Mapping the Landscape of Environmental Taxation Studies with a Bibliometric Approach

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ABSTRACT

This study presents a comprehensive bibliometric analysis of environmental taxation research, aiming to map the thematic landscape, identify research trends, and highlight potential areas for future investigation. Utilizing VOSviewer, the analysis encompasses 980 papers published between 1983 and 2024, revealing key themes such as economic impacts, sustainable development, emission control, and policy optimization. Temporal trends indicate a growing emphasis on integrating innovation and sustainability into environmental tax policies. Potential research areas identified include optimizing tax rates, exploring behavioral responses, and addressing equity considerations. The co-authorship network analysis highlights influential authors and collaborative clusters, suggesting opportunities for enhancing interdisciplinary research. This study provides valuable insights for policymakers, academics, and practitioners aiming to design effective environmental tax policies that address global environmental challenges.

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1. INTRODUCTION

Environmental taxation has emerged as a critical tool in the global strategy to address environmental issues [1], [2]. By imposing taxes on activities that have detrimental effects on the environment, governments aim to incentivize businesses and individuals to adopt more sustainable practices [3]. This approach is rooted in the "polluter pays" principle, which holds that those who produce pollution should bear the costs of managing it, thereby internalizing the environmental costs typically not reflected in market prices [4]v. Studies on environmental taxes have explored their impact on reducing carbon footprints, encouraging waste management, and promoting sustainable industrial practices [5].

The academic interest in environmental taxation has grown significantly over the past decades, reflecting increased public and policy attention to climate change and sustainability [6]. This burgeoning field has produced a diverse range of studies, examining the effectiveness, economic implications, and behavioral outcomes of various environmental tax policies [3]v. Researchers have used multiple methodologies to investigate how these taxes influence both macroeconomic and microeconomic factors, including consumer

behavior, corporate investment decisions, and national economic growth [4], [5], [7]

However, despite the expanding volume of literature, the field lacks a comprehensive synthesis of research trends and knowledge gaps. A bibliometric analysis can provide valuable insights into the evolution of the field, identifying the most influential studies, prevalent themes, and emerging trends [8]–[10]. This approach can help in understanding the geographical distribution of the research, the collaboration networks among scholars, and the impact of different types of environmental taxes across various contexts.

While the body of literature on environmental taxation is extensive, there is a noticeable absence of structured reviews that map the field's development and current state. Most studies tend to focus on specific aspects of environmental taxation, such as carbon taxes or resource taxation, without providing an overarching view of the disciplinary landscape [3], [11], [12]. Additionally, the rapid evolution of environmental policies and global economic shifts call for a renewed examination of the literature to discern whether past research aligns with current and future environmental challenges [4], [13]. Thus, there is a pressing need for a bibliometric study that can collate and synthesize existing research, highlight influential works, and uncover areas that require further investigation. [13]

The primary objective of this research is to systematically map the landscape of environmental taxation studies using a bibliometric approach. This analysis aims to identify the key research themes, assess the growth trajectory of the literature, and evaluate the network of scholarly communications within this field. By accomplishing this, the study will not only highlight the most impactful studies and prevalent trends but also pinpoint under-researched areas that could benefit from future scholarly attention. Through this comprehensive review, the research seeks to provide a foundational resource for policymakers, academics, and practitioners engaged in the design and implementation of effective environmental tax policies.

2. LITERATURE REVIEW

2.1 Theoretical Foundations of Environmental Taxation

Environmental taxation is underpinned by several economic theories, most notably the Pigouvian tax theory, which advocates for taxes equal to the external cost of pollution, thus correcting market inefficiencies that arise from externalities. Baumol and Oates further refined this concept through their theory of "optimal pollution," suggesting that taxes should be used not to eliminate pollution completely but to reduce it to a level where the cost of further reduction would outweigh the benefits [14]. Research in this area often explores the effectiveness of these taxes in achieving environmental goals while balancing economic growth, with studies by [15] and [16] providing comprehensive analyses of different tax schemes and their outcomes.

2.2 Empirical Assessments of Environmental Tax Effectiveness

Empirical research on environmental taxes has demonstrated varied outcomes in different economic and cultural contexts. [17] found that the revenue-neutral carbon tax in Sweden significantly reduced carbon emissions without adversely affecting the economy. In contrast, studies from developing countries often reveal challenges such as tax evasion and insufficient technological alternatives, which undermine the effectiveness of these taxes [18]. The heterogeneity in results suggests that the success of environmental taxes heavily depends on the specific economic, political, and social context, underscoring the need for tailored fiscal policies.

2.3 Behavioral Responses to Environmental Taxes

A growing body of literature focuses on behavioral economics to understand how individuals and businesses respond to environmental taxes. Research by [19] indicates that while environmental taxes can alter behavior, the responses vary

significantly based on the perceived fairness of the tax and the availability of alternatives. This area of study highlights the importance of designing taxes that are not only economically efficient but also socially acceptable and fair to ensure public support and compliance.

2.4 Bibliometric Analyses in Environmental Taxation Studies

Bibliometric methods have been increasingly applied in environmental taxation research to map the evolution and trends within the field. Recent studies by authors like [20] employ these methods to provide meta-analyses of the literature, revealing the most influential authors, articles, and research clusters. These studies often highlight the dominance of certain themes over time and show how the focus of research shifts in response to new environmental challenges and policy needs.

2.5 Integration of Environmental Taxes into Broader Fiscal Policies

The integration of environmental taxes into broader fiscal and environmental policies is crucial for achieving sustainable development goals. Research by [21] explores how environmental taxes can be harmonized with other fiscal instruments to enhance environmental and economic outcomes simultaneously. The literature suggests that a holistic approach, combining taxes with subsidies, regulations, and voluntary agreements, tends to yield the best results in terms of both environmental sustainability and economic stability.

3. METHODS

A bibliometric analysis was utilized in this work to map the field of environmental taxation research in a methodical manner. With an emphasis on publications from 1983 to 2023, data were gathered from Google Scholar. Peer-reviewed journal articles, conference proceedings, and English-language academic theses that specifically addressed environmental taxes were the focus of the inclusion criteria. With the use of VOSviewer, a program for building and displaying bibliometric networks, we examined authorship relationships, co-citation trends, and the development of study themes from keyword frequencies. Throughout the course of the analysis, this program made it easier to identify the most significant writers and works in the subject as well as the prevalent and developing trends. We retrieved quantitative data to evaluate the number of publications over time.

4. RESULTS AND DISCUSSION

Table 1. Citation Metrics of Literature

Publication years:	1983-2024
Citation years:	41 (1983-2024)
Papers:	980
Citations:	52865
Cites/year:	1289.39
Cites/paper:	53.94
Cites/author:	32472.76
Papers/author:	627.67
Author/paper:	2.12
h-index:	119
g-index:	206
hI,norm:	86
hI,annual	2.10
hA-index	42
Papers with ACC >= 1,2,5,10,20:	
508,391,854,168,97	

Source: Publish or Perish Output

Table 1 offers a thorough summary of the citation metrics for a corpus of work that was examined during a 41-year period, from 1983 to 2024. With 980 publications in the dataset, the total number of citations received is 52,865, which translates to a strong citation rate of 53.94 citations per paper and an average yearly citation rate of 1289.39. Several metrics indicate the productivity and impact of the authors in this corpus: the average number of citations per author is 32,472.76, and each author is attributed to 627.67 papers. This suggests that a relatively small number of authors—an average of 2.12 authors per paper—have made significant contributions to the corpus. The dataset attains a high h-index of 119, highlighting the influential character of these works by showing that 119 papers have each been mentioned at least 119 times. Even more, with a g-index of 206, the most cited papers appear to have a great number of citations. Additional complex indices that shed light on the constancy and durability of citation impact over time include the annualized version (hI,annual) of 2.10 and the normalized h-index (hI,norm) of 86. These results are supported by the hA-index of 42, which represents the author-adjusted citation effect. Furthermore, the distribution of papers with accumulated citations (ACC) highlights the different levels of influence found in the literature under study, with a large percentage of works obtaining higher citation thresholds and a considerable but lower fraction earning at least one citation.

Table 2. Top Cited Literature

Citation	Author and Year	Title
2085	[22]	Environmental taxation and the double dividend: a reader's guide
1717	[23]	Environmental levies and distortionary taxation
1229	[24]	Optimal environmental taxation in the presence of other taxes: general-equilibrium analyses
763	[25]	Environmental taxes and the choice of green technology
750	[26]	Pollution taxes and revenue recycling
681	[27]	The economics of taxation
621	[28]	Effects of carbon taxes in an economy with prior tax distortions: an intertemporal general equilibrium analysis
619	[29]	Competition in regional environmental policies when plant locations are endogenous
607	[30]	Dynamic relationship among environmental regulation, innovation, CO2 emissions, population, and economic growth in OECD countries: A panel investigation
587	[31]	Household responses to pricing garbage by the bag

Source: Publish or Perish Output, 2024

The most cited paper in the dataset, authored by LH Goulder, focuses on "Environmental taxation and the double dividend: a reader's guide," garnering 2085 citations. This seminal work discusses the dual benefits (double dividend) that environmental taxes can achieve: reducing environmental harms and improving economic efficiency through the revenue-neutral recycling of tax proceeds. Goulder's analysis serves as a comprehensive guide for understanding the theoretical and practical implications of environmental taxes, emphasizing their potential to simultaneously address environmental degradation and economic distortions caused by pre-existing tax systems.

The papers by AL Bovenberg and RA De Mooij, and Bovenberg along with Goulder, which received 1717 and 1229 citations respectively, delve into the intricate relationship between environmental levies and existing taxation systems. Their research critically examines how environmental taxes

can be optimally integrated with other forms of taxation, providing detailed general-equilibrium analyses. These studies highlight the complexities and potential economic repercussions of implementing environmental taxes in economies with various pre-existing tax distortions, offering valuable insights for policymakers on minimizing adverse economic impacts while enhancing environmental outcomes.

Further down the citation list, works by D Krass, T Nedorezov, and others, and IWH Parry, which received 763 and 750 citations respectively, explore specific applications and impacts of environmental taxes. Krass and his team investigate the

influence of environmental taxes on the adoption of green technologies, showing how fiscal tools can steer technological innovation towards more sustainable practices. Parry's work on pollution taxes and revenue recycling examines the effectiveness of using tax revenue to fund environmental initiatives, thereby reinforcing the environmental benefits of the tax system. Both papers contribute to a deeper understanding of the practical dynamics between environmental fiscal policies and technological and economic behaviors, underscoring the role of targeted fiscal policies in achieving environmental sustainability.
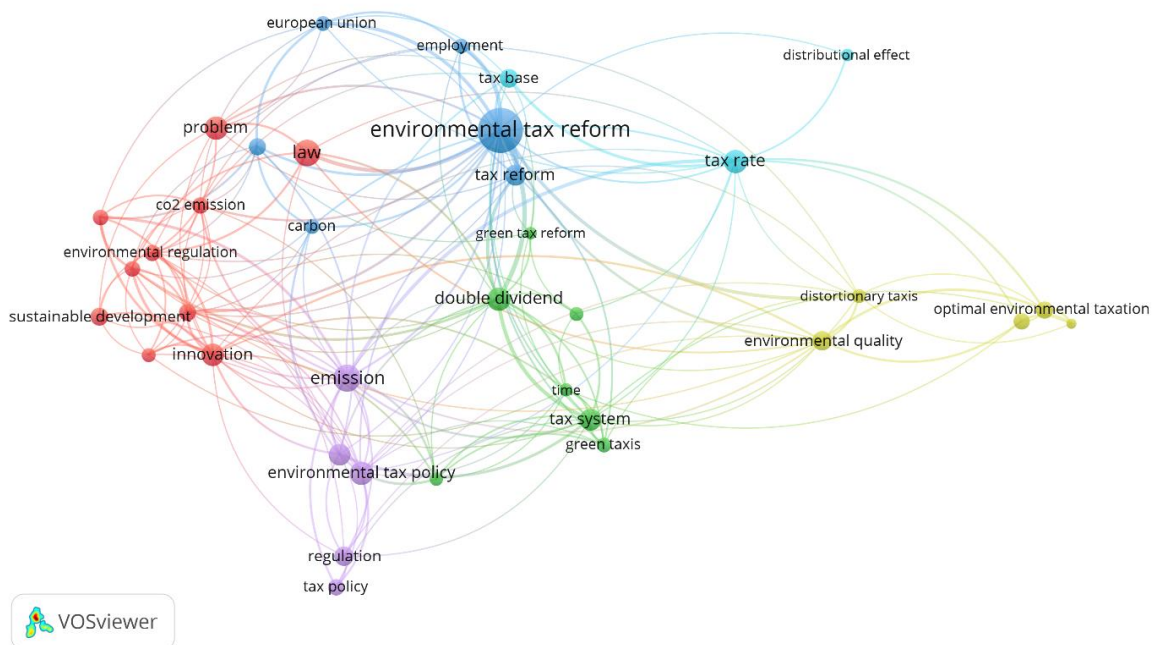
4.1 Keyword Co-Occurrence Analysis

Figure 1. Network Visualization
Source: Data Analysis by VOSviewer, 2024

The figure presents a bibliometric network visualization generated using VOSviewer, mapping the key themes and interconnections within the field of environmental taxation. Nodes represent keywords, and the links between them indicate co-occurrences in the literature. The size of each node reflects the frequency of the keyword's occurrence, while the thickness of

the links represents the strength of the co-occurrence relationship. The colors signify different clusters, each representing a thematic area within the research field. Based on the figure 1 above, we can find several thematical clusters in the literature about environmental taxation. Table 3 shows the clusters and each description

Table 3. Clusterization

No	Cluster	Key Terms	Description

1	Light Blue Cluster (Taxation and Economic Policy)	"tax rate," "tax base," "employment," "distributional effect," "green tax reform"	This cluster focuses on the economic aspects of environmental taxation, examining how different tax rates and bases affect employment and distributional outcomes. The presence of terms like "tax reform" and "green tax reform" indicates an ongoing discourse on adjusting existing tax structures to incorporate environmental considerations. The "distributional effect" suggests studies on how these taxes impact different socio-economic groups, which is crucial for designing equitable policies.
2	Red Cluster (Sustainable Development and Innovation)	"sustainable development," "innovation," "environmental regulation," "CO2 emission," "problem," "law"	This cluster is centered around the intersection of environmental taxation, sustainable development, and regulatory frameworks. The keywords "sustainable development" and "innovation" indicate research on how taxes drive innovation towards sustainable practices. "Environmental regulation" and "law" suggest a legal perspective, examining how regulatory frameworks support or hinder the implementation of environmental taxes. The focus on "CO2 emission" underscores the importance of these taxes in mitigating climate change.
3	Purple Cluster (Emission and Policy Implementation)	"emission," "environmental tax policy," "regulation," "tax policy"	This cluster highlights the practical aspects of implementing environmental taxes to control emissions. The focus on "emission" and "environmental tax policy" points to studies evaluating the effectiveness of these policies in reducing pollutants. "Regulation" and "tax policy" suggest a broader policy framework, indicating that effective emission control requires well-coordinated regulatory measures alongside taxation.

4	Yellow Cluster (Economic Implications and Quality)	"optimal environmental taxation," "environmental quality," "distortionary taxes"	This cluster explores the theoretical underpinnings of environmental taxation, particularly the balance between achieving environmental goals and minimizing economic distortions. "Optimal environmental taxation" suggests a focus on designing taxes that maximize environmental benefits without causing significant economic inefficiencies. "Environmental quality" indicates the ultimate goal of these taxes, while "distortionary taxes" reflect the challenges in maintaining economic stability.
5	Green Cluster (Behavioral and Double Dividend)	"double dividend," "tax system," "green taxes," "time"	The concept of the "double dividend" is central to this cluster, referring to the dual benefits of environmental taxes—environmental protection and economic efficiency. The terms "tax system" and "green taxes" indicate discussions on the structural aspects of implementing such taxes. "Time" suggests longitudinal studies assessing the long-term impacts of these policies.

Source: Own Interpretation based on the Figure 1, 2024

The network shows strong interconnections between different clusters, indicating a high degree of interdisciplinarity in the field. For example, "environmental tax reform" links closely with terms from all clusters, demonstrating its overarching influence. The connection between "tax rate" (light blue) and "CO2 emission" (red) suggests that discussions on economic policies are deeply intertwined with environmental outcomes. Similarly, "double dividend" (green) connects with "optimal environmental taxation" (yellow), indicating an ongoing debate on the theoretical and practical efficiencies of these taxes.

The visualization reveals a well-developed field with several interconnected themes, each addressing different aspects of environmental taxation. The central role of "environmental tax reform" highlights the importance of continuously evolving tax policies to address emerging environmental challenges. The strong links between economic, environmental, and legal perspectives suggest that interdisciplinary approaches are crucial for designing effective and equitable environmental taxes. Future research should continue to explore the integration of environmental taxes within broader fiscal policies, particularly focusing on equity and public acceptance. The red cluster's focus on sustainable development and innovation highlights the need for policies that not only mitigate environmental harm but also promote long-term sustainability. Additionally, the yellow and green clusters suggest that ongoing theoretical and behavioral studies are

essential for refining tax designs and ensuring their long-term effectiveness.
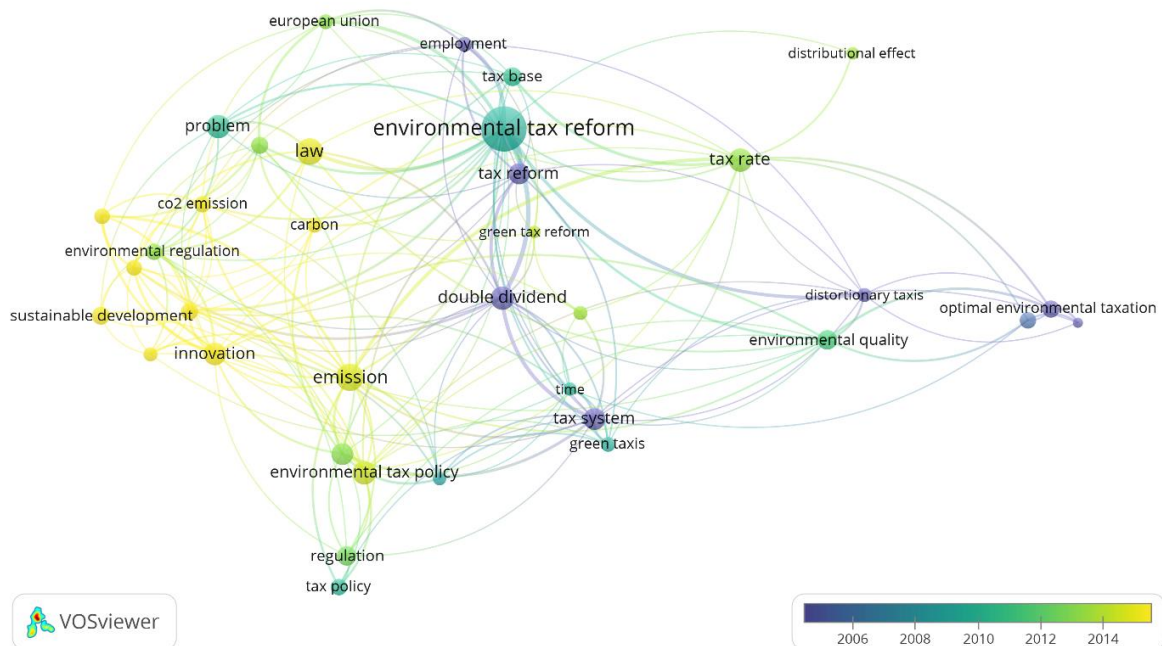

Figure 2. Overlay Visualization
Source: Data Analysis by VOSviewer, 2024

The strong interconnections between different clusters illustrate the interdisciplinary nature of environmental taxation research. For example, "environmental tax reform" links closely with terms from all clusters, highlighting its central role in the discourse. The temporal overlay indicates that while some foundational themes have persisted, newer themes have emerged and gained prominence over time.

1. Economic Policy and Distribution (Light Blue Cluster)

Research in this cluster has transitioned from foundational studies in the early 2000s (blue) to more complex analyses in recent years (yellow). This evolution reflects the increasing sophistication of economic models and the growing recognition of the need to address distributional effects and employment impacts in environmental tax policies.

2. Sustainable Development and Innovation (Yellow Cluster)

The predominantly green and yellow hues indicate a relatively recent surge in interest, likely driven by global policy shifts towards sustainability and innovation. The focus on "sustainable development" and "innovation" highlights the dynamic and forward-looking nature of this cluster, with ongoing research aimed at integrating environmental taxes with broader sustainability goals.

3. Emission Control and Policy (Green Cluster)

The presence of both older (blue) and newer (yellow) colors suggests a sustained and evolving interest in emission control policies. This cluster's enduring relevance highlights the continuous efforts to refine environmental tax policies and regulatory measures to achieve effective emission reductions.

4. Economic Efficiency and Quality (Purple Cluster)

The early focus on optimizing environmental taxation (blue) has evolved into more nuanced discussions on balancing economic efficiency with environmental quality (green/yellow). This trend indicates that while foundational theories remain relevant, ongoing research is increasingly concerned with practical applications and real-world impacts.

5. Behavioral Responses and Dual Benefits (Dark Green Cluster)

The shift from blue to yellow reflects growing interest in the behavioral economics of environmental taxation and the concept of the double dividend. Recent studies likely explore the practical implications of tax systems and green taxes, assessing their long-term benefits and public acceptance.

The temporal overlay on the bibliometric network visualization reveals several key trends and emerging areas of interest within environmental taxation research. The centrality of "environmental tax reform" and its connections to various themes underscore its critical importance in the field. The evolution of research focuses from foundational theories to practical applications and behavioral studies indicates a maturing field that is increasingly concerned with real-world impacts and policy effectiveness.

Future research should continue to explore the integration of environmental taxes within broader fiscal policies, particularly focusing on equity and public acceptance. The dynamic and forward-looking nature of the sustainable development and innovation cluster highlights the need for policies that not only mitigate environmental harm but also promote long-term sustainability. Additionally, the enduring relevance of emission control and economic efficiency clusters suggests that ongoing theoretical and practical studies are essential for refining tax designs and ensuring their long-term effectiveness.
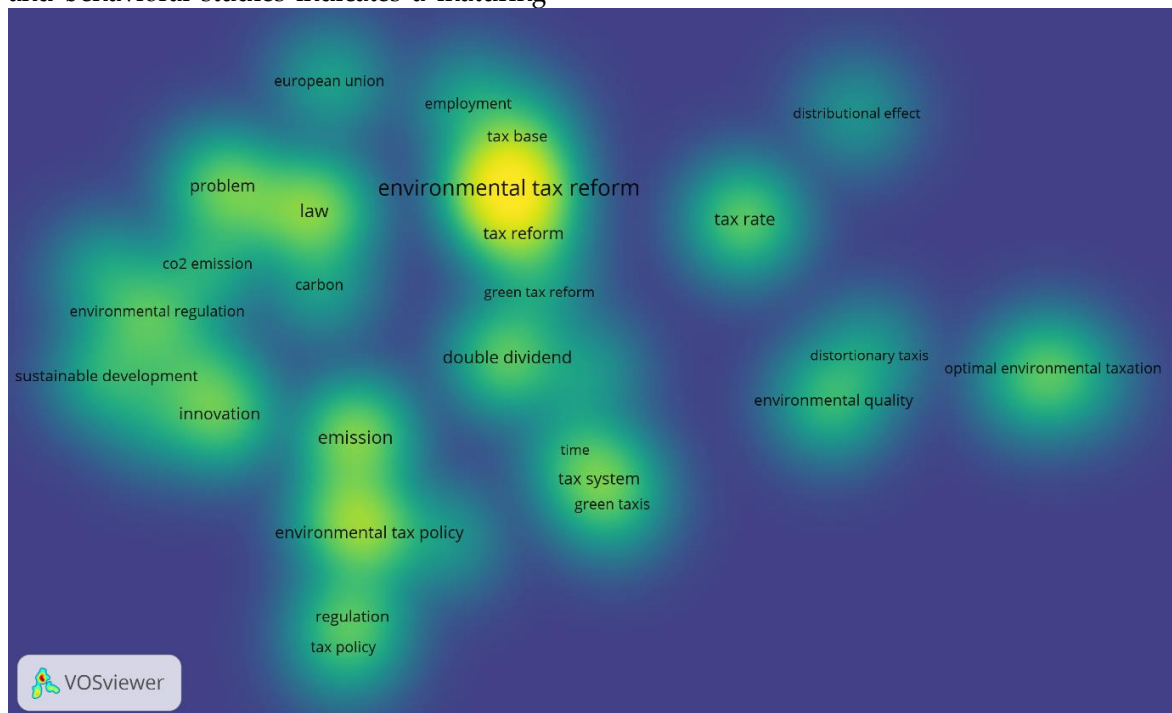

Figure 3. Density Visualization
Source: Data Analysis by VOSviewer, 2024

This heatmap visualization created using VOSviewer illustrates the density and distribution of key themes within the field of environmental taxation research. The nodes represent keywords, and the varying colors indicate the density of occurrences and the intensity of research focus. Yellow areas signify high-density regions with significant research activity, while green and blue areas indicate moderate and lower densities, respectively. The heatmap visualization provides a clear indication of the areas within environmental taxation research that have garnered significant attention and those that may benefit from further exploration. The centrality and high density of certain themes highlight the foundational aspects of the field, while the spread and variation in density across different clusters suggest diverse and evolving research interests.

Given the rising concern about social equity, future research should focus on understanding the distributional impacts of environmental taxes and developing strategies to ensure fair outcomes. This could involve in-depth analyses of how different socio-economic groups are affected by various tax policies and identifying ways to mitigate any negative impacts. Besides that, the ongoing interest in behavioral responses to environmental taxes suggests a need for more research in this area. Studies could explore how different tax designs influence behaviors and the conditions under which the double dividend can be achieved, providing valuable insights for policymakers aiming to enhance both environmental and economic outcomes.

As sustainable development and innovation remain key priorities, research

should continue to investigate how regulatory frameworks can be designed to promote innovation in green technologies. This involves examining the interplay between regulations and market incentives, and identifying best practices for fostering technological advancements that support sustainability goals. The presence of terms related to international contexts, such as the European Union, also indicates an opportunity for comparative studies. Research could focus on comparing the effectiveness of environmental tax policies across different countries and regions, providing insights into best practices and common challenges, and offering guidance for policymakers worldwide.

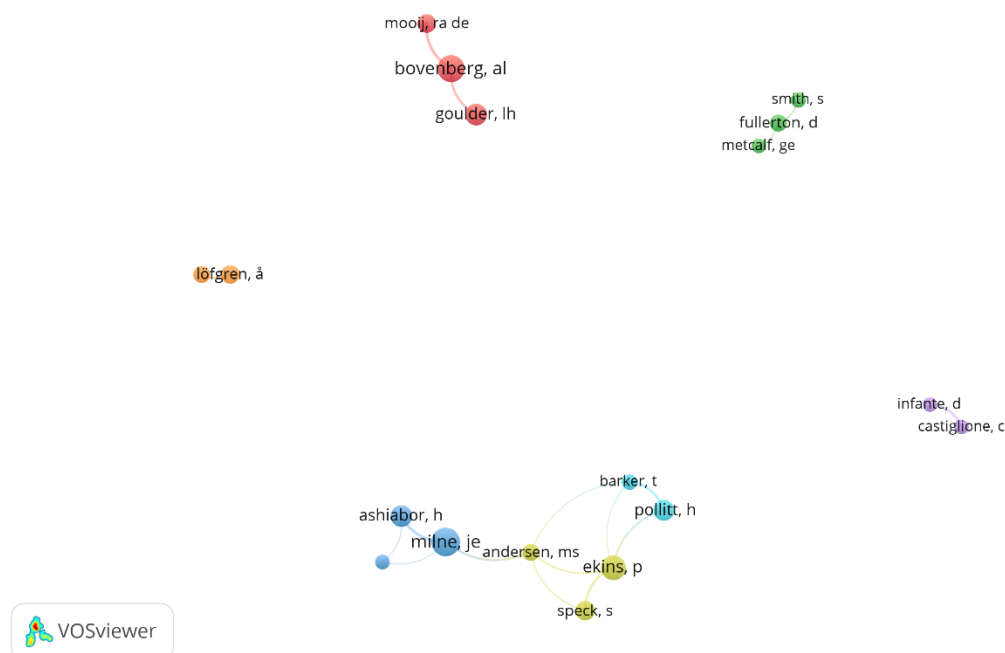### 4.2 Co-Authorship Analysis

Figure 4. Author Collaboration
Source: Data Analysis by VOSviewer, 2024

This figure presents a co-authorship network visualization, highlighting the collaborative relationships among key authors in the field of environmental taxation research. Nodes represent individual authors, and links between nodes indicate co-authorship relationships. The size of each

node reflects the number of publications, while the thickness of the links denotes the strength of the co-authorship connections. Different colors represent distinct clusters of closely connected authors, indicating collaborative groups within the research community.

Table 4. Author Collaboration Clusters

No	Cluster	Key Authors	Description
1	Central Cluster (Red Cluster)	LH Goulder, AL Bovenberg, RA De Mooij	This cluster, dominated by Goulder, Bovenberg, and De Mooij, signifies a highly influential group in environmental taxation research. Their collaboration is evident, with strong links between their nodes indicating frequent co-authorship. These authors are well-known for their seminal contributions to the theoretical and empirical analysis of environmental taxation, particularly in relation to optimal tax design and economic impacts. The prominence of this cluster suggests that their work forms a foundational basis for much of the research in this field.
2	Economic and Behavioral Studies Cluster (Green Cluster)	D Fullerton, GE Metcalf, S Smith	This cluster highlights another significant group of researchers, focusing on the economic and behavioral aspects of environmental taxes. Fullerton and Metcalf, in particular, have extensively studied the economic impacts of environmental taxation, including the distributional effects and revenue recycling mechanisms. The connections within this cluster suggest a collaborative effort to understand the broader economic implications and to develop policies that mitigate negative economic outcomes while achieving environmental goals.
3	Regulatory and Policy Frameworks Cluster (Blue and Yellow Clusters)	H Ashiabor, JE Milne, MS Andersen P Ekins, S Speck	These clusters represent researchers focused on regulatory and policy frameworks related to environmental taxation. The blue cluster, with authors like Ashiabor and Milne, indicates a concentration on the legal and regulatory aspects of environmental taxes, exploring how different jurisdictions implement and enforce these taxes. The yellow cluster, with Ekins and Speck, suggests a focus on integrating environmental taxes into broader sustainability and economic policies, examining how these taxes can drive innovation and support sustainable development.
4	Isolated but Influential Authors (Orange and Purple Clusters)	Å Löfgren D Infante, C Castiglione	These clusters show authors who, despite having fewer co-authorship links, have made significant contributions to the field. Löfgren's work may focus on specific aspects of environmental taxation, such as behavioral responses or case studies in particular regions, providing unique insights that complement the broader research landscape. Similarly, Infante and Castiglione's contributions, likely in the area of economic impacts or comparative studies, add depth and diversity to the overall body of research. The relative isolation of these authors suggests specialized areas of study

			or emerging research topics that have yet to form broader collaborative networks.

Source: Data Analysis, 2024

The visualization highlights several potential areas for future research and collaboration. The central clusters indicate well-established research themes, such as the economic impacts and optimal design of environmental taxes. However, the presence of isolated clusters and less connected authors suggests opportunities for integrating diverse perspectives and emerging topics into the mainstream research. Future studies could focus on underexplored areas like the intersection of environmental taxes with social equity, technological innovation, and international comparative analyses. Additionally, fostering collaboration between isolated authors and established clusters could lead to more comprehensive and interdisciplinary approaches to environmental taxation research.

5. CONCLUSION

The comprehensive analysis of environmental taxation research, as revealed through thematic clustering, research trends, potential research areas, and author collaboration, underscores the multidimensional nature of this field. Thematic clusters identified central themes such as economic impacts, sustainable development, emission control, and policy optimization, indicating a robust foundation of diverse research interests. The temporal analysis highlighted a significant shift towards integrating innovation and sustainability, reflecting evolving global environmental challenges. Potential research areas were identified in optimizing tax rates, integrating regulatory frameworks, and exploring behavioral responses and equity considerations, showcasing the need for interdisciplinary and practical approaches. Author collaboration networks emphasized the importance of key contributors and revealed opportunities for enhancing research depth through increased interdisciplinary and cross-cluster collaborations. Collectively, these insights provide a roadmap for future research endeavors, aiming to develop more effective and holistic environmental taxation policies to address global environmental issues.

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