a

nuance. The central bank is not a strictly regulatory or administrative body, it plays the game of *governance*. Besides, it does not account for the governance that happens *outside* of the central banks' "turf", but through markets (Braun, 2020; Gabor & Braun, 2021).

We can thus conclude that financialisation, driven by both finance and central banks themselves, have placed the ECB in a unique position, with a foot in both the market and state. Their reliance on repo markets to conduct monetary policy has given finance infrastructural power that influences the behaviour of the central bank as it wants to maximize its steering capability and capabilities to reach its policy goals. Yet, perhaps more importantly, the central bank also has infrastructural power over the financial system. As such, they have unique capabilities, and have a very important role over the financial system, somewhat determining what it looks like (Tooze, 2020; Vestergaard & Gabor, 2021). In such, central banks can sometimes directly shape finance through their actions. A good example of this is the aforementioned push by the ECB to promote repo-markets in Europe (Braun, 2020).
Critical Macro-Finance thus reconceptualises the role of the central bank within financial capitalism. As formulated by Gabor (Gabor & Braun, 2021), the central bank has, through structural and infrastructural power dynamics, become 'the vanguard for the derisking state' (Dafermos, Gabor, et al., 2021, p5; Gabor, 2015). This idea was first conceptualized to describe financialisation in development programs and studies, typified by the UN's sustainable development goals and the G20's "billions to trillions" agenda. In these programs, state (and international) institutions are to aid financially in the creation of new asset classes. For finance, always hungry for new high yielding investment opportunities, this is always interesting. As BlackRock CEO Larry Fink put it: "Our biggest difficulty is not capital. Our biggest difficulty is finding the appropriate investments.[2]" (Buller, 2022).

As mentioned earlier, this is integral to contemporary financialisation, especially in international development. Gabor (2015) found that as financial globalization abides, development projects are increasingly organised around partnerships with global finance. The goal of this approach is to encourage investors and asset managers to invest in development projects, by "de-risking" them. Often (yet not always) this can be understood as the use of public funds to ensure the profitability of a project, or at least insure private losses. Furthermore, these investments are then packaged into bankable assets and marketized. Sometimes known as *"development as derisking",* Gabor calls this the "Wall Street Consensus (WSC)". As we will see, these public-private arrangements are very much in the interest of the financial sector. Further on, we explore the ways finance would like to see private capital escorted towards "green investments", and what this means for the public, the state, and central banks.

[2] Other quotes: *"We have the capital. Capital is not the problem when it comes to infrastructure and sustainability" (Larry Fink)* (*2021 G20 Infrastructure Investors Dialogue: Financing Sustainable Infrastructure for the Recovery*, 2021, 42:01). As he continues, it becomes clear that what he aims at is for governments to "clear a path" for finance to mobilize their investments. *"It is working with governments, working with private sector companies moving forwards, and finding solutions. This is where capital from the private sector can go, this is where we have discussed with many governments that we have capital standing by to be investing in this" (Larry Fink)* (*2021 G20 Infrastructure Investors Dialogue: Financing Sustainable Infrastructure for the Recovery*, 2021, 42:25).

3.5. Macro-financial Climate Regimes

“We can invest, we can make the green transition happen, because we have all the capital, but we are not going to take any losses, you will have to take the losses. […] If there's no insurance, there's no transition” - Mark Blyth (Blyth, 2022, 13:15).

Specifically on climate change and the green transition, CMF scholars have theorised on how central banks and finance are to play a role, as the transition will require substantial financing. For example, the 2018 IPCC report estimates that yearly, until 2050, USD 1.6 to 3.8 trillion in investments are needed to transition energy systems to a low carbon standard, netting to an investment gap of 50-100 trillion USD (Park & Kim, 2020). As private investors (e.g. pension funds, banks) deem green investments to have a “unattractive risk/return profile”(Polzin & Sanders, 2020 , p2), public actors will have to play a bigger role, either directly financing the green transition, or by accommodating private investors.

In fact, as illustrated aforementioned quotes by Larry Fink, finance is expecting them to do so. Borrowing a phrase from Pecks (2002) work on the state of neoliberalism, Gabor claims that we have left the “roll-back” stage of the Wall Street Consensus (WSC). Peck focussed on the different phases of neoliberalisation, and posits that, starting in the late 1970’s, this phenomenon shifted from an ideational-philosophical movement to a political one. As he describes, this is the moment where, after years of successfully blaming the Keynesian state for then contemporary economic ills, “*state power was mobilized behind marketization and deregulation projects, particularly aimed at the central institutions of the Keynesian-welfarist settlement*” (Peck & Tickell, 2002, p2). Gabor argues that the WSC equivalent to this has not been aimed at the welfare state, but at attempts by the state to regulate investments in brown or dirty assets (Gabor, 2022c), analogous with the fossil fuel industry’s success in hampering GHG-emission policy, as well as international cooperation attempts at regulation (Cook et al., 2019). For example, BlackRock got a chance to oversee the setup of an arm of the European Commission’s Sustainable Finance strategy, a quite strong conflict of interest, as BlackRock is a carbon financier (Burns, 2020; Gabor, 2022c). Most notably, carbon financiers convened at COP 27 to, as Gabor put it: alter “[…] t*he grammar of climate finance and extinguishing concepts like carbon bias or dirty penalties from regulators’ vocabularies*” (Gabor, 2022c).

At COP 26, but more importantly at COP 27, this roll-back stage has given way for the next stage of the project. In this “*roll-out*” stage, finance aims to mobilise the state as a derisking agent. One of the ways this could be facilitated is through the use of public-private partnerships (PPP’s), as we have seen extensively used within the billions-to-trillions program and development in the Global South (Gabor, 2021b). These partnerships are often structured in such a way that governments provide insurance for the investor. This means that investors set a floor of return on investment. This has some profound implications for the project. Firstly, this means an investment must be profitable. Secondly, and following this, this need for profitability inherently implies user fees, or the direction of demand towards the project[3]. Thirdly, some of these PPP’s rely on governments to take over the investment when profitability can no longer be ensured (Dafermos, Gabor, & Michell, 2021; Gabor, 2021b, 2022c). As Gabor (2021b) reports, derisking is a

[3] A good, non-climate nor development-related example of this is the Diabolo-tunnel, that connects the Brussels city centre to its nearest airport. Since the projects costs had skyrocketed, and demand could not keep up with the profit requirements, the user-fees on the use of the tunnel have skyrocketed. The Belgian national railway company is forced to keep pushing these user fees, together with artificial demand, to prevent having to pay what is effectively a penalty to the banks within the PPP (De Boeck, 2013; Melville, 2009).

popular method to escort private finance towards green investments and infrastructure: by making them bankable, and profitable, creating new asset classes for private finance with public money.

In conclusion, giving private finance such a protagonist role in funding the green transition comes with complications. This comes at the costs of the state, which has historically led industrial transformation, and has the means to do now. Private financing requires a profit incentive. Many necessary investments will not be profitable (e.g. in public goods) (Van Lerven et al., 2020), and can create distributional effects (i.e. through rising energy prices) and a need for user fees (Dafermos, Gabor, & Michell, 2021).

As of now, we have implicitly discussed two pathways and measures of decarbonisation, each of which imply a different role for markets, the state, and central banks. Braun and Gabor (2022) present a typology of these different constellations as distinct macro-financial regimes. Each of these regimes has a set of characteristics, such as a coordination mechanism to channel investment (away from brown and towards green assets) and a degree of nationalisation. Besides, they each envision a different objective in financial regulation, and different roles of fiscal and monetary policy. As we shall see, from this list is somewhat sorted by the reliance on the price mechanism to bring about the transition, as well as the respective feasibility of each scenario (as imagined by Gabor & Braun (2021)).

Table 2. Typology of green macro-financial regimes[4]

Regime	Coordination mechanism of investment	Objective of financial regulation	Fiscal & monetary policy	Degree of Nationalization
Carbon shock therapy	Prices and competition on the free market	Liberalisation – price signals must flow freely	Fiscal discipline & monetary dominance – status quo	None
Small green state	Carbon prices, derisking, risk-based approach	Private ESG taxonomy, voluntary decarbonisation of balance sheets based on ESG incentives	Green asset derisking & asset price targeting	Nationalization of certain stranded assets to avoid financial collapse
Big green state	Carbon pricing, indicative planning	Public taxonomy & mandatory decarbonization of private balance sheets	Green public investment planning, Green monetary policy and coordination between monetary and fiscal policy	Stranded assets + parts of the financial sector (pension funds)
Green planning state	State planned greening	Financial repression and fiscal dominance	Fiscal dominance, monetary financing. Redistributive politics	Stranded assets, financial sector, some real economy sectors (energy)

[4] Adapted from Gabor, D., & Braun, B. (2021, december 11). *In Search of a Green Macro-Financial Regime*. Cambridge Society for Economic Pluralism. https://www.youtube.com/watch?v=5tSqwJTyfFA&t=1411s

The first regime is effectively carbon shock therapy and relies on a belief in the liberalisation of markets. State-owned capital is pushed towards marketisation, and structural change is sought through the subjugation of as many enterprises as possible to the discipline of price signals. This regime argues that if the right political and economic conditions are in place, higher carbon prices will function as signals to markets and investments to drive the transition without interference. This approach is considered to be an extension of the status quo because it does not envision significant institutional change and relies on traditional monetary and fiscal policies (Gabor & Braun, 2021; Gabor & Weber, 2021).

The second regime features a small green state that acts as a derisking agent. This approach acknowledges that carbon prices may not increase enough on their own to drive the transition due to political and economic obstacles. To steer private capital flows, derisking strategies are proposed, as we discussed above (Gabor, 2022c). This regime emphasizes the role of private finance in driving the transition through the use of environmental, social, and governance (ESG) ratings or frameworks, and focuses on voluntary decarbonization. The central bank may also take steps to change the direction of capital flows and credit creation through green asset risk management (Gabor & Braun, 2021). This regime introduces green asset derisking, meaning that the central bank provides price supports based on private or public ESG taxonomies to steer towards green investments. This is what in the literature on development is called the Wall Street consensus, the derisking state, activated in the pursuit of a goal (development, green transition, infrastructure rebuilding, …). As we will discuss below, this is the the regime most like the current macro-financial setup in Europe.

The third regime, or the big green state, is a form of green developmentalism, and involves a greater role for the state in driving the transition through the use of financial regulation and incentives to steer credit creation towards low carbon sectors. State-led decarbonization would require close collaboration between central banks, who actively redirect private capital flows towards low-carbon investments, and economic policy (Gabor & Braun, 2021). Of course, private capital would still be needed, and the state should gradually introduce market dynamics, carrots and sticks to mobilize the private sector (Gabor & Weber, 2021). Gabor & Weber (2021c) argue that this would resemble China’s industrial growth strategy, escaping carbon shock therapy. In a big green state scenario the state, or central bank, would have to nationalize some of these dirty assets, as some of these assets could create financial instability. As described by Braun (2022), these pension funds have grown enormously, and could constitute systemic risk in case of mass devaluation.

The fourth regime is what could be called the green planning state, and advocates for a form of ecosocialism: the complete overhaul of the economic system to prioritize environmental and social goals. This certainly involves the nationalization of certain industries and the creation of new financial institutions to support the transition. As private capitalists would protest government planning, the nationalisation of certain real economic sectors is implied. Financial regulation would be geared towards financial repression. Notably, redistributive politics and degrowth narratives are possible in this regime, as all other regimes imply green growth.

To conclude, Critical Macro-Finance is a heterodox and a diverse set of theories. Yet, what binds them together is a coherent narrative on the evolution of crises, global finance and financialisation, and the role of central banks. CMF theory can explain how central banks have become such central actors in a financialised global economy. Because of the central banks unique position, as pivotal actor both in times of business-as-usual and in times of deep crisis, it has been bestowed with the expectation to guide the financial side of the green transition. CMF provides a framework to think about the different roles central banks could play in the green transition. Using this framework, we can try to dissect the ECB’s decarbonisation plans as described below. In this last chapter, we try to evaluate the question: why did the

ECB put forward a plan of decarbonisation and why did it choose to go as far as it did? Do ECB plans to green monetary policy indicate a shift towards a certain new macro financial regime? Which one(s)? Can we explain ECB (in)action as a failure of the financial capitalist regime (the status quo), or as a feature of a new macro-financial regime? Can we explain the ECB climate action plan as an adaptation of its thwarting mechanism arsenal to preserve the effectiveness of its monetary policy transmission?

4. ECB Plans on Climate Change

4.1. How the ECB does harm

Within the literature on green central banking, the ECB has a bad track record. As we will see, the ECB injected trillions of euros into the European economy (Tooze, 2018, 2021). Due to its commitment to market neutrality, the central bank thus disproportionally aided carbon intensive investments through a carbon bias in its asset purchasing program (Cojoianu, Collins, et al., 2020; Gabor, 2020b). More recently, the ECB has changed this narrative, admitting possible biases. In the following section, we will explore the possible harm the ECB has done in this way.

The Euro-system collateral framework (ESCF) has been contributing to the pollution of greenhouse gasses in the atmosphere. The rise in relevance of this framework is rooted in three evolutions. First, the ECB has increasingly used collateral to secure its instruments, as e.g., refinancing operations have increasingly been achieved via secured loans (Gabor, 2012). This increased use of collateral is logical as secured lending can, in case banks default on their loans, avoid losses that in the best case is a loss of public money. This could harm the central banks' reputation, which is critical to the transmission of monetary policy. Furthermore, unsecured lending is time-intensive, as research must be done to ensure a low risk of default for every institution. As the eurosystem must provide its services to many banks, this would be time-consuming, costly, and inefficient. Collateral removes this need for research, as loss of value is kept to a minimum through the secured character of the transaction, and the retention of value through margin calls (discussed below). In fact, the majority of the ECB monetary policy tools now use collateral or the ESCF in some way (ECB, 2021f; Wallin Albuquerque, 2011).

Second, the adoption of asset purchase programs in the wake of the Great Recession, sovereign debt crisis and covid pandemic later on, further expanded the frameworks impact (Gabor, 2020b). Where the Bank of England (BoE) and Federal Reserve (or Fed) adopted quantitative easing programs to combat lowflation, liquidity shortages and low growth caused by the financial crisis of '07-'08, the ECB shied away from adopting outspokenly adopting QE. Its 2009 Securities Markets Programme might get close, but it probably best described as quasi-QE (Belke, 2010; Smith, 2020). The uniqueness of the European sovereign bond crisis and a perhaps more conservative skew within the ECB, illustrated by Jürgen Starks resignation after the announcement of the programme. The Eurosystem's first real round of QE thus was adopted in October 2014, as the Asset Purchasing Programs (APP) (ECB, 2016a). This started with the acquisition of sovereign bonds, to stabilise intra-European asymmetries in government debt. In 2015, corporate assets were included by the start of the CSPP. To determine what assets were to be eligible for purchase, the Eurosystem used their collateral framework.

Third, these policies created knock-on effects for the whole European financial sector. Since the start of the 21st century, the repo market grew enormously and became structurally fundamental to government bond markets, cash-rich non-financial institutions (i.e. pension funds) and the European financial stability as a whole. Institutions within the Euro-system, notably the ECB, have increasingly been aware of the growing importance of repo-markets (Gabor, 2012; *Report from the Commission to the European Parliament and the Council Evaluation Report on the Financial Collateral Arrangements Directive (2002/47/EC)*, 2006). It is thus vital to understand how repo-markets and the ECB's collateral framework can be vital in greening the financial sector and monetary policy.

Repo-loans work as a sort of loan, that is secured by the use of a financial asset. These assets are thus used as collateral for these loans, so that lenders can be sure of repayment. The basic mechanic works as

follows. We start with a classic loan: the lender loans cash to the borrower, the latter repaying this loan with an interest on top. To secure this loan however, the borrower “sells” a financial asset to the lender as collateral, for example a government bond. The “loaned” cash here is thus the “price” that the lender pays to the borrower for this asset. They then agree that the lender will sell this collateral back to the borrower on an agreed upon date. To ensure repayment and to account for market fluctuations, the value of the collateral will be higher than the total value of the repo loan. We call this discrepancy a “haircut”. Haircuts are another way that the ECB have a profound impact on the desirability of financial assets. As before mentioned, haircuts are used in the private financial sector to relay risk and value of assets used as collateral. The ECB does this based on their general framework. This means that haircuts on assets are determined by their asset type and issuer, and general risk evaluation by the Eurosystem, i.e. taking into account the liquidity risk, credit risk, duration or maturity, and market haircut rates (ECB, 2016c; Tooze, 2018). Thus, there is an interaction between market haircut rates and haircuts set by the central bank. The literature seems to suggest that the ECB’s effect on the market is the most outspoken (Nyborg, 2015), as it accounts for market rates in its calculation.

Yet, climate or environmental risk are not included. This means that, within the ECB’s CSPP, fossil fuel- and carbon-intensive companies’ environmental impact, greenhouse gas emissions, etc. are not considered, underestimating the long-term risk these assets have with “tragedy at the horizon”. Even more, the carbon intensive sector is overrepresented among issuers of eligible corporate bonds (Cojoianu, Collins, et al., 2020; Gabor, 2020b). According to a 2022 report (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022), 60% of corporate bonds held by the ECB in 2021 originated in carbon-intensive sectors, which represent less than 30% of the gross value added in the eurozone. Dafermos et al (Dafermos, Kriwoluzky, et al., 2021) thus conclude that the CSPP significantly contributed to the smooth financing of fossil fuel companies and carbon-intensive corporations. This bias was present through the ECB’s whole post-2009 QE program (Battiston et al., 2021; Cojoianu, Clark, et al., 2020; Matikainen et al., 2017), and endured in the Pandemic Emergency Purchase Programme (PEPP)(Cojoianu, Collins, et al., 2020). This bias is partly explained by the fact that carbon-intensive, but fossil fuel companies specifically are more likely to be funded by bonds than low carbon companies are (Cojoianu et al., 2019; Cojoianu, Clark, et al., 2020; Cojoianu, Collins, et al., 2020).The interaction between the ESCF and market haircut rates means that this bias is exacerbated on financial markets. The same is true for asset eligibility criterions, further worsening this tilt. Eligibility for Eurosystem collateral has a great impact on valuation of any bond. The existing literature indicates that assets bought by the central bank (Matikainen et al., 2017), know raising favourability among investors, lowering its yield and raising its price.
Currently, this price increase is explained mostly through the central bank draining supply (Christensen & Krogstrup, 2016). On a larger scope, this means that whilst QE's original goal is to stimulate the economy, benefits are tilted towards assets that end up on the balance sheet of the central bank, which are overwhelmingly issued by carbon-intensive companies.

To recapitulate, the Eurosystem collateral framework is important to climate finance as it could defines what assets are bought under the CSPP, and what assets can be used to collect central bank money. Yet, these effects could be optimised through the further promotion of the ESCFs use throughout the European financial sector and beyond, for the determination of eligibility and haircut rates. In combination with a greening of the existing framework, this might offset some of the financial browning that the collateral framework has done. For a further exploration of the options the ECB and Eurosystem have in the greening of their monetary policy, see section 4.2.

Somewhat paradoxically, the ECB’s recent communications on its relation to climate change may in fact be harmful to their future prospects. Dietrich et al. (2022) describe the *expectations channel* to climate

change-related central banking discourse. As they propose, media attention and salience around future climate change effects on the economy affect the expectations of people, mostly increasing the perceived likelihood of economic downturn in the near-future. These gloomy expectations would then, according to the model, have significant impact on real economic factors. For instance: the model shows that a higher expectation of natural disasters lowers the natural rate of interest. As Dietrich et al. (2022) states, a lowered natural rate of interest could hamper central bank efforts and reduce their flexibility in scenarios where interest rates are already low. In a wry twist, this means that central banks publicly discussing their concern with e.g. climate-risk could paradoxically be obstructing their own future policy goals. It should be noted that these concerns were made in the seeming assumption of an environment of sustained low inflation and low interest rates. Considering the recent return of high inflation, the global economic environment might be a very different one. The overall message remains, though, and central banks should be wary of these feedback effects. This is especially true in light of the following section, in which we list proposals for central bank action on climate change.

4.2. What central banks can do

In recent years, much has been written on the different actions the ECB can take to contribute to climate change mitigation efforts. As it is our goal to understand not only why the ECB has started on climate policy, but why it left some options on the table, it is essential that we discuss these options first. We can broadly identify different areas and policy approaches to this problem. Right now, sticks and carrots are not equally applied. Some central banks, such as the BoE, have delayed sticks (Bank of England, 2021). Others, including the ECB, have yet to announce any (Gabor, 2021c, 2022c). There remains a range of proposals that are not being implemented.

Topping the list is putting a stop to the financing of carbon intensive assets through the central banks' asset purchase program. To do this, it should use and maintain a green/brown taxonomy of assets according to climate impact (Gabor, 2020b). Central banks could also contribute to the further development, promotion and use of this taxonomy. In the European Union, the EU taxonomy was developed by the commission (Alessi et al., 2019), but is still very voluntary for governments, businesses and finance to use.
After discussing Critical Macro-Finance theory extensively, we learned that under contemporary financial capitalism, both finance and the central bank heavily rely on repo-markets to achieve their goals. As we saw, collateral-eligibility also has a measurable impact on the desirability of an asset. Thus, the central bank could aim to improve their collateral framework by taking into account the environmental underpinnings of an asset (Gabor, 2020b; Jia & Ilzetzki, 2021).

The ECB could use its power to create money through its quantitative easing (QE) program to stimulate financing for environmental investments rather than just pumping it into the financial sector (Campiglio et al., 2018). As proposed by Paul De Grauwe, the ECB could reorient the money flows towards environmental projects by replacing existing bonds with new "environmental bonds" when they come to maturity, without creating new money and therefore not risking additional inflation. One potential solution could be for the European Investment Bank (EIB) to be given a mandate to finance a certain amount of environmental investments, with guidelines provided by political authorities (De Grauwe, 2019).

The Eurosystem collateral framework is fundamental not only to the transmission of central bank policy, but also to the smooth operation of the European banking sector, as more and more finance has relied on collateral to insure redemption. The ESCF can be greened by two general approaches. The first, more passive and risk-based approach, aims to decarbonise the framework by ensuring that climate and environmental risk is included in the credit assessment of assets. This way, one would try to determine how

much risk has been taken on by central banks, private banks and financial institutions by taking on these assets. The more active approach, called the “environmental footprint”-approach by Dafermos, Gabor, Nikolaidi, & van Lerven (2022), is based on a belief that the collateral framework can help address the environmental crisis more directly, by penalising polluting assets, supporting greener assets, and signalling what companies are deemed climate-risk-free to the financial markets. The framework is thus treated to a more active decarbonisation method. This approach is more concerned with adjusting the haircuts of assets from carbon-intensive issuers, and including climate and environmental concerns as eligibility criteria.

Besides this, regulators should make sure to prevent "dirty arbitrage". As companies go through the greening process, some might try to avoid costly and impactful measures by practices as "brown-spinning", selling of their most polluting, "dirty" assets to private equity at a discount. In such a way, they might avoid disclosure rules and climate regulations (Gabor, 2021c; Taraporevala, 2021).

Green guidance is a more regulatory option. Through forcing the addition of risk premiums to carbon-intensive loans and investments by private banks, the ECB can incentivize private capital into investing in greener alternatives (Schoenmaker & Schramade, 2019). Similarly, banks could be forced to hold higher reserve requirements for brown investments that green investments. In this way, banks could hold lower reserve requirements when it lends to green business, making it more profitable. It has to be said that the ECB does not have complete control over these regulatory measures, as these rules are developed on different tracks that are outside of the scope of this paper.

Another way to appreciate green investments is the use of green reserve assets. The Eurosystem reserve assets, that it holds to ensure the stability of exchange rates, are contingent on certain criteria. As the Eurosystem holds over a trillion euro's in reserves (CEIC, 2023), adding greening considerations to these norms could have a significant impact (Volz, 2017).

Another option is the implementation of Green TLTROs, or targeted longer-term refinancing operations. These are a type of monetary policy tool used by central banks in times of crisis to encourage lending and stimulate economic activity. TLTROs work by allowing banks to borrow money from the central bank at a discounted rate for a fixed period of time. In exchange, the banks must use the borrowed funds to make loans to households and businesses. Green TLRO’s would work similarly, but would require these loans to finance green projects. One of the main advantages of TLTROs is that they can be targeted to specific sectors, regions, or investments. This allows central banks to tailor their monetary policy to make sure households and business are provided with credit to green their buildings, transportation, and infrastructure (Klooster & Tilburg, 2020). Christine Lagarde has shown some interest in greening refinancing operations towards banks and businesses (Caswell, 2022). Yet, as we shall see, the European Central Bank uses a select set of instruments. It is the goal of this thesis then, to explain why the central bank takes the measures that it does, and (maybe more importantly) why it leaves other proposed instruments overlooked?

Proposing appropriate goals, policies and instruments is to traverse a daunting path, with many pitfalls along the way. One has to balance unforeseen consequences, political difficulties (Gansmeier et al., 2021) and staunch opposition from carbon-dependent citizens and resourceful lobbies (Dechezleprêtre et al., 2022). Besides, broadening policy goals comes with the risk of disrupting the mechanism that the ECB has developed to ensure the smooth and effective transmission of its’ monetary policy. Schoenmaker (2020) states that, to avoid disturbing this mechanism, proposals that risk to interfere with policy transmission and price stability ought to be avoided. Among these are changing of the asset mix and maturity that are used

in monetary and reserves policy. Besides this, central banks should incrementally green their policy and avoid impacting the market asymmetrically as much as possible. This approach, while supported by modelled data, excludes a whole range of more creative central bank policies that could aid in the greening process. It is worth noting that real-world empirical data to support Schoenmakers' claim is not yet available. Yet, they can provide an insight into why policy elites have had a hard time implementing a green transition.

As we explored in previous chapters, besides the question of funding the transition, central banks might be faced with stranded assets, as a direct result of this transition. Of obvious interest are the oil exporting gulf states, whose oil sectors that have acquired immense amounts of capital. So much so, that their oil export business interests have occasionally clashed with their newfound interests in the banking sector (Nair et al., 2023). The massive oil reserves are, in the face of a shrinking global carbon budget, likely to become stranded assets. But the term encapsulates more than the classic examples of faraway oil reserves. Even if we ignore the fossil fuel reserves in coal and gas deposits within the eurozone, green transition policies could render now critical industrial infrastructure (such as certain ports and pipelines), agriculture, and real estate (such as inefficient buildings) virtually worthless (Caldecott et al., 2016). A combination of external shocks and internal price devaluations could thus bring serious financial instability to the Eurozone.

Thus, we can see that stranded assets are a broader class of capital that threaten devaluation through environmental-related risk (Caldecott et al., 2016; Kedward et al., 2022a). Using predictive modelling, Diluiso et al. (2021) proposes some central bank responses to possible asset stranding. Firstly, as we posited before, an orderly and predictable transition is paramount to maintaining financial stability. This includes a slowly rising and predictable carbon price, brown tax, and a transparent inclusion of CRFR's in risk assessment. Secondly, the private capital has a severe strategic deficit on stranded assets, as many investors have not yet planned for asset obsolescence, and existing tools are outdated and unrefined (Caldecott et al., 2016; Delis et al., 2018). A central bank could play a role here to guide and ease an anti-stranding strategy.

Even if the times of lowflation are seemingly over (although the nature of these developments is a still in ongoing debate), there are good reasons for the use of multiple "unconventional" policy instruments. According the Tinbergen rule of political economy, multiple policy goals can only be achieved through multiple instruments (Uher et al., 2021). If the 2021 strategic review actually reflects an incorporation of climate-related policy ambitions, more instruments will be needed to produce the desired results. Knowing this, we can ask ourselves (1) what goals the ECB has set and (2) which instruments it plans to use to achieve these goals.

4.3. What does the ECB do?

The ESCB presented their second ever review of its long-term strategy and internal decision-making in July 2021. In it, the ECB presents their plan with big promises:

"*Climate change has profound implications for price stability through its impact on the structure and cyclical dynamics of the economy and the financial system. Addressing climate change is a global challenge and a policy priority for the EU. Within its mandate, the Governing Council is committed to ensuring that the Eurosystem fully takes into account, in line with the EU's climate goals and objectives, the implications of climate change and the carbon transition for monetary policy and central banking. Accordingly, the Governing Council has committed to an ambitious climate-related action plan. In addition to the comprehensive incorporation of climate factors in its monetary policy assessments, the Governing Council*

will adapt the design of its monetary policy operational framework in relation to disclosures, risk assessment, corporate sector asset purchases and the collateral framework" (ECB, 2003, p2). We will discuss the promises made by the ECB in this chapter.

The review of the ECB's monetary review brought a new interpretation of its primary objective, price stability. As such, the inflation target was redefined from "below, but close to, 2 percent over the medium term", to a looser "aiming for 2 percent" (Höflmayr, 2021, p3), pursuing a symmetric target. We can simply understand this as a willingness of the ECB to allow inflation to rise a somewhat above 2 percent, considering their earlier problems with lowflation (ECB, 2021e). Deviations above or under the target are thus seen as "equally undesirable" (ECB, 2021c, p2).

As part of its strategic review, the ECB presented a climate action roadmap (ECB, 2022b). More specifically, the ECB climate roadmap describes a list of seven objectives (ECB, 2021a).

1. Data gathering and modelling: the European Central Bank is gathering data on and adapting macroeconomic models to consider climate change and its related risks. This includes analysing statistical data and incorporating climate-related risks into the ECB's analysis, modelling, and reporting (ECB, 2022b). In order to monitor the implications of climate change and climate change-related policies, the ECB is using macroeconomic models to factor in carbon pricing in the evaluation and prediction of commodity prices. These models are also being used to evaluate the economic impact and financial stability of climate change, as well as to understand the transmission mechanisms through which climate change could affect the transmission of monetary policy. For example, climate risks and climate change-related fiscal policies are taken into account when modelling for the ECB staff forecast, so that the effects of green transition policies on inflation, fiscal stance, and commodity prices are reflected in the trimonthly forecast. Although climate change related fiscal policy is taken into account for the ECB macroeconomic forecast, the war in Ukraine seemingly had dominated the march 2022 forecast (ECB, 2022e), with EU and national climate change policy fading to the background. Similarly, high inflation and energy prices dominated the September and December analysis (ECB, 2022f, 2022i).
2. Stress testing: to assess its own exposure to climate risks, as well as the potential impact of climate risk on financial stability (ECB, 2021a). However, it is important to note that the financial stability aspect of these stress tests is focused on assessing the individual exposure of banks to climate-related financial risks (Dafermos, Kriwoluzky, et al., 2021).
3. Climate-related disclosure requirements for the use of private sector assets as collateral in its monetary policy operations and for its private sector asset purchases. The ECB says it is evaluating the possibility of adjusting its collateral framework in order to make it more focused on green projects, and is looking at similar programs implemented by the Chinese central bank. According to the ECB, the Chinese central bank's experiments with possible adjustments to its collateral framework seem to have contributed to the desired effects, influencing pricing and skewing the market towards financing green projects, resulting in a green-biased market (as shown by an increase in spreads between green and non-green bonds in 2018) (Dafermos, Kriwoluzky, et al., 2021; ECB, 2021a, 2022b).
4. The inclusion of climate risk in assessments by credit rating agencies. It is unclear what the ECB plans to do if it determines that the rating agencies are not sufficiently considering climate risk in their ratings. In addition to reviewing the practices of credit rating agencies, minimum standards for credit ratings and indicators will be developed, for use by the ECB and third parties (ECB, 2021b, 2022b).

5. Asset purchase program greening, more specifically the CSPP. More specifically, the central bank aims to decarbonise their balance sheet through greening reinvestments of bonds reaching maturity.
6. Collateral framework: as discussed earlier, banks provide collateral to secure ECB loans. The ECB is also planning to include climate-related financial risks in the evaluation of this collateral. The ECB has stated that it will accept certain sustainability-linked bonds as collateral and for its asset purchases. This means that banks will need to disclose information about their exposure to CRFR's when offering to use certain assets as collateral for ECB loans (Dafermos, Kriwoluzky, et al., 2021; ECB, 2022b).
7. Market neutrality: the strategic review promised to change the approach to market neutrality and efficiency concepts in monetary policy operation by examining biases in market allocation amid market inefficiencies, and considering alternative allocations. In addition, the ECB is considering alternative benchmark proposals for the CSPP, which is a framework for alleviating market biases by foregoing the idea of market neutrality in purchase programs.

We can discern four practices: Risk assessment, disclosure support, greening corporate asset purchases and revising the collateral framework. Firstly, prudential measures are taken to make sure information on the economic impacts of climate change and climate change adaptation is gathered and processed. Practically, this means both transitional and physical effects of climate change are reflected and accounted for in macroeconomic modelling and projections, analysis and stress-testing. In this same vein, the ECB aims to analyse the climate risks of financial institutions, as well as capturing their carbon footprint. To this end, indicators are to be developed (Dafermos, Kriwoluzky, et al., 2021; ECB, 2022b).

On the monetary policy side, the new ECB strategy states that it takes into account *"the implications of climate change and the carbon transition for monetary policy and central banking"* (ECB, 2003. p2). The roadmap clarifies that this means an incorporation of climate risks into the collateral framework, as well as disclosure requirements. As the collateral framework also impacts what assets are eligible for the CSPP, this will impact the ECB's asset purchasing programs as well.

Finally, and most vaguely, market neutrality is now to be questioned as a useful benchmark for monetary policy. In principle, this should mean that the carbon bias within the ESCB's asset purchasing program would be accounted for in the future. We can already see this implemented in a following clarification of improvements to the CSPP benchmark. At its genesis, the CSPP was designed to avoid introducing biases into the market through their purchases of corporate assets. To do so, a benchmark was set up, made to reflect the market value of eligible bonds. The purchasing of bonds would then be calibrated to this benchmark to properly echo market distributions (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022; ECB, 2016b). The strategic review pledges to re-examines the benchmark, to include climate-related factors. The impact of this is severely dampened though, by the decision to decarbonise only reinvestments of the CSPP asset stock (ECB, 2021a, 2022b; Schnabel, 2021; Van Lerven et al., 2020).

Two programs are uniquely affected by the decarbonisation plans within the strategic review: the corporate asset purchasing programs (mainly CSPP and PEPP) and the collateral framework. These programs are of critical interest to the central bank, as well to the wider financial system, and European economic governance as a whole. In the following section, the central bank's strategy to the decarbonisation of the ECB's corporate assets and collateral framework are exposed in more detail, followed by an evaluation and analysis of these changes and some theoretical implications.

5. Corporate assets and the collateral framework

To take stock, the ECB has admitted to the carbon bias in the asset purchasing programs, and in its collateral framework (Schnabel, 2021). The 2021 strategic review seems to aim at least partially to counteract this, through the albeit soft "greening" of the benchmark, and revision of "market neutrality as a guiding principle". This benchmark was first designed to ensure that the ECBs asset purchasing programmes would remain market neutral. The benchmark was weighted in such a way to reflect the layout of the European bond market, and used to prevent skewed benefitting of certain markets, countries, sectors, and companies (Schnabel, 2021). In the 2021 strategic review, the ECB promised to rethink this benchmark, and the concept of market neutrality as a whole (Höflmayr, 2021). To have a framework of analysis, it's important to keep in mind an operationalised goal for decarbonisation. Dafermos, Gabor, Nikolaidi, Van Lerven, et al. (2022) proposes an alternative benchmark, with which to compare ECB policy. This new benchmark is based on the 2015 Paris agreement, where countries, and the EU, promised to try to keep global temperature rise under 1.5 degrees centigrade (United Nations, 2015). The authority of the Paris agreement on this matter is further bolstered by the ECBs commitment to its principal, the EU, as they are obligated to aid the EU in the achieving their policy goals, including the Unions efforts to comply with the agreement:

"In line with the EU Treaty, the ECB has the obligation, within our mandate and without prejudice to our primary objective of price stability, to support general economic policies in the EU. In this way, we contribute to the transition to a carbon-neutral economy and to protecting the environment" (ECB, 2022d).

To this end, the Paris benchmark is designed to reflect possible pathways to a Paris-aligned (read: sub 1.5 degrees) warming goal. To do this, the researchers considered an array of central banking policies, metrics and timelines that would aid in this goal. Unlike earlier discussed modelled benchmarks, this is not a numerical benchmark with explicit weightings. The benchmark should thus be understood as a minimum requirement to align the ECB's monetary policy with the Paris Agreement, based on scientific findings published in the report itself, as well as earlier papers by the researchers and their peers. Later, the July 2022 plan was pitted against the Paris benchmark, resulting in a meaningful comparison between necessary and actualised goals. Broadly, the researchers argue that current climate considerations of the review are too narrow, and the principle of market neutrality will have to be abandoned for a new principle of climate neutrality (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022; Dafermos, Kriwoluzky, et al., 2021). In this way, they developed a framework, and used it to compare the current ECB greening efforts with more optimal pathways to decarbonisation. In this paper, their findings, and others are used to evaluate the strategic reviews ambitiousness.

5.1. Corporate Asset Purchase Programs

As previously discussed, asset purchasing programs such as the CSPP and PEPP have a significant positive effect on the desirability and yield of eligible corporate bonds. The same is true for green corporate bonds, which saw a marked appreciation during the pandemics APP (Bremus et al., 2021). In this chapter, I focus on CSPP, PEPP, and the collateral framework for a couple of reasons. Firstly, as we saw, CMF theory places great value on the evolution of repo markets and the importance of collateral (both corporate assets and government bonds) within the economy, and economic (monetary) policy. Secondly, purely in monetary value, these are massive programs with billions of euros in cash flowing around. Thus, this is a great opportunity to have serious impact on the green transition. Lastly, and quite pragmatically, these are the programs that the ECB and the wider academic community have elaborated on more broadly.

We showed that the CSPP has a carbon bias, and it favours brown activities more than their added value to the European economy would suggest to be reasonable (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022). The ECB thus argues that to avoid funding carbon-intensive economic development further, starting in 2023, the benchmark will be tilted to take climate considerations into account for reinvestments of the CSPP. But what does this mean?
When the ECB buys up corporate bonds, the bond principals are paid out on the date of maturity of those bonds. This is comparable to a flow of cash from the private sector towards the central bank, in reality a passive form of quantitative tightening, as the central bank takes away cash from the economy. In a scenario where the central bank aims to stimulate the economy and depress real interest rates, this would counteract the CB's efforts. Hence, these funds are reinvested into other bonds on maturity, making sure that the overall portfolio would remain stable in size.

Operationally, the ECB incorporates climate considerations into its corporate bond purchases in three ways. Firstly, the (previously strictly market neutral) benchmark will be tilted towards companies with a better climate performance (for reinvestments). This means that apart from market considerations, which companies' bonds are bought, are based on the climate score of these companies, favouring corporations with a higher climate score.

Secondly, the ECB has adjusted their bidding procedures, favouring bonds from issuers with a higher climate score. The central bank claims that these bonds will be more favoured in the bidding process by the ECB on the primary market, when they comply with "a stringent identification process" (ECB, 2022c). Further details on this process are yet to be published at the time of writing. Thirdly, the ECB pledges to stop the buying of new bonds from low scoring issuers in times of partial reinvestment**.** In practice, this means that, during times of quantitative tightening through letting corporate bonds mature, the Eurosystem will favour letting low scoring bonds mature over high scoring assets (ECB, 2022c).

This seems like a stringent compromise between stability and climate considerations. In fact, the ECB implies and points out that they still value (price) stability and market neutrality over climate considerations: "The overall volume of corporate bond purchases will, however, continue to be determined solely by monetary policy considerations and the role played by such purchases in achieving the ECB's inflation target" (ECB, 2022c).
Additionally, rising inflation means that in practice the ECB will not be expanding their asset portfolio, instead shrinking their balance sheet through quantitative tightening (Schnabel, 2023). Dafermos, Gabor, Nikolaidi, Van Lerven, et al. (2022) discussed concerns on how this would stop reinvestments, possibly halting APP decarbonisation plans[5]. In reality, the ECB is tightening through a hybrid approach (Schnabel, 2023). Starting in Q3 2023, the central bank halved reinvestments from maturing bonds over the whole APP. In context, the grand total of the ECB's APP has over 3200 billion euros in holdings on its balance sheet. In the second quarter of 2023, they estimate between 22 to 35 billion euros in assets to mature monthly, of which 7 to 20 billion will not be reinvested, resulting in an average of -14.49 billion euros in monthly net purchases (read, tightening) (ECB, 2022a).

[5] In the May 2023 monetary policy update the ECB confirmed that it will halt reinvestments of the APP, probably including the CSPP. The PEPP program reinvestments wont be halted until the end of 2024. Sourced from ECB. (2023). Monetary policy decisions. https://www.ecb.europa.eu/press/pr/date/2023/html/ecb.mp230504~cdfd11a697.en.html. accessed on 01/07/2023.

Although these are big numbers, the corporate asset side of the ECB's asset purchasing program is far from the biggest part of the whole APP. This is not to say greening the CSPP will have no impact, but reinvestments will always be but a small percentage of the whole program. To put this into perspective, the ECB (2022a) estimates that assets held under the CSPP represent consistently under 10% of the total APP value. The actual rate of "greening" through CSPP reinvestments (under EUR 2 billion monthly on average in 2023), is small compared to the 300 billion euros in corporate assets held, and dwarfed by the whole of the APP (over EUR 3 trillion).

Table 3. Estimated APP and CSPP respective holdings and maturing bond reinvestments[6]

Month	CSPP holdings (as % of APP)	CSPP reinvestments (in millions EUR)	Total APP redemptions (in millions EUR)	APP holdings (in millions)
April	9.28%	1,593	29,948	3,216,490
May	9.31%	2,179	35,948	3,202,000
June	9.26%	2,157	22,893	3,216,490
July	9.20%	2,638	30,972	3,230,980
August	9.15%	586	17,880	3,245,470
September	9.10%	2,977	21,245	3,259,960

[6] Sourced from ECB. (2022). Asset purchase programmes. https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html, accessed on 25/05/2023. Complete table with own added calculations can be found in appendices 8.3.

One could then assume that a EUR 3 trillion problem cannot be solved with a EUR 2 billion policy. If it is serious about aiming for the Paris agreement-goals, the ECB should be decarbonising more aggressively. To do so, Dafermos, Gabor, Nikolaidi, Van Lerven, et al. (2022) propose an alternative benchmark, that of climate neutrality. This way, the ECB could aid the EU, as it is mandated, in the Unions decarbonisation and transition goals, as set in the Paris agreement. Their Paris decarbonisation benchmark leads them to believe that the greening of the CSPP should be more aggressive, excluding assets sourced from non-conforming companies, and selling bonds from climate-laggards. In this way, companies would be forced to decarbonise aggressively or be punished. Besides this, those that need time to adapt, are more likely to have lagged on decarbonisation, and contributed more to the exacerbation of the climate crisis. This thinking is already mirrored in the ECBs rationale, as their climate benchmark claims to include historical pollution (albeit quiet lightly) (ECB, 2022c).

More importantly, the decision to only green reinvestments seriously hampers the impact of the CSPP review. By waiting for these bonds to mature, the strength of the CSPP greening plans is greatly reduced. Instead, it could decarbonise faster and increase the cost of borrowing for carbon-intensive growth styles. Financial markets would be forced to calculate in climate considerations as companies scramble to adapt and find financing. A more conservative view could argue that an overaggressive decarbonisation effort in within the asset purchasing program could be contributing to an unorderly transition, triggering chaos and instability. While it is true that this possibility should be used as an upper bound to decarbonisation policy, the researchers estimated a full greening of the CSPP to have a low probability of negative stability impact (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022).

Beside this, the metrics and tools used to assess companies' green characteristics are forgiving, as only scope 1 and scope 2 emissions are considered on backwards-looking benchmark scores for issuing companies. This means that indirect emissions (scope 3 emissions) are only considered on the sectoral level. The ECB addresses these concerns, by remaining on the side of caution, mentioning possible cliff effects as later scope 3 data would be introduced. In practice, this means that some carbon-intensive companies could be insufficiently punished for historical carbon emissions, and are not only addressed on their core economic activity. As Dafermos, Gabor, Nikolaidi, Van Lerven, et al. (2022) write, oil companies' core business model is a too destructive to be included in the CSPP or collateral eligibility, no matter their recent greening efforts. Aggressively including scope 3 data on an issuer level, instead of on a mere sectoral one, could prevent greenwashing efforts from prolonging unsustainable business models. The ECB has earlier expressed concerns over how companies' trajectories to decarbonisation could be misleadingly portrayed in backwards looking data (Lagarde, 2020). It is quite surprising then, that the ECB decided to forgo the use of the EU taxonomy, instead developing their own scoring system (Stanislas Jourdan & Del Vasto, 2021). Using the taxonomy could have sent a strong signal to financial markets, further strengthening the EU taxonomy as a powerful tool in the EU's decarbonisation efforts.

We can further evaluate the ECB's greening of its corporate APP by looking at a their latest reporting on the topic. The July 2022 announcement takes three approaches to climate considerations within the corporate APP. First, the risk-based approach: as the ECB buys more corporate assets, and this buying has an inherent carbon bias, the central bank risks accumulating CRFR's on its balance sheet. The first approach is thus to monitor CRFR's in the ECB's monetary operations, specifically asset purchases. Secondly, the ECB vouches to support an orderly transition "with measures within our mandate" (ECB, 2023, p.9). This means that price stability and financial stability have priority in both outcome and approach, promoting a risk-based perspective. Thirdly, and most vaguely, the report states that "We help improve the overall understanding of climate-related risks and work closely with European and international partners on climate and sustainable finance topics" (ECB, 2023, p.9). To this end, it promotes its own

transparency, as a way of leading by example. While climate related transparency is welcome, we can doubt if this has serious effects for the private sector. The first wave of climate transparency reports published in March 2023 still show a rise in absolute carbon emissions, although this is mainly explained through the expansion of the corporate assets on the ECBs balance sheet (ECB, 2023a). Especially the PEPP program ballooned the balance significantly.

5.2. Collateral Framework

Another headliner for the Eurosystem climate plan is the revisions to its collateral framework. As we said, the collateral framework is important not only because it determines what collateral banks can use to access central bank loans, but because it has implications for asset purchasing programs such as the CSPP, and what collateral private banks realistically use in their own transactions (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022). As we analyse the strategic review through a macro-financial lens, we must keep in mind that collateral, through repo-loans, is hugely important for the functioning of the modern European economy. Thus, the main instrument for designating assets as eligible repo-loan fuel in Europe, is the ESCF. Changes to the framework could have drastic effects on the ECBs efforts to decarbonize its portfolio, its policies, and the wider European economic activity.

As the collateral framework and the CSPP share eligibility rules, the carbon bias we found in the corporate asset purchase program is also prevalent in the ESCF as a whole. This is a result of the eurosystem not taking into account climate considerations as an eligibility criterium. In the July 2021 announcement, the ECB promised to include climate considerations into its ESCF. Earlier, it had started to accept sustainability-linked bonds as collateral for credit operations (ECB, 2022h), presenting the private sector with a carrot to decarbonise. We then received more news in a July 2022 announcement, and further clarification throughout the year.

The revision relies on the Corporate Sustainability Reporting Directive (CSRD), a self-reporting mechanism for the private sector, to measure corporate CRFRs for its eligibility process. The CSRD was set up as a part of the EU green deal. Through European Sustainability Reporting Standards (ESRS), corporations can follow how to report on their sustainability targets and impacts. The reporting follows a certain ESG (environment, social and governance) logic, as companies must report on 12 standards over these impacts. Throughout the whole CSRD, the principle of double materiality applies. This means that companies must report on their climate impact both “outside in” (how they might be affected by climate change) and “inside out” (how they contribute to society, the climate and environment through emissions, water usage, etc.) (Baumüller & Sopp, 2022). This double materiality is applicable for the whole of corporate sustainability reporting. For bigger companies based in the EU will be obligated to report to the CSRD starting in 2026. From that moment onwards, companies that apply for eurosystem eligibility will have to comply with the directives’ guidelines, and report their climate impacts to be considered (ECB, 2022g).

To include CRFR’s then, climate risk is considered in collateral eligibility through a form of risk control. Risk control measures are routinely applied to the collateral that supports ECB policy instruments like credit operations (to both private and public actors) (ECB, 2022j) or TLTRO’s (Barbiero et al., z.d.; ECB, 2022j). The ECB maintains a risk-based approach to decarbonisation here: the main objective of these risk control measures is to protect the ECB from financial loss when assets devalue. This could go through three approaches: haircuts, valuation, and limits. Haircuts were explained in the previous chapter. In short, the credited redemption amount will not be the same as the full market value of the underlying asset, to account for market fluctuations. Through assigning larger haircuts (and thus lower valuations) to “brown

assets", the ECB sends a strong signal to the market that this particular asset should have greater borrowing costs and risks associated with it.

The July 2022 report promised that they would "limit the share of assets issued by entities with a high carbon footprint that can be pledged as collateral by individual counterparties when borrowing from the Eurosystem" (ECB, 2022g). Effectively, this is a (pretty weak) way to limit the amount of brown assets on the ECB's books, mainly to combat financial losses and instability risks. The report also promised to apply climate considerations on haircuts (ECB, 2022g; Gabor, 2023).

Yet, in a December 2022 press release, the ECB seemingly changed their minds, refusing to deploy haircuts in their greening efforts, citing that they "did not find empirical evidence that necessitates amendments to the haircut schedule based on climate change considerations, as the updated haircut schedule is already sufficiently protective against climate-related financial risks" (ECB, 2022j) . This is troubling, as haircuts are often cited first as a way to green the ESCF (Dafermos et al., 2018; Dafermos, Gabor, Nikolaidi, et al., 2021; Dafermos, Kriwoluzky, et al., 2021; Klüh & Urban, 2022).

The revision does not further apply ideas of exclusion, where brown collateral is simply excluded from eligibility. Assets with issuers with very high climate impact would be excluded from the ESCF, sending a strong signal to the markets to devalue these issuers and their assets. Besides this, there are a multitude of ways to green the ESCF that we did not yet discuss. Assets are routinely "marked to market", where market prices are compared to the initial valuation of the asset, and adjustments are made accordingly (ECB, 2023b). Market evaluation could be augmented with climate considerations and CRFR valuation adjustments, to incorporate carbon emissions and sustainability considerations into the price of collateral. Apart from valuation adjustments, the ECB could introduce "initial margins in reverse transactions". This means that counterparties must provide extra underlying assets with a value equal to or higher than the liquidity provided by the central bank, on top of the initial margin. The value of the extra assets would be determined by the climate risk associated with the original collateral.

The ECB is further criticized for overly relying on credit rating agencies, severely limiting their control over credit ratings of assets. Positive money (Stan Jourdan & Bosch, 2022) states that the ECB has an approach that is toothless. As they say, the ECB's promise to "*urge rating agencies to be more transparent about how they incorporate climate risks into their ratings and to be more ambitious in their disclosure requirements on climate risks*" (ECB, 2022g) is a way weaker approach to CRFR implementation in credit ratings than they could setup if they would stop relying on credit agencies.

Comparing with the methods of collateral framework decarbonisation from chapter 4.2, the collateral review has thus promised some environmental footprint approach measures (such as haircut adjustments, some form of disclosure-conditional eligibility). Yet, the haircut adjustments have not yet been implemented, and eligibility requirements are very weak (not requiring a certain sustainability score). The ECB has at least somewhat held onto an environmental risk exposure approach. The more active environmental footprint approach has some advantages. Firstly, this allows banks to play a more active role, where third actors or events are not required to change the haircuts or eligibility criteria on brown bonds. Secondly, the environmental risk approach risks punishing companies that will have to make adaptation and mitigation investments. A pure risk approach could see these companies struggle to find funding when climate risk considerations in their credit assessment increases their borrowing costs, even if this does not automatically mean that they are carbon intensive companies. The environmental footprint approach at least partly prevents that the costs of adaptation lands on companies for being exposed to physical risks, instead of causing them (Dafermos, Gabor, Nikolaidi, & van Lerven, 2022).

We can thus conclude that, where the ECB chooses to go beyond a strictly risk-based approach in the revision of its asset purchase programs, the collateral framework adjustment remains captured in its prudent and conservative ways. Where there is a lot to be gained from including CRFR's into the ESCF, as it is at the heart of the modern central bank, the ECB leaves a lot on the table by using the collateral framework not only as a carrot but also as a stick (Abdelli & Batsaikhan, 2022). The scientific literature proposes many options for collateral framework revision that could have a far greater impact than the current piecemeal revision, especially as haircut adjustments are again delayed, or in the worst case, scrapped.

In conclusion, the plan has been criticized for lacking ambition and not including clear interventions to directly incentivize green investment and reduce polluting activities, as well as being too focused on disclosures and protecting the Eurosystem balance sheet from climate risks. The conditions for asset eligibility are insufficiently rigorous in determining the harm done to the climate by corporations, as historical damages are not included in their metrics (Dafermos, Gabor, Nikolaidi, Van Lerven, et al., 2022).

The buying of primarily green bonds, and excluding carbon-intensive corporate bonds, could accelerate the green transition by persuading the private sector to green their activities as to appreciate their bonds. In fact, issuing green bonds makes firms more likely to decarbonise (Flammer, 2021). Yet, these options seem to be largely left aside for an overall risk-based approach, with but a EUR 2 billion per month exception in the ECB's corporate asset reinvestments. It seems as if the principle of double materiality has been accepted as a useful concept within the Eurocracy, as was applied to the CRSD. In the ECB though, we cannot say the same. Too much still has the focus been placed on the prevention of financial losses to the ECB due to climate risks.

It remains to be seen how the ECB will ultimately respond on questions over the market neutrality concept. As the literature explains, the time-pressed nature of the climate crisis will make it difficult to impossible to ensure an orderly transition while keeping the market neutrality afloat. More broadly, holding on to the market neutrality principle limits the ECB's potential to aid in its principal's climate goals, in an effort to comply with the Paris agreement. To limit further environmental damage, the central bank is thus strongly encouraged to switch over to a climate neutrality concept throughout the whole of its governance structure.

To conclude we can see that within the climate side of the strategic review, the ECB seems to hold on to a persistent tendency to focus on risk-assessment, especially related to its primary mandate of price-stability. While this is seemingly institutionally consequent and defendable through the ECB mandate, results will not favour the prudent. It seems that besides the breaking of some taboos, the central bank hopes to tackle the problems of now and tomorrow with only the instruments and structures of the past. In assuming its role within European governance as non-changing, and refraining for questioning its current institutional setup, it hampers its own devices to tackle the problem at hand. A major problem here is that the ECB has been granted some mandate over the outcomes of the climate crisis (preventing stranded assets, managing price-levels and maintaining financial stability) without the authority to seriously push for solutions to that problem.

5.3. The cleavage

Until now, we have managed our expectations quite radically, only really considering changes that could be made within the institution, power, and mandate of the contemporary central bank. Following Halls (1993) conceptualisation of policy paradigms, we can classify these as mostly first, and some second level changes, adjusting for new conditions but keeping policy goals, and in many cases, making but routine bureaucratic changes. One could question the effectiveness of these adjustments when faced with a challenge as titanic as the transformation of the European and global economy. It's important to note that we can evaluate the ECB's strategic review on multiple levels then: both with welcome surprise, as not many expected the central bank to make a "green turn" at all; and with some disappointment, as so much more of European monetary and financial policy could and should be transformed more radically to face climate change. As we saw, changing policy programs in the order of billions is considerable progress, but the climate crisis is a business of trillions.

Going forward then, we will also discuss changes that forgo the contemporarily conventional role of central banks, and consider adjustments of whole regimes. This is necessary as the role central banks play, and the power they have, are determined not only by their own qualities (mandate, institutional power, etc) but by their role within the macro-financial regime, and relations to other regime actors (governments, finance). This is because, as we shall see, these external actors can help in understanding the mode and measure of policy changes at the ECB.

It is important to point out a certain inconsistency in how far the central bank deviates from a risk-based approach. Even if the scale is relatively small, in the revision of its corporate asset program, the taboo of market neutrality has effectively been broken. The Eurosystem applies an active form of greening through the green tilted benchmark. Yet, in the greening of the collateral framework, a risk-based approach remains dominant. When arguing to decarbonise the central banks' balance sheet, the ECB refers to minimizing climate risk, avoiding stranded assets, and curtaining financial losses. All the while, the ECB keeps emphasising the importance of price-stability, it's mandate, and financial stability. Here we can discern a tension between two opposing tendencies of decarbonisation. This cleavage forms between approaches of active versus passive greening, of decarbonising to and through minimizing risk versus decarbonising more aggressively; an allocative yet punitive greening (Kedward et al., 2022b). We could say that the passive greening approach is in line with the ECB's "business as usual", whereas the new courage we see in the decarbonisation efforts of the CSPP are deviating from what we have come to expect.

This divide in approaches to central bank greening is reflected in (Kedward et al., 2022a) work on guiding credit towards the green transition. They distinguish two approaches, that overlap nicely with the tension we observed within the ECB's strategic review. The first approach is the market-led, risk-based approach. As this approach is rooted in fiscal conservatism, inflation-targeting and monetary dominance, this narrative relies on the private sector to guide itself towards decarbonisation. The role of the central bank is thus to provide price-stability and avoid financial turmoil. Overlapping with earlier typologies, this approach relies on informational techniques of transparency and disclosure, risk-based mechanisms to decarbonise, and derisking mechanisms to guide credit towards the green transition. Practically, this means that relative price differences are created through higher carbon prices, higher profit-margins through derisking interventions, and increasing the price of credit through risk-based monetary measures (derisking & carbon shock therapy) (Gabor, 2022a; Kedward et al., 2022b).

	Risk-based approach		Credit allocation policies	
Paradigms vis-à-vis green transition	Monetary dominance; Market-led decarbonisation		Fiscal dominance; State-led green industrial strategy	
Purpose	**Prudential** – financial stability		**Promotional** – supporting industrial policy	
Focus	Enhancing price discovery; Correcting price signals (de-risking)		Steering credit to green sectors; Restricting credit to dirty sectors	
Mechanisms	**Informational**	**Incentive**	**Incentive**	**Coercive**
Policy targets	Transparency and disclosure	Relative prices through de-risking interventions	Sector-specific green targets on price and conditions of credit	Sector-specific green targets on quantity of credit, or credit growth (+ conditions)
Scope	Banks + standard financial assets (loans + bonds + equity)		Banks + whole ecosystem of institutional capital (+ private equity + repos)	

Figure 1. Risk-based vs Credit allocation policy approaches. From: Kedward, K., Gabor, D., & Ryan-Collins, J. (2022b). Aligning finance with the green transition: From a risk-based to an allocative green credit policy regime. SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4198146*

Underpinning these approaches is a view on the role of states, finance, and central banks in the green transition. Where the risk-based approach emphasises the role of private finance as a result of curtailed state power, the second approach of credit allocation banks on a state-led green industrial strategy reminiscent of Green New Deals (Bourgin & Sol, 2021). These favour a promotional strategy of pushing green industrial policy, echoing the green developmentalism of the "big green state"-regime we described earlier. It proposes the use of the carrot and the stick: incentivising green investment through subsidisation, credit-conditions and price-setting, and coercing finance through market-shaping mechanisms. It aims to address regulatory blind spots such as greenwashing and shadow lending, for example through the mandatory exclusion of brown assets from mutual funds and ETFs that claim an ESG rating. Further proposals include haircuts (up to 100% for fossil fuel companies), complete decarbonisation of state and central bank balance sheets (with an exception for managing stranded assets, to ensure an orderly transition), and more.

Using Gabors (2022) work on green macro-financial regimes, we can try to square this with possible future frameworks for economic governance. It then becomes clear that this is a tension that spans over and between two regimes. As we saw, a small green state regime will prefer derisking as an investment mechanism, and a risk based approach to decarbonisation of balance sheets, where the big green developmental state aligns with the approach of green credit allocation. Where it could be possible that the ECB is simply loaning from two different approaches here, the two approaches are rooted in oppositional views on decarbonisation. More importantly, they represent oppositional views on the role of the state, finance, and the central bank, not only in the green transition, but in a regime of economic governance. As such, they represent a contradiction in ECB policymaking and confuse any analysis that aims to identify a greater strategy (or at least an indication of approach). The question then remains why the corporate asset program was actively greened, and the collateral framework was not. Why is it that we see this cleavage develop around these features of contemporary central banking policy?

We can lend from Benjamin Braun's (2020) work on infrastructural power theory, as he uses the framework to analyse a previous paradox in ECB history. Explaining how finance and the ECB became increasingly

entangled in repo-markets and securitisation-markets, he illustrates the importance for both actors. One example is a contradiction in European policymaking over the financial transaction tax. Where repo-lobbyists (that aimed to prevent such a tax) did not get much response in Brussels (where it tried to lobby the Commission), it did find an unexpected listening ear in Frankfurt, at the ECB headquarters. This was surprising, as the ECB had never voiced opposition to a financial transaction tax. Analysing this flip through the lens of infrastructural power theory requires that the finance lobbyists would find themselves pushing an open door at the ECB. Surprisingly, they did. Braun argues that this is the result of the central bank realising the potential impact of the tax on their capacity to ensure a smooth transmission of monetary policy through repo-markets.

Notoriously, securitisation and the rise of asset-backed securities markets were pivotal in generating the 2007-08 Great Financial Crisis. In retrospect, it has become clear that these ABSs, which are assets built on a pool of underlying mortgages and loans, were very problematic instruments (due to excessive lending, leveraging, fraud and asymmetrical information). Yet, the ECB classified ABSs as eligible collateral in 2000, making it increasingly entangled with the securitisation market, and later, during the fall of Lehman, acted as a crisis 'dealer-of-last-resort'.

We can wonder why the ECB would want to get so hung up in securitisation markets. Years after 2008, the central banks kept supporting securitisation markets, both in policy and politics. The ECB stubbornly kept the ABS on life support, through regulatory easing, quantitative easing, and even making securitisation markets a key pillar within the CMU. Braun finds that the ECB's interests (again, with the goal to maximize steering capacity) are served with the revival of securitisation markets after their fall. It creates eurosystem-eligible collateral, acts as a private refinancing mechanism (which is beneficial to monetary policy transmission), but most importantly, the ECB has a lot of control in these markets, because of their early and deep involvement. This means that, because the ECB had so many ABSs on its balance sheet after the 2008 crash, it gained both dependency and leverage in securitisation markets, starting the cycle of entanglement.

Historically, central bankers and finance interests have thus overlapped, leading them to push towards similar goals. Financialisation certainly deepened this entanglement, as finance and central banks grew more and more intertwined, amplifying this phenomenon in a self-reinforcing process. This entanglement is strengthened by the relation of the central bank to finance, governments, and enterprises. The infrastructural power of finance, and the role of modern central banks within the European derisking state are deeply linked. The central bank’s role within the macro-financial regime is both position-induced (structural power, monopoly on reserves) and self-imposed (ideologically, by instrument choice, and by reinforcing the infrastructural power of finance).

We can thus conclude that infrastructural power theory predicts that, where the interests of finance meet the central bankers’ capacity to steer (to ‘do’ monetary policy), their goals overlap and thus, the central bank will protect finance. Operationally, this leads to a self-reinforcing process. Central bankers look towards financial markets to determine what instruments are desirable. As we saw with repo-markets, the structural power of the ECB then forces this instrument to develop greatly, altering financial markets (Gabor, 2016).

The argument of market neutrality seems eclipsed then, as the central bank cannot but influence the financial market when it enacts monetary policy, as this policy must be transmitted through finance. Every benchmark is tilted in some way, and remaining market neutral merely extends and strengthens the default tilt, copying the biases that already exist within financial markets. As existing markets favour large,

shareholder value-driven and carbon-intensive companies, neutrality means adopting a carbon bias. Decarbonisation efforts thus require a deliberately tilted benchmark to counteract existing biases.

Infrastructural power theory thus prompts us to approach apparent contradictions in ECB policy positions from the angle of the central bank maximising its steering capacity. In trying to answer why the APP is greened more actively when the collateral framework is not, this could be a helpful framework. As Braun (2020) explains, the infrastructural power of finance can be leveraged when it doesn't work against the ECBs interests, and with the interests of finance. This means that especially for repo- and securitisation-markets, the finance and the ECB have a shared interest in the preservation and deepening of these markets, as they have become critical infrastructure for the transmission of monetary policy. The result is "a problematic alignment between the interests of bankers and central bankers, whereby both sides have a preference for a deep and liquid markets for everything, ideally" (Gabor & Braun, 2021; *In Search of a Green Macro-Financial Regime: Central Banks and Finance*, 2021).

It thus seems logical to assume that, on aspects of central bank policy that are more important to the ECB's steering capacity, the ECB will be more conservative in their decarbonisation efforts. For the ECB, realising their infrastructural dependency on repo-markets, it is thus critical to their interests that these markets are stable, liquid, and can operate on clear terms. As we argued, these markets grew to be so critical to the ECB's interests, and their continued operation is of existential interest to finance, the central bank was reluctant to meddle too deeply with the collateral framework that underpins its own repo-loans, and is so influential in the performance of European repo-markets. The same might not be said for the CSPP and PEPP. If the buying of stocks turns out to be of no such critical importance to the ECB's agency, and despite being in the interest of finance, infrastructural power theory could explain why the collateral framework was deemed too important to risk anything but a risk-based greening, while the CSPP was greened more actively. Such a reasoning would be in line with the historical arguments made by Benjamin Braun, and wider CMF-theory. To determine if empirical data supports this theory, further research is thus needed.

This could answer some of our questions though, that could offer a supporting narrative throughout further research. First off, if an overlap in the interests of finance and the ECB can explain the earlier discussed cleavage in the strategic review, this theory could be used more generally. This would allow us to answer questions on why the central bank decarbonises certain programs more aggressively than others. Why, despite being set up to be the economic crisis-handling institution of the past decade, does the ECB not act more radically than it has? The answer is two-fold. Firstly, it has taken some radical steps, breaking earlier taboos in the process. Second, I argue that the ECB's/finance interests overlap, in combination with the ECB's own vision on their role within the macro-financial regime delimit their active greening efforts, as discussed below.

This theory has some defining assumptions. Firstly, it assumes that finance prefers passive, risk-based greening, and views this as a more stable pathway to secure their profits. For finance, greening is acceptable in a risk-based and derisking approach, but forms of active, more allocative, and redistributive measures are seen as undesirable (at least for short-term interests). Finance is interested in greening approaches when these create opportunities for profitable investments. Secondly, the framework being greened in a risk-based approach is very important to the steering capacity of the ECB, and the CSPP being actively greened is not a risk to the ECBs interests. This all assumes that finance has a short-term horizon for stability analysis.

This brings us to some problems with our assumptions. Firstly, internal politics in the ECB are overlooked, and the ECB is analysed as a rather unitary actor. Because these internal debates are quite hard to get a grip on, and require time and resources not available for a master thesis, this has some practical advantages, though analytical disadvantages. Secondly, the interests of finance are not differentiated, also seen as a unitary block. In reality, asset managers and insurance companies might have very different ideas on what is in their best interest, especially on longer-term greening efforts.

5.4. The search for a regime

While CBs face increasing pressure to prioritize sustainability, governments bear the primary responsibility for addressing climate change and overseeing the transition. Although financial regulation can assist carbon pricing policies, it alone cannot effectively redirect capital and may result in unintended repercussions if not carefully crafted (Diluiso et al., 2021). The central bank must thus operate within a macro-financial regime, that describes its role within economic governance, its relation to other actors (e.g., monetary vs fiscal dominance), and overall mechanisms of reaching policy goals (such as the financing of the green transition).

Returning to the search for a green macro-financial regime, we can ask ourselves some consequential questions. Starting off, what regime does the ECB prefer? What regime is the review aiming for? Important voices from within the ECB have openly posited the inefficacy of carbon shock therapy, in effect conceding that markets alone cannot produce the desired results, and more involved intervention will be needed to decarbonise.
“Global carbon pricing alone, while being seen by many economists as the key tool in addressing climate change, will not be sufficient to ensure a swift transition to a carbon-free economy” (Schnabel, 2021). On the other hand, it is clear that the ECB, at least in external communications, wants to stay far “accusations of financial and fiscal dominance” [7]. Yet, some support for allocative greening efforts has been outed in recent years, showing interest in more active greening efforts that would go beyond the risk-based approach. For instance, Head of the ECB Christine Lagarde, has repeatedly expressed her interest in Green TLTRO’s , and some support for “real” green bonds (issued by the EU) was voiced, to respond to the shortage of green assets, as illustrated by the Larry Fink quotes above (Gabor & Weber, 2021). Although when theorised, these bonds are most often supported by regimes of coordination between fiscal and monetary policy at the highest level, something painfully absent in the current regime. Green European bonds could aim to provide funding for a green transition whilst securing solid collateral for repo-markets and a safe asset of European make. In this scenario, a return of monetary financing could allow the ECB to directly fund EU transition efforts through the purchase of green European bonds, as the governments of old. Furthermore, Green bond-buying would probably have to be further incentivised, as they tend to have a lower yield than non-green bonds, and could thus be less appealing (Huynh et al., 2022).

It seems we can find the most likely candidate for the green macro-financial regime of choice for the ECB in the “small green state” variant, that lacks monetary financing, but does inject cash through corporate asset

[7] Full quote, in the context of quantitative tightening: "Maintaining too large a balance sheet may also have undesirable side effects. One is that it could jeopardise central bank’s credibility by giving rise to accusations of financial and fiscal dominance."
Source: Schnabel, I. 2023. Quantitative tightening: rationale and market impact (Speech). https://www.ecb.europa.eu/press/key/date/2023/html/ecb.sp230302~41273ad467.en.html Accessed on 4/7/2023.

schemes. In a sense, this would be the regime that is most recognisable today, as the risk-based approach to decarbonisation still reigns in mainstream economic debate (Brenha Ribeiro & Bosch, 2021; Kedward et al., 2022b). We can see how the derisking state works through the strategic review in the way that it links with other EU policy, and the broader macro-financial regime in Europe.

The recent 'return of industrial policy', referring to the US Inflation Reduction Act (IRA) and European Green Deal Industrial Plan, were welcomed as a break with anti-interventionist and small-government ideology that hampered green transition policies in the past decades (Sullivan, 2023; Gabor, 2023). Whilst these developments are somewhat promising, the plans were criticized for their implementation of industrial policy. As Gabor (2023) states, the IRA was largely designed to be a derisking platform, to mobilize private capital using the power and purse of the government. In short, CMF theory calls this continuity and incremental change, a reorganisation of state investment and relations with finance plans around investibility, and thus a continuation of the logic of financialisation. Instead of the straight-forward modes of green interventionism, such as the state building social infrastructure, managing industries (like energy) and subsidizing projects, state interventions are made to steer price signals. In this way, green investments are incentivised by "tinkering with risk/returns on private investments"; this is the derisking state at work. The European plan has a similar profile, but the EU's macro-financial setup and restrictions around EU-ECB-Member State financing make it so that new derisking instruments must be created (such as the European Sovereignty Fund) to circumvent these constraints. Gabor also theorises that this macro-financial setup hampers the EU's capacity to penalise carbon-intensive economic activity, and focusses on promoting green investment instead. This is a trend that is also apparent in the ECB's strategic review: as we saw, the ECB focusses much more on the promotion of green investment, than it does on penalising brown investment.

What does this mean for the central bank then? As Gabor (2022) points out, derisking is not just a static tool, it is a "macro-financial phenomenon, an architecture of regulatory, fiscal and monetary interventions activated at different speeds and with different degrees of coordination, contingent on specific macro-financial constraints and vulnerable to political strains" and "coexists with other, more muscular forms of state intervention in private capital allocation". Most of the more direct derisking techniques we discussed, such as the PPP, are not carried out by central banks but rather by governments and recently investment banks (such as the EIB (Bourgin & Sol, 2021)). This derisking of social and energy infrastructure, shifting risk to government balance sheets is referred to as fiscal derisking. Yet central banks are critical the aforementioned architecture, and carries out some of these regulatory and monetary interventions to influence price signals on assets and investments. It does so via regulatory derisking (opening and liberalising markets and asset classes, to create new investible assets) and monetary derisking.
Monetary derisking is a broader term, but mainly focusses on preserving financial stability through market interventions (such as market-maker and lender-of-last-resort roles). This enables the ECB to derisk financing for the private sector, and to facilitate smooth government financing through ensuring sovereign collateral liquidity, while dodging their ban on monetary financing. This has become necessary, as financialisation processes transformed government-finance relations. The result is a complexly interwoven system, where governments, finance and central banks are in different ways dependent on the sovereign bond market. This dependency created the need for the ECB to act as an institution of crisis (as market-maker and lender-of-last-resort) in previous crises, fixing disruptions in the transmission of price signals, and it pushes the ECB to act as a green monetary derisking agent in the climate crisis; these are not one-time fixes for an exogeneous problem, these are structural components that are vital to the macro-financial setup of economic governance in the EU (Gabor, 2023).
This incredible importance of sovereign bond markets, repo-markets and collateral within the European regime can shed some light on the passive greening approach that was applied to the revision of the

Eurosystem collateral framework. As Gabor expressed, the European derisking state is reliant on these collateral and sovereign bonds-based markets, and the smooth transmission of price-signals within these markets. This is why the ECB has been bending over backwards to ensure liquidity in these markets, even if these were institutionally and ideologically uncomfortable decisions to make. We can theorise then, considering the importance of these price-signals, the ECB takes a passive greening approach to the collateral framework because it does not want to risk disrupting the transmission of price-signals through collateral and repo-markets by greening them more actively. Of course, this assumes that greening the framework following an allocative approach is more impactful on these markets than the risk-based one, or at least that the ECB thought that it would. Besides, it raises the question in which ways active approaches to decarbonisation are more disruptive to the collateral framework, and policy instruments like it, if and why does the ECB think that it would be disruptive, and what other policy instruments could be decarbonised more passively as a result, all of which are subjects for inquiry requiring further research.

6. Conclusion

To conclude, is the strategic review evidence for a ‘green turn’ at the ECB? While any decarbonisation plans are very welcome at this point, and the ECB’s roadmap was a welcome surprise to many, global climate change demands more. Especially in western Europe, broader economic and political trends seem to indicate a slow but certain turn towards environmentally conscious attitudes and practices, throughout the different levels of society. It remains the question whether these slow and often rather practical changes will eventually result in the rapid transformation that we will need to keep the worst effects of climate change at bay. The same can be said for the European central bank: where ecological and climate change consideration being taken into account is a very important step, and some institutional barriers were overcome to make the review possible, one cannot be assured of success. To accommodate a considerable transformation of at least the European economy, the economic regime that governs over this economy will probably have to change too, more radically than it ever has.

The central bank cannot act alone. They are entrenched in a regime, with a role that comes with agency and limitations. These result from their mandate, from their position within the regime, and from their infrastructural interests, lending power over European policy to the wider financial system. Throughout the decades; on the ebbs and flows of crisis and consolidation, the central bank has grown into role as the institution to combat economic troubles, even as their institutional constraints were not built for it. To ensure a smooth financing of the green transition in Europe then, further coordination between governments and central banks, fiscal and monetary policies will be needed. Hawkish attitudes towards government spending, central bank independence and inflation now block these efforts, while CO2 emission keeps rising. As German economist Sigl-Glöckner said *“We have it upside down at the moment: Debt to GDP is constrained, and CO2 [carbon dioxide] emissions are not. […] Fiscal policy, the whole financial and monetary system, should always follow our societal goals—that’s what it’s there for.”* (Schultheis, 2023).

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8. Appendices

8.1. Notes on QE and outright Monetary Transactions

QE gaat over algemene interbank liquidity -> ook in Europa pas vanaf 2015

- Liquidity verstrekken aan banken door assets (voornamelijk obligaties) over te kopen van banken in ruil voor cash
- Dus om droogte tegen te gaan!
    - En daarnaast zou het dus de real interest rate moeten verlagen

OMT gaat over het stabiliseren van obligatieprijzen op SECUNDAIRE markten

- Dus voornamelijk prijzen van griekse, spaanse etc bonds
- In return moesten deze landen dan ook austerity maatregelen doorvoeren om government debt terug te betalen en groei ervan tegen te gaan //

8.2. Notes on the ECB roadmap

Layout of the ECB roadmap – from ECB. (2021a). *Annex: Detailed roadmap of climate change-related actions 1*.

1. Data gathering on and adaptation of macroeconomic models to climate change, to include climate related risks in the ECBs analysis, statistical analysis, and reporting
    - Macroeconomic modelling to
        - Monitor implications of CC and CC-related policies, such as the factoring in of carbon pricing in the evaluation and prediction of commodity prices
        - Evaluate economic impact, financial stability
        - Transmission mechanism effects
            - Monetary policy
            - Banks to households
    - Eg. Climate risks and climate change-related fiscal policies are taken into account when modelling for the ECB staff forecast
        - As such, green transition policy effects on inflation, fiscal stance and commodity prices are reflected in the trimonthly forecast

2. Climate risk exposure stress testing
    a. ECB exposure
    b. Financial stability – caveat: checked by testing individual banks' exposure to CRFRs
3. Collateral climate risk disclosures
    - ECB: *"we will introduce climate-related disclosure requirements for using private sector assets as collateral in our monetary policy operations and for our private sector asset purchases. We will announce further details in 2022."*
    - Evaluation of possible collateral framework greening by looking at similar programs from the Chinese CB
        - Collateral framework adjustment seemingly has contributed to the desired effects. Thus, the Chinese central bank managed to influence pricing, skewing the market toward financing green projects, creating a green-biased market (showed as an increase in spreads between green and non-green bonds in 2018).

4. Credit rating review
    - Reviewing credit rating agencies' inclusion of climate risk in their assessments

    - No real indication what they will do if the rating agencies don't do this enough?
  - Minimum standards in the ECB's own ratings
  - Thus creating indicators for their own and third parties use

5. CRFR-inclusion in the ECB collateral framework
   - Climate risks will be included in the evaluation of collateral that banks want to use to get a ECB loan
   - *"we accept certain sustainability-linked bonds as collateral and for our asset purchases"*

6. Market neutrality and efficiency concepts in monetary policy operation
   - Biases in market allocation amid market inefficiencies
   - Alternative allocations?
   - Later on
     - Alternative benchmark proposals for the CSPP
       - // so framework for alleviating market biases by foregoing the idea of market neutrality in purchase programs such as:

7. Asset purchase program greening
   - *"We will further include climate-related criteria when guiding our corporate asset purchases. This could include looking at how issuers are complying with the Paris Agreement or how they are committed to similar goals. Additionally, as of 2023 we will start disclosing climate-related information on our corporate asset purchases."*

8.3. Clarification for table 3 – estimations of relative APPs sizes

	month	CSPP holdings (as % of APP)	CSPP reinvestments (in millions EUR)	total APP redemptions (in millions EUR)	APP holdings (in millions)	CSPP holdings (in millions EUR)	CSPP redemptions (in millions)	CSPP net purchases (in millions)	APP net purchases
q2 2023	april	9.28%	€ 1,593	€ 29,948	€ 3,216,490	€ 298,600	€ 1,993	-€ 400	-€ 14,490
	may	9.31%	€ 2,179	€ 35,948	€ 3,202,000	€ 298,200	€ 2,579	-€ 400	-€ 14,490
	june	9.26%	€ 2,157	€ 22,893	€ 3,216,490	€ 297,800	€ 2,557	-€ 400	-€ 14,490
q3 2023	july	9.20%	€ 2,638	€ 30,972	€ 3,230,980	€ 297,400	€ 3,038	-€ 400	-€ 14,490
	august	9.15%	€ 586	€ 17,880	€ 3,245,470	€ 297,000	€ 986	-€ 400	-€ 14,490
	september	9.10%	€ 2,977	€ 21,245	€ 3,259,960	€ 296,600	€ 3,377	-€ 400	-€ 14,490
q4 2023	october	9.05%	€ 2,189	€ 52,491	€ 3,274,450	€ 296,200	€ 2,589	-€ 400	-€ 14,490
	november	8.99%	€ 1,993	€ 17,537	€ 3,288,940	€ 295,800	€ 2,393	-€ 400	-€ 14,490
	december	8.94%	€ 936	€ 8,579	€ 3,303,430	€ 295,400	€ 1,336	-€ 400	-€ 14,490