INVESTING IN ENVIRONMENTAL PROTECTION: A CATALYST FOR GREEN ECONOMIC GROWTH IN EUROPE

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ABSTRACT

In the pursuit of sustainable development, most European countries, and especially EU members, are increasingly recognising the pivotal role of investment in environmental protection as a catalyst for fostering green economic growth. Hence, this study explores the relationship between expenditure in environmental protection and relevant sustainability constructs, highlighting the imperative for more 'greener' approaches to development. The nexus between investment in environmental protection and green economic growth in European countries stems from the acknowledgment of environmental degradation as a significant challenge with far-reaching socio-economic implications. As such, policymakers are embracing a paradigm shift towards prioritising sustainable practices that not only mitigate environmental risks but also stimulate economic prosperity. Furthermore, the integration of environmental considerations into economic policymaking accentuates the recognition of the intrinsic value of ecosystems and the need for their preservation to ensure long-term socio-economic resilience. By internalising environmental externalities and promoting resource efficiency, European countries can enhance their competitiveness while mitigating risks associated with climate change and resource scarcity. The goal of the study is to test whether the increase in environmental protection would promote green economic growth for 27 European countries. Covering the period 2014-2019, empirical evaluation is based on panel cointegration approach confirming the positive impact of environmental investment on green growth perspective.

Keywords: environment, green GDP, green growth, environmental protection, panel cointegration approach, European countries

1. INTRODUCTION

We are witnessing significant ambition and political backing for green economy initiatives and policies promoting green growth, particularly when they promise to improve social welfare without impeding economic advancement. However, the evolving global economic landscape, sustainability concerns, debates over wealth distribution, challenges related to environmental degradation, and the absence of comprehensive international environmental agreements are increasingly central to how policymakers and the political community should interpret the concept of green growth (Stjepanović, Tomić and Škare, 2022). In the pursuit of sustainable development, most European countries and especially European Union (EU) members, are increasingly recognising the pivotal role of investment in environmental protection as a catalyst for fostering green economic growth. Hence, this study explores the relationship between expenditure in environmental protection and relevant sustainability constructs, highlighting the imperative for more 'greener' approaches to development. The nexus between investment in environmental protection and green economic growth in European countries stems from the acknowledgment of environmental degradation as a significant challenge with far-reaching socio-economic implications. Hence, policymakers are embracing a fundamental shift towards prioritising sustainable practices that not only mitigate environmental risks but also foster economic prosperity. This transition reflects a deeper understanding of the vital role ecosystems play and the imperative to preserve them for long-term socio-economic resilience. By incorporating environmental concerns into economic policymaking, European nations recognise the intrinsic value of ecosystems and the necessity of their preservation. Through this approach, they aim to internalise environmental externalities and promote resource efficiency, thereby bolstering their competitiveness while simultaneously addressing the challenges posed by climate change and resource scarcity.

Exploring potential interactions in environmental expenditures among countries holds significant implications for various reasons (see Gallo and Ndiaye, 2021). It enables the comparison of efforts made by different nations in the realm of environmental protection. It offers the recognition of possible expenditure externalities and suggests that countries' policy decisions are interconnected rather than independent. In the context of environmental expenditures, these externalities may manifest as the ripple effects of public investments in environmental infrastructures within a particular country, extending their benefits to neighbouring nations. Such interdependence

underscores the need for a holistic understanding of the interconnected nature of environmental expenditures, both on a regional (EU for example), as well as on a global scale. The EU's approach to environmental protection has often been characterised as a complex tapestry of policy instruments and regulatory strategies. These encompass standard-setting, which places significant emphasis on the role of member countries in attaining environmental quality objectives, as well as technical and impact assessments addressing cross-border environmental impacts. Balancing the imperative of environmental preservation with the imperatives of trade and economic growth has posed challenges. Nevertheless, environmental protection has frequently found itself at odds with foundational EU priorities concerning economic development, trade, and growth (Alibašić and Atkinson, 2023).

Limited empirical evidence regarding the relationship between environmental protection expenditure and green growth dynamics prompted this research to investigate how investments in environmental protection affect prospects for green growth. The primary aim is to determine whether spending on environmental protection effectively reduces the disparity between conventional GDP and Green GDP measures. To achieve this, a longitudinal empirical assessment is conducted using panel cointegration modelling for the period spanning 2014 to 2019 across a sample of 27 European countries. The findings validate a positive impact of environmental spending on the dynamics of green growth. Section 2 surveys the theoretical and empirical literature. Section 3 gives a full perspective to the analytical part by describing used methodology and data, as well as evaluating the results. Section 4 provides some insights on the implications of the results, while Section 5 offers concluding remarks on the research and its future perspective.

2. ENVIRONMENTAL PROTECTION IN EUROPE: THEORY AND EMPIRICS

A significant portion of economic research has been dedicated to exploring the intricacies surrounding the shift towards environmental sustainability within economies. This includes detailed analysis of the costs associated with transitioning to greener practices, encompassing estimates of the expenses incurred by both acting and opting for inaction. On one hand, unsustainable economic strategies have exacerbated the socio-economic gap between developed nations and others, underlining the urgent need for creative collaborations that bridge economic and environmental priorities. On the other hand, there is a widespread belief that policies promoting green

growth are poised to yield positive welfare outcomes over the long haul. However, the upfront costs of transitioning may pose challenges to their immediate adoption and implementation (Gramkow, 2020).

2.1. THEORETICAL IMPLICATIONS

While concepts such as the green economy and green growth, aiming to harmonise socioeconomic progress with environmental sustainability are not novel, the adoption of national green growth strategies or roadmaps remains limited to a handful of economically significant countries like China and South Korea. The EU has solidified its reputation as a trailblazer in global environmental stewardship, backed by a comprehensive array of environmental policies and programmes. Nevertheless, the impact and success of these endeavours exhibit notable divergence among member and non-member countries, highlighting the intricate challenges inherent in environmental governance within diverse political and socio-economic landscapes. Norway boasts a rich history of grappling with sustainable development issues. While initial efforts were somewhat ambiguous, focusing on the exploitation of natural resources and environmental accounting, Norway has since shifted its attention towards hybrid accounts and indicators. Recognising the necessity for comprehensive environmental accounts rather than mere statistics, the country has made noticeable strides in enhancing the development of a robust environmental accounting framework tailored to meet the needs of policymakers. Similarly, the German Federal Statistics Office has made significant strides in this realm, implementing various modules of the System of Environmental-Economic Accounting (SEEA). These modules encompass areas such as energy and air emissions, physical input-output tables, land accounts, and sectoral reporting modules, among others. Moreover, a cadre of other nations, including Belgium, Denmark, Finland, France, Italy, the Netherlands, and Sweden, are actively engaged in advancing environmental accounting initiatives. While these countries lead the charge, numerous others are also accelerating their efforts in this crucial area (Stjepanović, Tomić and Škare, 2017).

As the EU aspires to standardise traditional methods of environmental conservation among its member countries, doubts have been raised regarding its ability to fulfil this commitment. The competence in adhering to EU environmental protection regulations ranges widely, spanning from highly proficient to nascent stages of development. Substantial disparities persist, particularly with recent shifts observed in the transfer of administrative responsibilities and the enforcement of environmental regulations from

individual member countries to EU institutions (Alibašić and Atkinson, 2023). Nonetheless, governments have outlined mitigation strategies to tackle the complexities of climate change through their Intended Nationally Determined Contributions as part of the Paris Agreement. The EU, alongside national governments, has established distinct targets for 2050 in alignment with EU priorities and Green Deal policies. These objectives are bolstered by dedicated research programmes, legislation, and funding initiatives. Across the globe, an array of environmental regulations has proliferated, reflecting the widespread commitment to addressing pressing environmental concerns.

This transformative shift tends to synchronise economic imperatives with environmental concerns, paving the way for a more equitable and robust foundation for societal advancement (Tomić and Stjepanović, 2022). Against the backdrop of a growing international focus on green growth and progress, grasping the intricate interplay between environmental investments and sustainable economic development has assumed paramount importance. In a way, it represents the discussion from the Post Keynesian Economics vs. Neoclassical Economics stance on the reconciliation of socioeconomic development with environmental sustainability.

The endorsement of a green economy has matured into a pervasive guiding principle shaping both local and international economic progress, motivated by the urgent need to enrich and protect ecological landscapes. Substantial cuts in funding for green initiatives during times of crisis yield adverse effects, exacerbating societal hardships. The scale of government investment in green economy endeavours, coupled with the dynamics of how such funds are allocated, holds considerable sway over the implementation of fiscal policies. This investigation is rooted in the acknowledgment that specific aspects of public expenditure exert a more discernible impact on promoting green economic practices than others (Feng et al., 2022). A considerable body of research highlights the significant impact of environmental degradation on shaping the allocation of government fiscal resources (Yuelan et al., 2019). However, there remains a noticeable gap in comprehensive evidence regarding the intricate relationship between green economic growth and government fiscal expenditure. Previous studies have shed light on the crucial role of government fiscal spending in driving forward green economic development. While an increase in fiscal spending contributes to the advancement of green economic growth, it is crucial to recognise that such growth may encounter setbacks due to heightened environmental vulnerabilities. Furthermore, fiscal expenditure acts as a tool to address market failures, thereby encouraging avenues for innovative technological solutions. In this context, the judicious utilisation

of fiscal resources not only fosters the expansion of a green economy but also plays a vital role in mitigating environmental challenges and catalysing advancements in technology (Huang et al., 2022).

2.2. LITERATURE REVIEW

In this section, we will focus on the most recent and relevant studies pertaining to the topic at hand. Arjomandi et al. (2022) introduced the ARDL model to explore the immediate and prolonged impacts of environmental policy stringency and environmental spending on pollution-adjusted GDP and productivity growth across several OECD countries. Although there are discernible differences in policies and outcomes across nations, our examination reveals that, in the immediate time frame, governmental investment in environmental protection serves as a significant catalyst for national economic growth. Namely, their long-term analysis implies that both heightened environmental policies and increased environmental expenditure may slowdown 'green' GDP and productivity growth over time, with policy stringency exhibiting a comparatively weaker influence. Consequently, their results do not support the idea that environmental regulations can spur economic growth. Instead, they align with the prevailing perspective that such policies might impede economic activity and long-term growth. In a recent study conducted by Niu (2024), an in-depth analysis employing a panel Tobit model shed light on the relationship between government spending on environmental protection and a nation's Environmental, Social, and Governance (ESG) performance. The findings unveiled a statistically significant and positive association, indicating that increased government investment in environmental protection correlates with improved national ESG performance. Moreover, the study uncovered additional insights, revealing that allocating resources toward environmental protection not only bolsters ecological and societal outcomes but also fosters advancements in governance standards. Furthermore, it was observed that heightened government expenditure on environmental initiatives spurs innovation in green technologies, leading to a cascade effect that positively influences the overall national ESG performance.

Santeramo, Lamonaca and Emlinger (2025) suggested that technical regulations are becoming increasingly prevalent, complex, and often less transparent than traditional price-based policy instruments. While these measures are widely implemented to achieve nontrade policy objectives, particularly in the realm of environmental protection, their trade effects remain insufficiently explored. Leveraging a unique and original dataset of

technical measures notified for environmental reasons, their study provided robust evidence that such regulations significantly reduce both trade values and volumes. Moreover, the analysis uncovered substantial heterogeneity in the trade effects of environmental technical measures across different sectors and countries, highlighting notable disparities in their impact. These findings are critical for evaluating whether environmental technical measures act as trade barriers and emphasise the need for further research into their trade-offs and spillover effects. A deeper understanding of these dynamics is essential for assessing the broader implications of such regulations on global trade and informing policy decisions that balance environmental objectives with economic considerations.

Wang and Naveed (2024) examined the impact of environmental protection expenditures on innovation and explore the potential causal relationship between these two variables. The study's novelty and primary contribution to the literature lie in its comprehensive approach, which considers total environmental protection expenditure from both public and private sectors while distinguishing between corporate and household expenditures within the private sector. Additionally, it accounts for both innovation inputs and outputs and addresses potential endogeneity concerns—key aspects that remain underexplored in the existing literature. By applying a panel of EU countries from 2006 to 2020, the analysis finds that environmental protection expenditure generally exerts a positive effect on innovation, even after controlling for trade, credit availability, education, and inflation. To address endogeneity, the study employs the System GMM estimator, ensuring robust inference. Notably, government-sector expenditures emerges as the primary driver of this positive relationship. The core findings remain robust across alternative measures of innovation and different estimation techniques that mitigate endogeneity concerns. This research provides valuable insights for policymakers involved in environmental and innovation strategies, offering guidance for designing effective policies that promote sustainable development.

Georgieva (2024) analysed the relationship between economic development, environmental investments, and greenhouse gas emissions within the European Union over the period 2008–2022. Employing correlation and regression analyses, the study assessed the impact of environmental protection expenditures and gross domestic product on greenhouse gas emissions. The findings indicate a sustained increase in environmental protection expenditures, particularly in recent years, reflecting the EU's strengthened commitment to sustainable development. Concurrently, greenhouse gas emissions demonstrated an overall downward

trend, with the most substantial reduction occurring between 2019 and 2020, likely influenced by the economic disruptions caused by the COVID-19 pandemic. Furthermore, the correlation analysis identified a significant negative relationship between environmental investments and emissions, reinforcing the efficacy of environmental expenditures in reducing carbon footprints. Krajewski (2016) examines the relationship between public expenditure on environmental protection and economic growth, particularly in the context of the recent global economic crisis. Utilising an econometric panel model (across eleven Central European countries, covering the years 2001-2012) which considers both the temporal and cross-sectional dimensions of the phenomenon under scrutiny, the study addresses the potential for misleading conclusions that may arise solely from temporal variations. The results suggest that public expenditure on environmental protection exerts a more pronounced influence on GDP during times of crisis. Therefore, the study underscores that such expenditure not only lacks negative repercussions on economic growth but also yields its most potent positive effects during periods of global financial turmoil.

Savranlar, Ertas and Aslan (2024) examined the impact of environmental taxes on pollution levels across the EU-27 countries, with a particular focus on their relationship with CO_2 emissions. Additionally, it incorporated renewable energy consumption and urbanisation as explanatory factors to assess their role in CO_2 emissions, while also testing the Environmental Kuznets Curve hypothesis. The empirical findings indicated that an increase in environmental taxes leads to a 0.14% reduction in CO_2 emissions, providing evidence of their effectiveness in mitigating environmental degradation. Furthermore, the results supported the validity of the Kuznets hypothesis, suggesting that economic growth initially exacerbates pollution levels before reaching a turning point where further growth contributes to environmental improvements. Causality analysis revealed a bidirectional relationship between CO_2 emissions and environmental taxes, highlighting the dynamic interplay between taxation policies and environmental outcomes. These findings revealed the role of environmental tax revenues as a vital policy instrument for promoting sustainability in EU countries. Effective implementation and enforcement of environmental taxation policies emerged as crucial strategies for balancing economic activities while advancing sustainability goals. Gallo and Ndiaye (2021) examined data from 1995 to 2017 across 28 OECD countries. Their research dived into the dynamics of strategic interactions in environmental expenditures among these nations, employing a spatial Durbin model. The findings unveiled a significant positive spatial dependence in environmental spending across

OECD countries, indicating a trend where neighbouring countries' policies influence each other's decisions regarding environmental expenditures. Moreover, their study brought to light distinct patterns in expenditure allocation, suggesting that highly populated nations, or those facing significant unemployment, tend to allocate relatively fewer resources to environmental concerns compared to their counterparts. Vavoura and Vavouras (2021) found that the green growth strategy essentially adopts a modified version of the conventional economic growth model, integrating certain environmental considerations within the EU. Authors demonstrate that while per capita income is steadily increasing, expenditure on environmental protection is growing at a considerably slower pace. Notably, the analysis reveals a discernible downward trajectory in investments allocated towards environmental protection. These findings suggest a regression in both the social and environmental facets of sustainability, with the traditional pursuit of economic growth taking precedence once again. In essence, despite the rhetoric of green growth, the research indicates a resurgence of prioritising economic expansion over holistic sustainability objectives.

Amjadi et al. (2025) empirically examined the impact of environmental protection expenditures on sector-level employment within the manufacturing industry, utilising detailed firm-level data from Sweden spanning the period 2002–2021. Employing a structural model, the analysis decomposed the overall employment effects of environmental protection expenditures into three key channels: the cost effect, the factor shift effect, and the demand effect. A key contribution of this study is the incorporation of an instrumental variable approach to address potential endogeneity in environmental spending, which may arise from factors such as corporate social responsibility and self-regulation. The findings indicate that, in general, increased environmental protection expenditures do not exert a statistically significant impact on employment across the sectors analysed. However, an exception is observed in the paper and pulp industry, where environmental expenditures are associated with a notable decline in employment. These results provide relevant insights into the employment implications of environmental policies, contributing to the ongoing debate on the trade-offs between sustainability efforts and labour market dynamics in manufacturing industries. Alibašić and Atkinson (2023) provided a thorough examination of environmental governance in the EU, with a specific focus on comparing the experiences of Bosnia and Herzegovina (a non-EU member) and Croatia (an EU member). Utilising policy transfer theory, the research evaluates how EU-led environmental initiatives fare when put into practice at both national

and local levels. It uncovers a notable disparity between these initiatives and their actual implementation, citing corruption and precarious political structures as significant hurdles to effective environmental protection. The findings underscore the crucial role of contextual factors and institutional capacity in assessing the success of environmental governance measures.

The study from Yang, Gao and Li (2022) analysed the relationship between economic development and environmental well-being, focusing on the decoupling dynamics of economic growth and environmental impacts across 30 Chinese provinces, autonomous regions, and municipalities. Its aim was to ascertain whether the pursuit of economic prosperity and environmental preservation has led to a harmonious »win-win« scenario. The study validated the reliability of NTL data as a pertinent source for evaluating decoupling performance. In addition, it observed a significant reduction in environmental pressures both nationally and provincially over the study period. Finally, the analysis revealed a positive trend indicating an enhanced relationship between economic activities and environmental conservation. This suggests that the endeavours toward economic growth and environmental protection have indeed yielded a mutually beneficial outcome, fostering a »win-win« scenario. Liu et al. (2016) analysed the impact of environmental protection investment on economic growth, specifically its benefits for the development of the green economy in China. Utilising data spanning the years 2004 to 2014, the study employed a multivariate regression model to empirically assess the influence of environmental protection investment on GDP growth. Results revealed a positive effect on GDP growth attributed to investments in environmental pollution control, industrial pollution control projects, and energy-saving and environmental protection initiatives.

2.3. RESEARCH GAP AND HYPOTHESIS DEVELOPMENT

Our study evaluates the complex relationship between investments in environmental conservation initiatives and their subsequent effects on a country's Green GDP. Evaluating the »green performance« of a country requires a robust basis of dependable statistical data. Traditional GDP is primarily suitable for comparing the productivity or economic growth among different nations and is not appropriate for gauging global well-being or considering environmental ramifications. Thus, it is inappropriate to assume a direct and linear correlation between GDP growth and environmental sustainability in any direction. Traditional GDP fails to offer sufficient parameters for a comprehensive evaluation of sustainability.

This underscores the potential of Green GDP, a variable to be utilised throughout the paper, to function as a metric for shaping sustainable progress policies and gauging the effectiveness of implementation measures for sustainability-promoting policies or programmes (Tomić, 2024). Equally, Green GDP is a measure that shows economic growth, which includes a component of the environmental consequences of such growth. Hence, it is incorrect to assume that economic development and growth alone will automatically result in environmental sustainability. The evidence suggests that heightened economic growth, in the absence of substantial macro-environmental policy interventions, coupled with the undeniable reality that advanced economies tend to consume more resources per capita than their developing counterparts, exerts significant pressure on nature and the environment. Therefore, the concept of green GDP emerges as a promising tool for evaluating environmental sustainability (Stjepanović, Tomić and Škare, 2022).

Environmental pollution, as a negative externality of production activities, necessitates government intervention through measures such as public spending, taxation, or subsidies. Given the public sector's greater resources for addressing environmental challenges, the strategic allocation of government funds for environmental protection can accelerate the development of innovative policies. Consequently, government spending may play a far more significant role in fostering innovation than previously recognised. This not only strengthens competitiveness but also supports broader societal objectives, including environmental sustainability and innovation-driven growth, ultimately contributing to green economic development (Wang and Naveed, 2024). To achieve green growth and sustainable development goals, Europe is taking a leading role in climate policy, with all countries collectively committing to a 40% reduction in CO2 emissions by 2030 and a 55% reduction by 2050 (Tomić, 2024). Notably, the trends in environmental investments closely follow the patterns of general investments and GDP, highlighting their alignment with sustainable economic growth.

Given the limited empirical research on the causal relationship between environmental protection investments and green growth, this study aims to examine the extent to which such investments stimulate green growth potential. The central hypothesis tested is whether increased expenditures on environmental protection contribute positively to green growth by narrowing the gap between conventional GDP and Green GDP measures. To empirically assess this relationship, a longitudinal analysis is conducted, modelling the long-term interactions between the relevant variables for a

sample of 27 European countries. The expected findings should confirm a positive and statistically significant impact of environmental spending on the trajectory of green growth, reinforcing the argument for policy-driven investment in environmental sustainability.

3. METHODOLOGY, DATA AND RESULTS

In this section we will discuss methodological issues, describe the data and present the model. As the main goal of the study is to empirically test the significance of investment in environmental protection within the green growth framework on an international scale, we use a panel approach.

3.1. METHODOLOGY BACKS THE EMPIRICS

To assess the nexus between environmental expenditures and the aspiration for greener growth, we will employ two metrics to gauge investment in environmental protection: expenditure and transfers dedicated to this cause. Conversely, we will employ the gap variable to signify the potential for green growth. Hence, the study aims to uncover whether expenditure on environmental protection effectively narrows the disparity between conventional GDP and Green GDP measurements. Our approach will manifest through one model that relates environmental protection expenditures and environmental transfers to the so-called green gap, examining the hypothesis asserting a positive impact of investment in environmental protection on the aspiration for a green economy. Our study is methodologically based on the preliminary research made by Tomić (2024), who evaluated only 7 countries within two distinct models pointed to similar research goals. Our empirical evaluation will utilise cross-country panel cointegration modelling, focusing on data from the period spanning 2014 to 2019, encompassing a sample of 27 European countries, mostly EU members: Belgium, Bulgaria, Czechia, Denmark, Estonia, Germany, Greece, Ireland, Spain, France, Croatia, Italy, Cyprus, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Norway and the United Kingdom. The sample is based primarily on data (un)availability for selected variables.

The growing recognition of the imperative to combat environmental pollution and safeguard natural resources has sparked an upsurge in both the supply and demand for environmental goods and services within European societies. These encompass products aimed at preventing, measuring, controlling, limiting, minimising, or rectifying environmental harm and