Sustainable finance in the EU: Financialization and its impact on greenhouse gas emissions

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ABSTRACT

This paper explores the relationship between financialization and sustainable finance within the European Union, examining how market-based instruments are employed to address climate change. Using a hierarchical cluster analysis, the study categorizes EU countries based on their degree of financialization and compares their adoption of green finance instruments such as bonds and loans. Findings indicate that highly financialized countries rely more on sustainable finance mechanisms but do not exhibit a proportional reduction in greenhouse gas emissions. This highlights the limitations of market-driven solutions in achieving environmental goals. The study argues that by promoting sustainable finance, the European Green Deal stabilizes the existing finance-dominated regime of accumulation rather than facilitating a transformative ecological shift. The research suggests the need for comprehensive regulatory frameworks that address both environmental and economic inequalities. Ultimately, this paper challenges the efficacy of financialization as a tool for genuine climate action.

KEYWORDS

Sustainable finance, Climate change mitigation, European Green Deal, Financialization, Regulation theory, Green bonds, Greenhouse gas emissions

JEL-CODES

E44, G18, O13, P18, Q54, Q56

DOI

10.59288/wug504.267

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1. Introduction

In the capitalist system the state plays a pivotal role in the context of initiating, organizing and securing production and distribution processes through its direct or indirect influence. Concurrently, the state safeguards these processes by guaranteeing private property, providing infrastructure and education, and maintaining public security through its monopoly of power (Jäger and Springler, 2012). The inherent systemic contradictions of capitalism produce instability, which poses a core challenge for regulation in capitalist economies, states and societies (Sablowski, 2014). The current attempts to mitigate the ecological crisis in capitalist societies reflects the entrenched patterns of production, distribution and consumption (Brand and Wissen, 2011; Wuppertal Institute, 2005). The dynamics of the ecological crisis are having a profound impact on the capitalist economic framework, often triggering broader economic crises and highlighting a crisis of social relations with nature that is inherently linked to the structural crisis of capitalist societies, especially within finance-driven capitalism (Brand and Wissen, 2011). With its dependence on non-renewable energy sources, the prevailing industrial metabolic regime is a significant contributor to global climate change; this has led to the urgent necessity for a transformative shift towards sustainable socio-metabolic regimes (Haberl et al., 2011). By prioritizing market-based mechanisms, the neoclassical economic perspective on climate change mitigation frequently compromises long-term sustainability for short-term financial gains, thereby further destabilizing ecological balances (Fatheuer, 2014).

Climate change is having a significant impact on global agriculture and food security, with fluctuations in crop yields due to unstable temperatures, changes in precipitation, and extreme weather events. This compounds rising food and energy prices, thereby complicating efforts to eradicate extreme poverty (Soergel et al., 2021). Climate change acts as a threat multiplier, exacerbating impacts on local water resources, global biodiversity, and societal well-being. This highlights the need for integrated approaches in environment and development policy (WBGU, 2011). The necessity for globally concerted action to mitigate emissions is underscored by the exceeding of safe planetary boundaries and the increasing frequency of extreme weather, including heatwaves, droughts and severe storms, which pose immediate risks to human health, livelihoods and infrastructure (Richardson et al., 2023; Arnell et al., 2019). The Sustainable Development Goals Report 2023 illustrates how climate change is undermining progress in health, food security, water availability and economic growth, underlining the importance of strengthening resilience and adaptive capacity in vulnerable regions where there is an increasing frequency and severity of extreme weather events (United Nations, 2023). Numerous political regulations have been implemented with the aim of combating this development (Brand and Wissen, 2017); the approach taken within the EU is known as the European Green Deal.

The political economy of climate change encapsulates the complex interplay between and global distribution of economic adjustments, political power and interests and socioecological consequences. Thus, climate policies should equitably balance and distribute the economic costs of mitigation across countries and sectors to encourage broad international cooperation and societal acceptance by ensuring the alignment of environmental goals with national economic

interests and social equity measures (Aldy et al., 2003). Cahen-Fourot (2020) emphasizes that the various forms of capitalism within the European Union (EU) reflect disparate approaches to environmental policy, distinguishing between the Northern-Continental and Southern-Central European models. Northern-Continental countries, including Austria, Belgium and Sweden, tend to pursue proactive environmental policies, which are supported by robust welfare states and capital relations that are conducive to environmental sustainability. In contrast, Southern-Central countries, such as Italy and Poland, exhibit a more materialistic approach with less emphasis on environmental sustainability, reflecting differing sociopolitical attitudes towards ecology (Cahen-Fourot, 2020). Indeed, the process of agreeing on a common green transformation within the EU has encountered resistance from certain countries, including Czechia, Hungary, Poland and Slovakia. This resistance carries the risk of selectivity and exclusion (Brand and Wissen, 2017). Despite its potential, the green transformation faces significant challenges, including ambiguity in its definition, implementation and measurement. The EU is tackling climate change by introducing political instruments to incentivize a green transformation via the European Green Deal. These instruments seek to overcome the resistance and the significant challenges of a green transition by providing clarity in its definition, implementation and measurement. Sustainable finance is identified as a critical component of the Green Deal, with the objective of directing investment towards environmentally sustainable projects, thereby facilitating the transition to a low-carbon economy (Fleming & Mauger, 2021).

This study is interested in the way key EU climate policies have promoted green financialization dynamics, and to what extent countries characterized by a high degree of green financialization have been more successful in reducing greenhouse gas (GHG) emissions. To this end, it addresses the research questions (1) *Do EU countries with a strongly financially dominated regime of accumulation make greater use of financial market solutions to combat climate change than countries with a less financially dominated regime of accumulation?* And (2) *Have EU countries with a high degree of green financialization been more successful in reducing GHG emissions?*.

The current body of research on the influence of sustainable finance on GHG emissions remains limited, with only a few comprehensive studies addressing this connection. Among these, Flammer (2023a, 2023b) provides foundational insights, demonstrating that corporate green bonds can lead to tangible reductions in carbon emissions, particularly when certified by independent third parties. However, while green bonds have been studied more extensively, complementary tools such as green loans remain underexplored. The International Finance Corporation (2017a, 2017b) highlights the growing role of green loans in financing climate-friendly projects like renewable energy and energy-efficient infrastructure but notes significant limitations, including inconsistent tracking and insufficient impact data. This gap in research reflects a broader challenge: the lack of standardized metrics and comprehensive datasets to evaluate the direct environmental impact of various sustainable finance instruments. While green bonds benefit from relatively robust certification frameworks, green loans and other tools face issues with traceability and governance, raising concerns about their actual contributions to emission reductions. Additionally, the broader issue of greenwashing further complicates assessments of sustainable finance's effectiveness, as many initiatives rely on voluntary reporting and standards that are

not consistently enforced or regulated (Flammer, 2023a; IFC, 2017b). These limitations suggest a critical need for research to explore the environmental impact of underrepresented instruments, improve data granularity and standardization, and develop robust comparative analyses to assess their scalability and effectiveness across different contexts.

2. Financialization in regulation theory

The central objects of analysis in regulation theory are modes of regulation and regimes of accumulation. While modes of regulation describe the political stabilization of an economic system and the associated political and social power relations and conflicts, the regime of accumulation describes the structure of an economy. The majority of regulationist analyses are conducted within the context of nation states, which are embedded within and influenced by an international system. The international system is conceptualized as a productive system comprising several states, including both core and periphery (Sablowski, 2014). Of particular significance in this context is the role of monetary relations, as they serve as the most direct instruments for maintaining these dependencies (Becker, 2009). The mode of regulation encompasses procedures and norms that align with, maintain and reinforce the prevailing patterns and regime of accumulation. The regime of accumulation represents a stabilized form of accumulation that encompasses the systematic allocation and reallocation of capital, including production conditions and consumption norms (Becker, 2009; Sablowski, 2014). The state plays a distinctive role in this context as it supports the prevailing regime of accumulation by implementing policies that determine the regulation and accumulation (Becker, 2009). Therefore, the modern state's role in the contemporary finance-dominated capitalist world system is to restructure its financial and regulatory frameworks to accommodate and attract global financial flows, particularly by developing attractive asset classes for global investors (Gabor, 2021). Despite differences in intensity and impact, a crisis – such as the climate crisis we are currently facing – represents a significant disruption to the regime of accumulation and the mode of regulation, frequently resulting in a fundamental restructuring of accumulation patterns and regulation processes (Becker, 2009).

Regulation theory offers a comprehensive and systematic approach to examining the intricate interconnections between economic systems and political regulation, including those pertaining to climate change. It understands climate change within the context of broader capitalist patterns of production and consumption and illustrates how these dynamics influence environmental policies and practices. This theoretical perspective is of vital importance for understanding the symptoms of climate change and for confronting its fundamental causes, which originate from capitalist accumulation and the concomitant exploitation of natural resources (Atzmüller et al., 2013). Moreover, regulation theory underscores the pivotal role of political and economic power structures in shaping environmental outcomes. This enables an analysis of the mechanisms that perpetuate unsustainable practices by examining the relationships between regimes of accumulation and their regulatory frameworks, which can be portrayed as a mode of regulation. Such an understanding is of critical importance for the promotion of emancipatory

regulatory reforms and transformative policies that are designed to establish more sustainable environmental governance. In conclusion, regulation theory provides a comprehensive framework for understanding and addressing the economic and social regulations that exacerbate ecological crises, including climate change (Atzmüller et al., 2013).

2.1 The mode of regulation

According to Aglietta (1979), regulation represents a set of mechanisms that provide a framework for social reproduction, whereas state institutions are understood as the legal expression of norms. For Boyer (2000), the distinction between institutions and structures is less clear; the mode of regulation is defined as the aggregate of all behaviours that facilitate the accumulation regime, both at the individual and collective levels. Sablowski (2014) posits that regulation exerts a significant influence on social action, enabling and favouring the accumulation of capital. This does not entail any specific action on the part of individual actors, in other words, no specific policy. Rather, it is the interaction of all state and non-state actors that is of consequence. Regulation – like capitalism itself – is characterized by its susceptibility to crises due to systemic contradictions (Sablowski, 2014). Since accumulation regimes are inherently unsustainable, they require regulation. Despite the contradictory interests of the various actors involved, regulation enables the reproduction of the accumulation regime. In conclusion, structural, social and institutional forms of regulation collectively constitute a mode of regulation. The frequent changes in the accumulation regime and structural forms of regulation result in instability and a pronounced vulnerability to crises. Constellations of instability can be analysed in terms of accumulation and structural regulation. It is often the case that serious crises originate in the field of accumulation or regulation, which in turn lead to changes in the accumulation regime or the mode of regulation (Becker, 2009). The nature of the regulatory changes implemented in crises is largely contingent upon the availability of capital for productive investment opportunities (Brand and Wissen, 2017).

2.2 The regime of accumulation

The regime of accumulation describes the relation and degree of an economy's productive and financialized accumulation. Sablowski (2014) describes the regime of accumulation as a manifestation of the systematic allocation and redistribution of capital. This includes the conditions of production, such as the amount of capital, its distribution between industries and the conditions of final consumption, such as consumption norms and collective spending (Sablowski, 2014). Productive accumulation describes a specific process of capitalist accumulation in which industrial capital dominates. The greatest surplus value is generated in the industrial sector; the capital cycle is therefore money capital – productive capital – commodity capital – money capital. Reinvestment in productive industrial goods leads to accumulation. In contrast, financialized accumulation is dominated by interest-bearing and fictitious capital, which collectively is referred to as financial capital. In this form of accumulation, monetary capital is lent or

invested, whereby value is extracted through the charging of interest, the distribution of dividends or the realization of capital gains. A regime of accumulation is always characterized by the dominance of one type of capital (Sablowski, 2014). Furthermore, Stockhammer (2007) posits that the degree of financialization has a strong impact on the growth of an economy in a finance-dominated regime. For Becker (2009), the distinction between productive and financialized accumulation is key: productive accumulation focuses on the productive sector, where the focus is on creating value and increasing value creation. When productive accumulation reaches its limits, investments are made in the financial sector, with financial intermediaries gaining in importance and the significance of fictitious capital increasing (Becker, 2009).

2.3 Measuring financialization

The phenomenon of financialization can be briefly described as the "increasing importance of financial markets, financial motives, financial institutions and financial elites in the operation of the economy and its governing institutions, both at national and international level" (Epstein, 2005, p. 3). This section provides indicators on how to determine a financialized regime of accumulation. The indicators identified by Kapeller et al. include the size of the financial sector as a proportion of the overall size of the economy, measured as the financial sector's share of GDP. Furthermore, they consider the development of the wage share, which is the proportion of income flowing into wages and salaries compared to total income; a declining wage share is regarded as an indication of financialization. Another indicator is the total of private and public debts as a percentage of GDP: an increase in debt is viewed as a sign of financialization. Furthermore, the significance of the financial market is assessed in terms of the total liabilities of the financial sector: rising liabilities suggest greater financialization (Kapeller et al., 2019). Sablowski's (2013) indicators with which to measure the extent of financialization in an economy include the deployment of money capital that is lent or invested to generate surplus value through interest, dividends or capital gains. Another indicator is the increasing indebtedness of wage-dependent households. Additionally, the ratio of GDP to the volume of credit and the increasing capture of the reproduction of labour by financial capital, exemplified by the privatization of insurances and pensions, are identified as significant measures. Finally, comparing the profit structures of the industrial sector with those of the financial sphere, particularly the profits of industrial companies versus financial companies, is a further indicator for identifying financialization (Sablowski, 2013).

Stockhammer (2007) specifies the mechanisms of a financialized regime of accumulation as follows. As consumer spending becomes an economic driver and households have greater access to credit, this leads to significant debt. The increased market uncertainty and focus of companies on shareholder value leads to a reduction in capital expenditure, resulting in no corresponding increase in investment despite high profits. This in turn leads to low long-term growth rates and frequent crises in which the economy is stabilized by government intervention, leading to high levels of public debt (Stockhammer, 2007). The accumulated debt must be repaid, which represents a potential source of instability and crisis. A highly financialized accumulation regime

is thus characterized by weak real growth and increasing financial fragility of all economic actors due to rising debt (Stockhammer, 2008). Indicators of this include real GDP growth, inflation, long-term real interest rates, the unemployment rate and real wage growth (Stockhammer, 2007). Furthermore, Stockhammer delineates indicators of financialization, focusing on the consequences of deregulation of the financial sector and liberalisation of international capital flows, as well as the emergence of new financial instruments and the involvement of institutional investors as new actors. This results in improved access to credit for households, corporates, and sovereigns, increased instability of exchange rates, strongly volatile stock market cycles, and a high level of real interest rates (Stockhammer, 2007, 2008). As financial developments and activities increasingly dominate real developments, financialized accumulation is outpacing productive accumulation. This can be observed in the measures of stock market capitalization, stock market turnover, stock market capitalization as a share of GDP, and financial profits as a share of corporate profits (Stockhammer, 2008).

Further indicators have been identified by various researchers, including steadily rising international capital flows and, in many countries, a steadily rising share of the financial sector in GDP in absolute terms and in growth rates (Staritz and Tröster, 2021; Kapeller et al., 2019; Heires and Nölke, 2013; Dore, 2002). This is accompanied by an increasing dependence on foreign financial institutions (Köhler et al., 2018). Moreover, financialization results in increased profits for individuals and corporations through rentier income and financial transactions that replace production and trade (Epstein, 2005; Staritz and Tröster, 2021; Sawyer, 2014; Lapavitsas, 2011; Evers, 1977). Finally, studies have demonstrated a correlation between increasing financialization and rising income and wealth inequality (Kapeller et al., 2019; Köhler et al., 2018; Sawyer, 2014). Moreover, wage ratios decline as the degree of financialization increases (Köhler et al., 2018), and the financial market integration of low-income and middle-class households results in rising levels of personal debt (Sawyer, 2014). Collectively, these indicators provide a multidimensional framework for measuring the degree of financialization in a regime of accumulation as they focus on different aspects of the economy. They are presented in figure 1, where their quantifiability, availability and suitability for quantitative analysis are evaluated.

3. Methodology

The initial step in this study was to ascertain which EU member states exhibit comparable levels of financialization and which have a financially dominant regime of accumulation. To achieve this objective, a hierarchical cluster analysis was conducted utilizing the indicators employed to assess the extent of financialization within a given state (fig. 1). The primary objective of cluster analyses is to identify the underlying structures within data by grouping similar objects together, which can facilitate a better understanding and categorization of the data and provide insights into data that are not readily apparent (Kaufman & Rousseeuw, 2009).

Hierarchical clustering is a systematic method that enables the formation of clusters on several levels, facilitating the identification of similarities among multiple stages and particularly useful

for exploratory data analysis. The method begins with each element as a separate subset, which are then progressively merged based on maximal similarity according to specified characteristics (Ward, 1963). The primary objective of each merger is to minimize the degradation of an optimally defined objective function, which quantitatively reflects the information loss or other detrimental effects resulting from the grouping. This process is repeated until either a single comprehensive subset remains or until the desired level of grouping is achieved (Ward, 1963). For purposes of this research an agglomerative or bottom-up approach was used, meaning that each object is initially grouped separately, and pairs of clusters are merged as the hierarchy is ascended (Kaufman and Rousseeuw, 2009). The data structures are visualized in a dendrogram, illustrating the relationships between clusters at various levels of granularity, thereby enhancing the analytical effectiveness (Kaufman and Rousseeuw, 2009; Ward, 1963).

To conduct the quantitative analysis, a dataset for quantitative research employing the hierarchical clustering method was constructed using the indicators outlined in figure 1. A total of 45 indicators of financialization were identified during a comprehensive literature review. The initial pool was then refined by removing any indicator that was unclear, aggregated from other metrics, or non-quantitative. This process resulted in a final pool of 36 quantifiable indicators. Further refinement was conducted based on data availability. A variety of sources were consulted, including from the World Bank, the International Monetary Fund, the United Nations, the OECD and Eurostat. This process resulted in a final pool of 27 available indicators. All quantifiable and available indicators were initially collated for the years between 1990 and 2024. Indicators that were only available for OECD countries and not for all EU member states were excluded, resulting in a final pool of 18 indicators for 27 EU countries. Moreover, the data availability for Malta and Cyprus is particularly limited. As they account for only a small proportion of the EU population (Malta 0.12% and Cyprus 0.2%) and economic power in terms of GDP (Malta 0.1% and Cyprus 0.2%), it was decided to exclude them from the analysis entirely (Statista, 2002; European Union, 2024). This left a pool of 18 indicators for 25 EU countries.

As not every single data point from the 18 indicators was available for all 25 EU countries over the entire period from 1990 to 2024, a second cleaning was conducted. The observation period was omitted for specific years in which data was missing for all countries. This process resulted in a narrowing of the observation period to the years between 2003 and 2022. Also, individual indicators that had single data points missing were excluded, reducing the number of indicators again from 18 to 13. This structured approach to data compilation ensures that the final dataset is robust and consists of 13 well-defined, quantifiable and available indicators across 25 countries, covering all years from 2003 to 2022, and is thus ready for hierarchical clustering analysis. This structured approach to data compilation, which includes dealing with missing data and refining indicators based on quantifiability and availability, ensures that the resulting dataset is of sufficient scientific credibility for conducting quantitative research. The following table provides an overview of the indicators, their quantifiability and availability, the data source, its suitability and scientific reference.

Figure 1: Indicators with which to measure financialization

Indicator	Quantifiable	Available	Source	Suitable	Reference
Investment rate of non-financial corporations	yes	yes	Eurostat	yes	Stockhammer, 2007; Stockhammer, 2008
General government debt as share of GDP	yes	yes	IMF	yes	Stockhammer, 2007; Stockhammer, 2008; Kapeller et al., 2019
Real GDP growth	yes	yes	IMF	yes	Stockhammer, 2007; Stockhammer, 2008
Total private (corporate) debt as share of GDP	yes	yes	IMF	yes	Stockhammer, 2007; Stockhammer, 2008; Kapeller et al., 2019
Total private (household) debt as share of GDP	yes	yes	IMF	yes	Sawyer, 2014; Becker, 2009; Stockhammer, 2007; Stockhammer, 2008; Sablowski 2013; Sablowski, 2015; Kapeller et al., 2019
Wage ratio as labour share of GDP	yes	yes	UN	yes	Kapeller et al., 2019; Köhler et al., 2018
Annual GDP growth	yes	yes	World Bank	yes	Stockhammer, 2007; Stockhammer, 2008
Dependence on foreign financial institutions as foreign direct investment inflows	yes	yes	World Bank	yes	Köhler et al., 2018
Dependence on foreign financial institutions as foreign direct investment outflows	yes	yes	World Bank	yes	Kapeller et al., 2019; Eichengreen, 2004; Staritz and Tröster, 2021; Kapeller et al., 2019; Heires andf Nölke, 2013; Dore, 2002; Stockhammer, 2007; Stockhammer, 2008
Domestic credit to private sector as share of GDP	yes	yes	World Bank	yes	Sablowski 2013; Sablowski, 2016
Income inequality as income share held by highest 10%	yes	yes	World Bank	yes	Kapeller et al. 2019; Köhler et al. 2018; Sawyer, 2014
Inflation rate on consumer prices	yes	yes	World Bank	yes	Stockhammer, 2007; Stockhammer, 2008
Long-term real interest rates	yes	yes	World Bank	yes	Stockhammer, 2007; Stockhammer, 2008
Debt-to-income ratio of households	yes	yes	Eurostat	no	Sawyer, 2014; Becker, 2009; Stockhammer, 2007; Stockhammer, 2008; Sablowski 2013; Sablowski, 2015; Kapeller et al., 2019
Consumer spending by private households	yes	yes	OECD	no	Stockhammer, 2007; Stockhammer, 2008
Financial corporations debt	yes	yes	OECD	no	Kapeller et al., 2019

Indicator	Quantifiable	Available	Source	Suitable	Reference
Growth rates of the financial sector	yes	yes	OECD	no	Kapeller et al., 2019; Staritz and Tröster, 2021; Kapeller et al., 2019; Heires and Nölke, 2013; Dore, 2002
Growth share of the financial sector in GDP	yes	yes	OECD	no	Kapeller et al., 2019; Staritz and Tröster, 2021; Kapeller et al., 2019; Heires and Nölke, 2013; Dore, 2002
Profit structures of the industrial sector and the financial sector; profits of financial companies	yes	yes	OECD	no	Sablowski 2013; Sablowski, 2018
Profit structures of the industrial sector and the financial sector; profits of industrial companies	yes	yes	OECD	no	Sablowski 2013; Sablowski, 2018
Profits from rentier income as financial assets held by household	yes	yes	OECD	no	Epstein, 2005; Staritz and Tröster, 2021; Sawyer, 2014; Lapavitas, 2011; Evers, 1977; Sablowski 2013; Sablowski, 2014
Real annual average wage growth	yes	yes	OECD	no	Stockhammer, 2007; Stockhammer, 2008
Share of the financial sector in GDP	yes	yes	OECD	no	Kapeller et al., 2019; Staritz and Tröster, 2021; Kapeller et al., 2019; Heires and Nölke, 2013; Dore, 2002
Share of the financial sector in GDP	yes	yes	UN	no	Kapeller et al., 2019; Staritz and Tröster, 2021; Kapeller et al., 2019; Heires and Nölke, 2013; Dore, 2002
Market capitalization as share of GDP	yes	yes	World Bank	no	Stockhammer, 2007; Stockhammer, 2008
Stock market capitalization as share of GDP	yes	yes	World Bank	no	Stockhammer, 2007; Stockhammer, 2008
Stock-market-turnover	yes	yes	World Bank	no	Stockhammer, 2007; Stockhammer, 2008
Degree of financialization measured by GDP	yes	no	x	x	Stockhammer, 2007; Stockhammer, 2008
Financial profits as share of corporate profits	yes	no	x	x	Epstein, 2005; Staritz and Tröster, 2021; Sawyer, 2014; Lapavitas, 2011; Evers, 1977; Sablowski 2013; Sablowski, 2014; Stockhammer, 2007; Stockhammer, 2008
Frequency and intensity of currency fluctuations	yes	no	x	x	Kapeller et al., 2019; Eichengreen, 2004; Beck et al., 2014; Stockhammer, 2007; Stockhammer, 2008
Frequency and intensity of economic crises	yes	no	x	x	Stockhammer, 2007; Stockhammer, 2008
Frequency and intensity of speculative bubbles	yes	no	x	x	Kapeller et al., 2019; Eichengreen, 2004; Beck et al., 2014

Indicator	Quantifiable	Available	Source	Suitable	Reference
Frequency and intensity of stock market fluctuations	yes	no	x	x	Beck et al., 2014; Sawyer, 2014; Allen and Pryke, 2013; Lapavitas, 2011; Stockhammer, 2007; Stockhammer, 2008
New financial products; development of new financial instruments	yes	no	x	x	Staritz and Tröster, 2021; Stockhammer, 2008; FIAN, 2020; Sawyer, 2014; Stockhammer, 2007; Stockhammer, 2008
Unemployment rate	yes	no	x	x	Stockhammer, 2007; Stockhammer, 2008
Wealth inequality as wealth share held by highest 10%	yes	no	x	x	Kapeller et al. 2019; Köhler et al. 2018; Sawyer, 2014
Deregulation of economic sectors	no	x	x	x	Stockhammer, 2007; Stockhammer, 2008
Deregulation of the financial sector	no	x	x	x	Stockhammer, 2007; Stockhammer, 2008
Emergence of institutional investors as new players	no	x	x	x	Stockhammer, 2007; Stockhammer, 2008
Importance of financial intermediaries	no	x	x	x	Becker, 2009
Inflation in the financial sector	no	x	x	x	Becker, 2009
Privatization	no	x	x	x	Karwowski and Centurion-Vicencio, 2018; Eaton et al,. 2016; Sawyer, 2014; Sablowski 2013; Sablowski, 2017
Shareholder value approach in corporate management	no	x	x	x	Kädtler and Sperling, 2003; Kapeller et al., 2019; Sawyer, 2014; Dore, 2002; Lazonick and O'Sullivan, 2000; Stockhammer, 2004; Davis, 2018; Becker, 2009
Significance and dominance of capital markets	no	x	x	x	Dore, 2008; Van der Zwan, 2014; Sawyer, 2014
Systemic instability	no	x	x	x	Becker, 2009

Source: Eurostat, 2024; International Monetary Fund, 2024; United Nations, 2024; The World Bank, 2024.

4. Sustainable finance as green financialization dynamics

4.1 Market standards of sustainable finance instruments

The markets for sustainable finance are subject to guidelines that establish the prevailing rules and norms, thereby serving as a regulatory framework within these systems. The global green bond and green loan market is underpinned by structured frameworks, key mechanisms, and

actors that maintain its integrity and promote its development. The Green Bond Principles (GBPs), established by the International Capital Market Association (ICMA), and the Green Loan Principles (GLPs), established by the Loan Market Association (LMA), represent foundational voluntary guidelines with the objective of promoting transparency, appropriate use of proceeds, and detailed reporting. Additionally, the Climate Bonds Standard from the Climate Bonds Initiative offers a more detailed certification scheme with specific sector-based criteria for climate change mitigation and stringent environmental standards (Berensmann, 2017). Furthermore, the roles of second-party opinion providers, credit rating agencies and stock exchanges are of high importance in this market. The second-party opinion providers evaluate the environmental impact of green bonds pre-issuance based on the GBPs, while credit rating agencies provide ongoing monitoring to sustain investor confidence. Stock exchanges ensure a regulated and transparent marketplace with environmental criteria for issuers, enhancing market transparency and investor trust (Berensmann, 2017).

The study by Nanayakkara and Colombage (2022) indicates a positive correlation between higher GBP compliance and increased investor demand. Nevertheless, government bonds tend to attract greater demand even at lower compliance levels, which underscores the pivotal role of issuer credibility. Their study proposes that mandatory GBP compliance and enhanced transparency may help to fill the significant investment gap required for the transition to a low-carbon economy. This would be achieved by boosting investor confidence and market growth (Nanayakkara and Colombage, 2022). Furthermore, Balázs and Szabadkai (2022) demonstrate that the standards established for green bonds and loans play a pivotal role in directing investments towards sustainable development projects. To achieve this, they establish criteria for environmental integrity and transparency, thereby ensuring that funds are used for environmentally friendly initiatives such as renewable energy and pollution prevention. Such standards reassure investors about the sustainability of their investments and prevent greenwashing by distinguishing genuinely sustainable bonds. Nevertheless, the efficacy of these standards is contingent upon their enforcement mechanisms. While some standards rely on self-regulation, which may be suitable for investors who are comfortable with self-certified investments, others demand external verification and continuous monitoring. This is appealing to investors who require tangible evidence of compliance and impact. These standards are undergoing a process of evolution, with the introduction of more detailed compliance mechanisms and a broader scope that encompasses a greater number of sustainability issues. This reinforces the essential role of these standards in sustainable finance (Balázs and Szabadkai, 2022).

From the perspective of regulation theory, the GBPs, GLPs and Climate Bonds Standard serve as guidelines for promoting sustainable finance markets and enhancing the acceptance of related instruments among investors. Due to their voluntary nature, they cannot be categorized as direct regulation to influence the mode of regulation. Nevertheless, the mode of regulation also comprises norms and prevailing practices on which these guidelines exert a strong influence, which tends to reinforce the establishment of sustainable finance markets and therefore foster the dominant regime of accumulation.

4.2 Mechanisms and objectives of sustainable finance

Sustainability strategies that involve aligning investment flows with sustainable and green projects have been leveraged through the creation of "green" financial instruments such as green bonds, sustainable bonds, green loans, sustainable loans and other market-based environmental initiatives (Gabor, 2021; EF Data, 2024). The integration of domestic revenue reallocation with global climate finance initiatives is perceived to offer a significant opportunity to implement effective climate policies, with the potential to reduce greenhouse gas emissions significantly (Soergel et al., 2021). Boufounou and Dellis (2021) posit that this approach constitutes a component of a broader discourse on green finance, with green bonds identified as a pivotal instrument. These bonds are designed to channel capital towards environmentally sustainable projects, thereby supporting economic growth that is presumed to be aligned with climate goals and attracting environmentally conscious investors, reinforcing broader environmental objectives under frameworks such as the Paris Agreement and the EU Green Deal (Boufounou and Dellis, 2021). Monasterolo and Raberto (2018) additionally suggest that sustainable finance policies could influence investment behaviours and create favourable conditions for green sectors through instruments such as green sovereign bonds, which enhance the market for sustainable investments. Furthermore, Xie et al. (2022) postulate that financial markets and institutions may facilitate positive environmental outcomes by supporting investments in sustainable and innovative technologies. The advent of green bonds, which are regarded as innovative financial instruments due to their capacity to meet specific, defined environmental objectives, has significantly altered market dynamics, rendering these bonds more appealing to investors (Neumann, 2023). Furthermore, there is a pressing need for sustainable finance to mitigate systemic risks and ensure the long-term viability of the global economy. This necessitates the integration of sustainability into financial frameworks (Beerbaum and Puaschunder, 2018).

Berensmann and Lindenberg (2019) highlight the EU's view that green finance constitutes a crucial instrument for guiding the global economy towards sustainability. This is achieved by supporting the development of green financial mechanisms, including green banking, green debt markets, and structured funds, which are influenced by several key actors, including institutional investors, international financial institutions, regulators and central banks. Nevertheless, this progress is being impeded by both microeconomic and macroeconomic obstacles. To effectively mitigate greenwashing, it is necessary to have precise definitions and adherence to voluntary principles, given the current lack of legally binding regulation (Berensmann and Lindenberg, 2019). The historical and conceptual evolution of green finance has been comprehensively mapped by Dziwok and Jäger (2024a), demonstrating its origins with the issuance of the inaugural green bonds by major international banks and its subsequent expansion to a diverse array of green financial products. This highlights the growing role of private finance in achieving environmental goals, a development that has occurred in parallel with global sustainability efforts, climate change mitigation policies and the global green transformation (Dziwok and Jäger, 2024a). Oyegunle and Weber (2015) posit that the upcoming transition from voluntary codes to more regulated frameworks in financial practices reflects the urgency to integrate sustainability considerations into financial operations within the EU (cf. also Weber, 2018). Furthermore, the

discussion about the effectiveness of green bonds and sustainable finance illustrates the central role assigned to it in channelling capital into environmental projects and highlights its assumed ability to align environmental, social and financial returns, thus contributing to the transformative potential of sustainable finance (Bisultanova, 2023; Schoenmaker and Schramade, 2018).

Recent studies by D'Orazio and Dirks (2021), Iqbal et al. (2021), and Zhang and Wang (2019) outline the significance of comprehensive financial frameworks for environmental outcomes. These studies identify the impact of financial development and climate-related regulations on carbon emissions across G20 nations. They reveal that both short- and long-term financial policies play a critical role in reducing emissions and enhancing environmental quality, particularly in high-emission countries. This research emphasizes the impact of economic growth and demographic changes on emissions and highlights the necessity to integrate climate mitigation policies (D'Orazio and Dirks, 2021; Iqbal et al., 2021, Zhang and Wang, 2019). Other studies have investigated the resilience of the financial system to climate-related risks by examining the impacts of climate change on credit and economic dynamics. They have proposed green financial policies and public credit guarantees to reduce carbon emissions and enhance economic stability (Lamperti et al., 2021). Fan et al. (2022) suggest that green credit policy regulations encourage firms towards environmental compliance and cleaner technological practices by linking financial access to environmental performance. This connection should lead to a reallocation of resources towards greener investments, which is seen to fundamentally alter corporate behaviour and financial health, especially in non-compliant firms (Fan et al., 2022). Contreras et al. (2019) and Eisenbach et al. (2014) highlight the discussion of the adoption of voluntary standards, emphasizing the significant impact of peer pressure and network effects on the likelihood of financial institutions adopting sustainable practices. This, in turn, should align financial operations with sustainability goals and enhance market performance (Contreras et al., 2019; Eisenbach et al., 2014). Wojewska et al. (2024) foreground the argument that there is a need for a nuanced understanding of the role of finance in enabling and potentially destabilizing sustainable transformations. Collectively, these studies provide an overview of the mainstream debates about the evolving landscape of green and sustainable finance, delineating the opportunities and challenges in aligning financial practices with global sustainability objectives.

4.3 Critique of sustainable finance

Critiques of the neoliberal model of green finance stress the need for reform to prioritize environmental sustainability over profit motives. For instance, Migliorelli (2021) identifies the absence of universally accepted definitions and inconsistent regulatory standards as key challenges, and calls for harmonization to improve coherence. Similarly, Gabor (2021) emphasizes that greenwashing undermines the credibility of sustainable finance, as financial benefits often overshadow any environmental improvements. Moreover, Bukvić et al. (2023) advocate rigorous monitoring and verification mechanisms to ensure the effectiveness of green finance, while Kemfert and Schmalz (2019) stress the necessity to integrate sustainability more effectively into mainstream markets. Furthermore, Scholtens (2006) argues that robust frameworks

are essential to enhance finance's role in corporate social responsibility and sustainable development. Additionally, Baines and Hager (2023) raise concerns about the sincerity of asset managers' environmental commitments, which underscores the need for greater scrutiny. Finally, the IFC (2017b) highlights that the absence of standard definitions and comprehensive data poses significant barriers to scaling green finance.

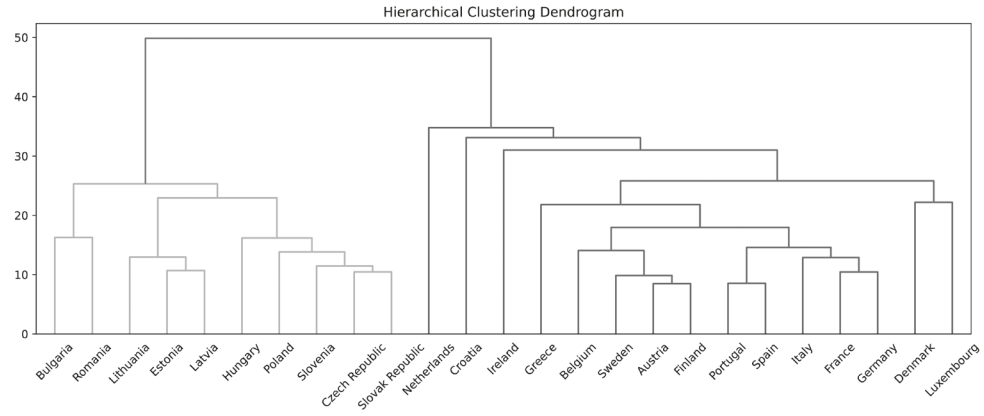
More critical approaches question whether green finance is actually capable of addressing climate change. Springler (2020) contends that its reliance on market-driven mechanisms often undermines long-term environmental goals and exacerbates financial instability, advocating for robust regulation and state involvement to mitigate these risks. Claar (2020) criticizes green finance for perpetuating the capitalist system's growth-driven logic which by its very nature is unsustainable, failing to address the root causes of ecological crises and reinforcing global inequalities, especially in the Global South. Renewable energy investments, for example, can exacerbate dependencies and restrict financial opportunities in these regions (Claar, 2020). Jäger and Schmidt (2020a, 2020b) provide empirical evidence supporting this criticism, demonstrating that neoliberal green finance mechanisms, based on voluntary standards and market-based solutions, often enhance corporate profitability rather than addressing environmental issues. They argue that these practices deepen existing global asymmetries and dependencies (Jäger and Schmidt, 2020a, 2020b). Dziwok and Jäger (2024a, 2024c, 2021) further contend that sustainable finance, as a response to the 2008 financial crisis, has primarily served to uphold the neoliberal financial hegemony, as voluntary environmental standards are often adopted only when aligned with corporate profitability. From a critical perspective, true environmental responsibility requires not only robust regulation but also a fundamental shift away from market-based solutions. A progressive-transformative approach, as proposed by Jäger (2020), would entail the restructuring of economic and social systems to ensure equitable and sustainable resource use. Rather than supporting the transition to "green capitalism", this approach aims for a genuine socio-environmental transformation, as outlined by Dziwok and Jäger (2024a). Only such transformative frameworks can address both environmental and social inequalities effectively.

4.4 Financialization in EU member states

To determine the degree of financialization of the EU member states, a cluster analysis was carried out based on the method of hierarchical clustering as described above. The quantitative indicators used relate to various dimensions and actors. An overview of the indicators as outlined in the theoretical frameworks of critical political economy and regulation theory is provided in figure 1. For the hierarchical cluster analysis, the agglomerative or bottom-up approach was selected, in which each object is initially grouped separately. The cluster pairs are then gradually merged into higher-level clusters in the hierarchy. Overall, the results of the hierarchical clustering of the applied indicators demonstrate that the 25 countries analysed can be grouped into two large clusters. This finding is illustrated in the following dendrogram (fig. 2). The countries included in cluster 1 are Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The countries included in cluster 2 are Austria, Belgium, Croatia, Denmark,

Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden. The hierarchical clustering indicates that the countries in a respective cluster are similar in their respective characteristics of the financially dominated accumulation regime, based on the financialization indicators examined. The length parameter on the left-hand side of the dendrogram indicates that the final allocation to the two clusters occurs at a relative length of 35. The length parameter is indicative of the degree of similarity between the underlying data of a given cluster. Although this is of no significance in terms of content, it will continue to be used in the following exclusively for the sake of better orientation within the graph.

Figure 2: EU member states by degree of financialization



Source: own illustration.

The method of agglomerative clustering will be employed to describe the data, with individual countries, starting on the lowest level. To facilitate a more comprehensive categorization of the countries analysed, they are compared in terms of the size of their populations and economies, measured by GDP where feasible. The European country profiles, as provided by the official homepage of the European Union, are used for this purpose. The first clusters begin to form at a longitude factor of around 8. This concerns the convergence of Austria and Finland, as well as Spain and Portugal. While at first glance there are no indicators for the merger of Austria and Finland other than those used to measure financialization, the merger of Spain and Portugal is characterized by geographic proximity, historical ties and the fact that the two economies joined the EU together in 1986. A similar phenomenon can be seen in the cluster formation at length factor 10, where Czechia and Slovakia – also geographically and historically connected countries that joined the EU together in 2004 – merge into one cluster. The situation is similar in the case of Latvia and Estonia, countries that are geographically and economically linked, joined the EU in 2004, and whose economic strength in terms of GDP and whose population size are also similar. The third Baltic country, Lithuania, which shares the same geographical location, economic history and EU accession year, merged into the cluster at a length factor of 13. Likewise, this development can be observed in Germany and France, both founding countries of the forerunner organization of the European Union and similar in terms of geographical location, economic

power measured by GDP, population, and economic history, at least since the end of the Second World War, which merge into a cluster with a length factor of 10. Like the Baltic states, Italy merged into a cluster with Germany and France at a longitude factor of 13.

The further the cluster formation progresses, the more difficult it becomes to find commonalities in addition to the degree of financialization without a comprehensive country analysis. What remains striking, however, is that countries whose geography, recent economic histories and EU accession years are similar tend to merge into a cluster. For example, Bulgaria and Romania form the first common cluster and the Czechia and Slovakia cluster then gradually merges with other eastern European countries, first with Slovenia, then with Poland and finally with Hungary. All the new countries were not previously grouped in a cluster with any other countries. This cluster now merges with the cluster of the Baltic countries and finally with the cluster consisting of Romania and Bulgaria. This completes the first large cluster, cluster 1. On the other side of the dendrogram, the cluster consisting of Germany, France and Italy merged with the cluster of the Iberian countries. At the same time, first Sweden and then Belgium merge into the cluster of Eastern Europe and Finland, whereby the newly added countries were not previously divided into a cluster. This cluster then merges with the cluster just described, which also contains the previously mentioned founding countries plus the Iberian countries, until Greece joins this cluster. All these countries then merge with the two clusters of Denmark and Luxembourg, which only formed when the length factor exceeded 20. The previously individual countries of Ireland and Croatia are now gradually merging into the cluster. The Netherlands is the last country to join the cluster, thereby completing cluster 2.

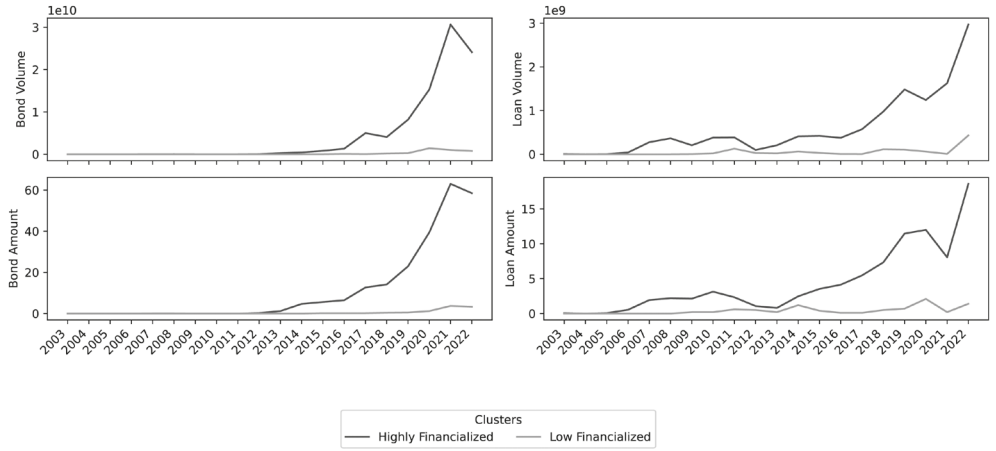
A further noteworthy observation is that the Benelux countries did not establish their own cluster from the outset. It is also apparent that countries in Southern Europe tend to be integrated into cluster 2, but only merge into the dominant cluster at disparate times. A similar pattern emerges in the case of the Northern European countries of Denmark, Sweden and Finland. While they do not form a common cluster, they tend to move into their own clusters at an earlier stage than the other countries. It is again important to note that the cluster classification was based solely on the indicators used to measure financialization. Consequently, the countries were only classified based on a similar regime of accumulation in terms of financialization between 2003 and 2022. It is not possible to ascertain from this analysis why their history of financialization is similar. Finally, Western, Southern and Northern European countries are characterized by a relatively high degree of financialization and are grouped together in cluster 2. Consequently, these countries are henceforth referred to as highly financialized countries. Eastern European countries are mostly characterized by a relatively low degree of financialization and are grouped together in cluster 1, with those countries henceforth referred to as low financialised countries.

4.5 Sustainable finance in EU member states

The impact of sustainable financing mechanisms on the clusters defined above is now examined. To this end, investments in presumably sustainable sectors are compared for each cluster. The

investments in sustainable sectors are quantified using sustainable finance instruments – including bonds and loans – that claim to direct investments towards sustainable sectors. The data on sustainable finance instruments were sourced from the Environmental Finance database; all corporate and government bonds and loans with the attributes "green", "sustainable", and "sustainability-linked" from the period 2003 to 2022 were analysed. The monetary volume in US dollars and the number in units of all bonds and loans from all countries within a cluster were added together for each individual year in the period under review. The results are shown in figure 3.

Figure 3: Issuance of green financing instruments by cluster, absolute



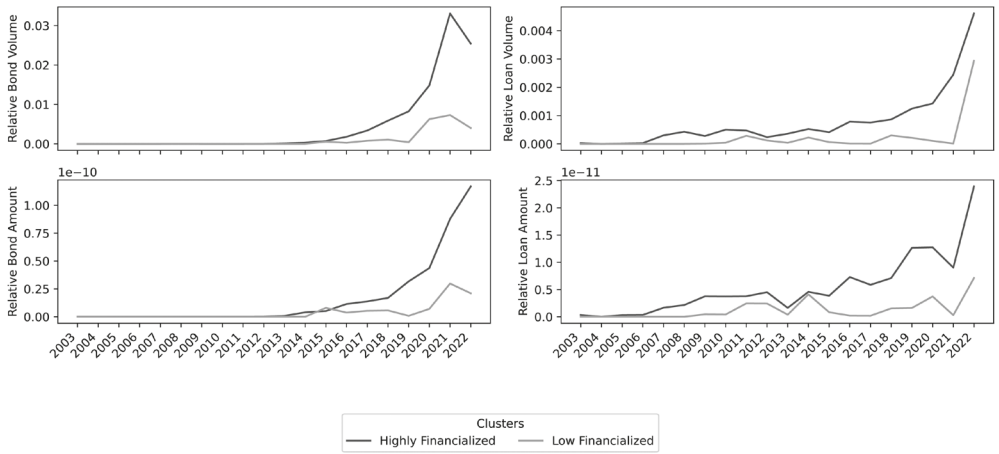
Source: Environmental Finance, 2024

The quantitative analysis revealed distinct patterns in the use of sustainable financial instruments among countries clustered based on their degree of financialization. Specifically, countries categorized in cluster 1, which exhibit a low degree of financialization, demonstrated a modest engagement with sustainable bonds and loans, both in terms of quantity and aggregate volume. In contrast, countries in cluster 2, characterized by a high degree of financialization, exhibited a significantly higher adoption of these instruments. This result is further reinforced by a relative analysis of bonds and loans based on the GDP of the respective country within a cluster. For this analysis, the volume of bonds relative to the aggregated GDP of the countries in a cluster was employed. The same procedure was applied to the volume of loans and the number of bonds and loans. The GDP data was sourced from the World Bank database. Although the volume and number of loans in the cluster of low financialized countries increase towards the end of the observation period, the results indicate that highly financialized countries have a greater reliance on sustainable instruments in general. Figures 3 and 4 illustrate the result of this analysis.

The findings indicate a correlation between the degree of financialization in a country's economy and its willingness to use sustainable financial mechanisms to reduce greenhouse gas emissions and thus combat climate change. From the perspective of regulatory theory, this result can be interpreted as indicating that countries that have already established a highly financialized

regime of accumulation are responding to the ecological crisis with measures that align with that dominant regime of accumulation.

Figure 4: Issuance of green financing instruments by cluster, relative to GDP



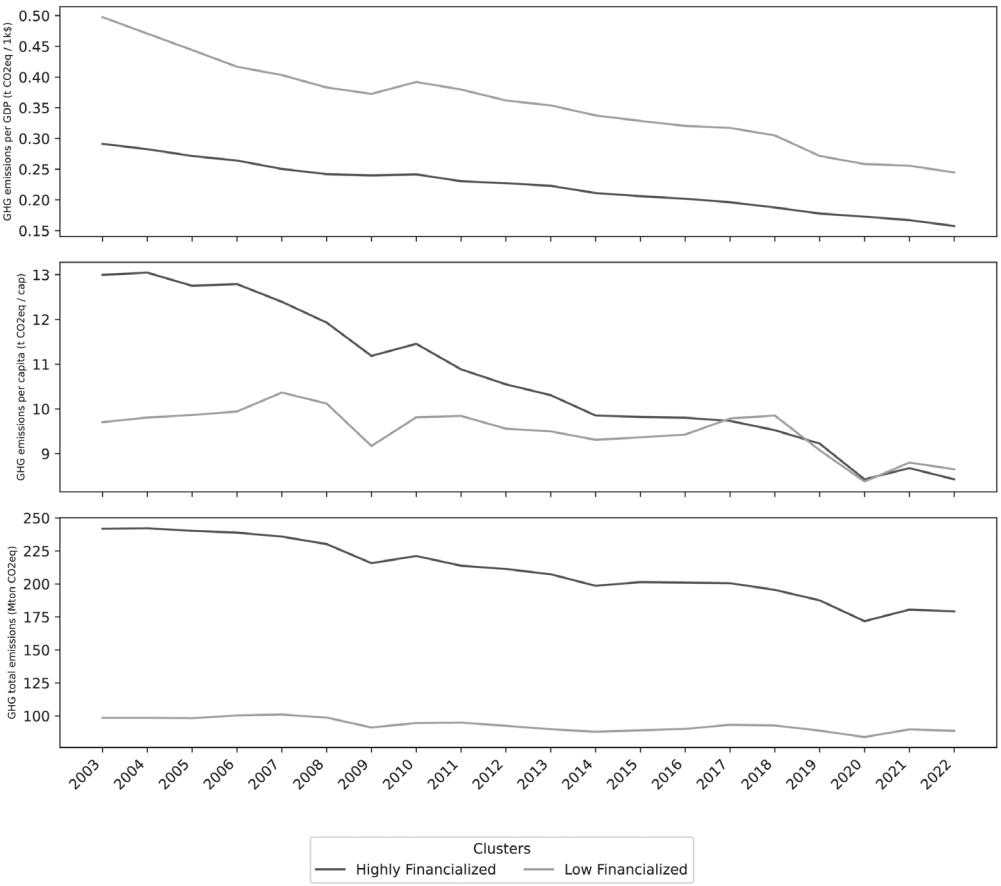
Source: Environmental Finance, 2024

To extend the scope of the research, the previous analysis of the use of sustainable financial instruments is juxtaposed with a subsequent assessment of greenhouse gas (GHG) emission reductions across the countries of the two clusters. For this comparative analysis, aggregate GHG emissions data for all countries within each cluster were compiled annually, spanning from 2003 to 2022, sourced from the EDGAR Emissions Database. This approach permitted a multifaceted examination of emissions trends, incorporating not only absolute GHG emissions figures but also emissions in relation to both per capita metrics and GDP. Such a comprehensive analysis aims to illustrate the potentially broader environmental impact of economic practices characterized by differing levels of financialization. By integrating multiple emissions metrics, the analysis seeks to provide a holistic understanding of how financialization may influence environmental outcomes across diverse economic contexts. The results are shown in the following chart.

As illustrated by the graphs, the countries in both clusters exhibited a consistent and comparable decline in their greenhouse gas emissions over the period analysed. In terms of absolute GHG emissions, the highly financialized countries exhibited significantly higher emissions than countries with low financialization, with a relatively flat reduction observed for both groups. Regarding GHG emissions per GDP, the low financialized countries began with higher emissions than the highly financialized countries. However, they also reduced their emissions to a greater extent, resulting in a smaller difference at the end of the study period than at the beginning. In terms of GHG emissions per capita, the highly financialized countries exhibited significantly higher emissions at the outset of the study period than the countries with low financialization. However, the highly financialized countries demonstrated a significantly greater reduction in these emissions, resulting in slightly lower per capita emissions than low financialized

countries by the end of the study period. The sharp increase in the use of sustainable finance instruments in highly financialized countries during the period under review, particularly from 2015 onwards, is not directly reflected in a reduction in GHG emissions. Based on this information, it could be suggested that the emission reductions would have continued even without the adoption of sustainable finance instruments. Consequently, this can be interpreted as a failure to achieve the goals of using sustainable finance instruments. This interpretation has limitations, but a correlation in the sense that sustainable finance has no direct influence on GHG reduction within the countries analysed during the period under review is likely.

Figure 5: Emission reduction of EU countries by cluster

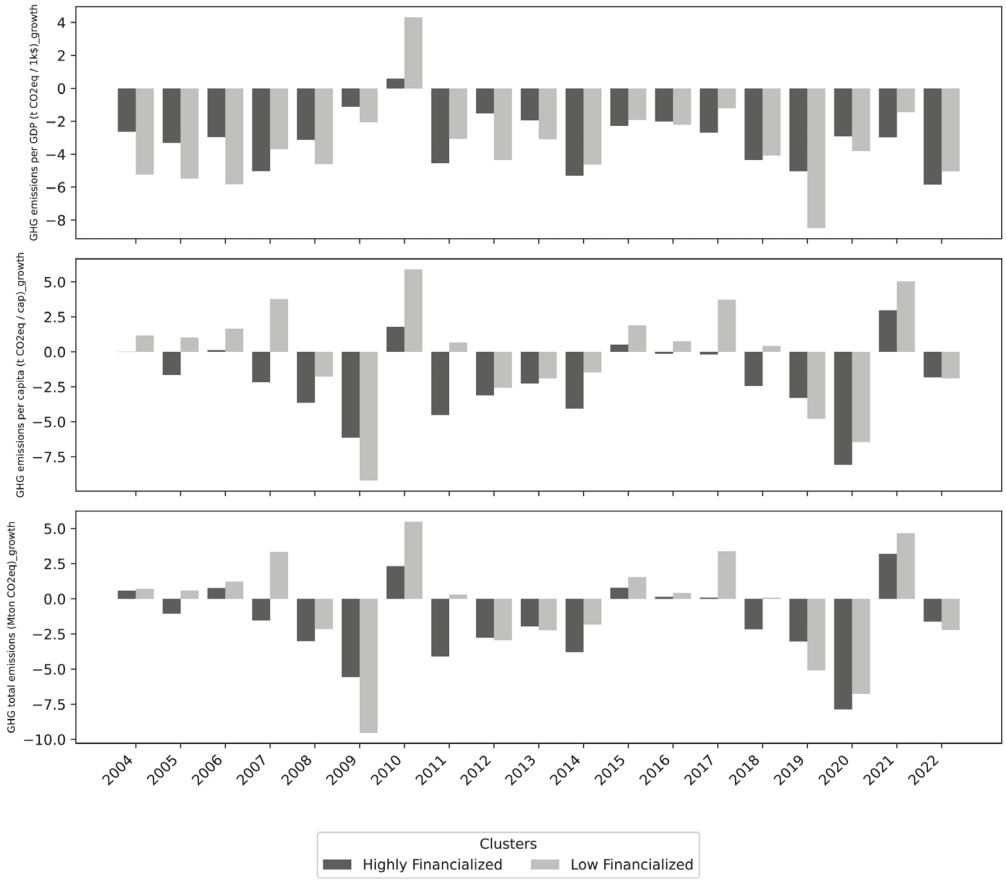


Source: Emissions Database for Global Atmospheric Research, 2024, by the European Commission, 2024

The examination of GHG emission growth rates offers a distinct perspective on the dynamics of emission reductions across EU countries. To facilitate comparison, the same aggregate GHG emissions data within each cluster were compiled annually over the same period. As illustrated in figure 6, throughout the study period, low financialized countries exhibited higher negative

growth rates in GHG emissions than highly financialized countries. Furthermore, these countries exhibited a more pronounced decline in growth rates. This indicates that, despite their minimal reliance on market-based mechanisms, low financialized countries have adopted effective alternative strategies or implemented structural alterations that facilitate substantial reductions in emissions. Following an increase in the use of sustainable finance instruments, highly financialized countries demonstrated a notable acceleration in negative growth rates in GHG emissions per GDP after 2015. The increased use of green bonds and loans during this period appears to have contributed to this acceleration, indicating that the increase in such instruments is linked with GDP growth, while they may facilitate emissions reductions at the same time. Nevertheless, the overall impact remains limited, with the reductions achieved exhibiting a comparable consistency to those observed in low financialized countries. This finding reinforces the notion that both more and less market-based approaches possess comparable potential, or that the reduction of GHG emissions may be contingent upon external factors.

Figure 6: Emission reduction growth rates of EU countries by cluster



Source: Emissions Database for Global Atmospheric Research, 2024, by the European Commission, 2024

A per capita analysis of the data reveals that countries with a high level of financialization have achieved a notable reduction in emissions per capita, indicative of enhanced efficiency in their emissions reduction strategies. In contrast, countries with a low level of financialization, while experiencing higher absolute negative growth rates, demonstrate a less pronounced decline in per capita emissions. This discrepancy may be attributable to underlying structural factors, such as population growth or restricted access to substantial resources for emission reductions. A further examination of GHG growth rates relative to GDP serves to accentuate the discrepancies between the two clusters. The evidence suggests that countries with a low level of financialization demonstrate a stronger decoupling of emissions from economic growth, as evidenced by a sharper decline in emissions per unit of GDP. This indicates that these countries have been more successful in integrating sustainable practices into their economic systems without relying extensively on market-based financial instruments. The countries with a high level of financialization, while demonstrating improvements in emissions per GDP, exhibited a more gradual decline, which suggests that financialization may inherently impede the pace of structural economic transitions. The trends in absolute, per capita and GDP-relative growth rates offer insight into the role of sustainable finance. While the increased use of environmentally focused financial instruments in highly financialized countries has facilitated accelerated reductions in emissions, the more pronounced and sustained negative growth rates observed in low financialized countries indicate the potential for regulatory and structural interventions. These findings suggest that sustainable finance, when applied in isolation, is an inadequate means of achieving transformative environmental outcomes unless complemented by policies that address systemic economic and social barriers.

From the perspective of critical political economy and regulation theory, the advent of sustainable finance can be attributed to the adaptation of regulatory frameworks to support the finance-dominated regime of accumulation. This particularly accounts for the European Green Deal, which alters the predominant mode of regulation to stabilize the finance-dominated regime of accumulation. The policies thus promote market-based approaches to tackling climate change and reinforce the dynamics of financialization. The results of the quantitative analysis in this study indicate that there is a more nuanced picture within the EU. In general, EU countries can be divided into two groups, one with a high degree of financialization and the other with a low degree of financialization. In the context of sustainable finance, it is evident that countries with a higher degree of financialization also have a higher level of emissions and sustainable finance instruments. This indicates that they are increasingly relying on financial market mechanisms to combat climate change. Yet these countries do not exhibit significantly higher emission reductions than the other group. Consequently, there is no evidence within this research that the financial market mechanisms surrounding sustainable finance can achieve their intended goal or are any more effective than other, non-market-based approaches. Therefore, the European Green Deal can be seen as a political endeavour to adapt the mode of regulation to the prevailing financially dominated regime of accumulation in such a way that climate change can be addressed without weakening the regime of accumulation. This is particularly evident in the integration of sustainable finance and the role that private capital plays in this, which promotes financial market solutions to combat climate change.

5. Discussion

This study examines the relationship between financialization and sustainable finance within the EU, with a particular emphasis on their contributions to GHG emission reductions, and questions possible causality in this context. The findings reveal considerable discrepancies in the use of sustainable financial instruments and environmental performance between countries exhibiting high and low degrees of financialization. Countries with a high level of financialization tend to rely on market-based solutions, such as green bonds and loans, as a means of addressing climate change. Notwithstanding their achievements in emission reductions, these countries continue to demonstrate a disproportionately high level of absolute GHG emissions. This indicates the constraints of market-driven mechanisms in achieving transformative ecological change. The analysis additionally demonstrates that the accelerated adoption of sustainable finance instruments in these countries, particularly following 2015, correlates with a reduction in the growth rate of GHG emissions. However, the impact of these instruments is restricted by their integration into finance-dominated regimes of accumulation, which prioritize stability and profit over systemic change, including environmental change.

Conversely, countries with low financialization exhibit higher negative growth rates in absolute emissions and a more pronounced decoupling of emissions from GDP. Despite their limited deployment of sustainable finance instruments, these countries are succeeding in attaining persistent and considerable reductions in emissions. This indicates that regulatory interventions, structural economic shifts and non-market strategies are of critical importance in driving emission reductions, especially in less financially oriented contexts. Furthermore, the study identifies discrepancies in per capita emissions trends, whereby countries with a high level of financialization initially have higher emissions but subsequently achieve significant reductions. In contrast, low financialized countries exhibit a slower reduction in per capita emissions, which could be influenced by structural factors such as population growth and resource constraints. These findings highlight the necessity for a balanced approach that integrates sustainable finance with robust policy measures and structural reforms.

From the perspective of regulation theory, these findings suggest that the EU's sustainable finance framework should adapt its mode of regulation to stabilize the finance-dominated regime of accumulation. These policies emphasize market-based solutions, reinforcing financialization while limiting the potential for transformative climate action. The findings challenge the assumption that sustainable finance alone can achieve meaningful environmental outcomes, emphasizing the need for systemic approaches that address both financial and non-financial dimensions of sustainability.

Furthermore, this research underscores the importance of distinguishing correlation from causality in the relationship between financialization and sustainable finance outcomes. While the methodology effectively identifies patterns of financialization among EU member states, it cannot establish causal links between the use of sustainable finance mechanisms and GHG emission reductions. Expanding the scope of research to include more granular and qualitative data,

additional indicators and a longer observation period would provide a deeper understanding of the political and economic contexts influencing financialization and the adoption of sustainable finance. Further research could also examine the role of per capita GHG emissions in greater depth, given the notable divergence from other GHG emission trends.

6. Conclusion

Investigating the relationship between financialization and sustainable finance in the EU, this study examines the impact of sustainable finance on greenhouse gas emissions using a hierarchical cluster analysis. The results show that highly financialized countries make extensive use of sustainable finance instruments, aligning these mechanisms with their finance-dominated accumulation regimes. However, this reliance does not translate into proportional reductions in absolute emissions, highlighting the limitations of market-based solutions. While highly financialized countries achieve notable efficiency in absolute emission reductions, as well as in emission reductions per capita and relative to GDP, their absolute emissions remain disproportionately high. Conversely, low financialized countries achieve lower yet notable GHG emission reductions and show stronger decoupling of emissions from GDP, despite their limited use of market-based financial instruments. These findings suggest that regulatory and structural interventions also equate to substantial environmental progress.

The rapid growth of sustainable finance markets in highly financialized countries, particularly after 2015, correlates with accelerated reductions in emission growth rates. However, this improvement remains limited by a systemic reliance on financialization that prioritizes short-term stability over long-term transformation. In contrast, countries with low levels of financialization provide a model for using non-market strategies to achieve rapid and sustainable reductions, highlighting the potential of diverse approaches. In conclusion, while sustainable finance is a valuable tool, it cannot deliver meaningful environmental outcomes in isolation. Policymakers need to adopt a comprehensive approach that integrates financial mechanisms with robust regulatory frameworks and public investment. This approach should prioritize systemic reforms to address structural barriers to overcome the prevailing regime of accumulation and ensure a just and sustainable transition. The findings underscore the need to rethink the role of financialization in climate strategies, moving beyond market-driven solutions to achieve real environmental transformation.

ACKNOWLEDGEMENTS

I sincerely thank the Austrian Chamber of Labour (Netzwerk Wissenschaft der Kammer für Arbeiter und Angestellte für Wien) for their institutional support in facilitating this research. I am also grateful to Universität Wien for providing an excellent academic environment and education, and access to essential research infrastructure. Additionally, I extend my appreciation to the peer reviewers and lecturers for their critical assessment of this work and their invaluable feedback, which greatly contributed to improving this article.

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