# Regional trends in the context of the European green transition:
## Financial development and governance

By

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## Abstract

The thesis aims to assess regional trends of governance and financial development about the green transition. The European Union faces one of its biggest challenges: the execution of the European Green Deal. The academic discussion raises the question of whether the market-based solution will be the better one or whether the involvement of the national governments is necessary, too. The thesis introduces the general discussion around the issues and the shortcomings of the available data set. The aim is to uncover whether financial development or governance is more impactful on environmental degradation at the EU and major regional levels. The author tests the hypothesis of Afzal et al. (2022), whose work is based on the Environmental Kuznets Curve, to see whether it fits the EU member states in contrast to their general European focus. Further, the thesis inquires about the impact of governance on financial development and environmental factors with OLS panel data regression based on primary data for the EU27 countries for the period 2000-2022. The results disapprove the findings of Afzal et al. (2022) and support recommendations for further and more comprehensive governmental involvement to foster and finance the green transition.

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## Table of content



## List of tables

# INTRODUCTION

Climate change and its environmental, economic, and social aspects have become urgent topics and buzzwords both in politics and academia. The European Union (EU) aims to be the forerunner of the sustainable transition in all its aspects. The European Green Deal and the EU sustainable finance taxonomy became focal points of the academic and political discussion. The reason, amongst others, is that the European Green Deal set ambitious goals for the EU to become net-zero greenhouses eminent by 2050. The path towards it is laid down by several action plans and policies, creating a complex environment for all actors of society and the economy. Hence, most of the debate revolves around the proposed policies, regulations, and monitoring processes. One of the fierce debates is about the issue of financing the paradigm shift. The EU supports a guided market-based approach with its sustainable finance taxonomy and targeted funding programs; however, the need for public involvement resurges within the literature. Environmental and socio-economic issues are frequently subject to analysis with the Environmental Kuznets Curve, whose application is debated.

One of the works in the European context was done by Afzal et al. (2022), who found that over time, financial development decreases environmental degradation in European countries. The thesis tests their hypothesis fitted for the EU to see whether the curvilinear relationship is true for the EU members, too. Furthermore, the relationship between governance and financial development will be assessed to see what impact governance has on financial development under the current circumstances and, by that, analyze possible solutions for pushing forward sustainable development. Additionally, the impact of governance on environmental degradation is analyzed to see whether governance has a substantial impact on it or whether market forces are more powerful. The thesis applies the Ordinary Least Squares (OLS) methodology to panel data for the EU27 countries within the period 2000 and 2022. The panel data were both carried out on the EU level and regional level to see whether any

difference could be seen. The reason for the restricted period is the lack of reliable data for a longer time horizon data; hence, the analysis is carried out based on the works of Afzal et al. (2022), amongst others. For the sake of consistency and replicability, the primary data is drawn from the World Bank and the Eurostat. The variables for environmental degradation consist of energy use per capita, greenhouse gas emissions, CO2 emission, and general natural degradation, which refers primarily to the living environment. The findings of the thesis contradict the findings of Afzal et al. (2022) in the context of the EU. However, supports the greater government intervention to foster green transition and transitional financing.

The thesis is divided into six major parts: i) the introduction of the green transition, the origins of environmental policy in the EU and the emergence of sustainable financing, ii) the introduction of the European Green Deal and the relevant academic debate around the market and governmental solutions, iii) introduces the Environmental Kuznets Curve and its scope of applicability, iv) the description of variables and testing the original hypothesis of Afzal et al. (2022) and testing literature based hypotheses, v) discusses the findings in the wider literature and the vi) concluding the thesis.

# 1 THE WAY TOWARDS THE EUROPEAN GREEN TRANSITION: POLICY CONTEXT AND LITERATURE REVIEW

## 1.1 ENVIRONMENTAL POLICY IN THE EU

The EU´s environmental policy discourse dates back to the 1970s. International treaties, such as the 1972 Stockholm Declaration and Action Plan for Human Environment, the 1992 Rio Declaration, and the United Nations Framework Convention on Climate Change, influenced the internal policy and law-making processes. In 1972, the European Council released a declaration regarding the need for an action program to fight pollution and improve and conserve the environment. The declaration laid down the basic framework of the EU´s

environmental policy under Environmental Action Programmes (EAP). The first EAP of 1973 set the community's future legislative path and policy goals in the form of multiannual programs (Kurrer & Petit, 2024). The term "sustainable development" appeared in the European policy-making discourse in the Brundtland report in 1987, whose considerations quickly found their way into the Single European Act enacted the same year and established the legal basis for common environmental policy (Claringbould et al., 2019). In 1993, the Maastricht Treaty made environmental policy an official policy area, falling under the co-decision procedure with a qualified majority. Furthermore, the Amsterdam Treaty enacted the promotion of sustainable development in all sectoral policies, which contributed to the latter horizontal policies supporting the environmental efforts of the EU, such as the Biodiversity strategy for 2030, Farm to Fork, or the most recent Nature Restoration Law (ibid).

In 2007, the Lisbon Treaty granted the EU rights to conclude international environmental agreements on behalf of all member states. These furtherances contributed to the EU commitment to the 2015 Paris Agreement and the proposal of the European Green Deal in 2019, whose execution is guaranteed by the European Climate Law enacted in 2021.

The 2018 Action Plan on sustainable growth covers several initiatives with specific developmental goals, such as the Circular Economy Strategy, which aims to reduce waste and recycle raw materials, the 2030 Climate and Energy Framework, and the European Energy Union Strategy, which is the EU´s long-term vision to achieve a socially, regionally cohesive, competitive, and climate-neutral economy (Claringbould et al., 2019).

The European Green Deal (EGD), which is foreshadowed by the 2018 Action Plan, is the most recent strategy of the EU to achieve sustainable transition and carbon neutrality by 2050 (Kurrer & Petit, 2024). The EGD is wider than an environmental project; it seeks to take the opportunity to restructure the European economy into a more resilient, socially inclusive, and less dependent on external resources. The main goal of the strategy is to reach net-zero

GHG emissions by 2050. On the way to it the first major deadline is in 2030, when the GHG emissions shall be lowered by 55 percent compared to the 1990 level. Another policy goal is the introduction of carbon tariffs under the Carbon Border Adjustment Mechanism to minimize the chances of companies outsourcing their pollution outside of the EU. Further initiatives are the review of the emission trading systems, the energy taxation directive, the EU forest strategy, the Farm to Fork strategy, or the Horizon Europe to enhance public-private partnerships in the field of research and development to foster technology transition. Besides the general environmental and climate targets, the EU aims to overcome the social tension of the continent with its Just Transition Fund to integrate less developed regions.

Furthermore, in 2020, the EU introduced the Green Recovery, which is a series of economic measures to counterbalance the COVID-19 pandemic-caused economic crisis, which later was accompanied by the REPowerEU in 2022 to support the member states to be less dependent on the Russian fossil energy sources with the introduction of new renewable energy sources. All of these further initiatives support the financing and coordination of the EGD and the Fit for Package to keep the community on the path toward the goals set by the European Climate Law (Hepburn et al., 2020).

### 1.2 SUSTAINABLE FINANCE

Sustainable and green finance emerged fairly recently as the world's leading industrial nations started to face the consequences of natural degradation and climate change. The most important milestone for the current efforts regarding green finance and sustainable financing is the Paris Agreement on Climate Change of 2015. The Paris Agreement's core target is to keep the average temperature rise below 2 degrees Celsius and to push for a limit of 1.5 degrees Celsius above pre-industrial levels. Furthermore, the Paris Agreement calls for the mobilization of financial flows for greenhouse gas-decreasing processes and climate-resilient development

and, by that, establishing “green finance” in the development policy jargon. As an aftermath of the agreement, the G20 countries set up in 2016 the G20 Green Finance Study Group (GSFG), which concluded its work on the challenges and framework of green finance in the G20 Green Finance Synthesis Report. Important to highlight that the GSFG incorporated into their report the financial risks of climate change and environmental degradation. Parallel to the GSFG, the European Commission set up its own High-Level Expert Group (HLEG) on sustainable finance to create a comprehensive strategy for the EU. The HLEG´s approach mirrored a broader concept towards sustainable finance, which is overarching the versatile policy goals of the EU: climate-resilient, low-carbon, circular, and more resource-efficient economy. On the other hand, the HLEG addressed the embedded shortcomings of the financial system and corporate actions, such as the need for transparency and systemic stability. The findings of the HLEG were applied to create the 2018 Action Plan to finance sustainable growth, which major components take into account the mobilization of investments for the transition, considering the risks of socio-political risk and possible long-term impacts of the transition. The research on ESG financing is still in its infancy due to the various industry standards and uncertainty over the whole development; however, green bonds-related studies as forerunners of ESG financing could provide some insight into ESG financing in practice.

### 1.3 Green Bonds as forerunners of ESG financing

There is a constantly expanding literature on the performance of ESG financing; however, there is no general verdict regarding their volume and yield in comparison to “traditional” investments. Although the findings are by and large inconclusive, there are some notable findings and observations. Silva & Cortez (2016) found that green funds perform worse in Europe than in the US; however, generally, green funds are contra-cyclical and, hence, perform better during economic crises. The generally negative performance of European green funds was supported by Ibikunle & Steffen (2017) too, who studied the periods between 1991

and 2014. The underlying reasons remain undisclosed, but the generally more restrictive legislation of the economic actors in all aspects of business, such as environmental protection or labor laws, in the EU compared to the USA contribute to the less favorable performance. Regarding ESG financing, one of the most well-researched areas besides classification and data reporting is green bonds.

The financial market for sustainable financial products started with green bonds, still one of the most characteristic products on the market. In 2007, the first green bonds were issued by the European Investment Bank and a year later, followed by the World Bank. By 2021, the ESG bond markets repented around a trillion USD, approximately 10 percent of global debt on the capital markets (EIB, 2022). Besides the ESG bond market, sustainable lending has shown significant growth in recent years, with approximately 700 billion dollars globally in 2021 (Toole, 2022).

The green bond markets are both on the product provider and investor side, dominated by institutional investors. In 2018, 75 percent of the global ESG financing under management was in the hands of institutional clients, such as development banks, central banks, investment funds, or pension funds (GSIA, 2018). Though in the case of green bonds, the markets are more mature, the findings are similarly inconclusive. In the case of bonds, the literature distinguishes between primary and secondary market yields. Hachenberg and Schiereck (2018) did not find any significant difference between the performance of conventional and green bonds on the primary market, while neither could establish any significant yield difference on the secondary market either. In the case of distinguishing between corporate and government bonds, a striking difference in performance is observed among corporate bonds based on the ESG score of the issuer. The lower the ESG score of the company, the higher the premium shall be paid as a climate risk premium (Bannier et al., 2022). In contrast to companies with

higher ESG scores, there were no significant differences between the conventional and green bonds issued (Flammer, 2020)

Although the most newly issued green bonds are coming from European issuers, the green corporate bond market is small, around one percentage of the total corporate bond market, which is rather a niche. The underlying reasons are argued by scholars; however, the consensus is the economic uncertainty caused by COVID-19 and the rather slow rollout of the EU´s taxonomy in the financial and corporate sector (Liebich et al., 2020; Venturini, 2022). Liebich et al. (2020) discuss in their article the patterns of issuers and sectoral placement of the green bond fundings of Germany as one of the most significant markets in the EU. They found that the German sectoral distribution heavily focused on the energy sector, and the underlying assets were overwhelmingly issued by either the state-owned KfW or government-backed entities. This type of government involvement in the green bond market is generally the case; however, there is a slight difference between the issuance of green bonds by state-owned or multilateral development banks and governments themselves.

Green sovereign bonds were issued first by the Polish government in 2019, followed overwhelmingly by EU members and some other countries such as Chile, Seychelles, or Hong Kong. The European green sovereign bonds market in the euro area shows some peculiarities. While France and the Netherlands generally issue single-maturity bonds in this asset class, Germany provides short-term from 2 to 5 years, medium-term 10 years, and long-term ones with 30 years of maturity. The differing maturities aim to target different investors: short-term meant for development and central banks to provide urgent liquidity, medium-term for investment funds, and long-term meant for pension funds (Liebich et al., 2020).

The German Finance Agency additionally introduced so-called twin bonds, which means that a green sovereign bond has an identical conventional sovereign bond in the portfolio of the Finance Agency. The reason for this concept is that green sovereign bonds are less liquid

than conventional bonds; hence, investors have the opportunity to switch their green sovereign bonds to conventional ones with similar maturity, coupons, and yield. Might the possibility of twin bonds sound like a good strategy to minimize liquidity issues, raising questions regarding the final flow of the funds since they are not bound to any specific project. On the contrary, the Netherlands generally issues its green bonds - at least 50 percent - with a specific project, which makes the spending and the outcome of the funds more trackable, however, they are less liquid than the German twin bonds (Dutch State Treasury Agency, 2019). It could generally drawn that state actors are and will be important actors of the long-term ESG financing, especially in controlling the several risk profiles. The various risks arising from climate change for the real economy and the financial sector bring up the question of who and how shall bear the risks.

## 1.4 Market versus state-based approach to green finance

Climate change and environmental depletion call into question the fundaments of the incumbent economic systems based on short-term profit, fossil fuels, linear production lines, and natural resource extraction. To push forward the paradigm shift towards a sustainable economic order, long-term investment horizons, fossil fuel independence, and circular raw material usage are key (Rant, 2022).

The paradigm shift and the rising inequality rather within countries around the world than between countries could enhance the socio-political polarization, which can endanger the long-term policy in favor of short-term populist policies (Milanovic, 2016, 2023, 2024; Bourguignon, 2018). Sustainable finance is based on the presumption that social and environmental considerations could be aligned with financial stability and long-term investment (Schramade & Schoenmaker, 2018). These thoughts and findings lead to the discussion of whether further steps are needed to facilitate the transition besides codifying ESG financing, such as the sustainable EU Taxonomy.

The recent developments of the green financial market trends lie within the underlying drivers of the actors of the market actors: financial institutions, such as banks as ESG finance product and services providers, and non-financial actors, companies, and governments up to some extent.

Non-financial actors are driven by the several risks connected to climate change: physical risk, transition risk, and even repetitional risks. Hockerts (2015) argues that ESG projects and investments are attractive for companies due to the perception of better competitive position and economic performance. Bengo et al. (2022) highlight that the most vivid advantages are operational benefits, such as risk reduction and efficiency benefits, through the implementation of new technologies and processes. Adaptation of new technologies is considered to be part of transition risks, which are not solely a risk for non-financial actors but also for financial institutions since approximately 30 percent of global assets under management are prone to physical and translational risk by climate change (Krueger et al. 2020). Financial institutions are not solely incentivized by the regulatory requirements but also by their pure direct and indirect exposure to climate change-related risks, which affect almost all aspects of their daily business.

Battiston et al. (2017) established that the banks´ loan and equity portfolios are more prone to climate change-related risks than ever before assumed. Furthermore, climate change impacts the asset pricing practices of banks, carrying a higher operational risk if done in inadequate ways (Campiglio et al., 2023; Venturini, 2022). To overcome these blind spots of asset pricing, financial market actors, non-governmental organizations, industry alliances, and international organizations created several ESG reporting standards and frameworks (Bracking & Leffel, 2021). However, these competing frameworks fall under scrutiny and criticism due to alignment uncertainty and the possibility of greenwashing. Hence the International Federation for Systems Research (IFSR) decided to establish the International Sustainability

Standards Board in 2021 (ISSB) and with the Global Reporting Initiative (GRI) to create a two-pillar global sustainability approach; "*a first pillar of investor-focused standards to be developed by the IFRS/ISSB for use in capital markets and a second pillar of multi-stakeholder oriented standards set by the GRI/GSSB"* (Rant, 2022, p. 9.).

GRI and the ISSB highlighted the EU´s global standard-setting power and technical expertise to lead the global sustainable transition. Other initiatives also appeared in the sustainable finance market, like "Maximizing Finance for Development" by the World Bank, which aims to shift towards sustainable finance by blending public and private resources (Rant, 2022). As Gabor (2021) mentions, the unleashing of private capital in the green transition could help leverage the financial flows by its shire size. However, there are also risks of subordinating the fiscal policy to the interest of the private capital and its restructuring needs by omitting the final social benefits. Similar fears were addressed by Tan (2022a, 2022b) and Carney (2015), that private capital seeks short-term benefits without taking into long-term environmental and social benefits. Carney (2015) further emphasizes the importance of going beyond political and business cycles to achieve the green transition, which is usually over the time horizon of market actors and central banks. To accomplish the green transition goals besides technocratic standards, facilitators of the financial system coordinators are also needed, who serve the wider social interests. Ideally, these are governments elected by the people and for the people. Governments have various tools to facilitate paradigm shifts in the economy, which are usually embodied by industrial policies.



# 2 EUROPEAN GREEN DEAL

## 2.1 POLICY DIMENSIONS

Policy dimensions of the European green transition are various; however, various authors took differing approaches to grouping them. Most of the authors or their works focus along the following divide into four major angels: i) the global dimension of sustainable

finance, ii) legal technicalities of the transition, iii) fostering sustainable finance at the national, regional, and local levels, iv) the social dimension (Claringbould et al. 2019; Baute, 2024; Ning et al., 2022, Dunlap, 2023; Tol, 2021).

Dunlap (2023) discovers in his paper the socio-economic impacts of high-voltage electricity grid expansion argues that there is an objective there is no "green energy transition," solely high-power voltage line infrastructure extension, which is overarching regions and nations, combined with the neo-liberalisation of the energy production and infrastructure. He argues the implementation of de-growth economic policies, also called "decolonial" in the context of his paper, refers to infrastructural development for the benefit of the urban population at the cost of the rural one and the environment.

Though there are some strongly worded thoughts in his paper, it should be considered that public support of the social dimensions is inevitable to succeed in the green transition, if it is even possible.

Tol (2021) argues that the whole transition within the EU is highly reliant on electoral fortune, and the final cost-benefit ratio for the community depends on the other big global polluters, such as the US or the PRC. There is also an ongoing debate among scholars regarding the performance of green financial products both in financial and real economic return terms (Dursun-de Neef et al., 2023; Liebich et al., 2020; Formetta & Feyen, 2019). The main reason for the debate is that the most mature and objectively researchable sustainable financing market is the green bonds market, which is dominated by governments and multilateral organizations (Gilchrist et al., 2021). Liebich et al. (2020) mention that the complexity of the transition requires a comprehensive public-private partnership approach to the execution of the 2018 Action Plan, which leads to the question of what shape this public-private cooperation shall take place.

## 2.2 INDUSTRIAL POLICY VERSUS ECONOMIC STATECRAFT IN THE EU

The governments of the member states shall be the catalyst of the green transition it is clear and argued by many authors (Tagliapietra & Veugelers, 2021) that financial development on its own does not provide enough financing for the transition. The need for public involvement is preemptively assumed by the EU, hence, in March 2020, the commission released the New Industrial Strategy for Europe**,** however, the paper does not specify any concrete green transition aspects for its policy. It mentions goals of *"securing the supply of clean energy and raw materials; stepping up investment in green research, innovation, deployment, and up-to-date infrastructure; and creating lead markets in clean technologies with regulatory policies, public procurement, and competition policy"* (Tagliapietra and Veugelers, 2021, p. 308). Tagliapietra and Veugelers (2021) point out the vagueness of the EU´s transitional policymaking, which has various reasons, such as the lack of political unity and proper fiscal power. However, the EU brings in the concept of the "new industrial policy," which is the revival of the developmental policies and could serve as an alternative approach to economic statecraft, prominently executed by the USA and China. The authors drove attention to the influential work of Rodrik (2014), "Green Industrial Policy," which is a reconsideration of the purely state-driven versus purely market-based economic intervention conversation. The aim of combining the strength of public and private actors is not new but has been neglected for economic restructuring in Europe for a while since the Marshall Plan. The most important notion of the new industrial policy is that both private and public actors can share their information and motivations to create pragmatic solutions, which could minimize market failures or capture by political interests. Furthermore, this process could create a constant loop of development, monitoring, accountability, and realignment of the path toward the goals (Rodrik, 2014; Fernández-Arias et al., 2020). Tagliapietra and Veugelers (2021)

argue that “green” industrial policy requires the incorporation of long-term objectives, incorporation of public interest due to the broad societal transformation, what calls for institutionalized collaboration, and even enhanced risk-taking. As mentioned before, for many private sector actors, the adoption of new technologies carries plenty of risks. The policy goals of the EU require the adoption of elements of not-yet-developed ecosystems and putting them to work in the real market environment. These technologies have proven to have higher risk and complexity however, they also have a larger spillover effect on several domains of the society and economy (Barbieri et al., 2020). They also mention that the long-term objectives should be faced with flexibility but still continuously striking towards it.

Such a complex and yet flexible policy-making and sectoral change does not require brand new capacities, established institutions could be and shall be incorporated, such as development banks, investment agencies, and scientific stakeholders. In the EU, such institutions are the European Alliances format for various R+D goals, such as green hydrogen, the European Innovation Council (EIC), European Research Council (ERC), the European Investment Bank (EIB), state aids, structural funds, regional smart specialization strategies (RIS3) (Tagliapietra and Veugelers, 2021). In the assessment of Tagliapietra and Veugelers (2021), there are two striking points in their recommendations: the enhanced activity of the EIB and the fact that the green financing and development projects shall be expanded to developing countries, not solely to help them to meet the climate targets under the Paris Agreement, but to provide foreign policy dividends to the EU.



## 2.3 Green transition and territorial disconnect

While many studies are concerned with the taxonomy and data collection issues on green finance, some scholars, such as Khan et al. (2022), took a more pragmatic approach towards it. In their study “Green finance development and environmental sustainability: A panel data analysis” they conducted a study on a global level. To create a comprehensive

understanding of green finance represented by GDP, investment in renewable energy sources, R+D spending for eco-friendly projects, and public-private partnership investment in renewable energy projects. Khan et al. (2022) found that public-private investments in renewable energy resources are one of the best ways to achieve environmental sustainability, which also means that state activism is needed for results, and markets on their own are not merely enough for the transition. Similar results and findings were provided by Balsalobre-Lorente et al. (2021) on the connection between public-private partnerships and renewable energy development projects. The need for R&D spending on CO2 reduction technologies is also proven by several studies (Kocak & Ulucak, 2019). The growth-based economy and its legitimacy are heavily debated, but the fact that GDP growth contributes to the growth of energy needs and, by that, to greenhouse gas output is supported by the findings of Khan et al. (2022) and similarly by González-Sánchez and Martín-Ortega (2020). These findings, if not explicitly, highlight the need for state activism, especially because many companies are considering investment in green transition-related technology as a prisoner dilemma in their markets.

Becker et al. (2020) conducted a review of the achievements of the Europe 2020 strategy by creating a composite indicator, which showed that the EU achieved some progress; however, certain members and regions drifted away even more from the common ground of the stated goals. Exception development was achieved in education generally; however, environmental indicators showed general downward trends. Their findings not only highlighted those Southern and Eastern European members underperformed but also drew attention to the lack of proper data collection on several levels and main indicators. Time series were not adequately matched for NUTS2 and NUTS3 levels or even missing for the member states for regional development, greenhouse gas emission, or research and development. Bianchini et al. (2022) discuss whether the “twin” transition of digital infrastructure and sustainability

reinforces each other's positive impacts in their paper. Their findings highlight that the Eastern members are lagging in terms of digital transition but in sustainable technologies, while the "twin" transition poses some doubt about their effectiveness. If the region is already endowed with digital development, green technologies contribute to the transition, while digital development on its own hurts sustainability regardless of the existing technologies. Lastly, they highlight that not all components of digital transition have the same negative impact; hence, one-size-fits-all policies of the EU in this regard shall not be rolled out, and tailored solutions shall be found by the governments.

Generally, the discussion around the green transition, especially within the EU, revolves around the question of the necessity of state involvement in the transition and, if yes, up to what extent. To assess the current stance of the trends in the EU, the thesis builds upon the work of, among others, the findings and methodology of Afzal et al. (2022). Afzal et al. (2022) applied the widely used method of the Environmental Kuznets Curve, whose applicability is discussed in the following section.

# 3 THE ENVIRONMENTAL KUZNETS CURVE

The complexity of the funding scheme could provide flexibility to the member states and the Commission to fine-tune the targeting of transition finance and ease the socio-economic burden; however, a challenge is the detailed analysis of the progress. To assess the stage of the transition on the macro level, the Environmental Kuznets Curve (EKC) could provide a proper basis with adequate indicators.

The EKC is based on the research of Simon Kuznets, whose macroeconomic theorem is concerned with the relationship between income inequality and income per capita in the long run of the national economic development (Kuznets, 1955). His theorem was published in 1955 during the rise of the post-war American economy and found that in the early stages of

economic development, unequal income distribution prevails, while after the peak point, as productivity rises, income inequality proportionally decreases. The 1960s-70s gave rise to socio-environmentalist movements in all walks of society and led to the application of the Kuznets curve concerning economic development and environmental degradation. Several studies took the Kuznets curve as a basis to describe the relationship between economic development, negative environmental externalities, and environmental degradation. Theodore Panayotou in 1993 coined the term “Environmental Kuznets Curve” in his work "Empirical tests and policy analysis of environmental degradation at different stages of Economic Development” (Panayotou, 1993). The application of the theorem led to a discussion about the proper application of the indicators. Many authors, such as Bo (2011), Dinda (2004), Kaika and Zervas (2013), Twerefou et al. (2017), and Stern (2004), highlighted the applicability and shortcomings of the EKC for various regions and factors.

It shall be noted that Stern (2004) draws attention to the fact per capita income and air pollution as a common pairing of indicators is not sufficient to conclude solid results, which contradicts the findings of Grossman and Krueger (1991). Grossman and Krueger (1991) studied the impact of NAFTA on the maquiladora sector in Mexico, which is the outsourcing of raw material procession and manufacturing for supplying upper parts of the supply chain. In their analysis, they switched from the variables of inequality compared to GDP per capita over time to income per capita and exposure to air pollution. Their findings reinforced the inverse U-shaped connection of the Kuznets Curve between income per capita and air pollution exposure per capita. Grossman and Krueger´s working paper is still cited (Bo, 2011; Leal & Marques, 2022) as an early example of the application of the Kuznets curve for environmental degradation; however, the paper itself does not recognize the possible shortcomings of the simple and non-decomposed application of the theorem. Kaika & Zervas (2013) looked at the evolution of EKC and found that the incorporation of indicators related to research and

development, governance, energy consumption, and international trade “pollution heavens” could improve the reliability of the concept, in case proper data is available.

An outstanding review article on the progress and wide application of EKC is done by Leal and Marques (2022), who assessed over 200 articles published between 1998 and 2022. Their work highlights the general applicability of EKC; however, it also draws attention to the methodological pitfalls. Their conclusion calls for the incorporation of time series on R+D, climate finance, and green energy transition and emphasizes the outsourcing of pollution as a possible distorting effect on the assessment. Furthermore, Lean and Marques (2022) found the comparison of countries and/or regions without common specific policy targets could lead to misleading findings, see Khan et al. (2022).

Khan et al. (2022) analyzed global regions in the context of financial development on sustainability. The paper took panel data for 15 years, which is considered a wide period in the context of sustainability and sought to overcome the lack of unified data regarding green finance. The primary difficulty of their analysis is that the five regions subject of the study do have differing definitions of green finance, even on a national level. Therefore, the authors decided to consider green finance development a common variable of the overall impact of GDP, investment in renewable energy, R+D for eco-friendly projects, and public-private partnerships. The dependent variables are regional GDP, regional innovation level, and air quality. Their findings reinforce the assumption that financial development has a positive spillover effect on the improvement of air quality generally; however, it does not show the difference within regions. Their policy recommendations argue for boosting foreign direct investment and private investment into sustainable projects.

Another angle of the analysis of the green transition is the possible regional disconnect within the EU. Diverging regional trends have been observed by several authors, such as Becker et al. (2020), Giannakis & Bruggeman (2020), and Rodríguez-Pose and Bartalucci

(2023). The findings of Becker et al. (2020) - already discussed earlier - and Giannakis and Bruggeman (2020) differ in the sense that they focused on the urban-rural economic resilience based on the economic resilience indicator applied by the European Union's statistical agency, which at the time of the study did not incorporate climate change and climate-related economic losses in the matrix, but pre- and post-economic crisis employment and output. For this reason, their work shows a closer economic resilience level of rural to crisis as urbanized regions, in the regions where agriculture and migration are prevailing. These findings could be altered by climate-related economic shocks, which were studied by Rodríguez-Pose and Bartalucci (2023).

Rodríguez-Pose and Bartalucci (2023) carried out their research on climate vulnerability indicators, such as CO2 emission, dependency on fossil fuels, coal energy dependency, the total value of wages and salaries in mining, tourism added value to GDP, number of cooling days and road freight transportation. They created from these values a NUTS3 level "Green Transition Vulnerability index", which could be considered as an experimental measure to assess the regional difference in the eye of the green transition. Their findings highlight that low-income regions are more susceptible to the negative impacts of climate change, namely southern Spain, Southern Italy, Greece, Bulgaria, Romania, Croatia, Hungary, Slovakia, Poland and Latvia. The authors also draw attention to the fact that the empirical data and the perception of the impacts of climate change could differ from each other depending on the country's socio-economic context.

A similar study was conducted by Afzal et al. (2022) for European countries aimed to see whether financial development has an impact in Europe on environmental degradation. This thesis would like to further analyze the impact of the financial system and governance on environmental degradation in the EU.

# 4 ANALYSIS

The thesis attempts to test the hypothesis provided by Afzal et al. (2022) using the data for the European Union as the main hypothesis: *H1 There is a curvilinear relationship between financial development and environmental degradation*. The literature revolves around certain major topics, such as i) the lack of sector-specific data due to the continuous introduction of the taxonomy, ii) the not-yet finalized CSRD regulation, iii) sustainable financing, iv) the role of the markets and state in the transition and v) regional disconnects. Based on the literature review and the secondary objective of the thesis to uncover the impact of governance on financial development to see whether, even under the current politico-economic circumstances, it could significantly impact it. Furthermore, due to the complexity of the green transition, whether governance impacts negatively environmental degradation under the current circumstances. The following hypothesis will be tested:

H1: There is a curvilinear relationship between financial development and environmental degradation.

H2: There is a positive relationship between institutional quality and financial development.

$$FD_{it} = \alpha + \beta 1\ GR_{it} + \beta 2\ R{+}D_{it} + \beta 3\ GDP_{it} + \varepsilon_{it}$$

Where FD is financial development, β1 is governance, β2 is R+D spending, and β3 is GDP

H3: There is a negative relationship between governance and environmental degradation.

$$END_{it} = \alpha + \beta 1\ GR_{it} + \beta 2\ R{+}D_{it} + \beta 3\ GDP_{it} + \varepsilon_{it}$$

Where END is environmental degradation, β1 is governance, β2 is secondary school enrollment, and β3 is GDP.

The thesis investigates major regional differences among the EU27 to see the regional connections between financial development, governance, and environmental degradation. The thesis builds on the findings of Rodríguez-Pose & Bartalucci (2023), Becker et al. (2020), and

Afzal et al. (2022), as the thesis relies on earlier applications of the EKC. The methodology strictly follows the model of Afzal et al. (2022) and introduces a regional approach to assessing the variables. The primary reason is that Afzal et al. (2022) sought to overcome the lack of SDG-related data by relying on the World Bank database and fitting it on European countries. In their work, they applied national-level data of the variables between 1990 and 2019 of 40 European countries, both EU and non-EU countries. Their findings are significant to be put in a more specific context on a national level, while other scholars (Becker et al., 2020; Rodríguez-Pose & Bartalucci, 2024) used NUTS regions to carry out results, whose findings are considerable, however, really restricted for micro trends also carry the possibility of heavily biased conclusions due to lack of wide array of SDG-data.

The scope of the analysis is the EU27, and the timeline for the panel data regression is the period between 2000 and 2022. The primary data is drawn from the World Bank and Eurostat. The time series were available with different periods; therefore, the analysis was restricted to 22 years and only EU 27 due to Brexit. For the period between 1990 and 2000, no adequate data treatment was possible to be carried out; hence, that period should have been omitted. The geographical units of investigation are tackled by several authors in different ways, and some prefer to compare based on the accession to the EU and divide the line between the Old Member states, who were members of the EU before 2004, and the New Member states, joined after 2004 (Szeles, 2018). On the other hand, Brinegar et al. (2004) took the welfare states models as a basis for grouping the countries based on Esping-Andersen (2019). The political-economic approach to group the countries is one of the most suitable approaches in the current case due to the complex socioeconomic angles of the green transition. The geographical scope of the analysis covers the following units: i) the EU27, i) Western Europe (Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands), ii) Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Sweden), iii) Eastern Europe (Czechia,

Hungary, Poland, Romania, Slovak Republic, Slovenia, Croatia, Bulgaria), and iv) Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain). This grouping of countries seems to be arbitrary but seeks to find common ground between the different approaches, such as EuroVoc, UN Geoscheme for Europe, or accession-based ones (Panarello & Gatto, 2023).

In the case of financial development, the green finance indicators would be wished; however, these are not yet available in a standardized EU taxonomy manner. For this reason, relying on existing research, FDI inflows and financial development move hand-in-hand while causing economic growth. Economic growth in the premature phase of the economy leads to higher energy consumption and, by that, to increased output. The increased output gives rise to liquidity, which results in the availability of credits for the whole economy. Not only the corporate sector but also the consumer sector is leveraging credits for increased consumption, leading to more energy-intensive consumption (Shahbaz et al., 2018; Ceglia et al., 2022).

Although early economic development is destructive to the environment and some environmental damage cannot be repaired, the course of environmental degradation could be mitigated, primely through governance, the implication of more efficient production methods, and long-lasting structural changes in the energy mixes of the country's source of energy. Economic growth and energy consumption have an interesting relationship; surplus energy is needed to start economic development, and energy surplus could cause induced demand for economic growth to maintain energy production (Ozcan, 2013; Taghizadeh-Hesary et al., 2021). Umar et al. (2021) found that there is a positive relationship between financial development and the growth of renewable energy production and consumption. It could be concluded that financial development, ie. Credit and private equity investment is crucial for sustainable development (European Commission 2020b). Another focal point is governance.

Governance is a widespread term in the literature; however, one widespread measure is provided by the World Bank, called the "government effectiveness index." Governments,

regardless of their political affiliations, are key components in the operation of financial systems. Political economic aspects are omitted from the assessment due to the time horizon and because public policy and political statements of given member states are not moving parallel to each other due to the comprehensive EU policies, directives, and regulations. The European Commission's "Cohesion in Europe Towards 2050" report found that the EU as a whole is catching up in all the targets of the community; however, strong regional differences could be observed, especially in the field of execution of measures related to cohesion funds, application of R+D in the everyday business (European Commission, 2022).

Research and Development could be ordered into two major categories, publicly and privately financed; however, the application of both is a public-private partnership in the manner of relying on the business and the government's rule book. Governments have a key role in the introduction of new technologies and processes in the form of financial support, proper regulation, and enhancing cooperation between academia private and public sectors. Fiscal policy has a positive impact on sustainable investment in developing countries, as proven by Azhgaliyeva and Liddle (2020), while the positive connection between regulation and sustainable investment, is supported by the findings of Gavrilakis and Floros, 2023 findings. Furthermore, the findings of Ntow-Gyamfi et al. (2020) on the role of government regulation in the field of environmental damage control and prevention show that governments have an undeniable influence. The findings of Ntow-Gyamfi et al. (2020) are even supported by Abid (2017), who found that institutions, such as the government and financial system, have a proven impact on CO2 emission decrease.

Environmental degradation consists of energy use, CO2 emission, greenhouse gas emission, and natural resource depletion, as they are comprehensive measures for the goals of the EU (European Commission, 2019; 2020a). Control variables are GDP per capita, population, secondary school enrollment, and rate of urbanization.

| 1. TABLE: DESCRIPTION OF VARIABLES | |
|---|---|
| Energy use | Energy use per capita (kg of oil per capita) |
| CO2 Emissions | CO2 emission per capita |
| Greenhouse Emission | Greenhouse Emission. Per capita |
| Natural Resource Depletion | Natural Resource Depletion (% of GNI) |
| Investment flows | FDI (% of GDP) |
| Domestic financial development FD1 | Domestic credit to the private sector (% of GDP) |
| Financial Development FD2 | Bank credit to the private sector (% of GDP) |
| Governance | Government effectiveness index |
| R+D | Combined R+D spending by public and private sector |
| Population | Population size (in millions) |
| Urbanization | Urban population (% of the total population) |
| Education | Secondary school enrollment of the eligible population |

| 2. Table: Summary Statistics | | | |
|---|---|---|---|
| Variable | Observations | Mean | Standard deviation |
| Energy Use | 621 | 3448,13 | 1426,07 |
| CO2 Emission | 621 | 7,4 | 3,44 |
| Greenhouse Emission | 621 | 9,10 | 4,63 |
| Natural Resources Depletion | 621 | 0,47 | 1,35 |
| Foreign Direct Investment | 621 | 10,98 | 42,21 |
| Domestic credit to the private sector ( FD1) | 621 | 82,28 | 42,11 |
| Bank credit to the private sector (FD2) | 621 | 82,13 | 42,08 |
| R+D | 621 | 1,49 | 0,90 |
| Income level | 621 | 504831459860,37 | 822549232846,50 |
| Governance | 621 | 1,08 | 0,61 |
| Population size | 621 | 16314526,70 | 21455757,47 |
| Urbanization | 621 | 72,17 | 12,63 |
| Education | 621 | 90,53 | 4,94 |

**Results for H1: There is a curvilinear relationship between financial development and environmental degradation.**

| 3. Table: Regression results for H1 | | | | |
|---|---|---|---|---|
| Variables | Energy Use per Capita | CO2 emission | Greenhouse emission | Environmental degradation |
| FD1 | 13,35 | -0,084 | 0,141 | -0,112 |
| FD2 | -26,00 | 0,061 | -0,159 | 0,110 |
| FDI | -0,52 | 0,001 | 0,001 | 0,000 |
| Quality of governance | 1398,45 *** | 4,2 *** | 6,443 *** | 0,263 ** |
| total R+D spending % of GDP | 373,05 *** | -0,795 *** | -2,665 *** | 0,052 |
| GDP (current USD) | 0 * | 0 * | 0 * | 0 *** |
| Population | 0,00 | 0,000 | 0,000 | 0 *** |
| Secondary School Enrollment | -35,43 *** | -0,193 *** | -0,178 *** | 0,009 |
| Urbanization | 29,38 *** | 0,035 *** | 0,033 ** | -0,008 ** |
| Observations | 621 | 621 | 621 | 621 |
| R-squared | 0,650750986 | 0,36089389 | 0,34377763 | 0,31076119 |
| ***p<0.01, **p<0.05, *p<0.1. | | | | |

H1 was carried out with the same variables and primary data as Afzal et al. (2022) did, however, applying the methodology to the European Union disapproves of their findings. The underlying reasons could be, besides the timeline limitations, that highly industrialized countries were in the sample of the data, which is a common argument against the application of the EKC. The findings support that the selection of countries influences the outcome, and the curvilinear development cannot be established due to a lack of statistical significance. On the other hand, it shows that energy use could be strongly impacted by financial development

since it drives up output and, by that, final energy consumption. R+D spending presumes that it could enhance energy use per capita since its impact depends on the objective of the financing.

**Results for H2: There is a positive relationship between institutional quality and financial development.**

**4. Table: Regression results for H2**

| Variables | EU 27 | Northern Europe | Western Europe | Eastern Europe | Southern Europe |
|---|---|---|---|---|---|
| Quality of governance | 46,23 *** | 1,73 | 20,33 ** | 20,02 *** | 95,93 *** |
| total R+D spending % of GDP | -21,48 *** | -16,14 *** | -6,9 *** | -13,45 *** | -18,10 |
| GDP (current USD) | 0 *** | 0 *** | 0 * | 0 *** | 0 *** |
| Population | 0 ** | 0 *** | 0,00 | 0 *** | 0 *** |
| Secondary School Enrollment | -0,029 | -2,7 *** | -0,35 | -0,12 | 1,19 |
| Urbanization | 0,54 ** | 4,14 *** | -0,31 * | -0,91 *** | -0,87 ** |

*****p<0.01, **p<0.05, *p<0.1.**

In the EU, there is a clear connection between the quality of governance and financial development, which is due to the highly regulated nature of the financial sector within the community. Regarding the regional trends, it is worth noting that Western and Eastern Europe show similar or almost the same impact on total financial development due to government, which is presumable due to the East-West integration of supply chains and economic activities. The northern European members of the EU governance seem to have a low impact on financial development. On the other hand, governance seems to have the highest impact on financial development in the southern member states. Notably, research and development spending

seems to have a general impact on the financial system, which could account for the risk profile of such investment and spending. The findings show the possibility of the general importance of governance in financial development.

**Results for H3: There is a negative relationship between governance and environmental degradation.**

**5. Table: Regression results for H3**

| Variables | EU 27 | Northern Europe | Western Europe | Eastern Europe | Southern Europe |
|---|---|---|---|---|---|
| Quality of governance | 348,86 *** | 511,77 *** | -27,34 | 347,02 *** | 10,26 |
| GDP (current USD) | 0 *** | 0 *** | 0 *** | 0 ** | 0 ** |
| Population | 0,00 | 0 | 0,00 | 0,00 | 0 *** |
| Secondary School Enrollment | -6,56 *** | -9,33 * | -47,46 *** | -5 *** | 0,85 |
| Urbanization | 6,43 *** | 1,16 | 15,1 *** | 7,36 *** | 0,85 |
| ***p<0.01, **p<0.05, *p<0.1. | | | | | |

The hypothesis, except for a slight negative impact on environmental degradation by the quality of governance in Western Europe, proved to be false. On the EU level, governance has a positive impact on the reduction of environmental degradation, while the highest impact is observable in Northern Europe and the lowest in Southern Europe. The impact of governance on environmental degradation in Eastern Europe is around the same measure as on the EU level. Furthermore, secondary education seems to have an impact on environmental degradation, especially negatively impacting it in Western Europe, while in Eastern and Northern Europe, it has less of a negative impact. The findings for Southern Europe are statistically insignificant.

# 5 DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

The findings support the general view that public involvement in the enhancement of green transition is needed. Not just in the field of environmental protection regulation but also in financing it. As the literature also mentions, the most developed segment of sustainable finance is the green bonds market, mostly driven by public actors. One key public actor in transitional financing could be public banks. However, another stream of renationalizing industrial policy is also on the rise.

Public banks play a clear role in the restructuring and facilitating of economies. The general view of them is found in a dichotomy of heterodox ("developmental") and orthodox ("political"), while Marois (2022) offers a dynamic view of rethinking the role of public banks. Public banks are known to possess capabilities to act counter-cyclically and invest in socially desirable but highly risky projects while being prone to political capture and economic inefficiencies (Griffith-Jones & Naqvi, 2020). Marois (2022) approaches public banks with a dynamic view since the dichotomy is mostly centered around the ownership of these institutions instead of their function in the economy. Public banks could be one of the best vehicles to foster the green transition through private-public partnerships. The facilitator role of public banks is underpinned by capabilities, such as long-term risk-bearing possibility, the experience of the real economy, some level of detachment from the political cycles, and policy uncertainty. In the EU, public banks have a relatively dormant function due to the last restructuring that happened in the post-war era, while the Eastern enlargement of the community did not have a classical developmental path.

The new member states of the Eastern enlargement followed the neoliberal economic patterns of the 1990s with open economies, intense inflow of FDI, and privatization to MNCs, usually headquartered in the Western member states, that caused a socioeconomic upheaval; however, transformed these countries into dependent market economies. This dependency

surfaced for the first time during the great financial crisis when Western mothers relocated their assets for the costs of the subsidiaries in the Eastern countries. Another reason for the relatively dormant stand of public banks in the EU is the change of financing of development through the structural funds, which generally flow through the governments, which enhance the developmental capabilities of ministries primarily but are prone to corruption and mismanagement (Piroska & Mero, 2021).

Naczyk (2021) brings in another less quantifiable but valuable axis of developmentalism, what he coins "comprador bankers." In his work, he focuses on the recent trends of re-nationalization of the Polish and Hungarian economies, especially through the financial sector by native bankers working for foreign banks. His analysis highlights the differences between the Polish and the Hungarian way, while the earlier one retains relative control over the flows of financing and favors domestic development, the latter one jeopardizes foreign capital and tends to prioritize control over output and development. Naczyk´s notion challenges the old way of top-bottom mobilization of market forces to force transition, which is usually reluctantly taken by the established markets (Thurbon, 2016). He argues for the internal motion of the leadership of market actors to bring change to the policy discussion, which is not a systemic approach but shows the importance of the human axis of transitory politics. The less quantifiable human component of the policy goals enforces the need for the public's involvement through the government. Nonetheless, the reappearance of "hidden developmentalism," which is the most seeable in the Western economies only in the US, brings real economic output without considerable negative market disruption, just as the appearance of Polish SOEs producing transitory goods, such as EV batteries (Naczyk, 2021).

# 6 CONCLUSION

The applicability of the Environmental Kuznets Curve under the current circumstances does not fit the EU members. However, the role of governance in the debate regarding market-based or government involvement in the green transition seems to be undebatable. The introduction of the new industrial policy in the times of reemergence of state activism could provide a middle ground in the debate of state versus market-led transition through public banks and governmental agencies.

Public banks, in cooperation with all the relevant stakeholders, could force the adoption of new technologies and support the closure of the green financing gaps. Their long-term investment horizon, risk-bearing capacity, and relative independence from political cycles could ensure long-term policy continuity. Another way, preferably jointly with the revival of development banks, could be the re-nationalization of economies to gain more policy and developmental sovereignty. However, re-nationalization could carry long-term risks if it is driven by partisan politics, such as in the case of the opt-out of some Central European countries out of the banking union (Méró & Piroska, 2016). Furthermore, the establishment of public-private partnerships could not only bring the EU closer to the goals laid down in the 2021 Climate Law but also enhance the availability of proper data for further research on regional trends. The Environmental Kuznets Curve remains a debated but versatile basis concept for the near future research.

Based on the findings and the current political environment, policymakers face the challenges not only of the industrial paradigm shift but also of the political one. The biggest threat to the regional disconnect, policy discontinuity, and not closing the sustainable financing gap is national governments themselves, who, based on the findings of the thesis, assumably have the biggest say.

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