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Sustainable Tax and Accounting Reporting in Building a New Tax Culture

Edited by
Lidija Hauptman and Ivana Pavić

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Guest Editors

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Editorial

Sustainable Tax and Accounting Reporting in Building a New Tax Culture

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Achieving the Sustainable Development Goals (SDGs) depends significantly on enhancing tax revenue mobilization and transforming tax culture among both institutional and individual taxpayers. Taxpayers today face growing regulatory complexity, evolving technologies, and increasing reporting obligations imposed by international organizations. The OECD encourages governments to improve tax systems by reducing tax non-compliance and analyzing taxpayers' behavior (Hauptman et al., 2024a, 2024b). These pressures demand greater transparency and directly influence tax compliance strategies and practices. The push for a more transparent and equitable global tax system (OECD, 2021a, 2021b, 2022a, 2022b), aligned with principles of sustainability, is supported by adopted tax and accounting reporting standards issued by international professional bodies. Companies are not only required to comply with tax laws but also have a broader responsibility to stakeholders and society to uphold effective tax governance. At the same time, new mechanisms are being introduced to encourage tax-sustainable behavior and foster the development of a new tax culture. The latter should be based on a 'culture of tax compliance', meaning educating taxpayers to perceive tax payments as an integral part of their relationship with the government, built upon rights and responsibilities (OECD, 2021b). Countries possess distinctive cultural, social, economic, and legal characteristics (Singh et al., 2023). A positive perception of taxes in society must take these multifaceted influences into account (Mohammed & Tangl, 2024).

The development of a new tax culture can be viewed from various perspectives, as it is shaped by numerous factors ranging from individual perceptions to systemic approaches. This Special Issue, "Sustainable Tax and Accounting Reporting in Building a New Tax Culture", explores these aspects through nine key areas that offer a diverse yet interconnected picture of contemporary challenges and opportunities in the study of tax culture and reporting. Topics range from the perspective of tax auditors, highlighting the influence of income and sales taxes on tax decision-making (Al-Khleifat et al., 2024), to the use of predictive methods, such as the gray forecasting model, to improve the understanding and forecasting of tax collection (Kaushik et al., 2024). An important element in shaping tax culture is also tax compliance within the framework of environmental tax policy (Hakam et al., 2024). For a more inclusive tax culture and reporting in the context of micro, small, and medium-sized enterprises, the role of innovation, creative tax reporting, and tax incentives is discussed (Saptono et al., 2024). Progress is further examined through the role of artificial intelligence in enhancing the quality of value-added tax reporting (Al Najjar et al., 2024). Special attention is given to tax evasion related to transactions involving stablecoins (Moura de Carvalho et al., 2024). Tax culture is also strongly influenced by quality control mechanisms, demonstrated by analyses of the quality of audit oversight impacting the financial performance of companies (Abraham et al., 2024). Tax compliance is assessed empirically through the evaluation of taxpayers' knowledge and perceptions of fairness, which directly influence tax behavior and willingness to cooperate with tax authorities (Hauptman et al., 2024c). Individuals may perceive taxation as a form of punishment, depending on whether they view it as a service or a strain; therefore, understanding the underlying factors is crucial (Mohammed & Tangl, 2024). All of the mentioned aspects are essential for understanding the various factors that shape public perceptions of taxation, thereby contributing to the development of a new, more inclusive, and sustainability-oriented tax culture and reporting.

Al-Khleifat et al. (2024) investigate the determinants influencing tax decision-making in Jordan from the perspectives of income and sales tax auditors, highlighting the impact of both internal and external factors on auditing practices and taxpayer compliance. Auditor independence, professional experience, and taxpayer awareness are significant determinants in tax-related decisions. Authors recommend strengthening auditor training, promoting greater independence, and enhancing taxpayer education to support transparency and fairness within the tax system (Al-Khleifat et al., 2024).

A sustainable economic framework must be maintained by ensuring the efficiency and effectiveness of the tax collection process, argue Kaushik et al. (2024). Using a novel gray forecasting model, the authors analyze trends and patterns in direct tax collection, the cost of tax collection, the share of direct taxes in total tax revenue, and the tax-to-GDP ratio in India to predict the future outlook of tax revenues. The results revealed that direct tax collection has consistently increased over the past two decades, with the proportion of direct taxes in total tax revenue also showing significant improvement. Conversely, the cost of tax collection has steadily decreased, indicating enhanced efficiency in the tax collection process (Kaushik et al., 2024).

In achieving the Sustainable Development Goals, the study by Hakam et al. (2024) examines compliance behavior within the context of environmental tax policies. By analyzing a broad range of environmental taxation instruments, rather than focusing solely on specific taxes or isolated policy mechanisms, the study demonstrates that interdisciplinary approaches and international collaboration are essential. Taxpayer compliance is influenced by factors such as social acceptability, regulatory quality, and perceptions of fairness (Hakam et al., 2024). Developing fair and effective environmental tax policies is crucial, and a combination of incentives and enforcement mechanisms plays a vital role in promoting compliance (Hakam et al., 2024). Through bibliometric and scientometric analyses, Hakam et al. (2024) identify emerging trends and key factors influencing compliance behavior. Their findings show that citations and publications on environmental challenges are dominated by China and the USA, with high-quality research also emerging from Canada and Australia (Hakam et al., 2024). Authors believe that the study provides valuable guidance for businesses, helping them innovate for sustainability and adapt to evolving policy landscapes.

The role of innovation, creative compliance, and tax incentives in the case of micro, small, and medium enterprises (MSMEs) in Indonesia is examined in the study by Saptono et al. (2024). As these enterprises make up around 90% of businesses worldwide (Lutfi et al., 2022; Saptono et al., 2024), the study explores how government financial assistance, through tax incentives, tax planning, and tax avoidance strategies, can enhance their resilience and sustainability by fostering innovation (Saptono et al., 2024). Creative compliance, such as tax planning and tax avoidance, does not directly influence resilience or sustainability, but tax incentives had a limited impact on resilience during times of crisis, and they played a more significant role in supporting long-term sustainability (Saptono et al., 2024). Innovation emerged as a key factor, serving as the critical link between creative compliance and business success, and fully mediating the relationship between tax incentives and resilience (Saptono et al., 2024). The authors conclude that MSMEs should prioritize innovation within their strategic planning, especially when combined with effective tax practices. They also emphasize the importance of government support through simplified regulatory frameworks to promote a more innovative-friendly business environment (Saptono et al., 2024).

Ensuring high tax reporting quality from the perspective of AI's role was explored by Al Najjar et al. (2024) through an experimental study focused on VAT in emerging markets (specifically in Lebanon). The authors tested reporting quality using both traditional methods and AI tools to determine whether low VAT reporting quality in emerging markets, often caused by accounting errors, can be improved using AI (Al Najjar et al., 2024). Based on experimental research involving AI intervention through ChatGPT-4, the authors found that AI-assisted reporting significantly enhances reporting quality (Al Najjar et al., 2024). The Al Najjar et al. (2024) study contributes by offering novel and practical insights into the role and potential of AI in enhancing tax reporting practices.

The study by Moura de Carvalho et al. (2024) investigates the tax evasion behavior of small and medium enterprises (SMEs) engaging in stablecoin transactions in Brazil. Specifically, whether factors such as a company's size, age, sector, or the intensity, frequency, and context of its transactions are associated with tax evasion behavior. This study provides a deeper understanding by investigating whether the intensity of stablecoin use is associated with a higher propensity for tax evasion. Furthermore, it examines whether companies engaged in high-frequency stablecoin transactions are more likely to evade taxes than those involved in low-frequency transactions. The authors examine whether companies engaging in on-chain transactions are more prone to tax evasion than those involved only in off-chain transactions. Additionally, they assess the relationship between a company's age and its propensity to engage in tax evasion. They also investigate whether companies in the service sector are more likely to evade taxes than those in the commercial sector. Finally, the study explores whether medium-sized companies have a higher probability of tax evasion than smaller ones (Moura de Carvalho et al., 2024). Moura de Carvalho et al.'s (2024) research shows that age, intensity, sector, size, and IntraVaspP2P (on-off chain) are significant predictors of tax evasion. The authors (Moura de Carvalho et al., 2024) were unable to confirm the hypothesis that firms engaging exclusively in P2P transactions have a higher propensity to evade taxes than those engaging solely in IntraVASP transactions. Younger and medium-sized companies, characterized by intensive stablecoin use, high transaction frequency, involvement in both IntraVASP and P2P transactions, and operating within the service sector, are more likely to engage in tax evasion (Moura de Carvalho et al., 2024).

Abraham et al. (2024) measured the effect of audit oversight quality on the financial performance of U.S. firms, with a special focus on firm profitability and its impact on firm value in the pharmaceutical and energy industries. According to the authors, audit oversight is provided by audit committees, which hire auditing firms to conduct audits of the firm in question (Abraham et al., 2024). Audit committees are additionally appointed to oversee the financial reporting process, monitor financial control systems, hire and evaluate independent auditors, and communicate their findings with management and auditors (Abraham et al., 2024). The added value of the study lies in proposing two new measures of audit oversight quality (the ability to fulfill one or more of their responsibilities, as mentioned in annual reports, and the number of times the term 'audit committee' is used). The main results of Abraham et al. (2024) show that the audit oversight quality measures were regressed against profitability, debt capacity, and firm value. The authors of the study concluded that audit oversight quality reduces return on equity and has a disciplining effect on borrowing, as increased oversight of debt growth lowers companies' tendency to take on additional debt using collateral and reduces investor returns on debt-financed projects. An increase in firm size, when accompanied by high audit oversight quality, enhances the firm's value, with the robustness of the first audit oversight quality measure needing to be considered (Abraham et al., 2024).

In the study by Hauptman et al. (2024c), the perceived levels of tax knowledge and tax fairness among taxpayers in Slovenia are assessed, with a focus on differences based on gender and settlement size. In their study, the correlations between tax knowledge and the dimensions of tax fairness are investigated. The results provide evidence that tax knowledge differs between male and female taxpayers; therefore, the authors conclude that developing appropriate educational programs in tax education is necessary to address this gap (Hauptman et al., 2024b). However, when examining tax fairness, the study's results revealed no differences based on gender or settlement size (Hauptman et al., 2024b). The study shows weak but statistically significant correlations between tax knowledge and tax fairness perception, varying by fairness dimension. Authors suggest that policymakers should consider taxpayers' perceptions of distributive fairness and tax knowledge when designing communication strategies and educational programs (Hauptman et al., 2024c).

Mohammed and Tangl (2024) analyzed individuals' perceptions and the factors behind viewing taxes as punishment, and presented a comprehensive examination weighing taxes as a service or a strain. The perceptions of taxes are shaped by various economic and psychological factors (fairness views, societal standards, and cognitive biases), government communication, and societal norms), as demonstrated in their study. The relationship between economic development and tax perception is crucial and multidimensional (Mohammed & Tangl, 2024). They confirmed that tax perceptions tend to be more positive in economically developed countries than in less developed nations due to the visible benefits of tax contributions, while negative perceptions are mostly rooted in the lack of apparent returns on taxes paid. In these circumstances, regressive taxation worsens negative perceptions by placing a disproportionate burden on lower-income individuals (Mohammed & Tangl, 2024). A crucial role in shaping tax perceptions is played by the fairness of tax policies and effective government communication. Incorporating financial literacy and civic education into school curricula is a powerful tool for changing tax perceptions through education (Mohammed & Tangl, 2024). Individuals who vividly recall instances of government waste or inefficiency are more likely to hold negative attitudes toward taxation, and governments can influence cultural norms by running awareness campaigns and emphasizing the societal costs of tax avoidance (Mohammed & Tangl, 2024). Public acceptance of taxation can be increased through progressive tax policies and clear, consistent communication from the government (Mohammed & Tangl, 2024).

The papers included in this Special Issue offer an in-depth and insightful exploration of the emerging tax culture aimed at promoting tax-sustainable behavior, covering a wide range of topics. Each paper presents practical solutions that policymakers can use in shaping a new tax culture, both in terms of policy development and reporting. The authors also provide valuable recommendations for researchers, highlighting potential future research directions that can build on the studies presented and address the gaps identified. We invite researchers to engage in these in-depth studies of specific problems.

Conflicts of Interest: The author declares no conflicts of interest.

List of Contributions:

1. Al-Khleifat, S., Abu Siam, Y., Nassar, M., & Sharairi, M. H. (2024). Determinants of tax decisions in Jordan: Income and sales auditor perspective. *Journal of Risk and Financial Management*, *17*, 579. https://doi.org/10.3390/jrfm17120579.

2. Kaushik, P., Mohsen B., Shubham K., & Kansra, P. (2024). The predictive gray forecasting approach for measuring tax collection. *Journal of Risk and Financial Management*, *17*, 558. https://doi.org/10.3390/jrfm17120558.
3. Hakam, S. L., Rahayu, A., Wibowo, L. A., Hakam, L. I., Nugroho, M. A., & Fuadi, S. S. (2024). Compliance behavior in environmental tax policy. *Journal of Risk and Financial Management*, *17*, 542. https://doi.org/10.3390/jrfm17120542.
4. Saptono, P. B., Khozen, I., Mahmud, G., Hodžić, S., Pratiwi, I., Purwanto, D., & Imantoro, L. W. (2024). Flourishing MSMEs: The role of innovation, creative compliance, and tax incentives. *Journal of Risk and Financial Management*, *17*, 532. https://doi.org/10.3390/jrfm17120532.
5. Al Najjar, M., Mahboub, R., Nakhal, B., & Ghanem, M. G. (2024). Exploring the role of AI in improving VAT reporting quality: Experimental study in emerging markets. *Journal of Risk and Financial Management*, *17*, 477. https://doi.org/10.3390/jrfm17110477.
6. Moura de Carvalho, R., Inácio, H. C., Marques, R. P. (2024). An empirical analysis of tax evasion among companies engaged in stablecoin transactions. *Journal of Risk and Financial Management*, *17*, 400. https://doi.org/10.3390/jrfm17090400.
7. Abraham, R., El Chaarani, H., & Tao, Z. (2024). The impact of audit oversight quality on the financial performance of U.S. firms: A subjective assessment. *Journal of Risk and Financial Management*, *17*, 151. https://doi.org/10.3390/jrfm17040151.
8. Hauptman, L., Žmuk, B., & Pavić, I. (2024d). Tax compliance in Slovenia: An empirical assessment of tax knowledge and fairness perception. *Journal of Risk and Financial Management*, *17*, 89. https://doi.org/10.3390/jrfm17030089.
9. Mohammed, H., & Tangl, A. (2024). Taxation perspectives: analyzing the factors behind viewing taxes as punishment—A comprehensive study of taxes as service or strain. *Journal of Risk and Financial Management*, *17*, 5. https://doi.org/10.3390/jrfm17010005.

References

Abraham, R., El Chaarani, H., & Tao, Z. (2024). The impact of audit oversight quality on the financial performance of U.S. Firms: A subjective assessment. *Journal of Risk and Financial Management*, *17*, 151. [CrossRef]

Al-Khleifat, S., Abu Siam, Y., Nassar, M., & Sharairi, M. H. (2024). Determinants of tax decisions in Jordan: Income and sales auditor perspective. *Journal of Risk and Financial Management*, *17*, 579. [CrossRef]

Al Najjar, M., Mahboub, R., Nakhal, B., & Ghanem, M. G. (2024). Exploring the role of AI in improving VAT reporting quality: Experimental study in emerging markets. *Journal of Risk and Financial Management*, *17*, 477. [CrossRef]

Hakam, S. L., Rahayu, A., Wibowo, L. A., Hakam, L. I., Nugroho, M. A., & Fuadi, S. S. (2024). Compliance behavior in environmental tax policy. *Journal of Risk and Financial Management*, *17*, 542. [CrossRef]

Hauptman, L., Pavić, I., & Časni, A. Č. (2024a). The influence of trust in tax administration and gender on tax compliance in Slovenia. *Lex Localis: Revija za Lokalno Samoupravo*, *22*(3), 140–163. [CrossRef] [PubMed]

Hauptman, L., Zmuk, B., & Pavic, I. (2024b). Taxpayers' attitudes toward tax compliance in the Slovenian tax system: Differences according to gender, income level and size of settlement. *Public Sector Economics*, *48*(2), 171–201. [CrossRef]

Hauptman, L., Žmuk, B., & Pavić, I. (2024c). Tax compliance in Slovenia: An empirical assessment of tax knowledge and fairness perception. *Journal of Risk and Financial Management*, *17*, 89. [CrossRef]

Kaushik, P., Mohsen, B., Shubham, K., & Kansra, P. (2024). The predictive grey forecasting approach for measuring tax collection. *Journal of Risk and Financial Management*, *17*, 558. [CrossRef]

Lutfi, A., Alsyouf, A., Almaiah, M. A., Alrawad, M., Abdo, A. A. K., Al-Khasawneh, A. L., Ibrahim, N., & Saad, M. (2022). Factors influencing the adoption of big data analytics in the digital transformation era: Case study of Jordanian SMEs. *Sustainability*, *14*, 1802. [CrossRef]

Mohammed, H., & Tangl, A. (2024). Taxation perspectives: Analyzing the factors behind viewing taxes as punishment—A comprehensive study of taxes as service or strain. *Journal of Risk and Financial Management*, *17*, 5. [CrossRef]

Moura de Carvalho, R., Inácio, H. C., & Marques, R. P. (2024). An empirical analysis of tax evasion among companies engaged in stablecoin transactions. *Journal of Risk and Financial Management*, *17*, 400. [CrossRef]

OECD. (2021a). *Behavioural insights for better tax administration: A brief guide*. OECD Publishing. Available online: http://www.oecd.org/tax/forum-on-tax-administration/publications-and-products/behavioural-insights-for-better-tax-administration-a-brief-guide.pdf (accessed on 2 May 2025).

OECD. (2021b). *Building tax culture, compliance and citizenship: A global source book on taxpayer education* (2nd ed.). OECD Publishing. [CrossRef]

OECD. (2022a). *Building trust to reinforce democracy main findings from the 2021 OECD survey on drivers of trust in public institutions*. OECD Publishing. [CrossRef]

OECD. (2022b). *Tax policy and gender equality: A stocktake of country approaches*. OECD Publishing. Available online: https://www.oecd.org/tax/tax-policy-and-gender-equality-b8177aea-en.htm (accessed on 2 May 2025).

Saptono, P. B., Khozen, I., Mahmud, G., Hodžić, S., Pratiwi, I., Purwanto, D., & Imantoro, L. W. (2024). Flourishing MSMEs: The role of innovation, creative compliance, and tax incentives. *Journal of Risk and Financial Management*, *17*, 532. [CrossRef]

Singh, A., Singh, A., Sharma, H. K., & Majumder, S. (2023). Criteria selection of housing loan based on dominance-based rough set theory: An Indian case. *Journal of Risk and Financial Management*, *309*, 309. [CrossRef]

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Article

Determinants of Tax Decisions in Jordan: Income and Sales Auditor Perspective

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Abstract: This study examines the factors influencing tax decision-making from the perspectives of income and sales auditors in Jordan. It explores how internal and external factors shape auditing processes and compliance. Using a sample of 215 tax auditors from 2018 to 2022, this study adopts a quantitative methodology and collects data through structured surveys. The findings highlight key variables such as auditor independence, professional experience, and taxpayer knowledge as significant factors influencing tax decisions. The study recommends enhancing auditor training, fostering independence, and improving taxpayer education to promote transparency and fairness in tax systems.

Keywords: tax audit; tax administration; income tax; auditor independence; taxpayer compliance

1. Introduction

In accordance with specific statutes or legislation, the federal government imposes an economic cost on members of society through taxation without providing immediate compensation for their contributions. The primary purposes of taxation are to cover government expenses and achieve specific societal and economic goals. Taxation is recognized as an essential means of financing, enabling government expenditures, funding projects, and addressing diverse societal needs. Taxation also aims to achieve an equitable distribution of wealth by redistributing income, taxing the wealthy, and exempting the poor, therefore contributing to social equilibrium. Additionally, institutions help keep the economy stable by strengthening domestic businesses and shielding them from the threat of rivals overseas via policies for taxation on imports (Abu Nassar 2021; Alimat 2013; Alwan 2017; Al-Zu'bi 2010; Asker and Yaqub 2020; D'Agosto and Pisani 2016).

Recognizing the importance of tax revenue in achieving these goals, many nations have established professional tax agencies to collect taxes from citizens. In response, governments have implemented regulations to ensure fair administration and enforcement of taxes, preventing biased interpretations or act Raions by tax authorities. The legislation provides individuals a specific timeframe to file their tax reports, after which tax auditors review them to determine the amount owed to the government (Abu Sinneh 2008; Al-Adi 2015; Al-Faouri 2017; Dawood 2015).

When making tax judgments, accountants are primarily responsible for verifying the accuracy of customers' reported financial information. The audit's judgment is based on a number of internal as well as external factors, with the objective of achieving substantial tax payments as set by the government's revenue department and ensuring that tax implementation is imposed accurately and scientifically while decreasing conflicts among customers and tax auditors. The auditing self-determination, level of higher education, expertise in accounting, as well as tax background in auditing are all insider variables that might affect the revenue-collection authority's goal of increasing revenues. Considerations outside of the taxpayer's control may involve their level of understanding about taxes, the expertise of tax officials, and the specifics of their business.

Accordingly, the purpose of the current study is to look at how both sales and income tax auditors in Jordan use both internal and external criteria to decide how much taxation an individual has to contribute in accordance with Jordan's sales and revenue taxation laws. This study addresses a critical gap in understanding the interplay of internal and external factors influencing tax decision-making in Jordan, a developing economy with unique administrative and legislative challenges. ***The major purpose is to recognize such variables. The primary aims of the research are to:***

- *Analyze the impact of auditor independence on tax decisions;*
- *Assess the influence of taxpayer knowledge of on compliance;*
- *Examine how professional experience shapes auditors' decision-making processes.*

This study contributes to the literature by identifying actionable recommendations for enhancing tax-auditing practices, focusing on auditor independence, professional development, and taxpayer education. This study's uniqueness lies in its focus on the Jordanian tax-auditing context, which has received limited attention in the literature. By examining the interplay between auditor independence, professional experience, and organizational pressures, the study provides new insights into improving audit effectiveness. Additionally, it offers practical recommendations for policymakers:

- Training programs tailored to enhance auditor knowledge of tax regulations and ethical standards.
- Public awareness campaigns to educate taxpayers and reduce disputes.

These contributions not only fill academic gaps but also have practical applications for improving tax systems in Jordan and similar developing economies.

The current investigation is structured as follows: the subsequent section focuses on the theoretical framework and a comprehensive literature assessment of applicable research that has been scrutinized and evaluated. Furthermore, the investigation's methodology section will generally include the formulation of the study, methods for obtaining and evaluating data, and the assessment of hypotheses. Furthermore, the results, and the corresponding debates, will be elaborated upon, followed by the main recommendations.

2. Conceptual Framework and Previous Studies

While taxes, as we perceive them, are believed to have originated at the beginning of time, they have changed considerably throughout the centuries. Taxes have been defined in a variety of ways throughout history (Fuest and Riedel 2009; Hair et al. 2010; Kumar 2020). "Money deducted by government organizations on both individuals and businesses corresponding to their respective financial competencies in an ultimate and non-reciprocal way with the purpose of absorbing governmental responsibilities and generating governmental revenue" is how Mehl (as stated in Cohen and Sayag 2010) describes taxation. According to Abu Nassar (2021), it is "a monetary policy the quantity of which is assessed by a government entity as well as a local government and derived from consumers in an ultimate as well as non-reciprocal behavior in accordance with particular regulation or rules, alongside the objective of assisting with encompassing state expenditure as well as accomplishing expected social and economical goals that the state attempts to attain". As an additional point, Asker and Yaqub (2020) defines taxes both as "what exactly may be considered to contribute to revenue from the government, contrasting with penalties handed down by authorities, as taxation cannot be used as a preventive or consequence for inappropriate performance".

During his 2022 study, Abbas focused on the Iraqi law that regulates the managerial appeal of taxation conclusions. Approaches for assessing the burden of taxes, avenues for appealing to the taxation authorities, and evaluation methodologies have been examined during the research. In analyzing Iraqi law and global norms, the results offer insight into the differences that exist between administration appealing techniques and court processes regarding challenging taxation decisions. The article went on to cover the topic of both administrative and judicial challenges regarding the immense authority of tax administrators. When it comes to managerial challenges in the assessment of taxes, Abbas's investigation penetrates extensively into the constitutional framework. The Iraqi constitutional framework has been extensively investigated; however, a greater comprehension of taxation appealing processes could have been achieved using a comparison technique, which involves a wider range of foreign tax administrations.

Outcomes from Dwaikat's (2021) research investigating Palestinian tax investigator methods of decision-making have been examined. This research investigated the way examiner decision-making is influenced by specific variables, the administration of taxes, those who pay taxes, and tax laws. The investigation, which analyzed answers from 100 accounting professionals throughout the West Bank, showed that auditor conclusions were significantly impacted by the government, law, personal variables, and the management of taxes. Several of the suggestions included improving investigator opportunities for continuing education and increasing consumer knowledge via conferences, including documents, particularly alternating investigators, in order to avoid close relationships compromising the findings they reached. Despite providing useful recommendations, Dweikat's investigation effectively recognizes important factors determining examiner conclusions. Nevertheless, accountants' reported information can potentially introduce bias into the investigations. The method of auditing might be seen in a fairer light if the public and outside stakeholder suggestions were included.

The key elements influencing Vietnamese enterprises' compliance with tax laws were studied by Nguyen and Tran (2020). Surveys and focus group discussions of 200 businesses were among the various qualitative and quantitative methodologies utilized in the research. Inspection of likelihood, reputation of the company, and structure of ownership have been shown to have an important influence on consensual compliance with taxes, whereas auditing likelihood, penalty fees, degree of severity, and social standards were identified to affect imposed conformity. Although Nguyen et al.'s dissertation provides a thorough analysis of compliance with tax variables, their conclusions might not be applicable to the Vietnamese atmosphere. A better understanding of the factors driving the payment of taxes might be gained by comparing these findings with those of other nations.

Through the process of customer understanding, Taha (2019) investigated the consequences of customer knowledge as well as tax development on compliance from taxpayers. Researchers found that adherence was greatly impacted by information acquisition and the process of socialization, leading to heightened understanding. This research emphasizes the vital importance of raising understanding among taxpayers and educating them to promote cooperation. In order to better comprehend how socialization and training shape tax behavior over time, follow-up information might be useful.

The impact of tax auditor compliance with professional requirements on the efficacy of audits in Kuwait was studied by Hamada (2014). According to the research, which included both primary and secondary information from the 211 auditing professionals, the performance of audits was greatly enhanced when inspectors complied with mandatory, individual, and professional requirements. The elements that strengthen the effectiveness of audits are explained in Hamada's research. However, larger systemic issues impacting the quality of audits could be missed if inspector viewpoints are the only ones considered.

Legislation uncertainty, accountants' level of expertise, and monetary incentives were some of the aspects studied by Al-Khalayleh (2014) as influencing Jordanian revenue and earning income auditor choices. The research concluded that these aspects had different effects on investigators' inferences and suggested easing tax rules while enhancing auditors' working circumstances better. The evaluation offers an in-depth examination of the variables that influence the judgments made by accountants in Jordan. Whether these variables interact with larger economic and political circumstances is an area that might need further investigation in future studies.

A qualitative study was carried out by Salem (2011) on administrative duties and exclusive and monetary factors that impact the determinations made by tax examiners in Jordan. The research's authors suggested that tax rules should be improved and that inspectors should be provided with specialized instruction. The research successfully determines significant variables that impact the choices made by tax evaluators. To gain an understanding of how such factors impact the assessment of taxes worldwide, it would be helpful to offer comparisons with different countries.

Approaches to improve the expert knowledge of Jordan's revenue tax assessors were evaluated by Jasim (2011). The research concluded that professional certifications should be more strongly supported and suggested that training programs should be improved. Tax inspectors should prioritize continuing their educational pursuits, based on Jasim's report. Investigator efficiency and the results of compliance with taxes might be more fully understood with more studies into the effects of different training initiatives.

Regarding the impact of administration and enforcement on compliance with taxes, Brouno and Feld (2012) investigated the dynamics among tax officials as well as individuals. Based on the research, customers were more likely to permit taxation when tax officials addressed them with respect. The importance of civility in interactions among tax officials and consumers is highlighted by this research. It would be interesting to see the way many different kinds of polite interaction affect compliance with taxes in the long run during subsequent studies.

Existing research primarily focuses on individual factors affecting tax auditor decisions, such as their level of education or independence (Dwaikat 2021; Al-Khalayleh 2014). However, there is a lack of studies examining:

- The combined impact of internal and external variables, such as workload pressures, organizational culture, and taxpayer awareness.
- Context-specific challenges in developing economies, where tax systems face unique administrative and compliance issues.
- The role of auditor independence in mitigating biases, particularly in high-pressure environments.

This study addresses these gaps by focusing on Jordanian tax auditors, an underrepresented group in the literature, and their unique operational challenges.

3. The Methodology

This descriptive–analytical study aimed to understand the impact of internal and external factors influencing tax-auditing decisions by surveying Jordanian sales and income tax auditors. A stratified random sampling method was used to select 215 auditors, ensuring representation from various departments within Jordan's Income and Sales Tax Department. This approach was chosen for its effectiveness in describing, analyzing, and interpreting responses from the research sample.

Auditors from the Hashemite Republic of the Jordanian Earnings and Revenue Taxation Department make up part of the research population. The auditing professionals who work for the Amman-based department of the Income and Sales Tax Department make up the study's sample. The research's information-gathering and analysis process began with the development and distribution of an internet-based survey to relevant department heads. Based on the accounting auditors assigned to these departments, 215 questionnaires were received. To achieve the study's objectives and address its research questions and assumptions, a questionnaire was developed based on a comprehensive literature review. The variables were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement items were adapted from previously validated scales, including those used in studies by Hamada (2014) and Dwaikat (2021). Cronbach's Alpha for the constructs ranged from 0.78 to 0.89, indicating good internal consistency.

3.1. Descriptive Analysis of Study Variables

Table 1 presents the findings, revealing that 51.6% of the 215 respondents were male. Among those who took the survey, 145 people (or 67.4% of the total) have a bachelor's degree or higher. Furthermore, 166 out of a total of 215 participants (or 77.2% of the sample) had accounting degrees. Nearly half of the survey participants had over 10 years of experience as tax auditors. About 9.3% of the group in question has occupational certificates, with 3.7% having a CPA designation, 1.9% a CMA designation, and 3.7% a JCPA designation. These statistics indicate that participants were well-informed and capable of understanding the survey questions. This suggests that their answers are reliable for statistical purposes and that the findings could potentially be utilized for larger numbers of people.

Table 1. The demographic characteristics of the study sample.

Demographic Characteristics of the Sample	Frequency (Count)	Percentage (%)
Gender		
Male	111	51.60%
Female	104	48.40%
Educational Qualification		
Bachelor's Degree	145	67.40%
Higher Diploma	4	1.90%
Master's Degree	46	21.40%
Doctorate	7	3.30%
Other	13	6%
Specialization		
Accounting	166	77.20%
Financial and Banking Sciences	7	3.30%
Business Administration	6	2.80%
Economics	3	1.40%
Law	8	3.70%
Other	25	11.60%
Tax Experience		
Less than 5 years	66	30.70%
5 years to less than 10 years	49	22.80%
10 years or more	100	46.50%
Professional Certifications		
CPA	8	3.70%
CMA	4	1.90%
JCPA	8	3.70%
Other	195	90.70%

Source: (Authors).

Regarding the first independent variable, which is the tax administration's attempt to raise revenues from taxes, a descriptive evaluation of responses is shown in Table 2. The average rating for this factor was 3.90 (agreeable), with a standard deviation of 0.50, as shown in Table 2. The sample's consistency of reply is shown by the small standard variation. The effect of elevated tax-assessor turnover percentages on revenue from taxes was the smallest scored factor (the average score: 3.66). The most highly scored product, on the other hand, had a mean score of 4.13 and is concerned with how successful tax audit training sessions have proven in increasing the collection of taxes. Auditors indicated that seminars significantly enhance their understanding of the subject, positively influencing their financial decision-making.

Table 2. The tax administration's initiatives to increase revenue from taxes.

Factor	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	Mean	SD	Rank
1. When interacting with consumers, the revenue tax management follows straightforward and stated standards.	19.5	67.4	10.7	1.9	0.5	4.03	0.64	4
2. Consumers may easily understand the tax administration's guidelines and rules.	12.1	63.7	17.2	6.5	0.5	3.8	0.74	4
3. The revenue collection management offers a team of highly competent and knowledgeable individuals that help increase the revenue from taxes in an effective manner.	16.7	61.4	16.3	4.7	0.9	3.88	0.76	3
4. The auditing of revenue and earnings taxes is impacted by the rapid turnover of accountants.	14.6	48.4	26	9.8	0.9	3.66	0.88	5
5. Improving revenue from tax collections is one outcome of instruction for accountants of taxes on income and sales.	32.1	54.4	8.8	4.2	0.5	4.13	0.77	1
All things considered						3.9	0.5	

Source: (Authors).

With respect to the secondary independent variable, which involves the completion of more files, the descriptive evaluation of the answers is shown in Table 3. With an average rating of 4.04 and a standard deviation of 0.51, the responses to questions pertaining to the abovementioned factor demonstrated an impressive level of acceptance, as shown in the table below. This indicates a significant amount of internal uniformity among the research participants.

Table 3. The results of the analysis for the factor of completing a higher number of files.

Factor	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	Mean	SD	Rank
6. Tax auditing firms' choices are influenced on the tax administration's requirement that they complete more files, which causes them to feel hurried along with opinionated.	21.4	50.2	18.1	9.8	0.5	3.82	0.89	4
7. The total amount of finished files for the sales and income tax investigations increases when monetary rewards are increased.	42.8	46	8.4	2.3	0.5	4.28	0.75	1
8. The necessary amount of documentation may be finished with the help of well-managed Revenue along with Sales Tax Departments.	31.1	57.2	7.4	3.3	0	4.18	0.7	3
9. Auditors' choices regarding sales and earnings taxes have been influenced by the absence of incentive payments offered by the administration of taxes.	23.3	42.8	19.5	13	1.4	3.73	1	5
10. The amount of finished documents is impacted by the income tax administration's substantial workload for tax inspectors.	34.9	55.3	7.9	0.9	0.9	4.22	0.7	2
As a whole						4.04	0.51	

Source: (Authors).

With a standard deviation of 3.73, the topic ranking last in terms of average rating is about how inspector choices are affected by the tax policy administration's failure to offer incentives with money. By contrast, problems concerning the impact of financial incentives affecting the quantity of finished documents by the tax auditors ranked highest, obtaining a mean score of 4.28. The result highlights the significant effect of monetary incentives on improving the quality of audits and preventing corrupt activities like corrupt behavior, which in turn affects tax options.

Observations associated with the following independent factor (variability in tax investigator occupational experience) are descriptively presented in Table 4. The data regarding this variable has a modest standard deviation of 0.47 as well as an average rating of 4.17, suggesting an impressive level of acceptance, as seen in the table below.

Table 4. The findings from the analysis of the variable factor of taxation auditors' specialist experience.

Factor	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	Mean	Standard Deviation	Rank
11. Auditing conclusions regarding earnings and revenue taxes can be affected by examiners' varying levels of experience as professionals.	39.5	53	7	0.5	0	4.31	0.62	2
12. Tax investigators' choices about auditing tax returns are influenced by educational resources in the assessment of taxes.	31.6	60.9	7	0.5	0	4.23	0.61	3
13. Tax accountants' capacity for handling a larger number of income files is influenced by the quantity of professional experience.	34.9	54.4	9.8	0.9	0	4.23	0.65	3
14. The auditing choices made by a tax accountant are heavily influenced by their comprehensive knowledge of the laws governing taxes.	46.5	48.4	5.1	0	0	4.41	0.58	1
15. When the tax auditors become uninterested with their assignment, they decide on choices that don't qualify as detailed.	20.9	39.5	26	12.1	1.4	3.66	0.98	4
As a whole						4.17	0.47	

Source: (Authors).

The following provides strong evidence of a significant degree of consistency in the replies within the research population. The subject matter concerning the influence of everyday tasks on the decision-making process of the tax auditors had the smallest median score, at 3.66. By contrast, having an average rating of 4.41, the question pertaining to the significance of an accounting auditor having comprehensive knowledge of the tax code stands out. Consequently, it is believed that competent tax auditor choices demand a broad knowledge of tax law.

The descriptive assessment of answers corresponding to the fourth-place independent variable (which includes the independence of tax auditors) is shown in Table 5. With an average rating of 4.06 and a standard deviation of 0.52, the answers regarding the given variable demonstrate a good degree of consistency with uniform results among the study's participant population. Concerning the effect of revenue auditing firms' and customers' personal relationships upon audit judgments, the piece of information receiving the smallest mean score (3.85) was connected to this topic. The highest-scoring item, with a mean score of 4.26, was the significance of equitable and impartial decision-making in guaranteeing equal taxation treatment. Accordingly, it is essential for reasonable tax audits to have an objective and impartial standing position.

Table 5. The Independent Status of Tax Auditors.

Factor	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree	Mean	SD	Rank
16. The audit's findings made by tax auditors are influenced by the independence they enjoy while conducting assessments of taxes.	29.8	50.7	13.5	6	0	4.04	0.82	3
17. When regulations are updated, however are often a lot of confidential guidelines and correspondence that guide audit choices.	22.8	59.5	14.4	2.8	0.5	4.01	0.72	4
18. Tax investigators' along with customers' close relationships are having an opportunity to influence auditing decision-making.	27	42.8	20	9.3	0.9	3.85	0.95	5
19. Taxpayers are given consideration with equity and fairness when decisions are made in a way that is fair and objective.	38.1	51.2	9.8	0.9	0	4.26	0.66	1
20. The decisions being made throughout the audit have been influenced by a tax the auditor's passion and commitment for the profession.	31.6	54	11.2	2.8	0.5	4.13	0.75	2
As a whole						4.06	0.52	

Source: (Authors).

Based on Table 6,The most significant aspect influencing the auditing professional's choice regarding taxpayer compliance, according to the average evaluation of 3.93, is the improvement of auditor understanding via different endeavors and sources of information, which has a mean of 4.10. Regarding the factors influencing decision-making processes, the influence of different operations and resources is the most insignificant, with a mean of 3.81.

Table 6. The investigation on the taxpayer's action type.

Taxpayer's Activity Nature	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	Standard Deviation	Rank
21. Tax auditing firms' opinions are molded by a variety of business operations as well as different sources of profits.	21.90%	48.40%	19.50%	9.80%	0.50%	3.81	0.9	4
22. The the auditor's competent judgment regarding audit findings can be improved through the implementation of many sources along with procedures.	25.60%	60.50%	13.00%	0.90%	0%	4.1	0.64	1
23. The choice about the auditing of taxes is influenced by the kind of each taxpayer's occupation and their income that is taxable.	17.20%	58.10%	16.30%	7.90%	0.90%	3.83	0.81	3
24. The approach towards various tasks according to various circumstances becomes affected by the taxpayer's employment type.	20.00%	60.90%	15.30%	3.30%	0.50%	3.96	0.72	2
As a whole						**3.93**	**0.57**	

Source: (Authors).

As shown in Table 7, with an average rating of 4.06, consumer ignorance of their tax rights and responsibilities is probably the most important aspect affecting their knowledge. With an average score of 3.86, customer attributes impacting negotiating are the most significant element.

Table 7. The consumers' level of knowledge regarding the tax factor.

Tax Awareness Weakness	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	Standard Deviation	Rank
25. Taxpayers' indifference of their legal privileges as well as duties impacts the way they file their taxes.	31.60%	62.80%	4.70%	0.90%	0%	4.25	0.58	1
26. Having an imposing individual as well as being aggressive constitute two attributes qualities that can impact auditing discussions.	21.40%	53.30%	15.80%	8.40%	0.90%	3.86	0.88	4
27. The auditor's judgment has been impacted due to the taxpayer's insufficient participation.	25.60%	62.30%	9.80%	1.90%	0.50%	4.1	0.67	2
28. The audit judgement has been influenced by a lack of understanding in coordinating with audits.	22.30%	61.90%	13.00%	2.80%	0%	4.03	0.68	3
As a whole						**4.06**	**0.47**	

Source: (Authors).

The most significant elements influencing the audit's findings involve the commissioner's knowledge regarding legal regulations (average score of 3.94), followed by the way they work among auditors (average rating of 4.04). Personality characteristics associated with the commissioner rank lowest, with an average score of 3.72 (see Table 8).

Table 8. The commissioners' professional and educational competency variable.

Professional and Academic Competency	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	Standard Deviation	Rank
29. Tax commissioners' educational qualifications influence investigation choices.	20.00%	54.90%	18.10%	6.00%	0.90%	3.86	0.83	3
30. Tax commissioner' effectiveness as practitioners influences auditing performance.	21.40%	61.90%	14.40%	2.30%	0%	4.02	0.67	2
31. Auditors' evaluations are impacted by their lack of experience regarding the whole body of regulations.	24.70%	59.10%	12.60%	3.70%	0%	4.04	0.72	1
32. Audit judgments are influenced by the commissioner's personality.	14.00%	55.30%	20.50%	9.30%	0.90%	3.72	0.85	4
33. Auditing decisions have been impacted by the commissioner's insufficient participation.	23.30%	62.30%	10.70%	3.30%	0.50%	4.04	0.71	1
As a whole						**3.94**	**0.53**	

Source: (Authors).

Based on Table 9, The average rating of 3.77 suggests that the judicial commissioner's extensive awareness of the laws and regulations is among the most important aspects connected to their title and credibility, with an average rating of 4.05. Considering a mean score of 3.57, the relationship between the commissioner of finance and the auditing personnel is perhaps the most important aspect.

Table 9. The credibility along with reputation of the commissioner variables.

Commissioner's Name and Reputation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD	Rank
34. The commissioner's along with the auditor's relationships with themselves affects auditing decisions.	20.00%	36.70%	25.60%	15.80%	1.90%	3.57	1.03	4
35. The the auditing and commissioner's friendly connection influences the audit's findings.	14.90%	50.70%	26.00%	7.90%	0.50%	3.71	0.83	3
36. Auditing judgments have been affected by the commissioner's collaboration along with credibility.	15.30%	38.60%	28.40%	17.70%	0%	3.51	0.95	5
37. The commissioner's relationships with audits are influenced by their education and experience within tax along with accounting.	22.30%	61.90%	12.60%	2.80%	0.50%	4.02	0.7	2
38. Auditing inferences have been influenced by the commissioner's comprehensive knowledge about the law.	23.30%	61.40%	12.60%	2.80%	0%	4.05	0.68	1
As a whole						**3.77**	**0.62**	

Source: (Authors).

This research demonstrates that the income tax commissioner's academic and occupational competence, the individual's understanding regarding their financial responsibilities, the taxpayer's different operations and sources of information, and the commissioner's comprehensive knowledge of the law constitute the most significant variables in auditing decision-making. The findings show that these components are essential when assessing effective auditing results.

The results pertaining to the tax-investigation decision, which is the dependent variable, will be examined in the following paragraphs. The effectiveness and integrity of the tax audit recommendations are among the main objectives of the investigation.

The taxation audit choices component has a mean rating of 3.95, suggesting that the auditor's judgments are both successful and equitable based on those who responded. The small standard deviation of 0.44 indicates that participants agree on the elements that influence auditing judgments. The verdict is independent and impartial: the assertion indicating that impartial and autonomous decisions result in the greatest impartial treatment of consumers had the greatest average score of 4.32. The significance of objectivity and justice in attaining fair taxation results is highlighted by the above result.

Based on Table 10, the impact of evidence-based decision-making on the reliability and precision of taxation audit outcomes is the next most important element, obtaining an average ranking of 4.17. The following underscores the importance of establishing audit decisions on substantial information.

Table 10. The findings concerning the income tax audit decisions variable.

Tax Audit Decision Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD	Rank
39. The greatest reasonable and equitable treatment of customers is achieved by recommendations that base themselves on independent along with impartiality.	43.30%	47.30%	7.90%	0.90%	0.50%	4.32	0.69	1
40. The revenue along with taxation from sales auditor operates free from discrimination along with societal demands.	11.20%	38.60%	29.80%	17.20%	3.30%	3.37	1	6
41. The judgement of the sales and income taxes auditors has been affected by the relationship of substantial motivations to success level.	20.00%	54.40%	19.10%	6.00%	0.50%	3.87	0.81	5
42. Auditing tax choices are not as effective given that there isn't an extensive record of all consumers.	21.40%	61.90%	15.30%	1.40%	0%	4.03	0.65	3
43. Taxation auditors' subjective interpretations of particular regulations determine their assessment decisions.	18.60%	59.10%	17.70%	4.20%	0.50%	3.91	0.75	4
44. The revenue that is investigation judgement has been affected by a certain degree of commitment of the investigators to complete the file along with the way it influences revenue from taxes.	17.70%	61.40%	15.80%	4.70%	0.50%	3.91	0.74	4
45. The tax investigation decision-making is affected by the degree to which the internal auditors follow the law.	21.90%	62.80%	13.00%	1.90%	0.50%	4.03	0.68	3
46. The factual accuracy along with refinement of audits of taxes conclusions have been affected by judgements which have based on evidence that is trustworthy.	30.20%	57.70%	11.20%	0.90%	0%	4.17	0.65	2
As a whole						**3.95**	**0.44**	

Source: (Authors).

Findings from audits of taxes should be established on objectivity through customers in the form of databases, trustworthy evidence, and impartiality for the audit to be deemed legitimate and efficient. All these variables facilitate making audits of taxes more reliable and effective. The capability of functioning independently despite the limitations of society, money-related rewards, and mutually beneficial ways remains less essential currently. The findings demonstrate the way these variables correlate with superior tax-auditing inference overall.

3.2. Testing of the Research Hypotheses

Hypothesis 1. *According to Jordanian revenue and earnings taxable auditing firms, the federal government's goal of raising tax revenues does not affect the audit decision-making process.*

According to Table 11 and the analysis of the statistics, Jordanian revenue and sales tax-auditing firms see the suggestion of the drive towards greater tax revenues being an important aspect that determines their examination decisions. At the level of significance (α) of < 0.05, the relationship coefficients (R) were 0.318. R^2 equaled 0.101, and β was 0.318, which are the values of the coefficients of proportionality. The conclusion drawn from this is that taxation investigation determinations have a negative impact because the main purpose of the tax system is for optimal earnings at the cost of various additional objectives.

Table 11. Regression analysis on management's efforts influencing audits.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
How the pursuit of Higher Tax Collection by Leadership Influences the decision to Implement a tax audit	0.318	0.101	24.002	0.318	1	0

Source: (Authors).

These findings support the alternative hypothesis, which states: "From the perspectives of financial status and sales tax examiners in Jordan, there exists a significant impact of management's goal of enhanced tax payments on the revenue inspection result". Therefore, we dismiss the neutral assumption and approve it based on these findings. The results of this study could be because accountants are vulnerable to pressure from taxing authorities to set priorities for developing revenues from taxes above additional objectives that were an immediate influence of the management's emphasis on the subject at hand. The results are in accordance with those of the research by Dwaikat (2021), which additionally discovered that taxes on income inspector judgments were significantly influenced by revenue and by the leadership's goal of increasing collections. This finding agrees with that of Salem (2011), who discovered that problems with administration significantly influenced the recommendations generated by Jordanian tax investigators.

Hypothesis 2. *No Effect of Completing a Higher Number of Files on the Tax Audit Decision from the Perspective of Income and Sales Tax Auditors in Jordan.*

To test this hypothesis, a linear regression analysis was conducted to evaluate the impact of completing a higher number of files on the tax audit decision. Table 12 presents the results.

Table 12. Impact of Completing a Higher Number of Files on the Tax Audit Decision from the Perspective of Income and Sales Tax Auditors in Jordan.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
Impact of Completing a Higher Number of Files on the Tax Audit Decision	0.42	0.176	45.621	0.42	1	0

Source: (Authors).

The results from the statistical analysis revealed a significant effect of completing a higher number of files on the tax audit decision from the perspective of income and sales tax auditors in Jordan. The correlation coefficient (R) was 0.420, with a significance level (α) of ≤ 0.05. The coefficient of determination (R^2) was 0.176, and the beta coefficient (β) was 0.420. This indicates that the pressure to complete a higher number of files, which is often linked to auditor monthly bonuses, can lead auditors to make hasty and less objective decisions.

Based on these findings, we reject the null hypothesis and accept the alternative hypothesis: "There is an effect of completing a higher number of files on the tax audit decision from the perspective of income and sales tax auditors in Jordan". The likely explanation is that the desire to process more files, which is tied to financial incentives, can pressure auditors to make quicker decisions that may lack thoroughness and objectivity. This finding aligns with the study by Al-Akkawi (2006), which investigated key factors affecting income tax auditor decisions in Jordan. The study found that administrative, personal, and financial factors have a direct impact on tax auditor decisions and recommended revising auditor duties and focusing on the quality of auditors and taxpayers.

Hypothesis 3. *No Effect of Differences in Professional Experience of Tax Auditors on the Tax Audit Decision from the Perspective of Income and Sales Tax Auditors in Jordan.*

A simple linear regression analysis was conducted to assess the impact of differences in the professional experience of tax auditors on the tax audit decision. The results are presented in Table 13.

Table 13. A Straightforward Linear Regressive Study of How the revenue along with sales tax auditors within Jordan consider the Effect of shifting Levels of professional qualifications on auditing decisions.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
Variations in tax auditors' Levels of Professional Knowledge along with how they influence Audit Outcomes	0.583	0.29	86.923	0.538	1	0

Source: (Authors).

Statistical research shows that variations in professional background had an important effect on the decision to conduct an audit of tax returns. On the 0.05 significant level with the ground, the corresponding correlation coefficients (R) equaled 0.583. R^2 was 0.290, and β was 0.538, which are the coefficients of proportionality. This additionally indicates that accounting inspectors with a greater background make better conclusions during audits.

The results obtained confirm the second theory, which states: "Based on the viewpoint of income and sales tax auditors in Jordan, it appears that an impact of variations in the professional background of revenue accountants on the tax-auditing decision". Therefore, we reject the null theory and implement this hypothesis as the basis for our study. Based on these results, it would appear that tax audit findings are more precise and comparable when auditors possess multiple decades of expertise within the field. This finding corresponds with the findings of Hamada's (2014), which suggests that educational initiatives ought to concentrate on audit requirements and assist them in developing more competent professionals. This result is in alignment with that of Al-Khalayleh (2014), who discovered that revenue auditors' failure to demonstrate competence as professionals impacts the auditing choices they make.

Hypothesis 4. *According to interviews with Jordanian revenue and earnings tax auditing firms, researchers hypothesized that the independence of auditors had little influence on auditing judgements.*

The findings in Table 14 show that the choice to conduct an audit on taxes is significantly affected by the independence of the auditor. At the 0.05 significant level, the corresponding correlation coefficients (R) equaled 0.493. The beta coefficient (γ) was 0.493, while the resulting coefficient of determination (R^2) was 0.243. More precise and impartial tax-auditing conclusions will result from examiners who operate more independently.

Table 14. The auditor impacted the fiscal auditing choices.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
Investigating the Impact of Auditing the Independence upon the final tax audit Finding	0.493	0.243	68.378	0.493	1	0

Source: (Authors).

Thus, we may conclude that there is an impact of independence of auditing upon the tax-auditing judgment from the viewpoint of the sales and income tax-auditing in Jordan and reject the null assumption in favor of the alternative hypothesis. This decision highlights the importance of independence for auditors in making fair and open auditing judgments. The importance of upholding moral standards like independence and honesty was emphasized in Hamada's (2014) research, and this is in line with the results we found. The current study opposes Al-Khalayleh's (2014) findings that inspectors' personal ties with customers do not impact their decision-making.

Hypothesis 5. *Jordanian profits along with retail sales tax auditors Do Not Consider the taxpayer's activity type When making a Decision About an audit.*

To determine how a taxpayer's activities affect outcomes during taxation auditing, a basic linear regression approach was carried out.

Based on Table 15, statistical analysis reveals that the choice regarding tax-auditing is significantly influenced by the specifics of the taxpayer's business. The significance level (α) was less than or equal to 0.05, and the relationship value (R) was 0.335. The experiment had a beta coefficient (β) of 0.335 and a coefficient of measurement (R^2) of 0.112. This suggests that accountants must possess a broad understanding and ability to effectively handle the broad spectrum of customer behaviors simply because of their broad spectrum and complicated systems.

Table 15. Taxpayer's activities affected the outcome during the taxation auditing.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
How the taxpayer's activities affects the audit finding	0.335	0.112	26.964	0.335	1	0

Source: (Authors).

From the point of view of sales and earnings tax auditors in Jordan, taxpayer activities affect their tax audit decision-making, which we acknowledge as being correct. Therefore, we reject the null theory. Regarding a broad range of taxpayer behavior, accountants need to be proficient in evaluating such situations with the goal of arriving at appropriate examination judgments. This outcome falls in accordance with the investigation of Al-Akkawi (2006), who discovered that accountants must be competent across a variety of disciplines attributed to the wide range of consumer operations that influence auditing choices. In addition, this falls in line with the results of Dwaikat's (2021) investigations, which particularly emphasized the challenges that investigators face while handling various sources of revenue.

Hypothesis 6. *As far as Jordanian sales and income tax inspectors are involved, customer knowledge had little impact on the choice they make about carrying out a tax audit.*

In order to assess how consumer knowledge affected their decision to launch an audit of their taxes, a basic linear regression examination was performed. The results are shown in Table 16.

Table 16. Revenue along with sales tax auditors within Jordan opinion on the effect of taxpayer Knowledge upon choosing to Conduct a revenue audit.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
The Role of customer knowledge in the Final Tax audit Call	0.412	0.166	43.554	0.412	1	0

Source: (Authors).

The results show that consumer knowledge significantly influences the decision to perform an audit of their taxes. Considering an acceptable level of significance (α) of <0.05, the corresponding correlation coefficient (R) equaled 0.412. A beta ratio of 0.412 and a coefficient about determination (R^2) around 0.166 were recorded. The following presents more evidence because taxpayer-funded education contributes to stronger and more precise auditing judgments, which subsequently leads to fewer disagreements among investigators and taxpayers.

Thus, we may conclude that there is an impact of taxpayer knowledge on the tax-auditing decisions from the point of view of the revenue and sales tax examiners in Jordon. Therefore, we reject the null hypothesis in favor of the other possibility. Greater precision and pleasant audit findings are usually a consequence of increased consumer familiarity with tax regulations and guidelines, based on this conclusion. The finding agrees with the research by Al-Akkawi (2006), which highlighted the crucial role of understanding taxes in minimizing avoidance of taxes. Furthermore, this falls in line with the findings of Dwaikat's (2021) research, which emphasized the important role of ethical behavior and financial understanding in determining revenue preferences. Additionally, this is consistent with Dwaikat's (2021) investigation, which indicated that investigators' judgments are adversely affected by insufficient awareness of taxpayers.

Hypothesis 7. *Considering the Viewpoint of Jordanian income along with Retail Sales Tax Auditors, there is no Impact of tax the leaders' professionals along with scientific competency to the audit decision.*

To determine how tax legislators' scientific and professional abilities influenced their auditing decision-making, a basic linear regression model was run. Table 17 displays the results.

Table 17. The Influence of tax authorities' professionals along with scientific competence on the audit Judgement from the point of View of Jordanian the revenue along with sales tax auditors.

Description	R (Correlation)	R^2 (Coefficient of Determination)	F	β (Beta)	df (Degrees of Freedom)	Sig (Significance Level)
The Role of Tax Inspectors' Academic along with professional background in tax Audit Results	0.434	0.189	49.489	0.434	1	0

Source: (Authors).

4. Research Findings

Findings indicate that tax inspectors' level of intellectual and technological expertise strongly impacts auditing findings. Considering a threshold for significance (α) of < 0.05, the corresponding correlation coefficients (R) equaled 0.434. R^2 was 0.189, and β was 0.434, which are the coefficients of reliability. It demonstrates that revenue officials' judgments throughout auditing are more accurate and efficient, and they possess greater degrees of professional and technological knowledge. From the point of view of the country's income and sales tax auditors, it appears that a consequence of taxation commissioner competence and scientific knowledge of auditing decisions affects audit results. Therefore, we accept the other assumption and reject the null hypothesis.

Research investigating the outcomes of several hypotheses regarding the tax-auditing decision-making process has led to several conclusions. The first hypothesis, which proposed that management's goal of increasing tax revenue would significantly impact tax audit decisions, was rejected based on the findings ($\alpha \leq 0.05$). This result aligns with previous studies by Salem (2011) and Dwaikat (2021). Similarly, the second hypothesis, which suggested that the motivation to complete more documentation would influence audit decisions, was also rejected as there was no statistically significant effect ($\alpha \leq 0.05$), corroborating the findings of Al-Akkawi (2006) and Shkhatreh (2020). Additionally, the third hypothesis, which proposed that variations in the professional experience of tax auditors would affect financial decisions, was also disproven with no significant statistical effect ($\alpha \leq 0.05$), consistent with Al-Khalayleh (2014) and Saputra (2012).

Further analysis of hypotheses regarding external influences on tax audits yielded similar results. The fifth hypothesis, suggesting that taxpayer activities affect income tax preferences, was rejected ($\alpha < 0.05$) in agreement with the research of Ratnawati (2020) and Mesfin (2017). Similarly, the sixth hypothesis, which proposed that a lack of consumer tax knowledge influences their financial decisions, was disproven ($\alpha < 0.05$), with findings supported by McKerchar and Evans (2009) and Kumar 2020).

The seventh hypothesis, which suggested that the technical and intellectual abilities of tax commissioners would have a significant impact on their financial decisions, was also rejected based on the analysis ($\alpha < 0.05$). This conclusion is consistent with the findings of Al-Akkawi (2006). Lastly, the eighth hypothesis, which posited that the identity and character of tax commissioners influence their judgment regarding tax audits, was rejected as well ($\alpha \leq 0.05$). This result is aligned with Hair et al. 2010 and Fuest and Riedel (2009) findings, which indicated that the commissioner's credibility and reputation do not significantly impact the decision to conduct a tax audit. In conclusion, the findings from this research demonstrate that none of the hypothesized factors, including management objectives, auditor experience, taxpayer activities, and commissioner characteristics, have statistically significant effects on tax audit decision-making, reinforcing the results of previous studies in this field.

The findings of this study have significant implications that extend beyond the Jordanian context, as they address challenges and patterns common to many developing economies. Jordan's tax-auditing system illustrates issues such as administrative pressure to meet revenue-collection goals, ethical dilemmas affecting auditor independence, and resource constraints that lead to heavy workloads. These patterns are not isolated to Jordan but are prevalent in many other emerging economies, such as those in North Africa, the Middle East, Sub-Saharan Africa, and South Asia. For instance, tax auditors in these regions often experience similar conflicts between meeting administrative revenue expectations and maintaining objectivity in decision-making. Furthermore, auditors' independence is frequently compromised by external pressures, emphasizing the importance of ethical training and structured reforms. Thus, the study's findings offer insights into these shared systemic challenges, contributing solutions that can support policymakers in improving audit practices globally.

Beyond contextual similarity, the study provides a broader contribution to international tax research and policy. The findings highlight that addressing auditor independence, promoting ethical training, and improving taxpayer education are crucial strategies that can enhance tax system effectiveness globally. These strategies align with international recommendations from organizations such as the OECD and World Bank, which emphasize ethical behavior, transparency, and impartiality as cornerstones of effective tax administration. Additionally, the study offers a valuable comparative framework for future cross-regional research. Using Jordan as a reference point allows for the examination of similarities and contrasts across tax systems in different regions, offering deeper insights into how structural, political, and economic factors influence auditor behavior and tax compliance.

5. Conclusions, Recommendations and Further Studies

Several conclusions emerge from the research findings. First, tax administrations should avoid pressuring accounting professionals to make quick revenue-focused decisions, as this can compromise the quality and fairness of tax audits. The findings highlight the need for enhanced training programs to improve accountant knowledge of legislation, accounting practices, financial management, and negotiation skills with commissioners and taxpayers. The qualifications and ethics of tax auditors are crucial. They must possess appropriate education and work experience and uphold ethical standards, including impartiality, independence, and integrity, to perform their duties effectively. Finally, raising public awareness about tax laws and regulations is essential. Governments should ensure transparency and provide accessible tax information across various platforms to improve public understanding. The results confirm that professional independence and training significantly impact auditing decisions, aligning with the objectives of enhancing transparency and reducing bias in tax assessments.

The findings of this study effectively summarize the key insights derived from the analysis of Jordanian tax auditors' decision-making processes. However, to strengthen the conclusion's impact, it is essential to revisit the original research problem and directly link the findings to the stated research objectives. This study aimed to investigate the internal and external factors influencing tax audit decisions in Jordan, with a focus on aspects such as auditor independence, professional experience, administrative pressure, and taxpayer knowledge. The findings highlight how these factors shape audit decisions and align with the research objectives by demonstrating the critical role of independence and ethical standards in ensuring impartiality and fairness, as well as the influence of administrative pressures and workload demands on auditors' decision-making processes.

Furthermore, comparing Jordanian tax practices with those of other Middle Eastern nations reveals both similarities and differences that provide a richer context for understanding the regional tax administration landscape. Like Jordan, other countries in the Middle East face challenges such as high revenue pressure, ethical dilemmas, and varying levels of taxpayer compliance. However, differences in governance, tax policies, and economic structures can lead to distinct practices and outcomes. Drawing these comparisons allows for a broader understanding of how regional factors influence tax audit decisions, offering opportunities to identify shared challenges and develop region-specific strategies. These comparative insights underscore the study's contributions beyond Jordan, providing guidance for policymakers and researchers examining tax systems in similar Middle Eastern contexts.

To address these findings, the following recommendations are proposed: First, tax administrations should refrain from pressuring accounting professionals to make rushed decisions for the sake of increasing tax revenue. Quality and fairness in tax audits should be prioritized over revenue generation. Second, tax accountants should be mandated to participate in continuous professional development programs that cover tax legislation, financial management, and negotiation skills to better equip them for their roles. Third, tax operations must ensure that revenue investigators meet the necessary qualifications and uphold ethical standards. This includes ensuring auditors have the appropriate educational background and work experience and adhere to principles of independence and ethical conduct. Fourth, to improve public knowledge of tax obligations, the government should continue its efforts to be transparent and clear in its communication of tax regulations. This can be achieved by publishing tax-related documents and information across various accessible platforms, ensuring citizens can easily understand and comply with tax laws. Finally, tax auditors should be informed about the potential influence that personal relationships and individual characteristics may have on their financial decisions. Awareness programs should aim to mitigate any biases or influences arising from these factors.

Further studies could explore several areas to build on these findings. One area of interest is to investigate the effectiveness of training programs for tax accountants and their impact on decision-making quality. Another potential area of research is examining the role of ethics and personal characteristics in shaping the decisions of tax auditors, particularly in different cultural or legal contexts. Additionally, future studies could assess the impact of government transparency initiatives on public compliance with tax laws and the effectiveness of penalties in improving adherence to tax regulations. These studies could provide deeper insights into improving tax audit systems and enhancing tax compliance in various regions.

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References

Abu Nassar, Muhammad. 2021. *Tax Accounting: Income and Sales Tax*, 3rd ed. Amman: Wael Publishing House.

Abu Sinneh, Tariq Hamdi. 2008. Factors Influencing Tax Evasion and Its Relation to the Legal form of the Audit Office and the Legal form of the Industrial Company. Master's thesis, Middle East University for Graduate Studies, Amman, Jordan.

Al-Adi, Ibrahim. 2015. The impact of tax system complexity on tax evasion: A field study in the Syrian business environment. *Tishreen University Journal for Scientific Research and Studies: Economic and Legal Sciences Series* 31: 80–83.

Al-Akkawi, Talal Jaijan. 2006. Evaluating the Factors Influencing Income Tax Assessors' Decisions to Address Tax Evasion in the Hashemite Kingdom of Jordan from the Perspective of Income Tax Assessors. Unpublished Master's thesis, Delmon University for Science and Technology, Manama, Bahrain.

Al-Faouri, Ahmad Abdel Hadi. 2017. The legal nature of income tax assessment methods. *The Legal Journal* 3.

Alimat, Khaled Ayada. 2013. Tax evasion: Causes, forms, and methods to limit it. *Al-Manarah Journal* 19: 116–19.

Al-Khalayleh, Osama Abdul-Rahim. 2014. Factors Affecting the Decisions of Income and Sales Tax Assessors in Jordan. Unpublished Master's thesis, The Hashemite University, Zarqa, Jordan.

Alwan, Alaa Hussein. 2017. The role of media in raising tax awareness among Iraqi citizens: An applied study in the General Tax Authority. *Journal of Accounting and Financial Studies* 12: 281–94.

Al-Zu'bi, Khalid. 2010. The impact of ethical, psychological, and social factors on the level of tax compliance from the perspective of income tax estimators in Jordan. *The Jordanian Journal of Business Administration* 6: 3.

Asker, Hamid Tami, and Fayhaa Abdullah Yaqoup Yaqub. 2020. The efficiency of the tax examiner and its impact on reducing tax evasion risks. *Journal of Accounting and Financial Studies* 15: 43–60.

Brouno, Samuel, and Yoav Feld. 2012. The tax authority and the taxpayers: An exploratory analysis. *Accounting and Business Research* 27: 91–121.

Cohen, Aaron, and Gad Sayag. 2010. The effectiveness of internal auditing: An empirical examination of its determinants in Israeli organizations. *Australian Accounting Review* 20: 296–307. [CrossRef]

D'Agosto, Manzo Modica Modica, and Stefano Pisani. 2016. Tax Audits and Tax Compliance: Evidence from Italy. IRS Research Studies. Available online: https://www.irs.gov/pub/irs-soi/17resconmodica.pdf (accessed on 10 May 2024).

Dawood, Rawaad. 2015. The role of tax auditing in detecting tax evasion: A field study in the financial directorates of Lattakia governorate. *Tishreen University Journal for Scientific Research and Studies* 37: 277–87.

Dwaikat, Ahmad. 2021. Factors Affecting the Decision of Income Tax Estimators in Palestine. Unpublished Master's thesis, An-Najah University, Nablus, Palestine.

Fuest, Clemens, and Nadine Riedel. 2009. *Tax Evasion, Tax Avoidance, and Tax Expenditure in Developing Countries: A Review of the Literature*. Oxford: Oxford University Center for Business Taxation.

Hair, Joseph, William Black, Barry Babin, and Rolph Anderson. 2010. *Multivariate Data Analysis: A Global Perspective*. Old Bridge: Pearson-Prentice Hall.

Hamada, Qut Jasim. 2014. The Extent to Which the Tax Auditor Adheres to the Requirements of the Auditing Profession and Its Impact on Improving the Effectiveness of Tax Auditing. Unpublished Master's thesis, Middle East University, Amman, Jordan.

Jasim, Siham. 2011. The Relationship Between Taxpayers and the Tax Administration and Its Impact on Reducing Tax Evasion. *Gulf Economic Journal* 19: 1–15.

Kumar, Bhupendra. 2020. Factors affecting tax audit effectiveness in East Gojjam Zone Revenue Office in Ethiopia. *Think India Journal* 22: 8040–60.

McKerchar, Margaret, and Chris Evans. 2009. Sustaining growth in developing economies through improved taxpayer compliance: Challenges for policy makers and revenue authorities. *e-Journal of Tax Research* 7: 171. [CrossRef]

Mesfin, Solomon. 2017. Factors Affecting Tax Audit Effectiveness in the Case of Category "A" Taxpayers in Gondar Town Administration Revenue Office. Unpublished Master's thesis, University of Gondar, Gondar, Ethiopia.

Nguyen, Anh, and Thao Tran. 2020. Factors influencing Vietnamese enterprises' compliance with tax laws. *Journal of Economic Studies* 18: 36–45.

Ratnawati, Vivin. 2020. Factors affecting tax auditors' performance: The moderating role of locus of control. *Problems and Perspectives in Management* 18: 36–45. [CrossRef]

Salem, Raaft. 2011. Factors influencing the decision of income and sales tax estimators: A survey study. *The Islamic University Journal (Humanities Series)* 19: 1311–37.

Saputra, Ketut Agus Kresna. 2012. The effect of locus of control on performance and internal auditor's job satisfaction with Lokal Tri Hita Karana as a moderating variable. *Journal Akuntasi Multiparadigma* 3: 86–100.

Shkhatreh, Mamoun. 2020. The impact of the income and sales tax system on enhancing tax collection efficiency in Jordan. *The Islamic University Journal for Economic and Administrative Studies* 28: 186–203.

Taha, Rami Ali. 2019. The impact of tax auditing procedures on reducing tax evasion in Jordan: An applied study in the Income and Sales Tax Department. *Amman Arab University Journal for Graduate Studies and Research* 3: 186–211.

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The Predictive Grey Forecasting Approach for Measuring Tax Collection

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Abstract: Taxation serves as a vital lifeline for government revenue, directly contributing to national development and the welfare of its citizens. Ensuring the efficiency and effectiveness of the tax collection process is essential for maintaining a sustainable economic framework. This study investigates (a) trends and patterns of direct tax collection, (b) the cost of tax collection, (c) the proportion of direct tax in total tax collection, and (d) the tax-to-GDP ratio in India. By utilizing a novel grey forecasting model (GM (1,1)), this study attempted to predict the future trends of India's direct tax collections, through which it aims to provide a concurrent and accurate future outlook on tax revenue, ensuring resources are optimally allocated for the country's growth. Results revealed that direct tax collection has consistently increased in the past two decades, and the proportion of direct tax in total tax has also improved significantly. On the contrary, the cost of tax collection has decreased regularly, indicating the efficiency of tax collection. Forecasting shows that the collection from direct tax is expected to reach INR 30.67 trillion in 2029–30, constituting around 54.41% of the total tax, leaving behind collections from indirect tax at a total of INR 25.70 trillion. Such findings offer insights that could enhance revenue management strategies with policy decisions relevant to economists, government, and other stakeholders to understand trends and the efficiency of direct tax collection in India.

Keywords: direct tax; income tax; fiscal policy; grey forecasting; India; tax efficiency; economic growth; tax management

1. Introduction

Tax revenue is the backbone of a nation's economy and the crucial source of funding to cover national expenditures (Huang et al. 2022), as one of the most important revenue sources for the government of any country. Initially, growing and rising economies require substantial tax revenues for the effective and efficient operation of the state at both national and sub-national tiers (Adeleke et al. 2021). Developing countries are seeing challenges in sustaining current tax collections due to competitiveness (Hasan et al. 2024), which holds great potential to draw the attention of policymakers, academicians, and regulators for many reasons. First, developing and emerging economies need substantial tax revenues to ensure smooth and efficient operations at both national and sub-national levels (Neog and Gaur 2020a, 2020b). Second, tax collection and its structure distort the economy through the tax burden (Kong et al. 2023).

Consequently, the dual effects of taxes complicate the 'tax–growth' link, and the configuration of taxation significantly influences the economic development process (Zhang et al. 2024). This has resulted in India's remarkable ascent to the top 100 in the World Bank's Ease of Doing Business (EoDB) rating in 2022, as India advanced 79 spots from 142nd in

2014 to 63rd in 2023. The government of India (GOI) has divided the tax collection system into two major types, i.e., direct taxes and indirect taxes.

Direct taxes are imposed on the taxable income of individuals and corporations, with the responsibility for tax payment resting on assesses. Direct taxes are levied directly on an individual's income, and indirect taxes are levied indirectly upon the consumers of goods or services. As per the CBDT Report (2022–23), more than INR 30 trillion were collected by the GOI as tax revenue, and the contributions of direct and indirect taxes were almost equal. In such a scenario, tax policy and tax reforms become a topic of keen interest for all stakeholders (Government of India, CBDT 2021). Conversely, indirect taxes are levied on the sale and supply of goods and services, with sellers responsible for collecting and remitting the taxes instead of the consumers directly. The taxation system in India involves the government imposing taxes at the central and state levels Moreover, local authorities, including municipalities and governments at the regional level, also impose trivial taxes.

In the past, there have been periods where varying numbers of challenges necessitated reforms of taxation systems by the tax administration, resulting in the evolution of different tax structures Ever since the year 2010, there has been a growing trend in the amount of tax collected; however, there has been a reducing trend of Indian investments in tax-haven countries because of the treaties made between India and such countries; thus, there is also a need for policy reforms to be put in place to manage this situation (Mukundhan et al. 2019). In recent years, there have been significant changes in tax policy and reforms in India, including introducing the Goods and Services Tax (GST) and changes in the corporate tax rate. One of the major challenges is political opposition to tax reform, as politicians are often reluctant to support measures that could lead to a reduction in revenue. In recent years, the central and several state governments have implemented diverse policy changes and streamlined processes to enhance predictability, equity, and automation.

Examining the tax–growth link in a budget-constrained country such as India allows us to devise appropriate policy measures for a more inclusive and fair growth process (Athira and Lukose 2024). Lowering tax liabilities and increasing returns on investment in the context of corporate investments is a great impetus for countries like India (Gupta et al. 2024).Thus, it is crucial to forecast direct and indirect tax collection in the Indian scenario for revenue planning and budget allocation, economic stability and policy adjustments (Ibtissem Missaoui and Rajeb 2018), and financing of welfare and infrastructure initiatives, in addition to forecasting the impacts of policy reforms and global economic fluctuations to regulate inflation (Mohsen and Zouari 2015), enhance investor confidence, and promote social justice.

Therefore, understanding the anticipated tax collection for the above reasons allows for the realization of the benefits mentioned above and serves as a basis for more effective planning and decision making. To obtain optimal results, this study focused on forecasting Indian direct and indirect tax by employing the grey forecasting model(GM) (1, 1) (Zhang et al. 2023; Xu et al. 2024; Li and Qi 2024). Grey forecasting is based on a system comprising both partially known and unknown data, backed by the theory of grey systems, which can be used in various fields to solve problems (Liu et al. 2023). Moreover, for examination of time series, the GM (1, 1) is beneficial, as it can be used with restricted data and short-term forecasts that yield precise forecasts; additionally, this approach ignores the statistical dissemination of data processing. It acts as a grey prediction used in this study to estimate the trend of the amount of collected electronic waste in emerging economies.

Thus, the importance of this study lies in understanding the forecasting of Indian direct and indirect tax collection based on a well-established grey forecasting model. Forecasting tax collection from 2022–23 to 2029–30 not only addresses our research objective but also fills a gap in the literature. Although there are limited studies on tax forecasting in India, the existing literature includes a forecast of corporate tax (Mukherjee and Bhattacharya 2023), GST forecasting (Thayyib et al. 2023), factors deriving the effective tax rate (ETR) for Indian manufacturing firms in different sectors (Panda and Nanda 2020), and effects of analysts' tax expense forecast accuracy on corporate tax avoidance (Lee 2021). Thus, this is the first study to investigate the forecasting of direct and indirect tax collection in India by focusing on the following four research objectives (ROs):

RO-1: To understand past direct tax collection trends and patterns in India;

RO-2: To forecast direct tax (representing personal tax, income tax, and other tax) collection in India;

RO-3: To forecast indirect tax collection in India;

RO-4: To unveil the relationship between indirect and direct taxes by analyzing the proportion of direct tax as a percentage of the total tax.

This study's findings reveal a consistent increase in direct tax collection and its major components, i.e., personal income tax and corporate tax. Total direct tax stood at INR 0.68 trillion in the financial year of 2000–01, which increased 24 times by 2022–23 to INR 16.63 trillion. The proportion of personal income tax decreased from 46.5% in the year 2000–01 to the lowest ever in 2015–16, at 38.8%. After 2015–16, personal tax had a complete turnaround, and the proportion increased to around 50% of the total direct tax. As far as the cost of tax collection is concerned, it reduced from 1.36% of the collection in 2000–01 to just 0.51% in 2022–23. However, the amount spent on tax collection, which stood at INR 8452 crores in 2022–23,increased regularly, especially as a result of digitization, which improved the online tax filing portals to shift the filing process to the online system. The GDP grew at an average rate of 12.24% from 2000–01 to 2022–23, and tax collection grew at 16.43%. A healthy positive correlation of +0.721exists between the GDP and tax growth rates. Historically, the direct tax was merely 36.31% of the total tax in 2000–01, which grew to as high as 60% in 2009–10. However, the proportion of direct tax hovered around an average of 53% until 2022–23. A forecast of direct tax shows that direct tax is set to contribute as much as INR 30.67 trillion by 2029–30,constituting around 54% of the total tax.On the other hand, indirect taxes are set to reach INR 25.70 trillion from their most recent collection of INR13.82 trillion in 2022–23.

Furthermore, this study is divided into six sections: Section 2 covers a literature review and the conceptual framework, and Section 3 outlines the data and methodology. Section 4 provides the findings and a discussion, while Section 5 shows the conclusion. Finally, Section 6 presents the practical implications of this study.

2. Literature Review and Conceptual Framework

This study conducted a systematic literature review process for previous studies by utilizing core keywords, i.e., "Tax", "India", and "Forecasting". We identified 28 documents (including15 articles, 8 conference papers, 3 book chapters, 1 erratum, and 1 review) from 1986 to 2024 in Scopus. We included the five most relevant articles (Appendix A) (as the remaining documents were excluded because they focused on electronic vehicle taxation, carbon taxation, tobacco taxation, etc.)to recognize core previous studies. Moreover, a concurrent study in the context of methodologies is covered in Appendix B.

Referring to other previous studies, Mukherjee and Bhattacharya (2023) forecasted CIT revenue using Vector Auto-Regression (VAR) and Seasonal Auto-Regressive Integrated Moving Average (SARIMA) models. Their findings revealed that the VAR model outperformed SARIMA in terms of accuracy, with their inequality index for CIT revenue growth being 0.17 for in-sample forecasts and 0.25 for out-of-sample projections. These findings highlight the value of utilizing multivariate models to achieve greater precision in tax revenue forecasting.

Thayyib et al. (2023) used sophisticated machine learning models, including the Hybrid Theta-TBATS and neural networks, including Artificial Neural Networks (ANN) and Neural Networks for Auto-Regression (NNAR)in the field of GST revenue forecasting. Their study demonstrated the Hybrid Theta-TBATS model's superiority in producing precise GST revenue estimates, highlighting the function of hybrid approaches in handling trend dynamics and seasonality in tax data.

Establishing a framework for fiscal policy, particularly taxation policy, influences growth performance (Kim et al. 2021). The level and structure of taxation influence house-hold saving behavior and investment in human capital (Benhamou and Cassin 2021). Conversely, a firm modifies its investment strategies and innovations in response to tax policies (Li et al. 2021).Tax policies are influenced by institutional factors such as economic conditions, political frameworks, and social contexts (Jesus et al. 2024). Policymakers must consider tax rates and broader institutional factors when designing tax systems (Jesus et al. 2024). These decisions and incentives in building physical and human capital generate differences in growth among countries and state economies (Yang 2020). Another study by Zhang et al. (2023) predicted tax collection in China using GM (1,1) and the LSSVM model. Accurate tax revenue forecasting is crucial for governments to execute fiscal programs effectively. Another study employed an agent-based model with a heterogeneous population and incorporated genetic algorithm-based decision making to simulate an economy and analyze taxation policy dynamics (Alexi et al. 2024).There is a lack of studies addressing the issue in the context of India. This study aims to address this gap by analyzing India's direct and indirect tax collections by employing a reliable forecasting method, i.e., the grey forecasting method.

2.1. Trends in Direct Tax Collection

India's direct tax collection has improved due to tax compliance enhancements resulting from tax policy reforms, lower tax rates, and improved tax administration (Acharya 2005). Over the period covering the fiscal years of 2000–01 to 2022–23), several trends and patterns were identified in India's direct tax income (Figure 1). Direct tax collection has increased steadily over the years, with very minor changes. Total tax revenue rose from INR 68,305 crores in 2000–01 to INR 16,63,686 crores in 2022–23, suggesting a significant growth in tax receipts over time. Throughout the period, corporate tax income increased steadily. The total amount increased from INR 35,696 crores in 2000–01 to INR 8,25,834 crores in 2022–23. This demonstrates firms' growing contribution to the country's overall tax income. Personal income tax revenue has also steadily risen, reflecting the rise in individual income levels. Personal income tax receipts increased from INR 31,764 crores in 2000–01 to INR 8,33,307 crores in 2022–23, demonstrating significant growth. Other direct taxes, albeit relatively small compared to corporate and personal income taxes, have undergone notable variations. However, their contribution to total tax revenue has remained relatively low. There have been situations where tax revenue has fluctuated significantly. For example, tax collections increased substantially during the fiscal years of 2006–07 and 2007–08, reflecting the period's substantial economic expansion. In contrast, the growth rate has slowed in some years (Government of India, CBDT 2022).

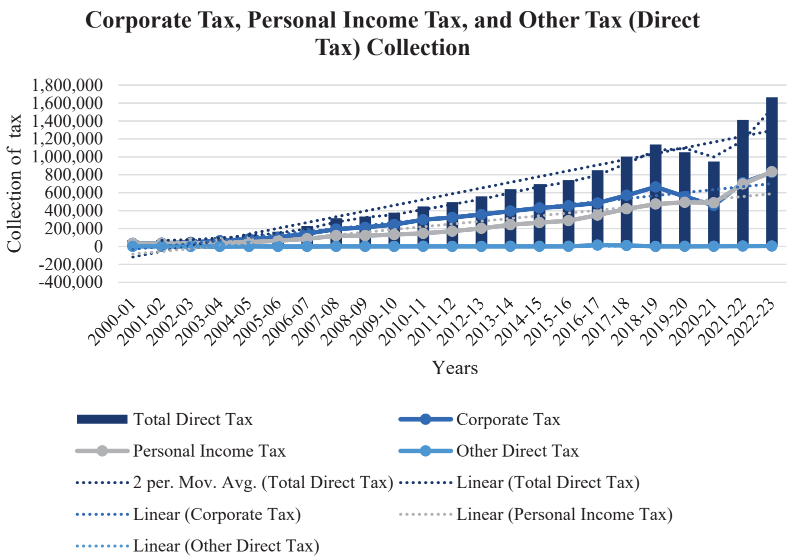

Figure 1. Collection of direct tax and its constituents. Source: Author calculation using Central Board of Direct Tax (CBDT) data.

Thus, we identified a rising trend in direct tax revenue in India over the years, owing to increased corporate and personal income tax collections. This reflects the country's enhanced tax compliance and broadening tax base. The government requires a sustained increase in direct tax collection to fund public services and development efforts.

2.2. Trends of Tax Collection During COVID-19

At the beginning of the pandemic, it was predicted that "direct taxes cannot be raised since profits and incomes were badly hit. Non-tax revenue, too, was not expected to contribute more since the public sector was also under stress" (Kumar 2020). Measuring macroeconomic uncertainty during a pandemic is challenging, and effective coordination of fiscal and monetary policies is essential in mitigating these uncertainties (Chakraborty and Harikrishnan 2022). Various events, such as natural calamities, economic recession, etc., severely affect a country's economy and tax collection. It was found that efficiency levels of tax collection fell during the economic slowdown in Spain (Cordero et al. 2021). Despite the fall in crude prices, rice helped the government increase the excise duty without passing the benefit of falling crude oil prices to the public to make up for its revenue loss due to the pandemic. Various states in India reprioritized their expenses to cope with falling revenues during the pandemic, but this was not enough for them to make up their losses (Mukherjee and Badola 2021). Pre-COVID studies observed that there was a continuous increase in tax collection without any exception; a study stated," Irrespective of economic and market conditions, the collection of direct taxes had always increased. The observed increase can be seen as a result of continuous reforms in taxation policy of India" (Mahapatra and Kaushik 2022). However, in the financial year of 2019–20, the number of income tax returns filed and the amount of income declared by taxpayers decreased. A fall of sixteen percent in corporate tax collection was also observed during the financial year (Rao 2021).

The COVID-19 pandemic caused significant disruptions worldwide (Abu-Rayash and Dincer 2020). The fact is evidenced by the fact that direct tax collection in India fell for the first time from INR 10,50,681 in 2019–20 to INR 9,47,176 in 2020–21. The recovery was expected to be slow and uncertain, and it took several years to return to pre-pandemic levels (Abu-Rayash and Dincer 2020).

Foreign Direct Investment (FDI) is a key economic growth and development driver, particularly in emerging market economies (EMEs). In recent years, the BRICS countries—Brazil, Russia, India, China, and South Africa—have emerged as major recipients of FDI and have become important sources of outbound investment. However, the COVID-19 pandemic has significantly impacted FDI flows worldwide, including in the BRICS countries. A literature review examined the trends and determinants of FDI in the BRICS countries, focusing on the implications of the COVID-19 pandemic (Chattopadhyay et al. 2022).

A combination of market size, economic growth, natural resources (Mohsen et al. 2024), and political factors drives FDI inflows to the BRICS countries. However, the COVID-19 pandemic significantly impacted FDI flows, with negative effects and opportunities emerging in some countries. Therefore, policymakers in the BRICS countries should address the pandemic and improve the business environment to attract FDI inflows post pandemic (Chattopadhyay et al. 2022).

2.3. Contribution of Direct Tax to Total Tax Revenue

Taxes levied and paid on income or wealth are called direct taxes because they are progressive. Indirect taxes are considered more regressive, as they are not directly imposed on the individual but on the consumption of goods and services. Personal liability and indirect trade measures encourage concerns about vat-based taxes discouraging businesses from growing.

In India, total tax revenue has steadily increased, suggesting economic progress and increasing tax compliance (Slemrod 2019). Direct taxes have generally increased, with minor changes, and account for a sizable share of total tax revenue. Income, corporate, and wealth taxes are direct taxes levied directly on individuals or entities. In contrast, indirect taxes include the goods and services tax (GST), excise duty, customs duty, and other consumption-based taxes. Direct taxes' percentage of total tax revenue has gradually increased, demonstrating the growing importance of personal and corporate income taxes. However, rather than raising tax collection, narrowing the tax gap is a more widely acknowledged solution (Singh 2019). Reducing the tax gap means lowering the gap between potential and actual tax collection.

Direct taxes provided around 36% of overall tax revenue in the fiscal year of 2000–01, increasing to 54.62% in the fiscal year of 2022–23 (Figure 2). Direct tax contributions have consistently ranged between 36% and 60%. Direct taxes made the greatest contribution in 2009–10, accounting for 60.78% of total taxable income. Changes in tax rates, tax changes, economic conditions, and compliance procedures can all have an impact on direct tax contributions. Changes in tax policies, such as the implementation of GST in 2017–18, may have influenced the relative proportions of direct and indirect taxes in certain years.

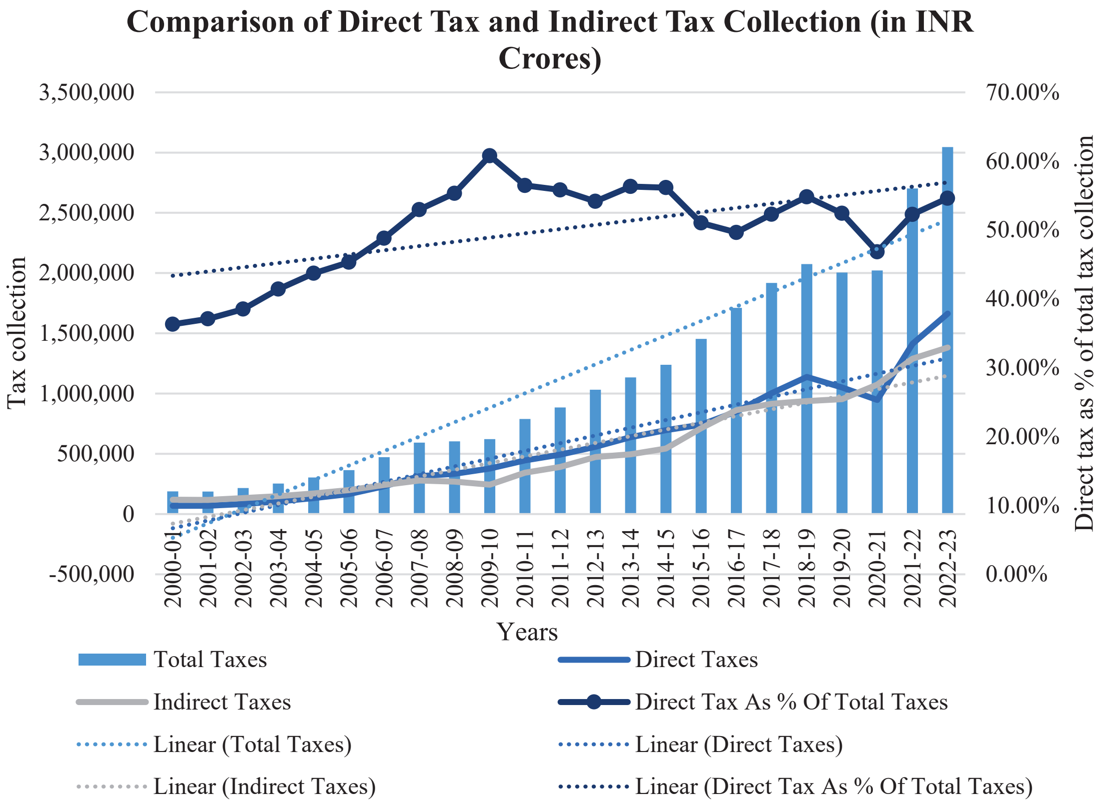

Figure 2. Contribution of direct tax to total tax revenue (Source: author calculation using data from CBDT database, CBIC).

There have also been decreases in contributions coming from direct tax payments for a longer period, covering years of 2021 and 2022, which are mainly attributed to the disruption of the economy by the pandemic. The reduction in economic activities and poor profits of corporations could have temporarily influenced the amount of direct taxes paid. However, it must be underlined that the more comprehensive treatment of tax revenues can account for other parameters, including but not limited to tax rates, holidays, tax credits, and collected tax as a fraction of GDP. Even so, the provided data are quite valuable, as they indicate how the proportion of direct taxes relative to total collection has changed in India over the years.

The increase in direct tax revenue indicates that people and businesses are earning more income and making profits. As demonstrated by the financial year of 2022–23, efforts to make tax administration more efficient are also needed, as well as the development of measures against tax evasion. Experts in the field of tax policy can rely upon this information to ascertain the efficiency or inefficiency of such policies, make necessary changes, and balance the level and structure of taxation.

2.4. DirectTax-to-GDP Ratio

The tax-to-GDP ratio in India is the lowest among major nations (Singh 2019). When compared globally, the cost of tax collection is quite low (Singh 2019). Because some compliance procedures are complex, India requires next-generation tax administration improvements (Singh 2019).

The direct tax-to-GDP ratio has fluctuated throughout time, reflecting changes in tax collection efficiency and the growth of the formal economy. The percentage fluctuated between 3.03% in 2001–02 and 6.3% in 2007–08, reflecting changes in tax policies, economic conditions, and tax administration. The direct tax-to-GDP ratio rose steadily until 2007–08, hitting a peak of 6.3% during that fiscal year (Figure 3).This growing trend shows that the tax base is expanding, compliance is increasing, and tax collection techniques are improving. The ratio fluctuated in subsequent years, driven by economic development, tax rate adjustments, and policy revisions.

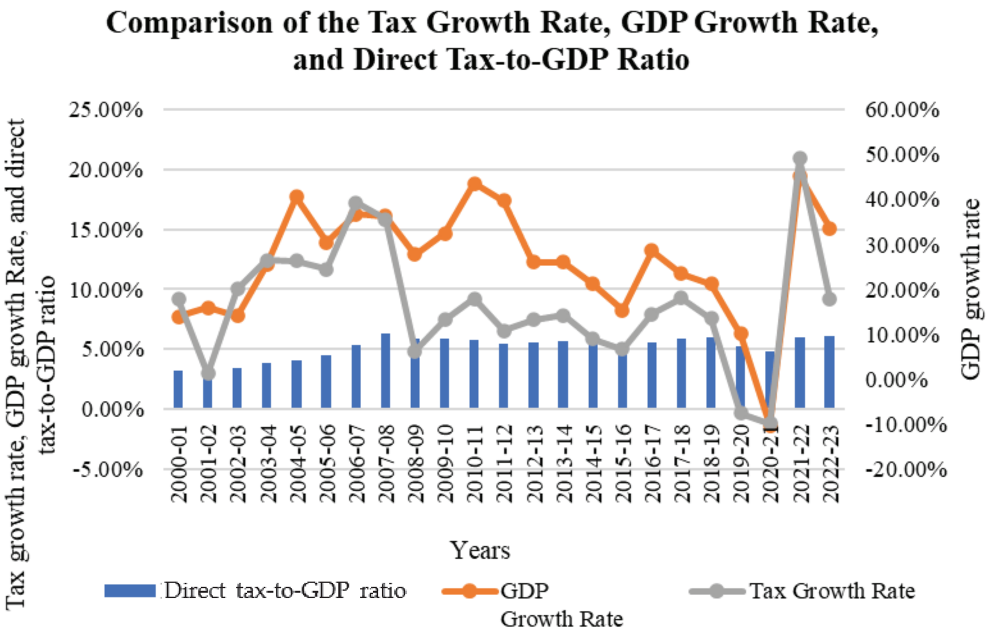

Figure 3. Comparison of the tax growth rate, GDP growth rate, and Direct tax-to-GDP ratio (Source: MOSPI).

In recent years, the ratio has decreased, falling to 4.78% in 2020–21 and marginally recovering to 5.97% in 2021–22. The drop in the ratio can be linked to causes such as the economic impact of the COVID-19 epidemic, reduced economic activity (Brahmi et al. 2023), and the government's response to the crisis (Mansour et al. 2022).

The direct tax-to-GDP ratio measures the tax system's progressivity and the distribution of tax burden. A higher ratio shows that a greater proportion of the country's economic production is paid in direct taxes, implying a more equitable allocation of tax burdens. It also suggests that the government can raise tax money from personal and corporate income. The direct tax-to-GDP ratio can affect revenue generation and economic growth. A greater ratio indicates that tax revenues are growing faster than GDP, showing positive buoyancy and the ability to support public expenditures. A lower ratio, on the other hand, may indicate income generation issues, probable budget deficits, and financial constraints for public services and investments.

The buoyancy factor assesses how responsive direct tax income is to fluctuations in GDP. A factor greater than one suggests that tax revenue is growing faster than GDP, indicating a growing tax base and increased tax compliance. A factor smaller than one suggests that tax revenue growth lags GDP growth, indicating the need for tax reforms or improved tax administration. The direct tax-to-GDP ratio can help policymakers evaluate the efficiency of tax programs, identify areas for reform, and ensure a stable revenue base. A balanced approach to tax reform that focuses on increasing the tax base, improving compliance, and encouraging economic growth might help boost the ratio over time.

3. Data and Methodology

This study considers the data from the financial years of 2000–2001 to 2022–23 for direct and indirect tax collection of India extracted from the Central Board of Directors Tax (CBDT), Government of India (https://www.india.gov.in/information-central-board-direct-taxes accessed on 25 January 2024) and the Ministry of Statistics and Programmed Implementation (https://www.mospi.gov.in). Based on the data of 22 years, we forecasted tax collection for 2023–24 to 2029–30 using grey forecasting (GM; 1,1).

Grey models and theory have evolved, resulting in a vast literature on theory and applications. The Scopus search engine discovered more than 1,26,000 publications containing "grey model" OR "grey forecasting" OR "GM" from 1854 to 2024 (October). This demonstrates an increased interest in grey models over the last decade. As evident in Appendix A, no previous study has used GM (1,1) for tax forecasting for India; Khan and Osińska (2023) found no significant difference in forecasting performance between the fractional grey model (FGM), GM (1,1), and ARIMA (1,1,1). Moreover, Sharma and Kumar (2024); Sharma and Kumar (2022) indicated that grey modeling generates more accurate conclusions with limited data points compared to other methodologies and is better suited for forecasting under chaotic and complicated settings with discrete data points.

The ability of GM(1,1) to handle limited and uncertain data makes it a good choice for the type of forecasting required in this study. The model suggests that tax collections will continue to grow until the end of this decade due to economic growth and improved tax compliance. While the COVID-19 pandemic posed challenges for accurate predictions, the model still performed reasonably. Compared to more traditional forecasting methods, like ARIMA, grey forecasting offers better accuracy, especially in a complex environment like India's tax system.

From a historical perspective, in 1982, Deng Ju-long introduced grey system theory, designed to perform effectively with a limited number of observations (Kazancoglu et al. 2021). The theory is especially useful for systems with incomplete or uncertain information. The purpose of grey system theory is to bridge the gap between the natural and social sciences, allowing it to be used in various fields to solve multiple challenges (Javanmardi et al. 2023). The name "grey system" comes from the color representing the subject under analysis. In control theory, the depth of the color indicates how clear the information is (Jiang et al. 2021). One well-known concept within this theory is the "black box", which is used when the internal features or mathematical formulas describing system dynamics are completely unknown (Pires et al. 2023). The grey forecasting model, or GM (1,1), is a method utilized for predicting limited and short-term datasets, producing an accurate prediction model without requiring the analysis of the statistical distribution of the data involved (Zhou et al. 2021). In this framework, "black" stands for information that is entirely unknown, "white" refers to fully clear and identified information, and "grey" represents a mixture of known and unknown details. Therefore, systems with no known information are called black systems, those with fully known details are called white systems, and those with partial knowledge are called grey systems. The term grey system was derived from the color of the subject being examined. In control theory, color depth denotes the degree of information clarity; a prominent variety is called a black box (Hassija et al. 2024).

The term black denotes unknown information, white signifies information that is entirely clear or identified, and grey represents partially clear and partially unclear information. Consequently, systems characterized by entirely unknown information are called black systems, those with explicit knowledge are termed white systems, and systems with partial information are designated grey systems (Javanmardi et al. 2023). The GM type (1,1) is a variant of grey system theory extensively utilized across multiple domains due to its computational efficiency compared to other grey system theories (Delcea et al. 2023). The GM type (1,1) is termed as the first-order grey model. A single variable is utilized for the development of predictions through the use of time-series data (Khan and Osińska 2023). The GM (1,1), a key part of this theory, is often applied for forecasting purposes. For the grey rolling model GM (1,1), Guo et al. (2015) postulated the use of an actual dataset $\left(x_1^0, x_2^0\right)$ to compute predicted data $\left(x_3^0\right)$.

To perform GM (1,1) modeling for prediction, six main steps are required, which are defined below. The first step involves using the initial data points, where 'x^0' represents the original data points:

$$x^0 = \left\{x^0(1), x^0(2), \ldots x^0(n)\right\}, n \geq 4 \tag{1}$$

Equation (2) is computed based on Equation (1).

$$x^0(i:k) = \left\{x^0(i), x^0(i+1), \ldots x^0(k)\right\} \tag{2}$$

Equation (3) is indicated below.

$$x^0(i:k) = \left\{x^0(1), x^0(2), \ldots x^0(k)\right\},\ i = 1 \tag{3}$$

Furthermore, an accumulating generation operation (AGO) is carried out on this sequence (Equation (3)), which results in the following sequence (x_1).

In the second step, using AGO, the x_0 series changes monotonically to increase the x_1 series. To calculate x_1, the Sigma function is used in the equation, which is shown below.

$$x_k^1 = \sum_{i=1}^{k}\left(x^0 i\right), i = 1, 2, \ldots, n \tag{4}$$

$$x_k^1 = x_1^1,\ x_2^1, \ldots, x_n^1 \tag{5}$$

In this step, Z_k^1 is calculated after finding x_k^1. The generated mean sequence (Z_k^1) of x_k^1 is computed using the formula defined below.

$$Z_k^1 = 0.5[(x_k^1) + (x_{(k-1)}^1)],\ k = 1, 2, 3,\ \ldots,\ n \tag{6}$$

By using the given formula, Z_k^1 is found as follows:

$$Z_k^1 = 0.5x_k^1 + 0.5x_{(k-1)}^1 \tag{7}$$

Subsequently, parameter values of both a and b are estimated using the least squares method, and the following equation is defined accordingly. Moreover, after structuring the required grey model, the output of the grey equation is computed by means of both parameters a and b.

Equation (8)is used as the substituted Equation (9).

$$b = x_{(k)}^0 + aZ_k^1\ ,\ x_{(2)}^0 = aZ_2^1 + b\ ,\ x_{(3)}^0 = aZ_3^1 + b \tag{8}$$

The output of Equation (6) is input to Equation (9) for further analysis.

$$x_{(n)}^0 = aZ_n^1 + b \tag{9}$$

Furthermore, to find the value of both parameters (a and b), the following matrices need to be structured utilizing the following formula:

$$x_2^0 - Z_2^1 1 \qquad x_3^0 - Z_3^1\ 1\ \mathrm{Y} = x_n^0,\ \mathrm{B} = -Z_n^1 1 \tag{10}$$

The matrix methodology is used to determine the value of both parameters (i.e., a and b).

$$a = (a, b)^T = \left(B^T B\right)^{-1}\left(B^T Y\right) \tag{11}$$

The grey differential equation must be calculated to determine the predicted value of the initial data point at (K + 1).

$$x^1_{(K+1)} = \left[x^0_1 - \frac{b}{a}\right]e^{-ak} + \frac{b}{a} \tag{12}$$

Furthermore, the inverse AGO method is used to control the calculated data, as shown in Equation (10).

In this step, the predicted value is calculated using parameter values and initial data points, as reflected in the following equations of the GM $(1, 1)$ model.

$$\begin{aligned} x^0_{(K+1)} &= \left[x^1_{(K+1)} - x^1_{(1)}\right],\ K = 1, 2, 3 \ldots, n \\ x^0_{(K+1)} &= \left[\left\{(1 - e^a)\left[x^0(1)\right]\right\} - \tfrac{b}{a}e^{-ak}\right],\ K = 1, 2, 3 \ldots, N \end{aligned} \tag{13}$$

When estimating errors in the GM (1,1), we eventually perform an error analysis to determine the discrepancies between the data's actual and anticipated values. Here, we assess the accuracy of the GM (1,1) prediction using error analysis. The following equation is applied to measure the average percentage error, where $\hat{x}^0_k$ shows the predicted value of the model and x^0_k shows the initial value of the data.

$$e(K + 1) = \left|\frac{x^0_k - \dot{\hat{x}}^0_k}{x^0_k}\right| \times 100\% \tag{14}$$

4. Results and Discussion

Accuracy of the Forecasting Model

It is important to gauge and assess the accuracy of the forecasting model; original values of the positive and negative errors are used to calculate the estimated error value using RPE (Relative Percentage Error) (Kayacan et al. 2010; McEwan et al. 2024). Previous research has shown that the forecasting results obtained by grey forecasting are more accurate than the results of the auto-regressive integrated moving average (ARIMA), which has a smaller mean absolute percentage error (MAPE) (Yuan et al. 2016). Khan and Osińska (2023) recommended employing the ONGBM (1,1) and NGBM (1,1)PSO models for short-term energy consumption forecasting and combining these forecasts with those from the GM (1,1) and ARIMA(1,1,1) models. Moreover, Sharma and Kumar (2024); Sharma and Kumar (2022) indicated that grey modeling generates more accurate conclusions with limited data points than other methodologies and is better suited for forecasting under chaotic and complicated settings with discrete data points.

First, we applied grey modeling to the values of indirect taxes. The calculation of indirect tax generation using the GM (1,1) is elaborated systematically below. "X_0" represents a non-negative data series for indirect tax in previous consecutive years, expressed as follows:

$$X_0 = (119{,}814,\ 237{,}132,\ 369{,}740\ldots)$$

Then, a new X_1 series is calculated, which is effectively a cumulative addition of the X_0 series, which is an AGO.

$$X^1 = (238{,}380,\ 422{,}002,\ 628{,}914\ldots)$$

Based on the following sequences, Z_k^1 of X_k^1 is determined as follows:

$$Z_k^1 = (1,249,118.3,\ 2,807,055.8,\ 3,306,198.3,\ 5,034,118.3)$$

Using the least squares method, the values of a and b are obtained as follows:

$$Y = |117318132608148608\ \ldots\ |\ B = |-238,380 - 422,002 - 628,914\ \ldots\ 1111|$$

Then, we calculate $\left(B^T.B\right)^{-1}$ for using Equation (8).

$$\left(B^T.B\right) = |1.25042E + 15 - 124,242,656 - 12,424,265,622|$$
$$\left(B^T.B\right)^{-1} = |1.82225E - 151.0291E - 081.0291E - 080.103572|$$
$$a = -0.098,\ b = 123,997.4,\ e = 2.7183$$
$$x^1_{(K+1)} = \left(1,455,398 - \tfrac{123,997.4}{-0.098}\right)e^{-(-0.098)(k)} - 123,997.4$$

Once constants a and b are calculated, the predicted values for each year are calculated using the forecast mentioned in the above equation.

Similarly, we also calculate the forecasting equation for direct taxes as shown below:

$$x^1_{(K+1)} = \left(1,604,571 - \frac{153,627}{-0.1}\right)e^{-(-0.1)(k)} - 153,627$$

Moreover, the results of implementing GM (1,1) show a consistent and continuous increase in the proportion of direct tax as a proportion of total tax collection (Table 1). Total revenue collection from direct tax, around INR 16.63 trillion in 2022–23, is set to become INR 30.67 trillion by 2029–30. On the other hand, indirect tax collection, which is currently around INR 13.82 trillion, is set to become INR 25.70 trillion. Total tax collection from direct and indirect taxes is set to increase from INR 30.45 trillion in 2022–23 to INR 56.37 trillion in 2029–30 (Table 1).

Table 1. Predicted values of tax collection in India (INR in crores).

Year	2023–24	2024–25	2025–26	2026–27	2027–28	2028–29	2029–30
Direct Tax	1,683,223	1,860,250	2,055,896	2,272,118	2,511,080	2,775,175	3,067,044
Indirect Tax	1,427,485	1,574,463	1,736,576	1,915,380	2,112,594	2,330,114	2,570,031
Proportion of Direct Tax	54.11%	54.16%	54.21%	54.26%	54.31%	54.36%	54.41%

Source: Authors' contributions (Idem for all tables).

The anticipated increase in tax income, based on the increased share of direct taxes, indicates a move towards a more progressive taxation regime (Cloyne et al. 2024). Direct taxes becoming a bigger fraction of total revenue reflect a system in which taxation is more directly linked to income and profits, perhaps leading to lower income disparity. This can lead to a more equitable allocation of wealth, as higher earners contribute a larger portion of the government's resources; such a move has serious repercussions. Greater emphasis on direct taxation can boost fiscal stability because these taxes are more predictable than consumption-based indirect taxes. Governments can better plan and distribute resources thanks to this predictability (Wildasin 2021).

Furthermore, the rising revenue base provides more capacity for investment in the significant expected increase in direct and indirect tax collections, reflecting the economy's formalization and greater tax compliance (Okunogbe and Santoro 2023). As the tax base grows, the government can lessen its reliance on borrowing and external funding, resulting in increased financial independence. This increase in revenue may also allow for more targeted fiscal policies, allowing the government to address specific economic difficulties such as unemployment, inflation, and social welfare demands, promoting long-term economic resilience (Larch et al. 2024).

As the actual and predicted values of tax collection rose over the period, Table 2 shows the actual values and predicted values for the period, with error terms indicated by direct (Figure 4) and indirect (Figure 5) tax collection. GM (1,1) predictions are based on the base period, i.e., 2000–01 with zero error and yearly forecasts.

- From 2000–01 to 2005–06, both direct and indirect taxes had considerable negative errors, indicating lower tax collections than expected. From 2006–07 onwards, the difference between actual and forecast numbers for direct and indirect taxes began to close, with lower errors over time.
- By 2010–11, the error in direct tax revenues began to fall substantially, eventually approaching zero in 2012–13, when real and forecast numbers were nearly identical. Although the number of indirect tax mistakes decreases over time, greater differences still occur.
- From 2017–18 to 2021–22, direct tax receipts showed positive errors, suggesting that they exceeded forecasts. This indicates a possible improvement in economic conditions or changes in tax policies.

Table 2. Actual and predicted values of direct and indirect tax collection in India.

Year	Actual Values ($X^0{}_k$)		Predicted Values ($X^1{}_k$)		Error E (k)	
	Direct Tax	Indirect Tax	Direct Tax	Indirect Tax	Direct Tax	Indirect Tax
2000–01	68,305	119,814	68,305	119,814	0	0
2001–02	69,198	117,318	186,504	165,282	−117,306	−47,964
2002–03	83,088	132,608	206,119	182,300	−123,031	−49,692
2003–04	105,088	148,608	227,796	201,071	−122,708	−52,463
2004–05	132,771	170,936	251,754	221,774	−118,983	−50,838
2005–06	165,216	199,348	278,232	244,608	−113,016	−45,260
2006–07	230,181	241,538	307,494	269,794	−77,313	−28,256
2007–08	314,330	279,031	339,833	297,573	−25,503	−18,542
2008–09	333,818	269,433	375,574	328,212	−41,756	−58,779
2009–10	378,063	243,939	415,074	362,006	−37,011	−118,067
2010–11	445,995	343,716	458,728	399,279	−12,733	−55,563
2011–12	493,987	390,953	506,973	440,390	−12,986	−49,437
2012–13	558,989	472,915	560,292	485,734	−1303	−12,819
2013–14	638,596	495,347	619,219	535,747	19,377	−40,400
2014–15	695,792	543,215	684,343	590,910	11,449	−47,695
2015–16	741,945	711,885	756,317	651,752	−14,372	60,133
2016–17	849,713	861,515	835,860	718,859	13,853	142,657
2017–18	1,002,738	915,256	923,769	792,875	78,969	122,381
2018–19	1,137,718	937,322	1,020,923	874,512	116,795	62,810
2019–20	1,050,681	953,513	1,128,295	964,555	−77,614	−11,042
2020–21	947,176	1,074,809	1,246,960	1,063,869	−299,784	10,940
2021–22	1,412,422	1,289,662	1,378,105	1,173,408	34,317	116,254
2022–23	1,663,686	1,382,013	1,523,042	1,294,226	140,644	87,787
2023–24	-	-	1,683,223	1,427,485	−1,683,223	−1,427,485
2024–25	-	-	1,860,250	1,574,463	−1,860,250	−1,574,463
2025–26	-	-	2,055,896	1,736,576	−2,055,896	−1,736,576
2026–27	-	-	2,272,118	1,915,380	−2,272,118	−1,915,380
2027–28	-	-	2,511,080	2,112,594	−2,511,080	−2,112,594
2028–29	-	-	2,775,175	2,330,114	−2,775,175	−2,330,114
2029–30	-	-	3,067,044	2,570,031	−3,067,044	−2,570,030

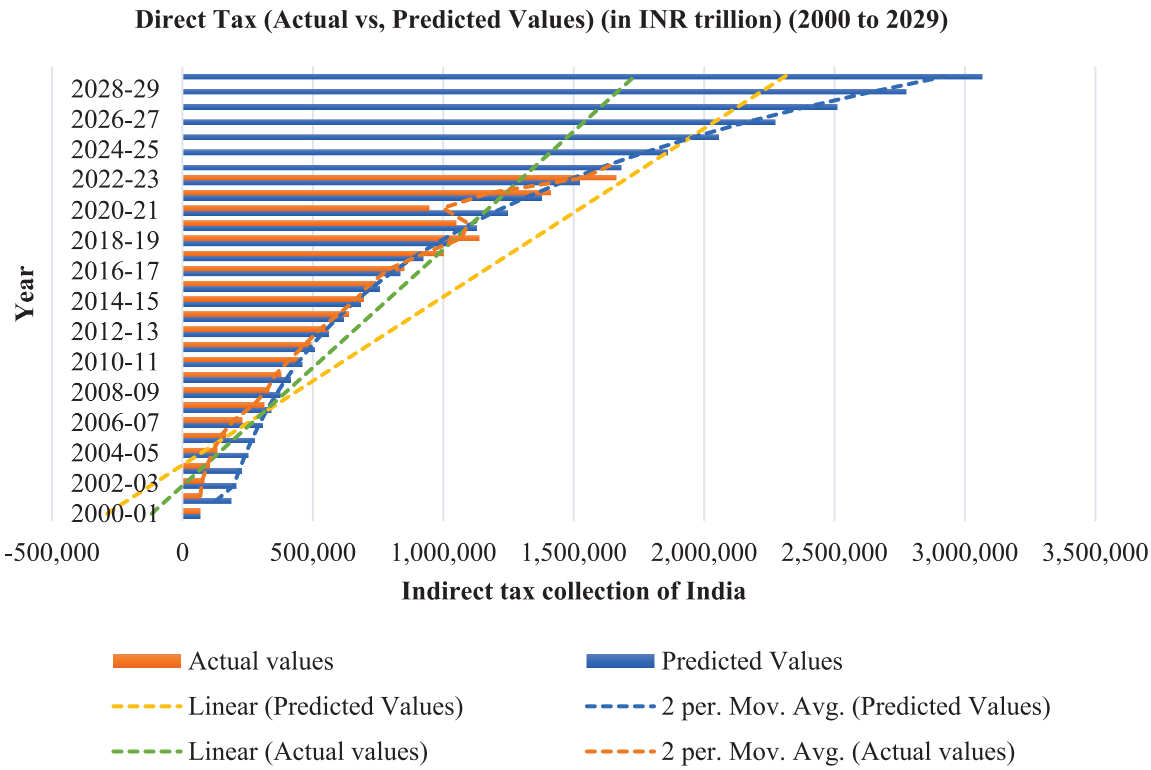

Figure 4. Comparison between actual and predicted data on direct tax.

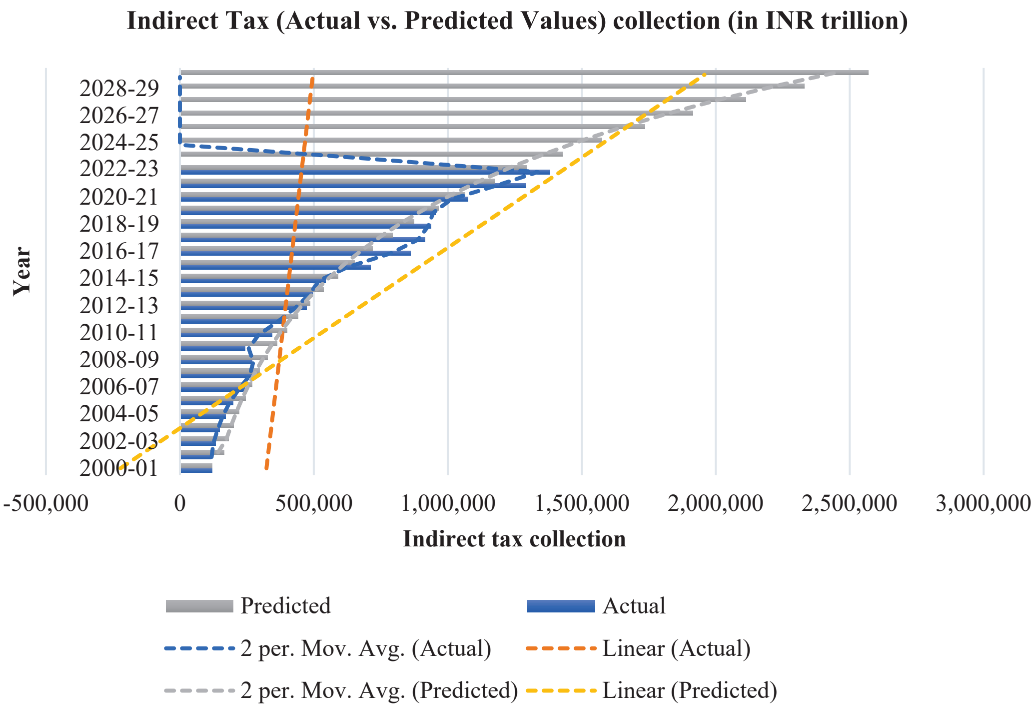

Figure 5. Comparison between actual and predicted observations of indirect tax collection in India using the GM (1,1).

However, indirect tax revenues continued to exhibit major inaccuracies, particularly in 2020–21, when there was a significant departure, possibly due to economic disturbances such as the pandemic.

The error was reduced, indicating either better forecasting techniques or more stable economic conditions. Notable variations emerged during economic downturns, such as during the COVID-19 pandemic in the financial year of 2020–21, when the error for direct taxes was particularly large. This most likely reflects the effect of COVID-19 on tax revenue due to the lockdown, which caused the shutdown of manufacturing and other economic activities (Missaoui et al. 2022). The expected tax collection shows a constant upward trend for both direct and indirect taxes, indicating predictions of economic growth or revisions in tax regulations. In short, we find an increase in the accuracy of tax predictions over time, particularly for direct taxes. Significant inaccuracies in previous years, as well as during economic crises, highlight the difficulties of forecasting in unpredictable situations. Future projections indicate an increase in tax collections, which will stimulate economic growth in the long run.

Moreover, we identified the relative percentage of the error term, which varies from 0% to 8.50% for direct taxes and from 0% to 6.35% for indirect taxes (Table 3). Furthermore, we calculated the average RPE, i.e., 12.62% for indirect (direct tax) tax, which reflects 87.38% accuracy of the prediction.

Table 3. Actual relative percentage error (RPE) generated by GM (1, 1).

Year	RPE		Year	RPE	
	Direct Tax	**Indirect Tax**		**Direct Tax**	**Indirect Tax**
2000–01	0.00%	0.00%	2012–13	−0.20%	−2.71%
2001–02	169.50%	−40.88%	2013–14	3.00%	−8.16%
2002–03	148.10%	−37.47%	2014–15	1.60%	−8.78%
2003–04	116.80%	−35.30%	2015–16	1.90%	8.45%
2004–05	89.60%	−29.74%	2016–17	1.60%	16.56%
2005–06	68.40%	−22.70%	2017–18	7.90%	13.37%
2006–07	33.60%	−11.70%	2018–19	10.30%	6.70%
2007–08	−8.10%	−6.65%	2019–20	−7.40%	−1.16%
2008–09	−12.50%	−21.82%	2020–21	−31.70%	1.02%
2009–10	−9.80%	−48.40%	2021–22	2.40%	9.01%
2010–11	−2.90%	−16.17%	2022–23	8.50%	6.35%
2011–12	−2.60%	−12.65%			

Source: Authors' contributions.

5. Conclusions

Taxation has always been a rich source of revenue for the government. Governments are vigilant and active enough to upgrade the regulations and collection mechanisms related to taxes. The grey forecasting model has proven to be a reliable tool for predicting India's direct tax revenue.

The findings of this study indicate that the cost of tax collection increased from INR 929 crores in 2000–01 to INR 8452 crores in 2022–23, but the cost of tax collection as a proportion of tax collected decreased significantly from 1.36% in 2000–01 to 0.51% in 2022–23. The proportion of direct tax relative to total tax revenue increased from 36.31% in 2000–01 to 54.62% in 2022–23. The analysis also revealed that, apart from the COVID-19 epidemic, direct tax collections consistently increased.

After applying the grey forecasting model, the forecasted total revenue collection from direct tax, around INR 16.63 trillion in 2022–23, is set to become INR 30.67 trillion by 2029–30. On the other hand, indirect tax collection, which is currently around INR 13.82 trillion, is set to become INR 25.70 trillion. Total tax collection from direct and indirect taxes is set to increase from INR 30.45 trillion in 2022–23 to INR 56.37 trillion in 2029–30.

Moreover, the findings reveal consistent revenue growth, as the prediction indicates a robust increase in direct and indirect tax revenues. This suggests that the government can expect increased revenues to sustain public spending and long-term investments.

Increased tax revenue correlates with expected economic growth. This means that India's economic policies will likely continue to promote growth, boosting the country's budgetary position. Revenue growth is expected to be driven not only by economic causes but also by improvements in tax compliance. Continued efforts to improve tax enforcement and administration, including digitalization, will be critical in realizing this promise.

Despite the hurdles of the COVID-19 pandemic, the grey forecasting model remained consistent. This demonstrates its stability under unpredictable situations, making it an important tool for future economic forecasting. Based on the robustness of this model, this study emphasizes that policymakers may become more reliant on it for strategic fiscal planning and resource allocation. With total tax income predicted to increase from INR30.45 trillion in 2022–23 to INR56.37 trillion by 2029–30, the government is expected to have more funds to invest in social programs, infrastructure, and other public services.

6. Practical Implications

Based on the study's first objective, "to understand past direct tax collection trends and patterns in India", the study's findings assist in determining historical growth rates and peaks and dips in tax collection. Understanding trends could shed light on how economic conditions, legislative changes, and global variables have influenced tax collection in the past, in addition to indicating consistent trends, which can help with future estimates.

Furthermore, based on the study's second objective, "to forecast direct tax (representing personal tax, income tax, and other tax) collection in India", the findings reveal that accurate direct tax forecasting can help with fiscal policy and budget planning. Such forecasting can aid in economic planning by allowing the government to better estimate revenue from personal income taxes and help policymakers modify tax rates or implement reforms based on expected deficits or surpluses.

After exploration of the third objective, "to forecast indirect tax collection in India", this study reveals that forecasting indirect taxes, such as GST, allows the government to estimate revenue from consumption-based taxes. This is critical for financial planning and controlling public spending. It can also help guide decisions on consumer tax adjustments to fulfill fiscal aims.

Lastly, based on the fourth objective, "to unveil the relationship between indirect and direct taxes by analyzing the proportion of direct tax as a percentage of the total tax", this study can help readers to understand how the balance of direct and indirect taxes changes over time, indicating whether the government relies more on consumption or income taxes, which may affect tax justice and economic growth policies. The reported results may also lead to policy changes aimed at improving tax structure balance. Recommendations for policy are outlined as follows:

- ➢ The government should continue to enhance tax changes to capitalize on the expected income growth. This involves digitizing tax administration systems and increasing anti-evasion measures to improve compliance and revenue collection.
- ➢ Given the anticipated increase in tax revenue, the government should prepare for long-term investments in vital areas. One way to improve economic resilience and societal well-being is to prioritize sustainable projects in areas such as infrastructure, education, and health.
- ➢ The government and financial institutions should consider using more advanced forecasting models, such as the grey forecasting model, particularly in areas with ambiguous or complex data. This can help to produce more accurate economic and budgetary forecasts.
- ➢ Despite the good outlook, the government should remain prepared for economic shocks such as global recessions or pandemics. Creating contingency savings and diversifying income streams outside taxes may improve fiscal resilience.
- ➢ Given the economy's changing nature, authorities should routinely evaluate tax revenue trends and adjust policies as needed. Continuous monitoring of tax revisions and compliance activities will be critical to staying on track with the expected increase.

➢ The government should guarantee that increased income is invested in areas encouraging inclusive growth by targeting all 17 sustainable development goals (SDGs). Focusing on rural development, job creation, and poverty reduction will ensure that the advantages of economic expansion reach everyone, which can also be enhanced integrating policies resulting an increase in total tax collection.

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Appendix A

Table A1. Literature review of Indian taxation and forecasting.

Author(s)	Variables	Method	Objective	Findings
Mukherjee and Bhattacharya (2023)	Corporate Income Tax Collection(CIT), Real Gross Value Added (GVA), and statutory CIT rate	Vector auto-regression (VAR), and the seasonal auto-regressive integrated moving average (SARIMA) model	To forecast revenue of corporate income tax (CIT)	The inequality index for CIT revenue growth, based on in-sample forecast errors, is 0.17. Based on out-of-sample projection error, the Theil inequality index for CIT revenue growth from Q1 2021–22 to Q4 2023–24 is 0.25. For Q2 2022–23 to Q1 2023–24, the average absolute percentage out-of-sample forecast error for CIT revenue was 0.12. The VAR model outperforms the univariate SARIMA model regarding out-of-sample RMSE and the Theil Inequality Index.
Thayyib et al. (2023)	GST	Trigonometric Seasonality Box–Cox Transformation ARIMA error Trend Seasonal components (TBATS) and neural networks (artificial neural networks(ANNs)and neural networks for autoregression (NNARs)).	To forecast goods and services tax (GST)revenue for India	This study shows that the advanced Hybrid Theta-TBATS model offers superior forecasting accuracy relative to TBATS, which can anticipate GST income.
Neog and Gaur (2020b)	Income tax share, corporation tax share, and excise tax share	Auto-regressive distributed lag (ARDL) model	To examine tax structure and economic growth in India from 1980 to 2016	The reduction in corporate tax share hinders short-term growth. Utilizing the ARDL-bound testing methodology proposed by Pesaran et al. (2001), this study identified a long-term link among the examined variables.
Neog and Gaur (2020a)	Using data from fourteen Indian states, the analysis includes the growth rate of per capita net state domestic product (NSDP); state gross investment as a percentage of state domestic product; and TAX, which represents tax shares from property, commodity and services, and income. The tax burden is the ratio of total tax revenues to state domestic product.	Panel pool mean group estimation	Tax structure and state-level growth	This study identified a U-shaped relationship between tax structure and growth. To support long-term growth in Indian states, it suggested reducing the overall tax burden and shifting revenue generation from income and commodity taxes to property taxes.

Table A1. *Cont.*

Author(s)	Variables	Method	Objective	Findings
Panda and Nanda (2020)	ETR and its determinants for manufacturing enterprises across eight important sectors of the Indian economy.	Arellano–Bond panel regression model	To empirically explore the determinants of the effective tax rate (ETR) for Indian manufacturing enterprises in different industries	The effective tax rate (ETR) is largely driven by the size of the business, profitability of the industry, rate of growth, and non-debt tax shields across most sectors, while the debt ratio, asset tangibility, and firm age influence the ETR differently across industries. Factors such as business size, profitability, growth, and non-debt tax shields in the manufacturing sector raise the ETR, whereas asset tangibility reduces it.

Note: Sources for all tables: authors' contributions.

Appendix B

Table A2. Literature summary of different taxation forecasting models in India.

Author(s)	Method	Area of Focus
Yadav et al. (2024)	Non-linear cointegration techniques	Demand for fuel, tax on carbon, and electric vehicle (EV) adoption for transportation in India
Thayyib et al. (2023)	TBATS, ETS, neural networks, and hybrid time-series models	Forecasting Indian goods and services tax revenue
Mukherjee and Bhattacharya (2023)	Univariate seasonal auto-regressive integrated moving average (SARIMA) model and vector auto-regression (VAR) model	Revenue forecasting of corporate income tax (CIT) in India
Khurana et al. (2023)	Multiple linear regressions using SPSS	The relationship between the interest rate and the price of vehicles; findings indicate a reduction in the goods and services tax (GST) for small cars could increase sales
Nithin and Roy (2016)	Theil's inequality coefficient and maximum entropy bootstrap	Normative fiscal evaluations of India's Finance Commission (FC) and the implementation of budgetary policy concerning central finances
Dossani (2003)	Dynamic foundations of machine-loaded structures	Need for venture capital in India to support the growth of its information technology industry and forecasts of the venture capital industry

References

Acharya, Shankar. 2005. Thirty years of tax reform in India. *Economic and Political Weekly* 40: 2061–70.

Adeleke, Richard, Tolulope Osayomi, and Toluwanimi Adeoti. 2021. Does subnational government revenue have an effect on socioeconomic and infrastructural development in Nigeria? A geographical analysis. *Regional Science Policy & Practice* 13: 1603–14. [CrossRef]

Alexi, Ariel, Teddy Lazebnik, and Labib Shami. 2024. Microfounded tax revenue forecast model with heterogeneous population and genetic algorithm approach. *Computational Economics* 63: 1705–34. [CrossRef]

Athira, A., and P. J. Jijo Lukose. 2024. The Increasing Trend in Effective Tax Rates in India: Role of Macroeconomic Factors, Tax Policy Changes and Firm Characteristics. *Journal of Emerging Market Finance* 23: 09726527231214075. [CrossRef]

Benhamou, Zouhair Ait, and Lesly Cassin. 2021. The impact of remittances on savings, capital and economic growth in small emerging countries. *Economic Modelling* 94: 789–803. [CrossRef]

Brahmi, Mohsen, Luca Esposito, Anna Parziale, Karambir Singh Dhayal, Shruti Agrawal, Arun Kumar Giri, and Nguyen Thi Loan. 2023. The Role of Greener Innovations in Promoting Financial Inclusion to Achieve Carbon Neutrality: An Integrative Review. *Economies* 11: 194. [CrossRef]

Chakraborty, Lekha Chakraborty, and S. Harikrishnan. 2022. COVID-19 and Fiscal-Monetary Policy Coordination: Empirical Evidence from India. *Levy Economics Institute, Working Papers Series*. 1002. Available online: https://ssrn.com/abstract=4028927 (accessed on 25 January 2024). [CrossRef]

Chattopadhyay, ArupKumar, Debdas Rakshit, Payel Chatterjee, and Ananya Paul. 2022. Trends and determinants of FDI with implications of COVID-19 in BRICS. *Global Journal of Emerging Market Economies* 14: 43–59. [CrossRef]

Cordero, Jose Manuel, Carlos Díaz-Caro, Francisco Pedraja-Chaparro, and Nickolaos G. Tzeremes. 2021. A conditional directional distance function approach for measuring tax collection efficiency: Evidence from Spanish regional offices. *International Transactions in Operational Research* 28: 1046–73. [CrossRef]

Cloyne, James, Nicholas Dimsdale, and Natacha Postel-Vinay. 2024. Taxes and growth: New narrative evidence from interwar Britain. *Review of Economic Studies* 91: 2168–200. [CrossRef]

Delcea, Camelia, Saad Ahmed Javed, Margareta-Stela Florescu, Corina Ioanas, and Liviu-Adrian Cotfas. 2023. 35 Years of Grey System Theory in Economics and Education. *Kybernetes*, *ahead-of-print*. [CrossRef]

Dossani, Rafiq. 2003. Reforming venture capital in India: Creating the enabling environment for information technology. *International Journal of Technology Management* 25: 151–64. [CrossRef]

Government of India, Central Board of Direct Taxes (CBDT). 2021. Annual Report. Available online: https://incometaxindia.gov.in/Documents/4(1)(b)_15092009.pdf (accessed on 25 January 2024).

Government of India, Central Board of Direct Taxes (CBDT). 2022. Time Series Data 2021–22. Available online: https://incometaxindia.gov.in/Documents/Direct%20Tax%20Data/time-series-data-2021-22.pdf (accessed on 25 January 2024).

Guo, Xiaojun, Sifeng Liu, Lifeng Wu, Yanbo Gao, and Yingjie Yang. 2015. A multi-variable grey model with a self-memory component and its application on engineering prediction. *Engineering Applications of Artificial Intelligence* 42: 82–93. [CrossRef]

Gupta, Surbhi, Surendra S. Yadav, and P. K. Jain. 2024. Impact of foreign ownership on leverage: A study of Indian firms. *Global Business Review* 25: 51–67. [CrossRef]

Hasan, Arshad, Naeem Sheikh, and Muhammad Bilal Farooq. 2024. Exploring stakeholder perceptions of tax reform failures and their proposed solutions: A developing country perspective. *Meditari Accountancy Research* 32: 721–55. [CrossRef]

Hassija, Vikas, Vinay Chamola, Atmesh Mahapatra, Abhinandan Singal, Divyansh Goel, Kaizhu Huang, Simone Scardapane, Indro Spinelli, Mufti Mahmud, and Amir Hussain. 2024. Interpreting black-box models: A review on explainable artificial intelligence. *Cognitive Computation* 16: 45–74. [CrossRef]

Huang, Shwu-Huei, Ming-Miin Yu, and Ya-Ling Huang. 2022. Evaluation of the efficiency of the local tax administration in Taiwan: Application of a dynamic network data envelopment analysis. *Socio-Economic Planning Sciences* 83: 101337. [CrossRef]

Ibtissem Missaoui, Mohsen Brahmi, and Jaleleddine Ben Rajeb. 2018. Quantitative relationship between corruption and development of the Tunisian stock market. *Public and Municipal Finance* 7: 39–47. [CrossRef] [PubMed]

Javanmardi, Ehsan, Sifeng Liu, and Naiming Xie. 2023. Exploring the challenges to sustainable development from the perspective of grey systems theory. *Systems* 11: 70. [CrossRef]

Jesus, Filipa, José Amorim, and Catarina Cepeda. 2024. Corporate Income Taxation Dynamics: A Comparative Analysis of Portugal, Germany, Belgium, The Netherlands, and Luxembourg. *Journal of Risk and Financial Management* 17: 251. [CrossRef]

Jiang, Du, Gangfa Li, Chong Tan, Li Huang, Ying Sun, and Jianyi Kong. 2021. Semantic segmentation for multiscale target based on object recognition using the improved Faster-RCNN model. *Future Generation Computer Systems* 123: 94–104. [CrossRef]

Kayacan, Erdal, Bais Ulutas, and Okyay Kaynak. 2010. Expert Systems with Applications Grey system theory-based models in time series prediction. *Expert Systems with Applications* 37: 1784–89. [CrossRef]

Kazancoglu, Yigit, Melisa Ozbiltekin, Yesim Deniz Ozkan Ozen, and Muhittin Sagnak. 2021. A proposed sustainable and digital collection and classification center model to manage e-waste in emerging economies. *Journal of Enterprise Information Management* 34: 267–91. [CrossRef]

Khan, Atif Maqbool, and Magdalena Osińska. 2023. Comparing forecasting accuracy of selected grey and time series models based on energy consumption in Brazil and India. *Expert Systems with Applications* 212: 118840. [CrossRef]

Khurana, Anjali, Vandana Ahuja, and Phani Tej Adidam. 2023. Estimating Demand for Passenger Cars: A Model for the Indian Market. *Prabandhan: Indian Journal of Management* 16: 37–56. [CrossRef]

Kim, Jungsuk, Mengxi Wang, Donghyun Park, and Cynthia Castillejos Petalcorin. 2021. Fiscal policy and economic growth: Some evidence from China. *Review of World Economics* 157: 555–82. [CrossRef]

Kong, Dongmin, Mengxu Xiong, and Ni Qin. 2023. Tax incentives and firm pollution. *International Tax and Public Finance* 30: 784–813. [CrossRef]

Kumar, Arun. 2020. Impact of COVID-19 and what needs to be done. *Economic and Political Weekly* 55: 10–12.

Larch, Martin, Peter Claeys, and Wouter Van Der Wielen. 2024. Scarring effects of major economic downturns: The role of fiscal policy and government investment. *European Journal of Political Economy* 2024: 102509. [CrossRef]

Lee, Ye Ji. 2021. The effects of analysts' tax expense forecast accuracy on corporate tax avoidance: An international analysis. *Journal of Contemporary Accounting & Economics* 17: 100243. [CrossRef]

Li, Cheng, and Qi Qi. 2024. A novel hybrid grey system forecasting model based on seasonal fluctuation characteristics for electricity consumption in primary industry. *Energy* 287: 129585. [CrossRef]

Li, Qin, Mark Shuai Ma, and Terry Shevlin. 2021. The effect of tax avoidance crackdown on corporate innovation. *Journal of Accounting and Economics* 71: 101382. [CrossRef]

Liu, Lianyi, Sifeng Liu, Zhigeng Fang, Aiping Jiang, and Gang Shang. 2023. The recursive grey model and its application. *Applied Mathematical Modelling* 119: 447–64. [CrossRef]

McEwan, Gary P., Viswanath B. Unnithan, Chris Easton, Andrew J. Glover, and Rosie Arthur. 2024. Decision-making accuracy of soccer referees in relation to markers of internal and external load. *European Journal of Sport Science* 24: 659–69. [CrossRef]

Mahapatra, Sushanta Kumar, and Pitresh Kaushik. 2022. Effect of Sensex on direct tax collection: An empirical study from India. *International Journal of Economics and Accounting* 11: 99–114. [CrossRef]

Ministry of Finance. 2022. Gross Direct Tax Collections for the Financial Year (FY) 2022–23. Available online: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1884583 (accessed on 25 January 2024).

Missaoui, Ibtissem, Mohsen Brahmi, and Jaleleddine Ben Rajeb. 2022. Ownership structure management and its effect on dividend policy in the Tunisian stock exchange enterprises: An empirical study. *International Journal of Technology Transfer and Commercialisation* 19: 83–96. [CrossRef]

Mohsen, B. Brahmi, and Sonia Zouari. 2015. Financial Stability, Target Inflation as a Monetary Rule and Concepts of Money Policy: Implications for the Optimal Analysis. *Acta Universitatis Danubius, OEconomica* 12: 72–93.

Mohsen, Brahmi, Bruna Bruno, Karambir Singh Dhayal, Luca Esposito, and Anna Parziale. 2024. From manure to megawatts: Navigating the sustainable innovation solution through biogas production from livestock waste for harnessing green energy for green economy. *Heliyon* 10: e34504. [CrossRef]

Mukherjee, Sacchidananda, and Rudrani Bhattacharya. 2023. Revenue forecasting of corporate income tax (CIT) in India. *Indian Economic Review* 58: 329–49. [CrossRef]

Mukherjee, Sacchidananda, and Shivani Badola. 2021. Public finance management in India in the time of the COVID-19 pandemic. *The Indian Economic Journal* 70: 452–71. [CrossRef]

Mukundhan, K. V., Sreevas Sahasranamam, and James J. Cordeiro. 2019. Corporate investments in tax havens: Evidence from India. *Asian Business & Management* 18: 360–88. [CrossRef]

Mansour, Nadia, Salha Ben Salem, and Mohsen S. Brahmi. 2022. Impact of the health crisis COVID-19 on finance market and economic sectors: Case of Italian Government Measures. *International Journal of Public Sector Performance Management* 12: 187–209. [CrossRef]

Neog, Yadawananda, and Achal Kumar Gaur. 2020a. Tax structure and economic growth: A study of selected Indian states. *Journal of Economic Structures* 9: 38. [CrossRef]

Neog, Yadawananda, and Achal Kumar Gaur. 2020b. Tax structure and economic growth in India: Insights from ARDL model. *Indian Growth and Development Review* 13: 589–605. [CrossRef]

Nithin, K., and Rathin Roy. 2016. Finance commission of India's assessments: A political economy contention between expectations and outcomes. *Applied Economics* 48: 73–88. [CrossRef]

Okunogbe, Oyebola, and Fabrizio Santoro. 2023. Increasing tax collection in African countries: The role of information technology. *Journal of African Economies* 32 S1: i57–i83. [CrossRef]

Panda, Ajaya Kumar, and Swagatika Nanda. 2020. Receptiveness of effective tax rate to firm characteristics: An empirical analysis on Indian listed firms. *Journal of Asia Business Studies* 15: 198–214. [CrossRef]

Pesaran, M. Hashem, Yongcheol Shin, and Richard J. Smith. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 16: 289–326. [CrossRef]

Pires, Ingrid, Helon Vicente Hultmann Ayala, and Hans Ingo Weber. 2023. Nonlinear ensemble gray and black-box system identification of friction induced vibrations in slender rotating structures. *Mechanical Systems and Signal Processing* 186: 109815. [CrossRef]

Press Information Bureau Government of India Ministry of Finance (PIB). 2019. Press Release. Available online: https://pib.gov.in/Pressreleaseshare.aspx?PRID=1585641 (accessed on 25 January 2024).

Rao, R. Kavita. 2021. The Economy as Reflected in Income Tax Data. *National Institute of Public Finance and Policy.* Available online: https://www.nipfp.org.in/media/medialibrary/2021/03/WP_330_2021.pdf (accessed on 25 January 2024).

Abu-Rayash, Azzam, and Ibrahim Dincer. 2020. Analysis of mobility trends during the COVID-19 coronavirus pandemic: Exploring the impacts on global aviation and travel in selected cities. *Energy Research & Social Science* 68: 101693. [CrossRef]

Sharma, Himanshu, and Harish Kumar. 2022. Sustainable Collection and Classification of E-Waste: A Proposed Computer Vision Technology-Based Framework. SSRN 4049693. Available online: https://ssrn.com/abstract=4049693 (accessed on 25 January 2024). [CrossRef]

Sharma, Himanshu, and Harish Kumar. 2024. Precising E-waste Generation for Economic Recycling. *The Indian Economic Journal*. [CrossRef]

Singh, Pratap. 2019. Complexity in Some of the Compliances Is Very High, India Needs Next Level Reforms in Tax Administration. *Tax Review*. Available online: https://www.isec.ac.in/wp-content/uploads/2023/07/WP-448-Pratap-Singh-Final.pdf (accessed on 14 August 2024).

Slemrod, Joel. 2019. Tax compliance and enforcement. *Journal of Economic Literature* 57: 904–54. [CrossRef]

Thayyib, P. V., Muhammed Navas Thorakkattle, Faisal Usmani, Ali T. Yahya, and Najib HS Farhan. 2023. Forecasting Indian Goods and Services Tax revenue using TBATS, ETS, Neural Networks, and hybrid time series models. *Cogent Economics & Finance* 11: 2285649. [CrossRef]

Wildasin, David E. 2021. Open-economy public finance. *National Tax Journal* 74: 467–90. [CrossRef]

Xu, Ning, Tianyu Wang, and Qiuhao Qin. 2024. Novel grey forecasting model with bi-level structure for application to logistic demand. *Expert Systems with Applications* 235: 121181. [CrossRef]

Yadav, Purushottam, Kakali Kanjilal, Anupam Dutta, and Sajal Ghosh. 2024. Fuel demand, carbon tax and electric vehicle adoption in India's road transport. *Transportation Research Part D: Transport and Environment* 127: 104010. [CrossRef]

Yang, Xiaoxuan. 2020. Health expenditure, human capital, and economic growth: An empirical study of developing countries. *International Journal of Health Economics and Management* 20: 163–76. [CrossRef] [PubMed]

Yuan, Chaoqing, Sifeng Liu, and Zhigeng Fang. 2016. Comparison of China's primary energy consumption forecasting by using ARIMA (the autoregressive integrated moving average) model. *Energy* 100: 384–90. [CrossRef]

Zhang, Kai, Kedong Yin, and Wendong Yang. 2023. Probabilistic accumulation grey forecasting model and its properties. *Expert Systems with Applications* 223: 119889. [CrossRef]

Zhang, Xiekui, Yihan Huang, and Fenglan Wei. 2024. The incentive effects of the macro tax burden on economic growth: A negative or positive incentive effect? Analysis based on panel data. *International Review of Economics & Finance* 93: 128–47. [CrossRef]

Zhou, Weijie, Yuke Cheng, Song Ding, Li Chen, and Ruojin Li. 2021. A grey seasonal least square support vector regression model for time series forecasting. *ISA Transactions* 114: 82–98. [CrossRef] [PubMed]

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Compliance Behavior in Environmental Tax Policy

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Abstract: This study examines compliance behavior in the context of environmental tax policies, highlighting the essential role that these policies play in achieving the objectives of the Sustainable Development Goals (SDGs). Environmental taxes are crucial instruments for reducing environmental damage and increasing energy efficiency. Nevertheless, taxpayer compliance, which is impacted by several variables, including social acceptability, regulatory quality, and perceptions of fairness, is a key component of these policies' efficacy. In contrast to earlier research, which frequently concentrated on certain kinds of tax or discrete policy mechanisms, this study takes a broad approach, looking at a range of environmental taxation instruments. Emerging trends, significant factors influencing compliance behavior, and noteworthy contributions from eminent authors and organizations are all identified via bibliometric and scientometric analyses. To create fair and effective environmental tax policies, interdisciplinary approaches and international collaboration are required. Along with presenting policies to improve environmental regulation compliance, this study offers insightful advice for businesses that can help them innovate toward sustainability and adjust to shifting policy. It also provides a solid theoretical base for future researchers by highlighting important areas that require more investigation, especially when it comes to the wider effects of environmental taxes on various industries.

Keywords: environmental tax; carbon tax; compliance behavior; sustainable development goals (SDGs); tax policy; bibliometric analysis

1. Introduction

The Sustainable Development Goals (SDGs) have become a global policy agreed upon by the United Nations (UN) and in international agreements, and environmental taxes have been identified as a policy tool (Wang et al. 2023b; Miceikiene et al. 2019). Through an analysis of compliance behavior, we can establish the efficacy of environmental tax policies in facilitating sustainable development. By analyzing important elements influencing taxpayer compliance, such as societal acceptance, regulatory quality, and perceptions of justice, our study aims to enhance policy design and implementation. Environmental tax programs have supported climate action, affordable and clean energy, and responsible consumption and production, all of which comply with the SDGs (C. Zhang et al. 2022; Ignat and Tache 2023). Environmental taxes aim to reduce greenhouse gas emissions, promote energy efficiency, and encourage sustainable industrial practices by integrating environmental costs within the scope of economic activity (Yusoff et al. 2024; Indarto and Ani 2023).

The Paris Agreement emphasizes the importance of market-based instruments, one of which is an environmental tax that aims to contribute towards global climate targets.

In addition, the Paris Agreement discusses increasing financial flows, technology transfer, and capacity building to achieve clean emissions by the midpoint of the century (Chang et al. 2022; Basic 2016). Carbon pricing and energy levies are integral to this strategy, incentivizing industries to adopt cleaner technologies and reduce their carbon footprint (Digitemie and Ekemezie 2024; Febe Christine et al. 2024). Alignment between national policies and global commitments allows countries to utilize environmental taxes to drive progress toward a low-carbon economy (Jakob et al. 2022; Wijaya 2023). According to Shahrour et al. (2024), the rapid effects of global warming pose a threat to ecosystems, public health, and economic stability, underscoring the urgent need for swift, focused action to counteract climate change. They emphasize the significance of environmental tax laws and sustainable behaviors as vital instruments for lowering carbon emissions by making climate change mitigation a primary priority. Environmental taxes, which put a price on pollution, encourage enterprises and individuals to embrace sustainable practices by making financially viable and environmentally friendly choices, acting in harmony with global sustainability targets such as the UN Sustainable Development Goals. Similarly, Wojewodzki et al. (2023) talk about how fiscal tools like carbon pricing and environmental levies are becoming increasingly important in international climate policies as a way to encourage cleaner technology and deter poor practices. For instance, carbon pricing creates a benchmark that encourages congruence between national policies and international commitments, such as the Paris Agreement, and connects local and global climate activities. This pattern illustrates the increasing understanding that sound fiscal policies may promote global environmental preservation as well as sustainable economic growth.

We aim to respond to three primary research questions in this bibliometric analysis: (a) What are the main factors influencing compliance behavior in environmental taxation, and how do they differ across countries and industries? (b) Who are the major contributors—writers, organizations, and governments—to the study of environmental tax compliance, and which are the most well-known joint ventures. (c) What are the most common research themes, trends, and emerging fields and how have they changed over time? The manuscript is structured as follows: The bibliometric analysis approach, including data collection and processing, is described in Section 2. The findings are presented in Section 3, which details each research topic and includes an analysis of the main contributors, compliance factors, and theme trends. The findings' implications for environmental tax policy are examined in Section 4, which also offers ideas for future study topics. Section 5 concludes by highlighting the need for more research on environmental tax compliance and summarizing important findings.

2. Literature Review

2.1. Environmental Tax

Environmental taxation is a policy instrument that has gained significant attention in recent years due to its potential to address environmental challenges while influencing economic behavior. The implementation of environmental taxes, energy taxes, and carbon taxes has evolved from being primarily adopted by a few developed nations in Europe and the OECD to becoming more widespread across developed and developing countries (Ghazouani et al. 2020). These taxation policies are designed to have diverse effects on the economy, residents, and climate change, aiming to reduce carbon emissions by enhancing innovation and energy efficiency, which are crucial drivers of environmental sustainability (Ulucak et al. 2020).

Research has shown that environmental tax changes may impact welfare and unemployment, especially in emerging nations with traits like a large informal economy and rural–urban mobility (Kuralbayeva 2019). Research on the influence of environmental taxes on businesses' green innovation has also been conducted, emphasizing the significance of integrating market-based tax policies such as environmental taxes with tax incentives for research and development to foster successful green innovation (Zheng et al. 2023).

Moreover, environmental taxes have been extensively advocated in industrialized nations as the main tool for market-based policy (K. Wang et al. 2020).

According to research, environmental tax incentives boost company investment and export growth, make it easier for companies to disclose their CSR information, and support environmentally conscious business practices (Boubaker et al. 2023). Nevertheless, there is a need for accurate research and evaluation of the efficacy of environmental tax policies, since there have been cases in which detrimental tax expenditures have outweighed environmental taxes (Pérez and Vence 2021). Furthermore, research has examined the inadvertent outcomes of environmental tax incentives, highlighting the need to comprehend the wider ramifications of these initiatives (Boubaker et al. 2023).

In Spain, economic incentives and tax penalties have been recognized as driving policies in building and demolition waste management, demonstrating the beneficial impacts of these policies on waste recycling and the market for recycled aggregates (Calvo et al. 2014). In comparison, research on incentive policies for building and demolition waste recycling in China has shown how crucial it is to strike the correct mix between environmental taxes and subsidies for managing trash (Hua et al. 2022). Furthermore, it has been shown that tax incentives might inadvertently increase the energy efficiency of investments, highlighting the potential of tax incentives as a tool for accomplishing environmental objectives (Song et al. 2023).

The interaction between carbon taxes and innovation externalities has been examined to determine the optimal timing of climate change policy implementation, emphasizing the need for tailored R&D instruments and a combination of climate change and R&D policies to effectively target climate change goals (Gerlagh et al. 2009). Furthermore, tax incentives have been found to enhance corporate Environmental, Social, and Governance (ESG) performance, contributing to the body of research on the relationship between tax incentives and corporate behavior. In China, incentive-based environmental regulations have been shown to have a significant impact on carbon intensity reduction in certain provinces, highlighting the role of incentives in driving environmental outcomes (Xu 2022).

2.2. Tax Compliance Behavior

Global tax systems rely significantly on tax compliance behavior, which affects both revenue collection and the overall efficacy of fiscal policy. Policymakers and tax authorities must comprehend the factors influencing compliance behavior to create policies promoting voluntary conformity to tax laws. The complexity of tax compliance behavior has been the subject of several studies, which have shed light on the different processes and elements that affect people's and companies' desire to abide by the law (Oladipo et al. 2022; Bin-Nashwan et al. 2020; Markonah and Manrejo 2022)

The study conducted by Hikmah et al. (2021) emphasizes the importance of tax knowledge and justice that can shape tax compliance behavior. A level of understanding of regulations and taxation can significantly affect individuals' or organizations' compliance when it comes to paying taxes. Perceptions of fairness in the tax system play an important role in compliance. Taxpayers view tax regulations as fair and correct, so people tend to voluntarily comply with their tax obligations (Mas'ud et al. 2020).

Numerous studies have focused on the voluntary nature of tax compliance behavior, emphasizing the importance of elements such as attitudes, societal norms, and intents in promoting compliance (Albert and Fadjarenie 2022; Asri et al. 2023; J. M. Wang et al. 2021). People's intent to abide by tax rules, their views toward taxes, and societal norms influence their compliance. Comprehending these normative and psychological elements is essential to forecasting and encouraging tax compliance across various taxpayer categories.

Moreover, regulatory frameworks and enforcement instruments significantly influence encouraging tax compliance behavior. Research has investigated the efficacy of enforcement tactics, including tax agent training and compliance model implementation, in raising tax compliance rates (Hikmah et al. 2021). Good enforcement influences taxpayers' behavior by signaling that tax authorities take compliance with tax legislation seriously and discourage non-compliance.

Several external elements, such as work competency, social perceptions, and financial performance, have also been studied in relation to tax compliance behavior (Albert and Fadjarenie 2022). Work competency affects how well employees follow safety guidelines, which may extend to how they behave when paying taxes in an organizational setting. The fact that people's inclination to abide by tax regulations can also be influenced by their opinions of the government, society, and their financial situation highlights the complex nature of tax compliance behavior.

The impact of tax education, belief systems, and early intervention on compliance behavior has been extensively studied. Educating individuals about taxes at an early age has the potential to promote compliance at an early age that may influence future behavior. In conclusion, the factors that influence individual and corporate tax compliance decisions have been identified in the literature on tax compliance behavior. Normative, psychological, and coercive external influences can drive compliance behavior and ensure tax system effectiveness.

2.3. Tax Compliance Theories

Tax compliance theory aims to comprehend the variables that affect people's and companies' decisions to abide by or disregard tax rules (Damayanti and Martono 2018; Markonah and Manrejo 2022). Perceptions of justice, the possibility of positive incentives, and the deterrent effect of punishments are the main components of this theory. According to studies, if individuals believe the system is fair and the laws are clear and apply to everyone equally, they are more likely to comply with their tax duties (Saad 2011; Kirchler 2007). Compliance tends to rise when people or businesses believe that tax rates are fair and when they benefit from the public services financed by their payments.

The functions of incentives and deterrents are important components of this theory. Measures including fines, audits, and the threat of legal action deter tax evasion. Compliance is encouraged by the psychological deterrent of the possibility of being discovered and subject to fines or other sanctions. However, people may oppose the system if perceived as unjust or onerous due to excessively complicated regulations or harsh penalties (Muflihani et al. 2021; Damayanti and Martono 2018). Conversely, incentives can promote favorable tax practices by providing observable advantages for early and precise tax returns, including credits or deductions.

However, assessments of tax compliance are influenced by larger social and environmental issues and are not made in a vacuum (Alm et al. 2019). The study of social influence theory looks at how peer, community, and social network expectations and behavior affect an individual's compliance (Trivedi et al. 2004). Individuals are inherently prone to seek guidance on appropriate conduct from their social circles, relatives, and coworkers. When adherence to tax rules is accepted as the standard in a society, people are encouraged to follow suit in order to gain acceptance and stay out of trouble (Muflihani et al. 2021). Furthermore, people may adopt behaviors based on reliable information from their social networks, a phenomenon known as informational impact. For example, if people perceive that following tax regulations leads to tangible benefits for the community, such as improved infrastructure, they are more likely to feel compelled to comply with said regulations. By supporting initiatives that highlight taxes as a means of advancing societal well-being, tax authorities can capitalize on these social incentives.

The Environmental Behavior Theory emphasizes how sustainability awareness and dedication can influence compliance, especially with regard to environmental levies (Sen et al. 2020; Akdogan and Akdogan 2023). Many taxpayers are prepared to pay taxes that directly support environmental goals, such as carbon or pollution taxes, as concerns about the climate and the health of the environment develop on a worldwide scale (Kusumawardhani et al. 2024; Osman et al. 2021). Compliance becomes not only a legal requirement but also a moral decision in line with individual ideals when people realize that the money they pay in taxes supports initiatives that reduce environmental harm or advance renewable energy (Zhang et al. 2024a; Lin and Jia 2018). Clear government communication regarding the ecological impact of these fees can further increase the alignment between compliance and environmental responsibility.

Overall, the literature on environmental tax compliance emphasizes three key themes that are essential to our understanding of taxpayer behavior and the effectiveness of policy measures. First, despite specific research which cautions that excessively complex regulations can hinder compliance, most studies support the efficacy of transparent and well-structured environmental tax policies in improving compliance Boubaker et al. (2023); Kuralbayeva (2019); Jakob et al. (2022); Baranzini et al. (2017); Parry et al. (2012). Second, social and psychological elements bolster tax compliance Alm and Torgier (2011); Bin-Nashwan et al. (2020); Bobek et al. (2013); Hartmann et al. (2020). These elements include perceptions of fairness, societal norms, and early tax education. Even though most studies concur, some contend that more than social considerations are needed in the absence of financial incentives. Third, environmental levies have a range of economic effects. Although Ulucak et al. (2020) draw attention to economic hazards, especially in developing nations, Goulder (2002) and W. Chen and Hu (2018) argue that carbon prices have a beneficial effect on the adoption of clean technology.

3. Materials and Methods

Our systematic literature review was conducted using qualitative methods that provide a thorough and objective explanation of the literature on environmental tax compliance behavior. This approach reviews knowledge and identifies gaps in the literature (Stratton 2019; Sucharew and Macaluso 2019). Because it is evidence-based, this approach is suitable for making recommendations to policymakers.

This study uses bibliometric and scientometric analyses, which provide a solid basis for understanding the structure and dynamics of environmental tax compliance research. Both analyses are used to identify trends, patterns, and the impact of the literature on a field (Barbu et al. 2024; Hong et al. 2022; L. I. Hakam et al. 2023). The objectives of both analyses include identifying research gaps for the development of conceptual models or theoretical frameworks and deepening insights into the impact of research on environmental tax compliance behavior.

The bibliometric analysis focuses on collecting and mapping metadata from publications related to environmental taxes and compliance behavior (Binti Ibrahim and Jahja 2022). Meanwhile, scientometric analysis focuses more on measuring the scientific impact of the publications identified in the bibliometric analysis (Qasim 2017; Aryadoust 2023). Outputs from scientometric analysis include assessing the impact of research, such as the number of citations and the h-index; identifying collaborative networks between researchers or institutions; and analyzing the evolution of concepts (Borgohain et al. 2021; Waila et al. 2016). Figure 1 is an illustration of the methodology used in this study.

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-study (PRISMA) criteria to guarantee a fair and open scientometric study. This process had four steps: inclusion, eligibility, screening, and search.

In the first stage, the Scopus database was used because it has wide coverage, reliable citation data, and normalization features (Thelwall 2019), making it a good choice as a determinant of search strings and databases in scientometric research on environmental tax compliance behavior. During the data collection stage, 1979 documents were found.

In the second and third stages, we considered the publication category, e.g., the journals in which the articles were published, and eliminated any duplicates. In the final stage, we ensured all the collected studies were published in the English language, and we assessed the suitability of the title, abstract, and keywords. The database search was conducted using the keywords listed in Appendix A. In this search, we found 1383 documents published between 2000 and 2024.

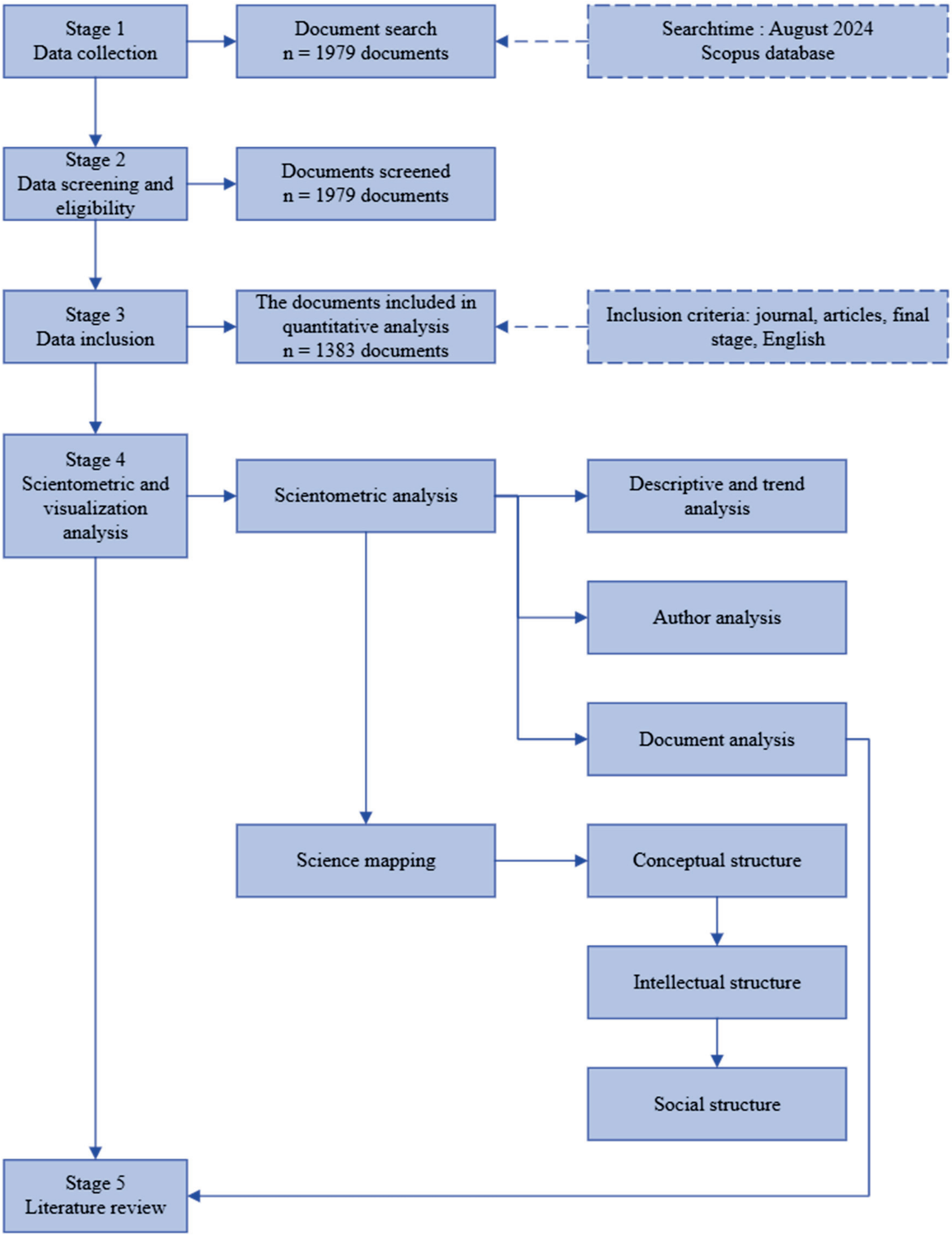


Figure 1. Methods for article selection and analysis procedures (L. I. Hakam et al. 2023).

During the fourth stage, the Biblioshiny program was used for the scientometric analysis. This step included science mapping through a co-authorship/co-citation network analysis and performance analysis (with the latter focusing on citation trends and identifying the most influential journals and authors). The main study themes in environmental tax compliance were identified using co-word analysis and thematic evolution to determine the conceptual framework.

4. Results

4.1. Descriptive and Trend Analysis

In Table 1 shows the bibliometric analysis used 1383 articles from 531 sources published between 2000 and 2024. In general, the article topics followed the theme of this research, focusing on environmental policy, corporate strategy, and regulatory effectiveness in encouraging behavior toward sustainability. The number of publications focusing on behavior in environmental tax studies increased by 9.025% per year. The average age of the articles referenced in this study is 6.95 years. On average, each document has been cited 24.19 times; these results indicate that research on this theme is active and makes a recognized contribution to the wider literature. In this analysis, the 6157 relevant studies indicate that research on the theme of behavior in environmental tax is quite broad and covers a variety of diverse perspectives. The authors' keywords (DE) indicate the total number of keywords identified in all the articles analyzed covering a wide range of specific topics and subtopics (Passas 2024). In our study, 3855 keywords were generated, which provided a basis for identifying trends and patterns. The total number of authors who contributed to the analysis of all articles in this study was 3346, while 231 authors published articles without collaborating with other authors, comprising a total of 242 articles. On average, each document on compliance behavior in environmental tax theme was written by about three authors. Almost 25% of the documents on this topic were written by authors from more than one country.

Table 1. Summary of the descriptive information.

Description	Indicator	Results
Main information	Timespan	2000:2024
	Sources (journals, books, etc.)	531
	Documents	1383
	Annual growth rate %	9.02
	Average age of document	6.95
	Average citations per doc	24.19
	References	59,915
Document contents	Keywords plus (ID)	6157
	Authors' keywords (DE)	3855
Authors	Authors	3346
	Authors of single-authored docs	231
Author collaboration	Single-authored docs	242
	Co-authors per doc	3.03
	International co-authorships %	24.95
Document types	Article	1383

Figure 2 shows the trend of the number of publications and citations over a 24-year period (2000–2024). In the pre-COVID-19 period from 2000 to 2020, there was a significant and consistent increase, with some fluctuations, while 2020 saw a peak in the number of citations and the number of articles published (2632 total citations and 99 articles). The number of published articles increased significantly from 2021 to 2023; the highest number of published articles was 162, which was achieved in 2023. However, in 2024, there was a decrease in the number of articles published (127). This was inversely proportional to the total citations, which also decreased after COVID-19, with the lowest number of citations (151) recorded in 2024. The graph in Figure 2 shows that although the number of publications increases significantly on a yearly basis, the total citations have decreased. There is an urgent need for relevant and influential research that provides a new perspective on environmental tax compliance challenges.

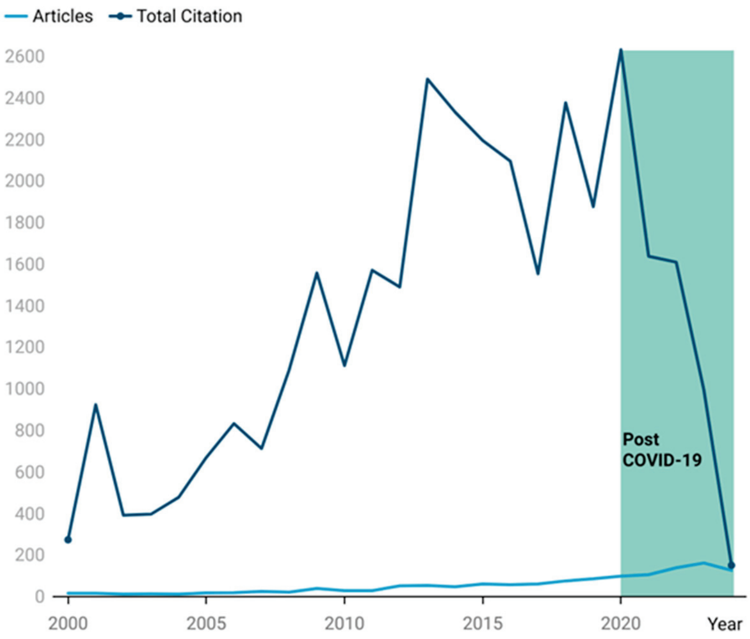


Figure 2. Trend analysis.

4.2. Source Analysis

Figure 3 shows a list of the journal sources most relevant to the research topic of environmental tax behavior based on the number of published articles. Energy policy and economics dominate, with 69 and 64 articles, respectively; these publications play a significant role in the analyzed literature. In addition to energy-focused journals, some journals cover sustainability issues (D. F. Hakam et al. 2024). The journal *Sustainability*, which has published 52 articles on this topic, and the *Journal of Cleaner Production*, which has published 49 relevant articles, show that this research topic has a broad scope. This research also emphasizes economic analysis and environmental resource management, which are critical for understanding the impacts of environmental policies. Research on this topic has been published in *Environmental and Resource Economics* (48 articles) and the *Journal of Environmental Economics and Management* (34 articles). The journals *Climate Policy* (33 articles) and *Ecological Economics* (31 articles) show that environmental policies, including mitigation and adaptation strategies, are a significant concern in the literature. The journals *Energy and Environmental Science* and *Pollution Research* have published research that considers various aspects of environmental issues, with 31 and 27 articles, respectively. This research focuses on a multidisciplinary approach, including economics, public policy, and sustainability.

The most cited countries (Figure 4) are indicative of the quantity and quality of publications for each country. In particular, China has published numerous papers on this topic (up to 1185 publications), followed by the United States, with 674 papers. However, this country is still a significant contributor, despite publishing far fewer papers on this topic than China. Other countries such as the UK (240 articles), Canada (175 articles), and Australia (163 articles) have also made significant contributions to the number of documents published. China also dominates in terms of the overall research impact based on the total number of citations (6576). However, the United States almost matches this, with 5962 citations. In terms of the average number of citations per article, Australia stands out with an average of 35 citations per article, followed by Canada with an average of 30 citations per article, indicating tDhat the articles published in Australia are of high quality and are frequently referenced. The data in Table 2 highlight that although China has published many articles on this topic, most of the research is conducted nationally, and the number of SCPs is greater than the number of MCPs. In contrast, countries such as

Australia and Canada have higher MCP ratios due to international collaborations, which are essential for improving research quality and global relevance.

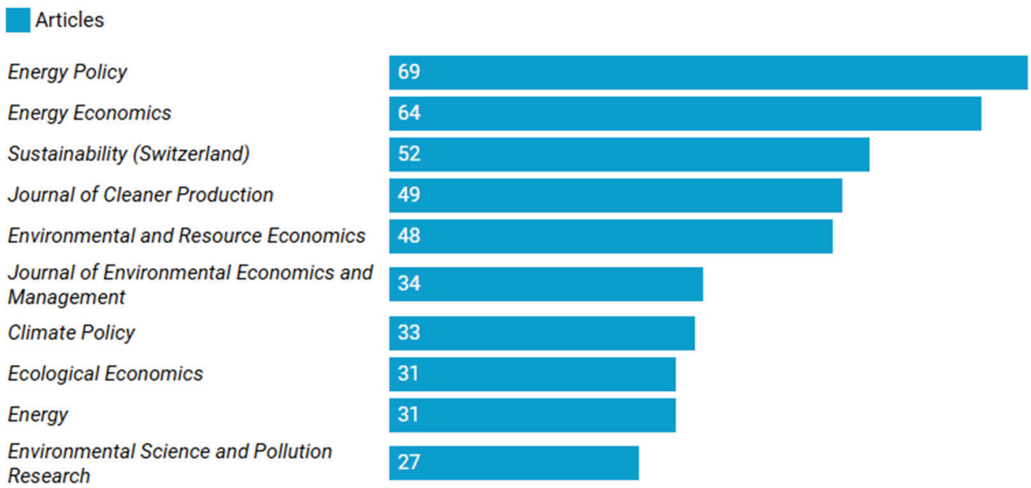


Figure 3. Most relevant source.

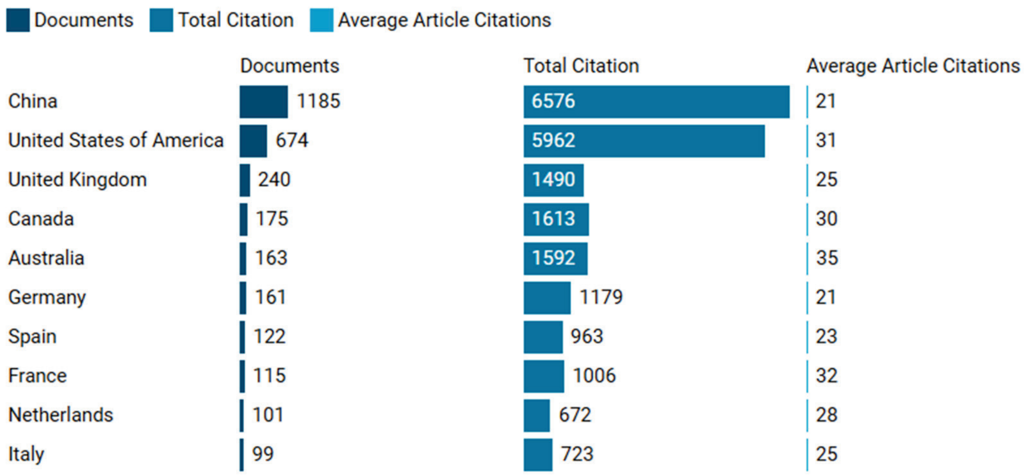


Figure 4. The most cited countries.

Table 2. Most relevant countries by corresponding author.

Country	Articles	SCP *	MCP **	Freq	MCP_Ratio
China	318	257	61	0.23	0.192
USA	194	147	47	0.14	0.242
United Kingdom	59	44	15	0.043	0.254
Germany	55	37	18	0.04	0.327
Canada	54	34	20	0.039	0.37
Australia	46	26	20	0.033	0.435
Spain	41	30	11	0.03	0.268
Japan	35	26	9	0.025	0.257
France	31	25	6	0.022	0.194
Italy	29	23	6	0.021	0.207

* SCP: Single-country publication ** MCP: multiple-country publication.

Tsinghua University, Jiangsu University, and Chongqing University are leading institutions in China that dominate in terms of the publication of articles related to environmental tax research. China is very active in formulating environmental policies and involving tax instruments as a way to reduce emissions and improve energy efficiency. Several universities listed in Figure 5 are experts in energy technology and policy, such as North China Electric Power University and Huazhong University of Science and Technology; these institutions study how environmental taxation can be integrated into the behavior of companies and wider society in order to reduce emissions. Peking University, which is in seventh place in terms of the number of published articles, focuses on the compliance of countries with high levels of industrialization. At the same time, the University of Maryland, which has the same number of published articles, examines effective policies for encouraging environmentally friendly behavior in developed countries. Although China dominates in terms of overall contributions, the graph shows that significant contributions have been made by institutions in the United States and Europe.

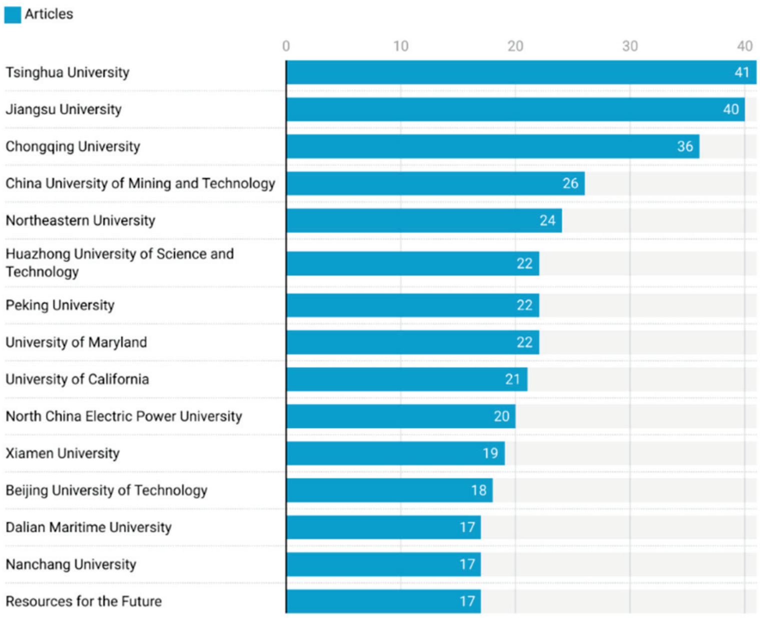


Figure 5. Most relevant affiliations.

4.3. Author Analysis

The number of citations indicates the value and influence of an author's work. It is an essential reference for the topic of environmental tax behavior (Ullah et al. 2019). Three authors are very influential in this research area, as they have achieved the most citations. Among them, an article written by Goulder (2002) has the highest number of citations with 132 articles; in second place is a paper by Nordhaus (2008), which has been cited in 118 articles; and in third place is the work of Lin and Jia (2018), which has been cited 112 times. Böhringer and Rutherford (2009) and Fischer and Springborn (2011) have 92 citations each, followed by Y. Wang et al. (2024) with 81. Authors ranked four to ten have between 69 and 92 citations, which shows a fairly even contribution among these authors.

The analyses in Figure 6 and Table 3 have different purposes; the author impact analysis assesses each author's impact and shows each author's relationship. Wang et al. (2023a) and Zhang et al. (2024b) are in the first position with the highest number of publications among the listed authors, publishing 17 and 9 articles, respectively. A high number of publications is not guaranteed to affect the number of citations because the quality of the article and the relevance to the study are of greater importance in this regard. The author impact analysis will generate the h-index, m-index, and g-index values to quantify an article's citations. Zhang et al. (2024b) has the highest h-index with ten articles, achieving a significant and consistent impact in this research area. In addition, Zhang et al. (2024b) has the highest g-index with a value of 15, followed by J. Li et al. (2014) with 12 articles. This result shows that other authors widely cite articles written by both authors. Z. Li et al. (2021) is the author with the fastest-growing impact; in a relatively short time (two years, from 2022 to 2024) he obtained an m-index value of 2.333. Y. Chen et al. (2021) is the author who has the highest number of citations (451); this shows that Y. Chen et al. (2021)'s writing is very famous and has a broad impact. Y. Chen et al. (2021) started publishing in 2008, whereas L. Liu and Xu (2022) published their first articles in 2009.

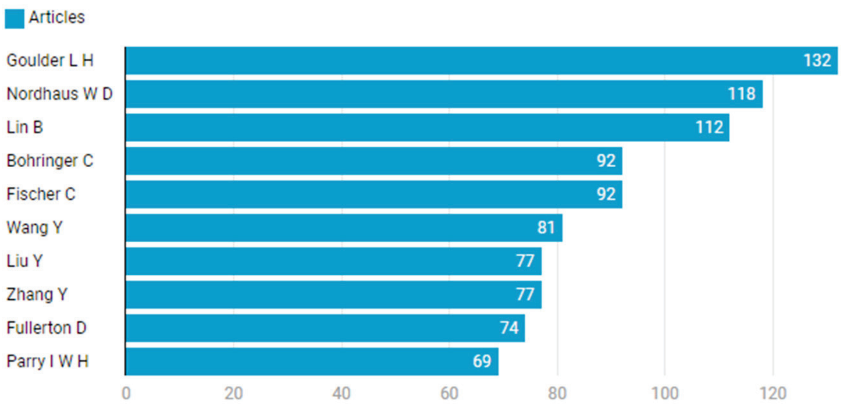


Figure 6. Authors with the highest number of article citations.

Table 3. Author impact.

Author	h_index	g_index	m_index	TC	NP	PY_start
(Zhang et al. 2024b)	10	15	0.833	244	17	2013
(L. Liu and Xu 2022)	8	9	0.5	255	9	2009
(J. Li et al. 2014)	7	12	0.636	296	12	2014
(Z. Li et al. 2021)	7	7	2.333	140	7	2022
(Zhang et al. 2024a)	7	11	0.538	143	11	2012
(Liu and Yang 2018)	6	9	0.857	176	9	2018
(Wang et al. 2023a)	6	9	0.545	260	9	2014
(Alberini et al. 2022)	5	6	0.357	292	6	2011
(Y. Chen et al. 2021)	5	7	0.294	451	7	2008
(Z. Chen et al. 2023)	5	6	0.556	90	6	2016

4.4. Document Analysis

Table 4 shows that a multidisciplinary approach combining policy, technology, circular economy, and risk analysis is critical to understanding environmental tax compliance. Studies by W. Chen and Hu (2018) and Krass et al. (2013) highlight how tax policies and incentives can influence green technology adoption and government and producer behavior. The important role of green technology in supporting environmental tax policy has been demonstrated by studies written by Binswanger (2001), Guandalini et al. (2015), and Pinzi et al. (2009). Research conducted by Geng et al. (2009) highlights how the circular economy approach is important for SDG-related policies and resource efficiency. Dai et al. (2016) showed the importance of statistical modeling and simulation in understanding environmental risks, especially in compliance with carbon tax policies.

Table 4. Top 10 cited documents of compliance on behavior environmental tax.

Ref.	Title	Year	Total Citations	Method	Variables	Sample	Result (Positive/Negative)	Author Keywords
(Krass et al. 2013)	Environmental Taxes and the Choice of Green Technology	2013	597	Comparative policy analysis	Environmental tax levels; technology adoption rates	Case studies or national-level or case studies on the uptake of technology in sectors affected by green taxes.	Positive: Research indicates that environmental taxes aid green technology adoption.	Green Technologies Sustainability Environmental Policy Environmental Taxes Subsides and Rebates
(Binswanger 2001)	Technological progress and sustainable development: what about the rebound effect?	2001	509	Economic modeling	Technological progress; energy use; rebound effect	Data on energy consumption trends pre- and post-technology implementation.	Mixed—Positive impact of technology, but negative rebound effect in energy efficiency.	Rebound effect Technological progress Energy efficiency Time Allocation Energy Taxes
(Pinzi et al. 2009)	The Ideal Vegetable Oil-based Biodiesel Composition: A Review of Social, Economical and Technical Implications	2009	417	Systematic literature review	Production costs; environmental impact; market demand	Literature from biodiesel production studies across various countries.	Positive—Biodiesel is viable with certain optimizations in feedstock.	Biodiesel Production Vegetable Oils Sustainability Transesterification Optimization Non-edible Feedstocks
(Guandalini et al. 2015)	Power-to-gas plants and gas turbines for improved wind energy dispatchability: Energy and economic assessment	2015	308	Energy and economic assessment model	Energy storage; dispatchability; economic costs	Simulation data from power-to-gas plants and economic assessments in wind energy sectors.	Positive—Demonstrates economic and energy efficiency benefits in power-to-gas systems.	Power-to-gas Electrolysis Energy storages Wind power Grid balancing Green gas
(W. Chen and Hu 2018)	Using evolutionary game theory to study governments and manufacturers' behavioral strategies under various carbon taxes and subsidies	2018	292	Evolutionary game theory	Government policies; manufacturer investment decisions	Simulated data to assess decision-making under carbon tax scenarios.	Mixed—Shows both incentives and barriers for manufacturers in adopting low-carbon technology.	Governments Manufacturers Carbin taxes Government subsidies Evolutionary game

Table 4. *Cont.*

Ref.	Title	Year	Total Citations	Method	Variables	Sample	Result (Positive/Negative)	Author Keywords
(Geng et al. 2009)	Implementing China's circular economy concept at the regional level: A review of progress in Dalian, China	2009	283	Case Study Review	Resource efficiency; waste reduction; economic growth	Regional data from Dalian, China, on circular economy projects.	Positive—Highlights successful implementation in Dalian and offers lessons for other regions.	Circular economy Sustainable Development Resource efficiency Eco-Industrial Parks Environmental Management
(Leme et al. 2014)	Techno-economic analysis and environmental impact assessment of energy recovery from Municipal Solid Waste (MSW) in Brazil	2014	249	Techno-economic analysis and LCA—evaluates the economic feasibility and environmental impact of MSW-to-energy processes.	Economic costs; emissions; energy output	Data from MSW processing plants in Brazil.	Positive—Shows MSW-to-energy as economically viable with reduced environmental impact.	Municipal Solid Waste Landfill Biogas Waste-to-Energy (WtE) Techno-economic analysis Life cycle assessment (LCA)
(Hardisty et al. 2010)	A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory	2010	239	Experimental survey study	Framing effects; political affiliation; environmental choice	Survey of consumers' environmental preferences based on framing.	Mixed—Demonstrates influence of framing and political views on environmental decision-making.	Attribute framing Constructed preference Consumer choice Political affiliation Query theory
(Dai et al. 2016)	CO_2 Accounting and Risk Analysis for CO_2 Sequestration at Enhanced Oil Recovery Sites	2016	235	Risk analysis and geostatistical modeling	CO_2 storage capacity; environmental risks	Data from enhanced oil recovery sites in various locations.	Positive—Supports CO_2 sequestration as viable with managed risks.	CO_2 Sequestration Enhanced Oil Recovery Risk Analysis Geostatistical Modeling Monte Carlo Simulations
(Seifert et al. 2008)	Dynamic behavior of CO_2 spot prices	2008	228	Stochastic optimal control and econometric analysis	CO_2 spot price fluctuations; emission trading volatility	Time-series data on CO_2 spot prices in international markets.	Positive—Provides insights on price behavior and volatility management	CO_2 emission certificates Emission trading Sport price process Stochastic optimal control

The graph in Figure 7 shows that issues relating to carbon emissions, environmental taxes, and climate policy have remained a major research focus over the years. Environmental taxes and carbon taxes were the most discussed topics in 2011. The development of carbon pricing, climate policy, and electric vehicles increased from 2015 to 2023, in line with the growing global environmental concern. Environmental regulation and emissions trading have become frequently discussed in recent years (post COVID-19), indicating a focus on applicable policy and regulatory mechanisms (Y. Chen et al. 2021). Evolutionary games and uncertainty highlight human behavior in dealing with environmental policies, including ecological tax compliance behavior in 2013–2023 (W. Chen and Hu 2018). This research is on a path that is highly relevant to current global issues and can significantly contribute to the development of more effective policies for promoting environmental tax compliance.

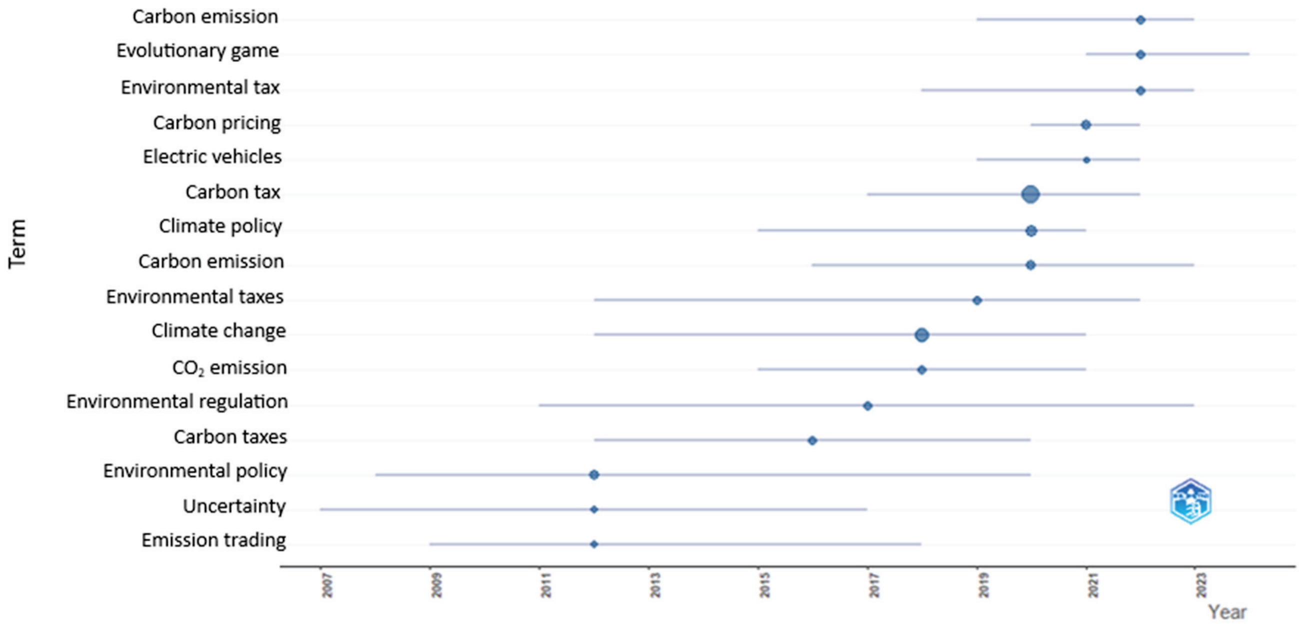


Figure 7. Trend topics.

4.5. Conceptual Structure

Figure 8 shows the evolution of research topics from 2000 to 2024. From 2000 to 2009, the focus was on pollution mitigation and basic emission-related regulations, with air pollution, pollution abatement, carbon taxes, and climate change being the dominant research topics. Meanwhile, the issues of sustainability and environmental regulation were introduced in this period in the form of a basic policy context. The period from 2010 to 2019 saw a shift, with topics becoming more specific (carbon taxes, environmental taxes, carbon emissions and efficiency). In this period, carbon taxation and emission reduction strategies attracted increased attention. The focus has since shifted to the latest trend (2020–2024), which focuses on more complex topics such as SDGs, carbon price, decarbonization, and carbon neutrality. These topics highlight the integration of environmental policies aimed at long-term sustainability. Commitment and optimality in environmental policy are relevant to this research.

In thematic map analysis, research topics are divided into groups based on two dimensions, namely density and centrality. Density is used to measure the development of a topic; if a topic has a high density, then its theory, methodology, and application are mature and broad. While centrality measures the relationship between issues in the field of study, high centrality will be the highlight. The thematic map is divided into four quadrants that showcase various themes. The first theme is motor, which is in the top right and has the potential to grow and be highly relevant. The second theme is niche, which is on the top left and has strong potential for development and more specific relevance. The third theme is emerging or declining, which is in the bottom left and has less developed topics and low relevance. The fourth theme is basic, depicted in the bottom right; it has a high level of main relevance but limited topic development (Barbu et al. 2024; Aryadoust 2023).

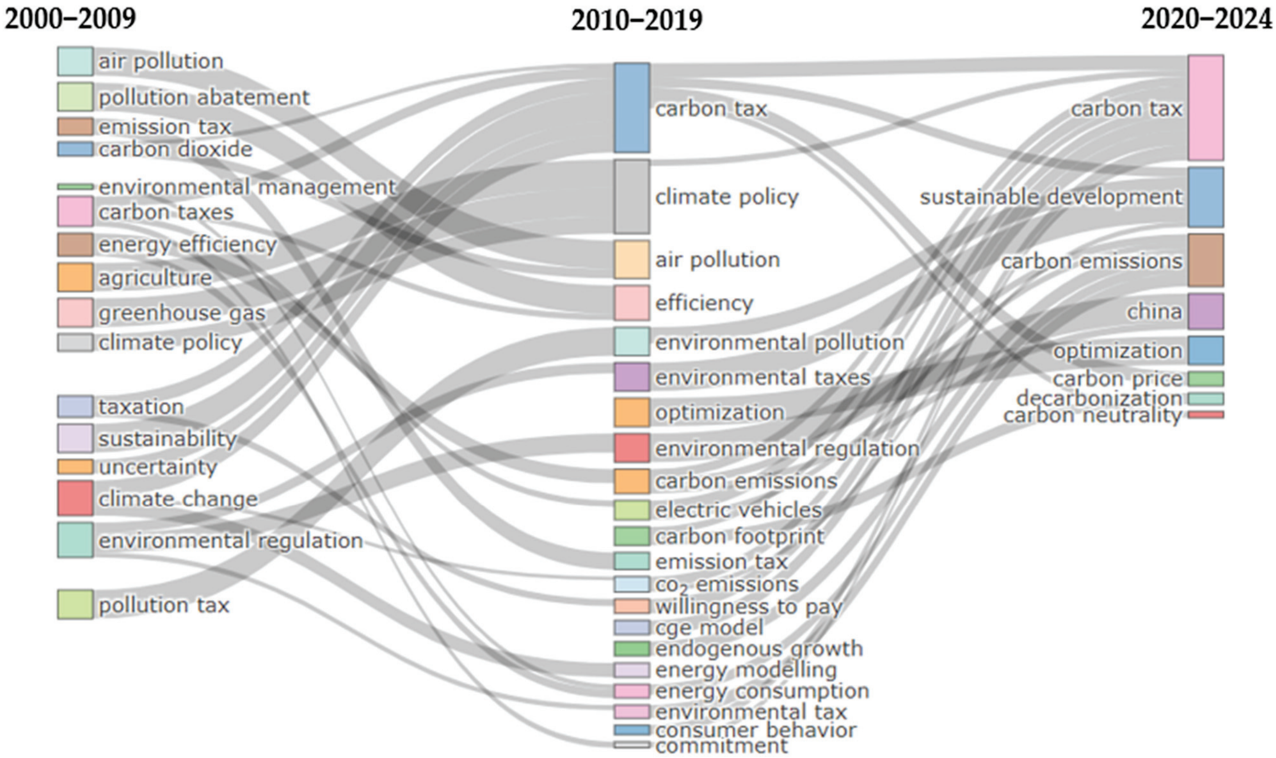
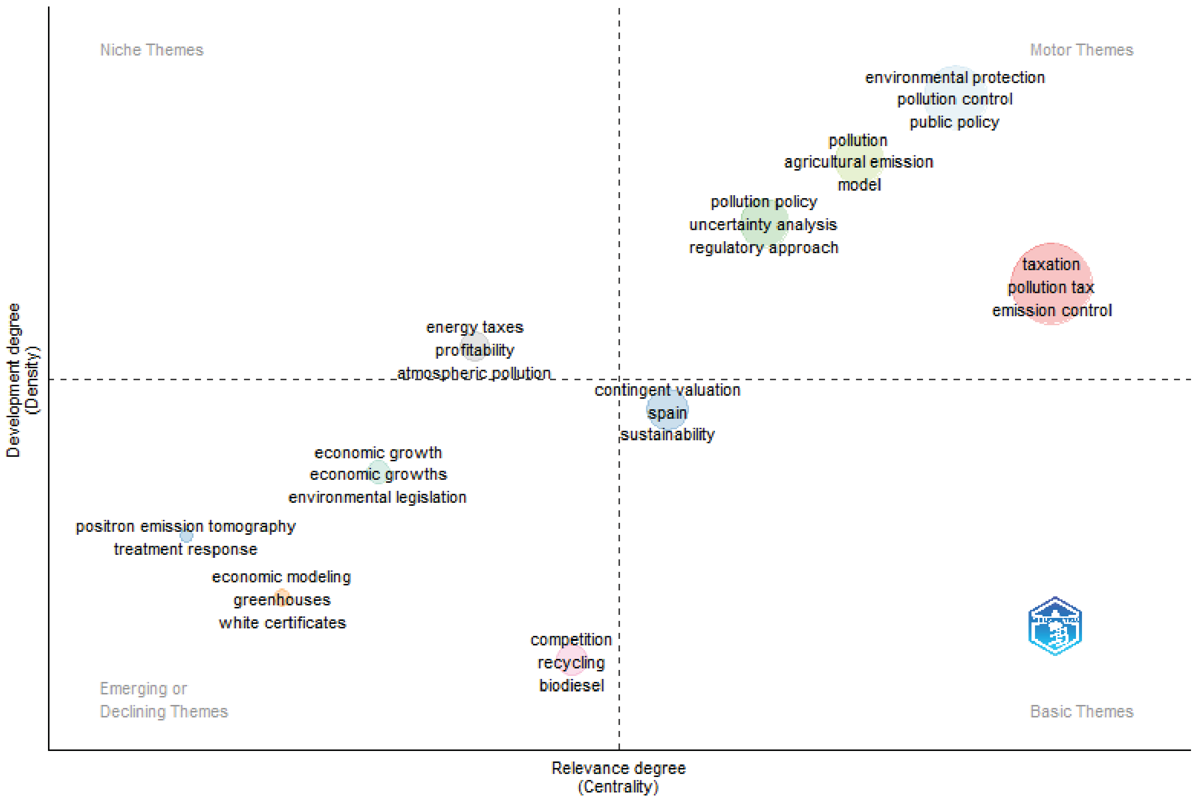


Figure 8. Thematic evolution.

Between 2000 and 2010 (Figure 9a), public awareness of climate change and regulatory actions increased, and research on pollution prevention, environmental protection, and public policy accelerated. These themes, which fall under the category of motor themes, emphasize the importance of emission control and environmental management regulations. Niche subjects like profitability and energy taxes, on the other hand, point to initiatives to comprehend the financial effects of environmental taxes. Furthermore, the emphasis on environmental laws and economic growth points to a move away from traditional economic expansion and toward a regulation-based strategy for pollution control. There is room for more research into the burgeoning or waning subjects, which include economic modeling, greenhouses, environmental laws, and economic expansion. These undeveloped regions indicate a desire to investigate sustainability solutions and evaluate the financial impacts of environmental legislation. At the nexus of economics, sustainability, and public health, issues like energy taxes and profitability are becoming increasingly popular because they provide insights into how to balance environmental and economic objectives.

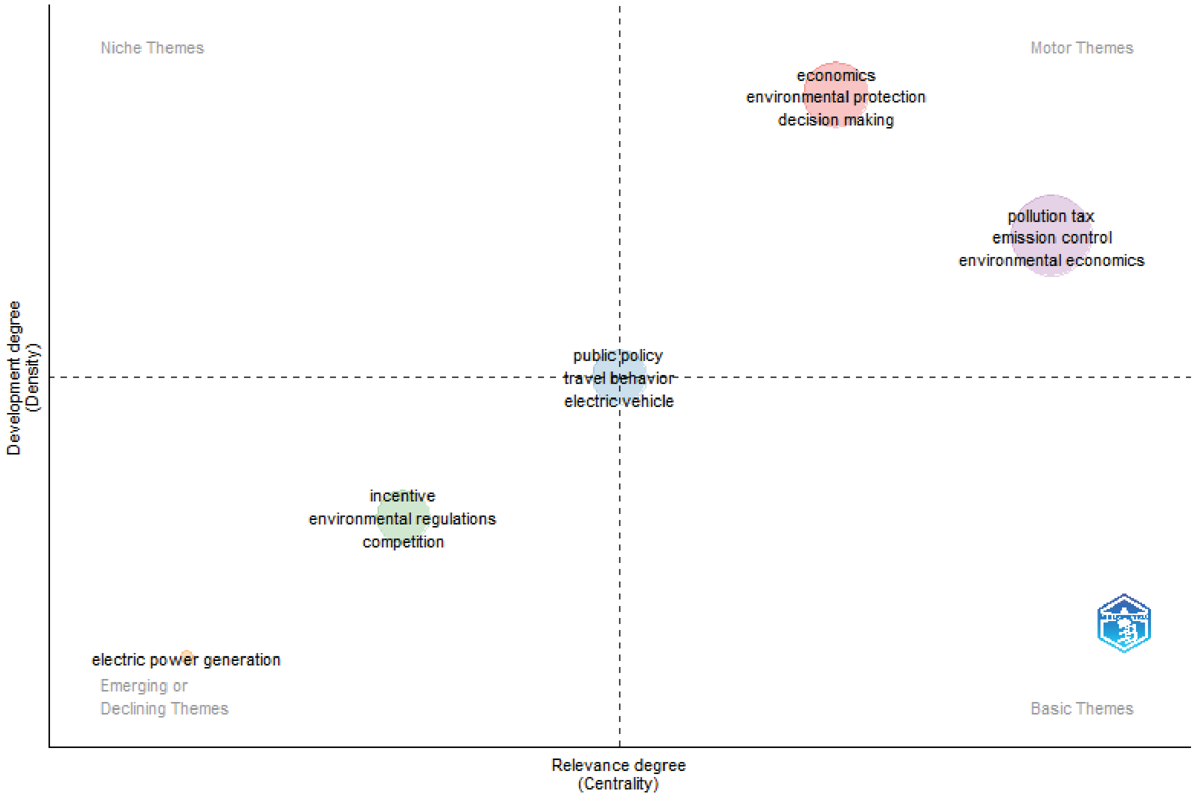
Between 2010 and 2020 (Figure 9b), the research focus in this area switched to more focused uses of fiscal tools to reduce emissions, with pollution tax, emission control, and environmental economics becoming the main subjects, in line with international initiatives to use carbon fees and other regulatory tools to meet climate commitments. Niche topics like economics and decision-making highlight the importance of strategic planning and economic analysis in environmental preservation. The growing emphasis on transportation and the implementation of green technologies within policy frameworks is reflected in fundamental subjects like public policy and electric automobiles. Research areas that are currently underdeveloped but have room to grow are highlighted in the Emerging or Declining Themes quadrant, which features topics like electric power generation and incentives for environmental legislation. These themes suggest that further research should be conducted to analyze how competitive dynamics and regulatory incentives promote sustainable power solutions, particularly with regard to the production of electric power. Research can strengthen the shift to clean energy and improve the efficacy of policy initiatives at the nexus of technology, the economy, and the environment by extending these new areas.

Research on taxation, pollution taxes, and emission control has increased significantly between 2021 and 2024 (Figure 9c), showing a clearer trend toward the employment of tax laws and strict rules to control emissions. The main research themes—such as carbon emissions and pollution taxes—emphasize the importance of fiscal measures in resolving environmental problems. An increasing interest in comprehending how individual preferences and behavioral characteristics affect environmental tax compliance is reflected in basic themes, including compliance, desire to pay, and discrete choice analysis. The problem indicates a greater understanding of how psychological and financial incentives contribute to the effectiveness of fiscal strategies for environmental management. Some topics, including economic conditions, carbon neutrality, and spatiotemporal analysis, are underdeveloped but have room for expansion in the Emerging or Declining Themes quadrant. The quest for carbon neutrality, the spatial and temporal dimensions of emissions, and the ways in which economic conditions impact the adoption of environmental policies are some of the study opportunities represented by these growing themes. Investigating these fields may yield a more thorough comprehension of the geographic and economic aspects of environmental taxes, improving the efficacy of policies intended to promote SDGs.

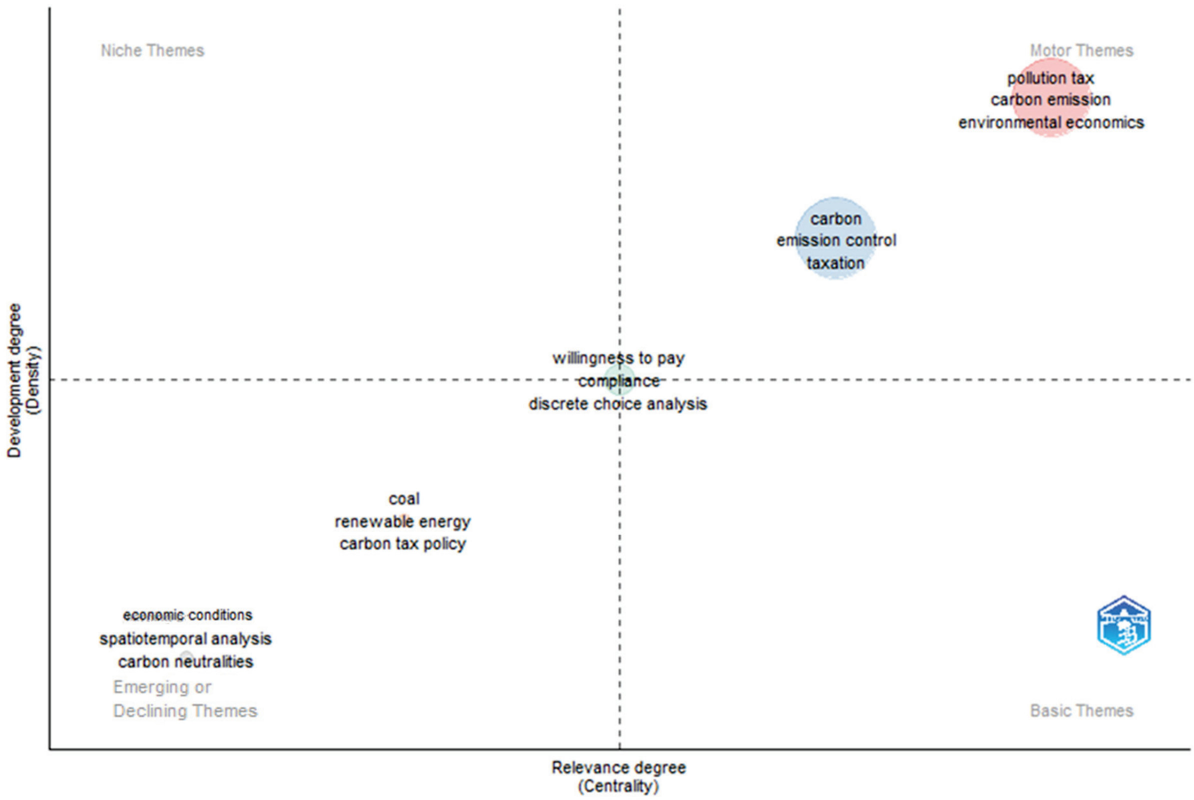


(a)

Figure 9. *Cont.*



(**b**)



(**c**)

Figure 9. Thematic map. (**a**) Periode: 2000–2010. (**b**) Periode: 2010–2020. (**c**) Periode: 2020–2024.

4.6. Intellectual Structure

Coupling authors is one of the tests used in intellectual structure analysis. This type of analysis identifies a study's conceptual structure, domain themes, and topic evolution (Passas 2024; Borgohain et al. 2021). Figure 10 shows a network of frequently used keywords and demonstrates how ideas and concepts can be interrelated. The colors of the clusters show the grouping of interconnected topics, aiming to identify the main themes and subthemes in the field of study. The size of the nodes represents the frequency of word usage, indicating the most studied concepts in the literature. The lines indicate how often two keywords co-occur for the same topic, providing insight into the conceptual relationships between topics (Waila et al. 2016; Hong et al. 2022). According to the network structure and the relationship between issues (Figure 10), the keywords carbon tax and climate change have the largest nodes, indicating that the two topics appear frequently and highlighting the close relationship between the keywords and the visualization center.

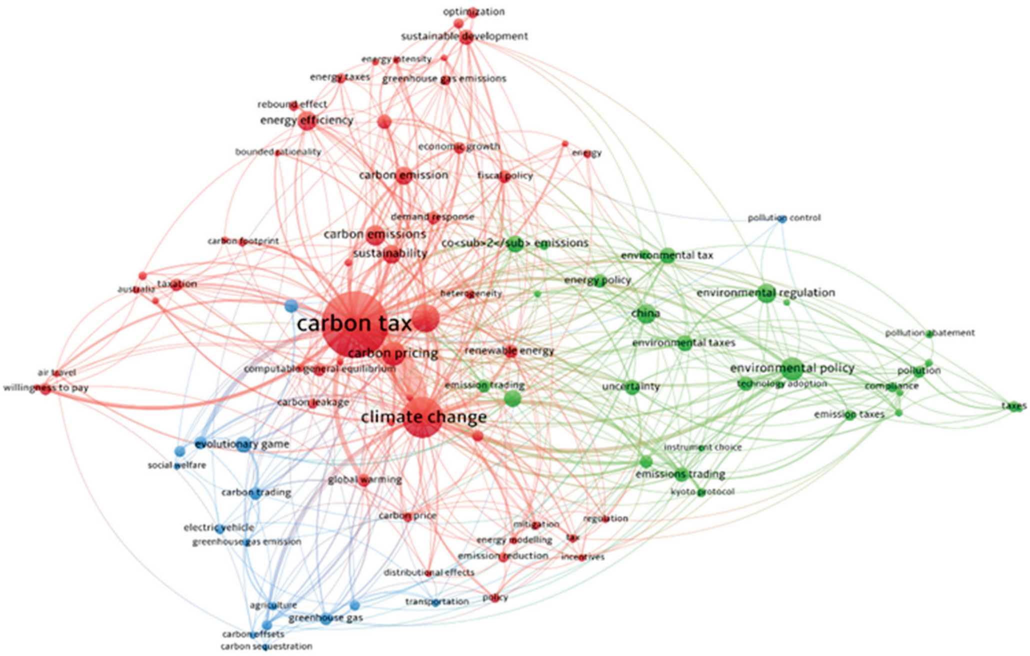


Figure 10. Coupling author keywords.

The red cluster highlights the issues of carbon tax, carbon emissions, climate change, and SDGs. These issues indicate a strong relationship between carbon tax policy and climate change mitigation efforts, with links to energy efficiency, carbon pricing, and the economic impact of environmental policies. The green cluster relates to environmental policy, environmental regulation, compliance, and environmental taxes. Environmental policy and regulation are thus important pillars in understanding how compliance levels can be affected by various regulative factors. The blue cluster leads to analytical and theoretical approaches related to evolutionary games, willingness to pay, and carbon leakage. Figure 10 highlights the importance of integrating policy approaches with behavioral analysis and economic theory to understand the dynamics of compliance and policy effectiveness.

4.7. Social Structure

Figure 11 provides a visual depiction of the influence of global research that is conducted collaboratively between different countries. China and the United States dominate the research on environmental tax behavior because these countries experience rapid knowledge development (as shown by the red cluster). In addition, the red cluster highlights collaborations between several other countries, such as the United States, China, Germany, the United Kingdom, and other European countries. Asian countries such as Indonesia, India, Pakistan, and other countries can be found in the green cluster. Japan, New Zealand, and Africa are found in the blue cluster. South Korea, Belgium, Mexico, Sweden, and Columbia are found in the yellow and purple clusters.

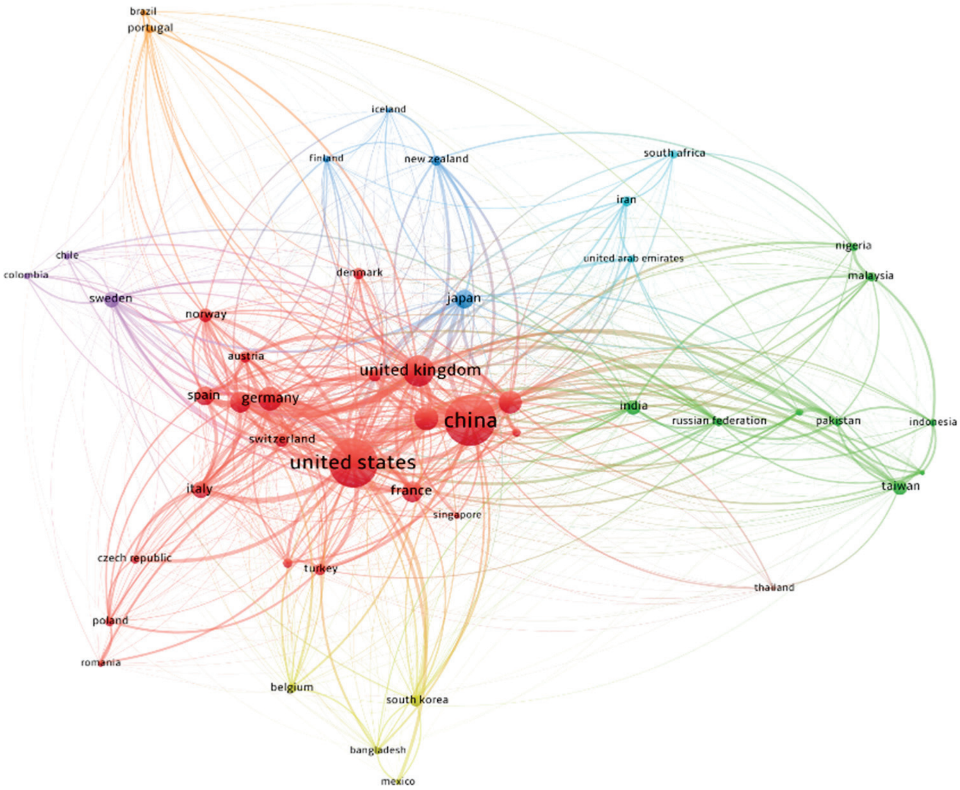


Figure 11. Coupling countries.

5. Discussion

The purpose of analyzing environmental tax compliance behavior is to provide insights that will assist with the formulation of SDG-related policies. In light of the increasing public focus on the SDGs, environmental taxes are becoming a tool for mitigating climate change and encouraging environmentally friendly economic practices. However, the success of this program is highly dependent on tax compliance. Feelings of fairness, regulatory clarity, and social participation are highly influential in this regard. An increase in the number of publications on environmental taxes indicates that there is academic interest in this area. However, the decline in citation rates post COVID-19 suggests that there is a gap between studies and their applications. This gap has become a concern. There is a need for research that is not only theoretical but can also be applied to address the complexities of environmental taxation in the context of cyberspace (Rahayu et al. 2020; Savitri et al. 2021).

China and the US dominate the citations and publications on this topic due to their significant academic, economic, and environmental footprints. Both countries have extensive research infrastructures and want to address environmental challenges by creating innovative policies. Although China has the highest number of publications, research from Australia and Canada is of high quality and relevance due to these countries' high level of international collaboration. This condition shows that cooperation between countries can lead to high-impact research, and will result in findings that can be used to face global challenges. The recent thematic evolution of research on pollution control and behavioral compliance, which was first investigated in the 2000s, reflects the increasing complexity of environmental governance.

A key finding of this research is the central role of perceived fairness and transparency in shaping environmental tax compliance. Economic theory explains that taxpayers will comply if the tax system is fair and rules are transparent and accountable. Public involvement and insight into paying taxes are very important because they can increase the legitimacy of environmental taxes and encourage voluntary compliance. A combination of incentives and enforcement mechanisms is vital in promoting compliance. These approaches help us to achieve economic and environmental outcomes that are expected to balance the carrot-and-stick dynamics in policy implementation.

In this study, we highlight the importance of international cooperation in improving research quality and environmental tax policies' effectiveness. In addition, developing an effective environmental tax policy requires a multidisciplinary approach that integrates economic analysis with behavioral science and technology insights. Future research should explore the interdisciplinary nexus, focusing on developing practical and context-specific strategies to improve the implementation and impact of environmental taxes on a global scale.

6. Conclusions

From the results of the analysis, it can be concluded that environmental taxes (for both carbon and energy) are needed to achieve the SDGs and mitigate climate change. The success of this policy is reliant on the compliance of environmental tax actors because several factors can affect compliance, such as perceptions of fairness, tax knowledge, regulatory quality, and social involvement. This study proves that the number of publications regarding compliance behavior in environmental tax has increased every year but the number of citations has decreased since the COVID-19 pandemic. The results of this analysis indicate that relevant and practical research is needed to overcome the challenges of environmental taxes. Countries such as China and the United States dominate in terms of the number of publications and citations, which is driven by active collaboration across countries.

Following this study, we can make several suggestions regarding policies to improve compliance with environmental taxes. Firstly, since people have perceptions of compliance, fairness and people's perceptions must be considered when designing regulations. This purpose will be achieved by increasing transparency, e.g., by educating the public about the purpose and benefits of environmental taxes and including communities, companies, and policymakers in the public consultation process.

In addition, compliance is strengthened by a combination of incentives and law enforcement. In its application, incentives such as subsidies or tax breaks can be given to industries and companies that have implemented environmental taxes, and strict sanctions will be imposed on violators. This approach can balance positive and negative factors, thus encouraging compliant behavior.

International cooperation is necessary to improve the quality of research and policy implementation. China and the United States have strong research capacities, so they can share knowledge and experience with other countries to help formulate and implement more effective environmental tax policies.

In addition, the development of environmental tax policy needs to incorporate a multidisciplinary approach by integrating technology, economics, and risk analysis to deal with the complexity of policy implementation and evaluate its effectiveness on an ongoing basis. This will allow policymakers to respond quickly to challenges and adapt policies to the needs of the field. By applying these approaches, we hope that environmental tax policy can become an effective fiscal instrument and tool to influence behavior and create more inclusive and participatory SDGs.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

(TITLE-ABS-KEY ('green tax' OR 'eco-tax' OR 'ecological tax' OR 'carbon tax' OR 'pollution tax' OR 'sustainability tax' OR 'environmental levy' OR 'climate tax' OR 'resource tax' OR 'energy tax' OR 'environmental duty' OR 'environmental charge' OR 'environmental fee' OR 'pigovian tax' OR emissions AND tax) AND TITLE-ABS-KEY (ABS-KEY ('compliance' OR 'response' OR 'behaviour')) AND PUBYEAR > 1999 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, 'ar') AND (LIMIT-TO (PUBSTAGE, "final") AND (LIMIT-TO (LANGUAGE, "English") AND (LIMIT-TO (SRCTYPE, "j")).

References

Akdogan, Tulin, and Ibrahim Akdogan. 2023. Theoretical Approach to Tax Compliance. *PressAcademia Procedia (PAP)* 16: 44–49. [CrossRef]

Alberini, Anna, Levan Bezhanishvili, and Milan Ščasný. 2022. 'Wild' Tariff Schemes: Evidence from the Republic of Georgia. *Energy Economics* 110: 106030. [CrossRef]

Albert, Albert, and Rien Agustin Fadjarenie. 2022. Early Tax Education: Could It Change the Future Compliance Behavior? *International Journal of Evaluation and Research in Education* 11: 1912–22. [CrossRef]

Alm, James, and Benno Torgier. 2011. Do Ethics Matter? Tax Compliance and Morality. *Journal of Business Ethics* 101: 635–51. [CrossRef]

Alm, James, William D. Schulze, Carrie von Bose, and Jubo Yan. 2019. Appeals to Social Norms and Taxpayer Compliance. *Southern Economic Journal* 86: 638–66. [CrossRef]

Aryadoust, Vahid. 2023. Bibliometrics and Scientometrics in Applied Linguistics: Epilogue to the Special Issue. *Studies in Second Language Learning and Teaching* 13: 925–33. [CrossRef]

Asri, Trisna Yudi, Ida Ayu, and I. Nyoman Angga Prabawa. 2023. The Effect of Faith in The Law of Karma in The Relationship Between Tax Digitalization and Taxpayer Compliance of MSME Owners. *International Journal of Management Studies and Social Science Research* 5: 88–97. [CrossRef]

Baranzini, Andrea, Jeroen C. J. M. van den Bergh, Stefano Carattini, Richard B. Howarth, Emilio Padilla, and Jordi Roca. 2017. Carbon Pricing in Climate Policy: Seven Reasons, Complementary Instruments, and Political Economy Considerations. In *Wiley Interdisciplinary Reviews: Climate Change*. Hoboken: Wiley-Blackwell. [CrossRef]

Barbu, Liliana, Alexandra Horobeț, Lucian Belașcu, and Anca Gabriela Ilie. 2024. Approaches to Tax Evasion: A Bibliometric and Mapping Analysis of Web of Science Indexed Studies. *Journal of Business Economics and Management* 25: 1–20. [CrossRef]

Basic, Murks Aleksandra. 2016. Climate Dilemma: Link between Uncertainty and Success. *International Journal of Earth & Environmental Sciences* 1: 3–5.

Bin-Nashwan, Saeed Awadh, Ahmed Mubarak Al-Hamedi, Munusamy Marimuthu, and Abobakr Ramadhan. 2020. Study on System Fairness Dimensions and Tax Compliance in the Middle East Context. *Problems and Perspectives in Management* 18: 181–91. [CrossRef]

Binswanger, Mathias. 2001. Technological Progress and Sustainable Development: What About the Rebound Effect? Available online: www.elsevier.com/locate/ecolecon (accessed on 18 August 2024).

Binti Ibrahim, Marhaiza, and Adi Susilo Jahja. 2022. A Scholarly Examination of Tax Compliance: A Bibliometric Analysis (1960–2021). *Journal of Indonesian Economy and Business* 37: 52–72.

Bobek, Donna D., Amy M. Hageman, and Charles F. Kelliher. 2013. Analyzing the Role of Social Norms in Tax Compliance Behavior. *Journal of Business Ethics* 115: 451–68. [CrossRef]

Borgohain, Dhruba Jyoti, Manoj Kumar Verma, and Suriana Che Daud. 2021. Scientometric Profile of Fisheries Research in Saarc Countrie. *DESIDOC Journal of Library and Information Technology* 41: 429–37. [CrossRef]

Boubaker, Sabri, Feiyang Cheng, Jing Liao, and Shuai Yue. 2023. Environmental Tax Incentives and Corporate Environmental Behaviour: An Unintended Consequence from a Natural Experiment in China. *Europian Financial Management* 30: 800–38. [CrossRef]

Böhringer, Christoph, and Thomos F. Rutherford. 2009. Integrated Assessment of Energy Policies: Decomposing Top-down and Bottom-Up. *Journal of Economic Dynamics and Control* 33: 1648–61. [CrossRef]

Calvo, Nuria, Laura Varela-Candamio, and Isabel Novo-Corti. 2014. A Dynamic Model for Construction and Demolition (C&D) Waste Management in Spain: Driving Policies Based on Economic Incentives and Tax Penalties. *Sustainability* 6: 416–35. [CrossRef]

Chang, Andres, Alexander Farsan, Alberto Carrillo Pineda, Cynthia Cummis, and Chris Weber. 2022. Comment on 'From the Paris Agreement to Corporate Climate Commitments: Evaluation of Seven Methods for Setting "Science-Based" Emission Targets'. In *Environmental Research Letters*. Bristol: IOP Publishing Ltd. [CrossRef]

Chen, Wanting, and Zhi Hua Hu. 2018. Using Evolutionary Game Theory to Study Governments and Manufacturers' Behavioral Strategies under Various Carbon Taxes and Subsidies. *Journal of Cleaner Production* 201: 123–41. [CrossRef]

Chen, Yang, Thomas A. Adams, II, and Paul I. Barton. 2021. Optimal Design and Operation of Flexible Energy Polygeneration Systems. *Industrial & Engineering Chemistry Research* 50: 4553–66. [CrossRef]

Chen, Zi-rui, Jia-yi Guo, and Pu-yan Nie. 2023. Tax Scheme for Agricultural Technology Innovation Incentive. *Paddy and Water Environment* 21: 343–52. [CrossRef]

Dai, Zhenxue, Hari Viswanathan, Richard Middleton, Feng Pan, William Ampomah, Changbing Yang, Wei Jia, Ting Xiao, Si-Yong Lee, Brian McPherson, and et al. 2016. CO_2 Accounting and Risk Analysis for CO_2 Sequestration at Enhanced Oil Recovery Sites. *Environmental Science and Technology* 50: 7546–54. [CrossRef]

Damayanti, Theresia Woro, and Samuel Martono. 2018. Taxpayer Compliance, Trust, and Power. *Jurnal Keuangan Dan Perbankan* 22: 1–22. [CrossRef]

Digitemie, Wags Numoipiri, and Ifeanyi Onyedika Ekemezie. 2024. Assessing the Role of Carbon Pricing in Global Climate Change Mitigation Strategies. *Magna Scientia Advanced Research and Reviews* 10: 22–31. [CrossRef]

Febe Christine, Abigail, Dzikri Firmansyah Hakam, Yunieta Anny Nainggolan, Sudarso Kaderi Wiryono, and Lazuardi Imani Hakam. 2024. Environmental, Social, and Governance (ESG) Impact on Corporate Financial Strategy of Energy and Utilities Companies. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4728055 (accessed on 24 August 2024).

Fischer, Carolyn, and Michael Springborn. 2011. Emissions Targets and the Real Business Cycle: Intensity Targets versus Caps or Taxes. *Journal of Environmental Economics and Management* 62: 352–66. [CrossRef]

Geng, Yong, Qinghua Zhu, Brent Doberstein, and Tsuyoshi Fujita. 2009. Implementing China's Circular Economy Concept at the Regional Level: A Review of Progress in Dalian, China. *Waste Management* 29: 996–1002. [CrossRef]

Gerlagh, Reyer, Snorre Kverndokk, and Knut Einar Rosendahl. 2009. Optimal Timing of Climate Change Policy: Interaction Between Carbon Taxes and Innovation Externalities. *Environmental and Resource Economics* 43: 369–90. [CrossRef]

Ghazouani, Assaad, Wanjun Xia, Mehdi Ben Jebli, and Umer Shahzad. 2020. Exploring the Role of Carbon Taxation Policies on CO_2 Emissions: Contextual Evidence from Tax Implementation and Non-Implementation European Countries. *Sustainability* 12: 8680. [CrossRef]

Goulder, Lawrence H. 2002. *Mitigating the Adverse Impacts of CO_2 Abatement Policies on Energy-Intensive Industries Mitigating the Adverse Impacts of CO_2 Abatement Policies on Energy-Intensive Industries*. Discussion Paper 02–22. Washington, DC: Resources for the Future.

Guandalini, Giulio, Stefano Campanari, and Matteo C. Romano. 2015. Power-to-Gas Plants and Gas Turbines for Improved Wind Energy Dispatchability: Energy and Economic Assessment. *Applied Energy* 147: 117–30. [CrossRef]

Hakam, Dzikri Firmansyah, Fajar Nurrohman Haryadi, Harry Indrawan, Muhammad Hanri, Lazuardi Imani Hakam, Ova Kurniawan, and Andreas Putro Purnomoadi. 2024. Analyzing Current Trends in Career Choices and Employer Branding from the Perspective of Millennials within the Indonesian Energy Sector. *Energies* 17: 2570. [CrossRef]

Hakam, Lazuardi Imani, Eeng Ahman, Disman Disman, Hari Mulyadi, and Dzikri Firmansyah Hakam. 2023. Exploring Trends in Innovation within Digital Economy Research: A Scientometric Analysis. *Economies* 11: 269. [CrossRef]

Hardisty, David J., Eric J. Johnson, and Elke U. Weber. 2010. A Dirty Word or a Dirty World? Attribute Framing, Political Affiliation, and Query Theory. *Psychological Science* 21: 86–92. [CrossRef]

Hartmann, Andre Julian, Martin Mueller, and Erich Kirchler. 2020. Tax Compliance: Research Methods and Decision Processes. In *Psychological Perspectives on Financial Decision Making*. Edited by Tomasz Zaleskiewicz and Jakub Traczyk. Cham: Springer International Publishing, pp. 291–330. [CrossRef]

Hikmah, Hikmah, Priyo Hari Adi, Supramono Supramono, and Theresia Woro Damayanti. 2021. The Nexus Between Attitude, Social Norms, Intention to Comply, Financial Performance, Mental Accounting and Tax Compliance Behavior. *Asian Economic and Financial Review* 11: 938–49. [CrossRef]

Hong, Yi Kyung, Ze Yu Wang, and Ji Young Cho. 2022. Global Research Trends on Smart Homes for Older Adults: Bibliometric and Scientometric Analyses. *International Journal of Environmental Research and Public Health* 19: 14821. [CrossRef] [PubMed]

Hua, Chunxiang, Chenyu Liu, Jianguo Chen, Chenxi Yang, and Linyan Chen. 2022. Promoting Construction and Demolition Waste Recycling by Using Incentive Policies in China. *Environmental Science and Pollution Research* 29: 53844–59. [CrossRef] [PubMed]

Ignat, Ioana, and Marta Tache. 2023. Transfer Pricing System of EU Countries: An Analysis in the Context of SDGS. *Transylvanian Review of Administrative Sciences* 2023: 45–66. [CrossRef]

Indarto, Bambang Ahmad, and Dwi Ari Ani. 2023. The Role of Green Accounting Through the Implementation of Carbon Taxes as an Instrument for Climate Change Mitigation in Indonesia. *The Accounting Journal of Binaniaga* 8: 73–84. [CrossRef]

Jakob, Michael, Stavros Afionis, Max Åhman, Angelo Antoci, Marlene Arens, Fernando Ascensão, Harro van Asselt, Nicolai Baumert, Simone Borghesi, Claire Brunel, and et al. 2022. How Trade Policy Can Support the Climate Agenda. *Science* 376: 1401–3. [CrossRef]

Kirchler, Erich. 2007. Tax Compliance Decisions. In *The Economic Psychology of Tax Behaviour*. Edited by Erich Kirchler. Cambridge: Cambridge University Press, pp. 103–51. [CrossRef]

Krass, Dmitry, Timur Nedorezov, and Anton Ovchinnikov. 2013. Environmental Taxes and the Choice of Green Technology. *Production and Operations Management* 22: 1035–55. [CrossRef]

Kuralbayeva, Karlygash. 2019. Environmental Taxation, Employment and Public Spending in Developing Countries. *Environmental and Resource Economics* 72: 877–912. [CrossRef]

Kusumawardhani, Adhityawati, Vanessa Saptadjaja, and Megan Cahyono. 2024. The Effects of Carbon Tax, Fairness, and Government Trust on Public Views of Carbon Tax. *InFestasi* 20. [CrossRef]

Leme, Marcio Montagnana Vicente, Mateus Henrique Rocha, Electo Eduardo Silva Lora, Osvaldo José Venturini, Bruno Marciano Lopes, and Cláudio Homero Ferreira. 2014. Techno-Economic Analysis and Environmental Impact Assessment of Energy Recovery from Municipal Solid Waste (MSW) in Brazil. *Resources, Conservation and Recycling* 87: 8–20. [CrossRef]

Li, Jian, Weihao Du, Fengmei Yang, and Guowei Hua. 2014. The Carbon Subsidy Analysis in Remanufacturing Closed-Loop Supply Chain. *Sustainability* 6: 3861–77. [CrossRef]

Li, Zhi, Yiji Lu, Rui Huang, Jinwei Chang, Xiaonan Yu, Ruicheng Jiang, Xiaoli Yu, and Anthony Paul Roskilly. 2021. Applications and Technological Challenges for Heat Recovery, Storage and Utilisation with Latent Thermal Energy Storage. *Applied Energy* 283: 116277. [CrossRef]

Lin, Boqiang, and Zhijie Jia. 2018. The Energy, Environmental and Economic Impacts of Carbon Tax Rate and Taxation Industry: A CGE Based Study in China. *Energy* 159: 558–68. [CrossRef]

Liu, Liying, and Jiuping Xu. 2022. Multi-Objective Generation Scheduling towards Grid-Connected Hydro–Solar–Wind Power System Based the Coordination of Economy, Management, Society, Environment: A Case Study from China. *International Journal of Electrical Power & Energy Systems* 142: 108210. [CrossRef]

Liu, Yupeng, and Yutao Yang. 2018. Empirical Examination of Users' Adoption of the Sharing Economy in China Using an Expanded Technology Acceptance Model. *Sustainability* 10: 1262. [CrossRef]

Markonah, Markonah, and Sumarno Manrejo. 2022. Tax Compliance Model Based on Planned Behavior of Taxpayers Mediating Intention to Pay Taxes. *International Journal of Applied Economics, Finance and Accounting* 14: 60–66. [CrossRef]

Mas'ud, Abdulsalam, Rabiu Yusuf, Noraza Mat Udin, and Redhwan Al-Dhamari. 2020. Enforce Environmental Tax Compliance Model for the Oil and Gas Industry. *International Journal of Energy Sector Management* 14: 1073–88. [CrossRef]

Miceikiene, Astrida, Jurate Lideikyte, Jurate Savickiene, and Jevgenija Cesnauske. 2019. The Role of Environmental Taxes as a Fiscal Instrument for Mitigation of Environmental Pollution: Lithuanian Case. *European Scientific Journal ESJ* 15: 26–41. [CrossRef]

Muflihani, Firna, Bambang Subroto, and Mohamad Khoiru Rusydi. 2021. The Effect of Motivation, Tax System Complexity, and Financial Conditions on Taxpayer Compliance. *Business & Accountancy Ventura* 24: 184–94. [CrossRef]

Nordhaus, William. 2008. *A Question of Balance Weighing the Options on Global Warming Policies*. New Haven and London: Yale University Press.

Oladipo, Olufemi, Tony Nwanji, Damilola Eluyela, Bitrus Godo, and Adekunle Adegboyegun. 2022. Impact of Tax Fairness and Tax Knowledge on Tax Compliance Behavior of Listed Manufacturing Companies in Nigeria. *Problems and Perspectives in Management* 20: 41–48. [CrossRef]

Osman, Magda, Pauline Schwartz, and Saul Wodak. 2021. Sustainable Consumption: What Works Best, Carbon Taxes, Subsidies and/or Nudges? *Basic and Applied Social Psychology* 43: 169–94. [CrossRef]

Parry, Ian W. H., Ruud A. de Mooij, and Michael Keen. 2012. *Fiscal Policy to Mitigate Climate Change: A Guide for Policymakers*. Washington, DC: International Monetary Fund.

Passas, Ioannis. 2024. Bibliometric Analysis: The Main Steps. *Encyclopedia* 4: 1014–25. [CrossRef]

Pérez, Sugey de Jesús López, and Xavier Vence. 2021. When Harmful Tax Expenditure Prevails over Environmental Tax: An Assessment on the 2014 Mexican Fiscal Reform. *Sustainability* 13: 11269. [CrossRef]

Pinzi, Sara, Isabel Liorente Garcia, Francisco Juan Lopez-Gimenez, Miguel de la Cruz Luque de Castro, Gabriel Dorado, and Morales Pedro Dorado. 2009. The Ideal Vegetable Oil-Based Biodiesel Composition: A Review of Social, Economical and Technical Implications. *Energy and Fuels* 23: 2325–41. [CrossRef]

Qasim, Mubashir. 2017. Sustainability and Wellbeing: A Scientometric and Bibliometric Review of The Literature. *Journal of Economic Surveys* 31: 1035–61. [CrossRef]

Rahayu, Agus, M. Saparudin, and R. Hurriyati. 2020. Factors Influencing Online Purchase Intention: The Mediating Role of Customer Trust (a Study Among University Students in Jakarta). *Advance in Economics, Business and Management Research*, 107–117.

Saad, Natrah. 2011. Fairness Perceptions and Compliance Behaviour: Taxpayers' Judgments in Self-Assessment Environments. Available online: https://www.researchgate.net/publication/48382697 (accessed on 22 September 2024).

Savitri, Citra, Ratih Hurriyati, Lili Adi Wibowo, and Heny Hendrayati. 2021. The Role of Social Media Marketing and Brand Image on Smartphone Purchase Intention. *International Journal of Data and Network Science* 6: 185–92. [CrossRef]

Seifert, Jan, Marliese Uhrig-Homburg, and Michael Wagner. 2008. Dynamic Behavior of CO_2 Spot Prices. *Journal of Environmental Economics and Management* 56: 180–94. [CrossRef]

Sen, Iman, Nina Mazaar, and Julian Jamison. 2020. Applying Behavioral Insights to Tax Compliance: Experimental Evidence from Latvia. *Journal of Tax Administration* 6: 1–33.

Shahrour, Mohamad H., Mohamed Arouri, Dung V. Tran, and Sandeep Rao. 2024. Carbon Consciousness: The Influence of CEO Ownership. *Journal of Environmental Management* 364: 121455. [CrossRef]

Song, Yijia, Xitao Li, and Xin Peng. 2023. The Unintended Energy Efficiency Gain from Tax Incentives for Investment: Micro-Evidence from Quasi-Natural Experiments in China. *Review of Development Economics* 28: 310–38. [CrossRef]

Stratton, Samuel J. 2019. Literature Reviews: Methods and Applications. *Prehospital and Disaster Medicine* 34: 347–49. [CrossRef] [PubMed]

Sucharew, Heidi, and Maurizio Macaluso. 2019. Methods for Research Evidence Synthesis: The Scoping Review Approach. *Journal of Hospital Medicine* 14: 416–18. [CrossRef] [PubMed]

Thelwall, Mike. 2019. The Influence of Highly Cited Papers on Field Normalised Indicators. *Scientometrics* 118: 519–37. [CrossRef]

Trivedi, Umashanker V., Stuart Mestelman, and Mohamed Shehata. 2004. Attitudes, Incentives, and Tax Compliance. *Canadian Tax Journal* 1: 53.

Ullah, Rizwan, Samira Adnan, and Azam S. Afzal. 2019. Top-Cited Articles from Dental Education Journals, 2009 to 2018: A Bibliometric Analysis. *Journal of Dental Education* 83: 1382–91. [CrossRef]

Ulucak, Recep, Danish, and Yacouba Kassouri. 2020. An Assessment of the Environmental Sustainability Corridor: Investigating the Non-Linear Effects of Environmental Taxation on CO_2 Emissions. *Sustainable Development* 28: 1010–18. [CrossRef]

Waila, Pranav, Vivek Kumar Singh, and Manoj Kumar Singh. 2016. A Scientometric Analysis of Research in Recommender Systems. *Journal of Scientometric Research* 5: 71–84. [CrossRef]

Wang, Jia Ming, Pin Chao Liao, and Guan Biao Yu. 2021. The Mediating Role of Job Competence between Safety Participation and Behavioral Compliance. *International Journal of Environmental Research and Public Health* 18: 5783. [CrossRef]

Wang, Ke, Jiayu Wang, Klaus Hubacek, Zhifu Mi, and Yi Ming Wei. 2020. A Cost–Benefit Analysis of the Environmental Taxation Policy in China: A Frontier Analysis-Based Environmentally Extended Input–Output Optimization Method. *Journal of Industrial Ecology* 24: 564–76. [CrossRef]

Wang, Longke, Pingping Ma, Yan Song, and Ming Zhang. 2023a. How Does Environmental Tax Affect Enterprises' Total Factor Productivity? Evidence from the Reform of Environmental Fee-to-Tax in China. *Journal of Cleaner Production* 413: 137441. [CrossRef]

Wang, Weiwei, Weihao Kang, and Jingwen Mu. 2023b. Mapping Research to the Sustainable Development Goals (SDGs) Mapping Research to the Sustainable 1 Development Goals (SDGs) 2. *Research Square*. [CrossRef]

Wang, Yanyan, Lijun Qi, and Wenjing Cui. 2024. Analysis of Multi-Stakeholder Behavioral Strategies in the Construction and Demolition Waste Recycling Industry through an Evolutionary Game Theory. *Buildings* 14: 1425. [CrossRef]

Wijaya, Melinda. 2023. Complexity of Tax Aspects in Carbon Tax Implementation. *Jurnal Multidisiplin Madani* 3: 2585–95. [CrossRef]

Wojewodzki, Michal, Tsun Se Cheong, Jianfu Shen, and Louis T. W. Cheng. 2023. Does Corporate Carbon Performance Converge in the Global Market? Evidence from a Distribution Dynamic Approach. *Journal of Environmental Management* 342: 118355. [CrossRef]

Xu, Bin. 2022. How to Efficiently Reduce the Carbon Intensity of the Heavy Industry in China? Using Quantile Regression Approach. *International Journal of Environmental Research and Public Health* 19: 12865. [CrossRef]

Yusoff, Yusri Hazrol, Intan Nadilah, Muhammad Khoirul Anwar, Raihan Adnan Yustiansyah, Raihan Herwin Utama, and Muhammad Dahlan. 2024. Optimizing the Implementation of Carbon Tax in Reducing the Impact of Environmental Pollution. *Accounting and Finance Research* 13: 89. [CrossRef]

Zhang, Chuan, Cai Feng Zou, Wenbo Luo, and Lamei Liao. 2022. Effect of Environmental Tax Reform on Corporate Green Technology Innovation. *Frontiers in Environmental Science* 10: 1036810. [CrossRef]

Zhang, Jinbo, Liu Chen, Yulei Xie, Pingjian Yang, Zheng Li, Huaicheng Guo, Yang Zhang, and Lirong Liu. 2024a. Climate Change Mitigation in Energy-Dependent Regions—A Carbon Tax-Based Cross-System Bi-Layer Model with Equilibrium-Optimization Superposition Effects. *Resources, Conservation and Recycling* 200: 107315. [CrossRef]

Zhang, Yuanyuan, Shaochuan Fu, Fangfang Ma, and Benxuan Miao. 2024b. The Complexity Analysis of Decision-Making for Horizontal Fresh Supply Chains under a Trade-off between Fresh-Keeping and Carbon Emission Reduction. *Chaos, Solitons & Fractals* 183: 114893. [CrossRef]

Zheng, Qian, Jinye Li, and Xiaole Duan. 2023. The Impact of Environmental Tax and R&D Tax Incentives on Green Innovation. *Sustainability* 15: 7303. [CrossRef]

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Flourishing MSMEs: The Role of Innovation, Creative Compliance, and Tax Incentives

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Abstract: This study explores the interplay between tax incentives, creative compliance, and innovation in enhancing business resilience and sustainability among micro, small, and medium enterprises (MSMEs) in Indonesia, addressing gaps in the existing literature regarding their interrelationships during crises. A cross-sectional survey of 360 MSMEs was conducted, utilizing the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to analyze complex relationships among variables. The findings reveal that creative compliance, including tax planning and avoidance, does not directly impact resilience or sustainability. While tax incentives did not significantly enhance resilience during crises, they contributed to long-term sustainability. Innovation emerged as a critical factor linking creative compliance to business success and fully mediating the effects of tax incentives on resilience. This study emphasizes the necessity for MSMEs to prioritize innovation in their strategies, particularly in conjunction with effective tax practices, and highlights the need for government support through simplified regulatory frameworks to foster an innovative business environment. Limitations include the challenges of incorporating control variables in SEM and the need for further research into the long-term effects of these factors on sustainable performance.

Keywords: tax incentive; creative compliance; innovation; business resilience; sustainable performance; MSMEs; contingency theory; entrepreneurial self-efficacy; institutional theory; Indonesia

1. Introduction

Micro, small, and medium enterprises (MSMEs) have formed around 90% of businesses worldwide, showcasing their ability to navigate economic and social intricacies while attaining organizational objectives (Lutfi et al. 2022). Researchers have identified the pivotal role of MSMEs in supporting the national economy and mitigating unemployment levels with job opportunities (Wolff et al. 2015; Jansson et al. 2017; Pu et al. 2021; Sayal and Banerjee 2022; Khan et al. 2023). In Indonesia, there are over 64 million MSMEs, constituting about 57% of the gross domestic product and absorbing 97% of the total workforce (Ministry of Cooperatives and SMEs 2019). Meanwhile, large companies only employ around 3% of the workforce and contribute around 43% to Indonesia's GDP. Apart from their important role in generating economic prosperity, the presence of MSMEs has been identified as being able to foster innovation and technological progress (Oakey 1991; Kobe 2012).

Nevertheless, compared to larger businesses, MSMEs are more susceptible to a range of unforeseen circumstances, including the COVID-19 pandemic, mainly due to their weaker financial reserves, fewer assets, more restricted access to resources, and more underdeveloped managerial skills (OECD 2020; Tambunan 2021). It was exacerbated by the adoption of control measures such as lockdowns, quarantine, and social distancing to limit the spread of the virus, which affected the production factors' mobility and stopped most MSMEs' activities (Lonergan and Chalmers 2020). Consequently, the impact of this crisis on the performance of MSMEs is far worse than that of the 2008 global financial crisis (Fairlie et al. 2023). These adversities were soon compounded by the Ukraine–Russia conflict, which caused global raw material prices to soar (Ben Hassen and Bilali 2022). Despite the Indonesian economy seeing a rebound since the end of 2022, especially after the reopening of the economy post-COVID-19 (World Bank 2022), several MSMEs continue to face challenges in resuming their operations, placing them at risk of permanent closure.

Accordingly, innovation is needed to protect MSMEs from waves of bankruptcy. Ebersberger and Kuckertz's (2021) study demonstrates that MSMEs in Asia, Oceania, North America, and Europe have successfully addressed these challenges via innovation. Furthermore, Xie et al. (2022) prove that innovation is one of the crucial steps that MSMEs need to take to remain viable and sustainable during the global outbreak. However, frequently, companies carrying out innovative activities experience deadlocks (Niu et al. 2023). According to the 2021 Global Innovation Index (GII) statistics published by the World Intellectual Property Organization, Indonesia's innovation rating is very low, standing at 87th place. Furthermore, while examining the GII pillar, Indonesia's performance remains below the average. The Central Bureau of Statistics (2021) corroborates these statistics, indicating that the innovation rate among enterprises in Indonesia stands at about 30%. Specifically, 23.41% of companies innovated in products, while 23.90% focused on process innovation. This low level of innovation is most likely due to funding constraints (e.g., Kelley 2009), which has been a major problem for MSMEs during the pandemic (Baldwin and Mauro 2020; Cao and Leung 2020) and will probably continue to be felt in the future, long after the pandemic ended (Gourinchas 2020; Khan 2022).

To overcome the obstacle of financial limitations that hinder the ability of MSMEs to innovate and contribute to development objectives, policymakers globally are offering financial assistance to MSMEs. This assistance includes facilitating access to new credit, providing cash transfers, deferring payments, granting fiscal exemptions, and offering wage subsidies (e.g., Dell'Ariccia et al. 2020; Garicano 2020). Indonesia, as one of the most affected countries during the pandemic, is also taking similar proactive steps, which are reflected in the National Economic Recovery (PEN) program in 2021 (Coordinating Ministry for Economic Affairs of the Republic of Indonesia 2021). A notable allocation of IDR 162.4 trillion (about USD 10.4 billion) out of the total IDR 744.5 trillion budget for national economic recovery has been earmarked specifically for the MSMEs. These funds have been disbursed in the form of supplementary business capital for 12.71 million business units, interest subsidies for 4.96 million business units, the deployment of guarantee funds, and credit restructuring for numerous business entities. Additionally, the government has not only reduced the tax rate from 1% to 0.5% but also waived taxes for businesses with a turnover of less than IDR 500 million. These financial aid and government policies have proven beneficial for MSME innovation in Indonesia during the pandemic (Najib et al. 2021). In addition, in the Indonesian context, the positive relationship between government support and MSME innovation is not only proven in crises but also in normal situations (Najib and Kiminami 2011), such as the period after the pandemic.

Apart from relying on support and cooperation with external parties (i.e., the government) as mentioned above, any company, including MSMEs experiencing financial constraints, usually adopts alternative strategies to increase internally generated funds, such as, for example, tax planning (Edwards et al. 2016; Seidu et al. 2023) and tax avoidance (Elbannan and Farooq 2020; Falavigna and Ippoliti 2023). It should be remembered that tax planning and avoidance do not always mean that the company is carrying out inappropriate actions, and many provisions in tax regulations allow and encourage companies to reduce their tax burden (Dyreng et al. 2008). On this matter, companies comply with the "letter of the law" with the aim of lowering certain levels of taxable income below those intended by the legislators (Gribnau 2015). This behavior has been labeled "creative compliance" (McBarnet and Whelan 1999). Furthermore, the increase in internal cash flow resulting from such behavior has been shown to be a major source of financing innovation activities among MSMEs (Himmelberg and Petersen 1994).

Building upon the points mentioned above, we come up with the following proposition: financial assistance and government policies provided to MSMEs and alternative strategies to increase internal funding sources through tax planning and tax avoidance are able to promote innovation among MSMEs. As previously mentioned, this innovation is the key to the success of MSMEs in surviving the waves of the outbreak. Furthermore, the resilience of MSMEs will enable them to maintain their sustainability in the long run by implementing effective strategies to withstand any future shocks (Beech et al. 2020; Agarwal et al. 2023). Most importantly, as Winnard et al. (2014) stated, managing both resilience and sustainability is crucial to reducing vulnerabilities and maintaining high-quality performance, which ultimately leads MSMEs to flourish rather than just survive.

This study, therefore, is intended to examine whether government financial assistance in the form of tax incentives, tax planning, and tax avoidance strategies can increase the resilience and sustainability of MSMEs by stimulating innovation. Using primary data from 360 MSMEs in Indonesia, we found that creative compliance, including tax planning and avoidance, does not directly enhance resilience or sustainability. While tax incentives did not significantly boost resilience during crises, they support long-term sustainability. Innovation plays a crucial role, significantly influencing both resilience and sustainability, and mediates the relationship between tax-related factors and our endogenous variables. Our analysis reveals a U-shaped relationship between innovation and sustainability, indicating that initial high costs of innovation may reduce performance but eventually enhance sustainability. We also confirm that innovation is not exogenous, reinforcing its central role in our model.

The results of this study contribute to the literature in several important ways. First, it integrates two concepts that are usually studied as separate issues (Winnard et al. 2014), but basically, both are needed to achieve a flourishing business, namely resilience and sustainability. Second, theoretically, this study highlights the importance for organizations to develop alternative financial plans, which are essential to ensure the availability of critical resources during an emerging crisis. This insight is in line with the contingency theory popularized by Fiedler (1964), where organizational decisions are not one-size-fits-all—they must be tailored to the specific circumstances at hand. In this regard, companies can implement creative compliance that reflects entrepreneurial self-efficacy and utilize tax incentives that are in line with institutional theory to promote innovation and thereby the resilience and sustainability of MSMEs. Although there is much evidence regarding the importance of entrepreneurial strategies for the flourishing of MSMEs (e.g., Schmitt et al. 2018; Khanam and Sakib 2020; Khan et al. 2021; Pulka et al. 2021; González-López et al. 2021; Kisubi et al. 2022; Ibidunni et al. 2024), little research has investigated whether managerial strategies from the tax aspect, such as creative compliance, are an integral part of the resilience and sustainability of MSMEs in a country. Lastly, it is expected that the findings of this study can help MSMEs in Indonesia outline their strategic roadmap towards achieving sustainable development goals. Moreover, these outcomes can serve as valuable insights for MSMEs in other regions, as well as guide policymakers in implementing effective policies for these business units.

The subsequent sections of this work are structured as follows. Section 2 offers a concise yet comprehensive overview of the literature dealing with the conceptualization of resilience and sustainability of business and explores how they might be integrated into decisions to lead to flourishing rather than surviving businesses. Additionally, this section details the conceptual frameworks for the explanatory variables under investigation, including tax planning, tax avoidance, tax incentives, and innovation. Section 3 outlines the theoretical background and several hypotheses that serve as the backdrop for empirical testing in this current study. Moving forward, Section 4 meticulously details the data utilized in the estimation process, the development of the questionnaire, and the data analysis methods designed to produce rigorous empirical results. Section 5 dissects the empirical findings. Section 6 presents an in-depth discussion. Section 7 concludes the findings and presents cogent theoretical and policy implications, drawing the curtains on this comprehensive academic endeavor.

2. Literature Review: A Conceptual Definition

In this section, we define the variables conceptually by referring to both the theoretical and empirical literature, which is very useful in building a common understanding of the terms and constructs under investigation and crucial to ensuring the consistency and validity of the research (Wacker 2004). By delineating these definitions, we can precisely frame our hypotheses, select appropriate methodologies, and compare our findings with previous studies. This clarity not only enhances the credibility of the research but also facilitates the replication of studies and contributes to the cumulative knowledge in the field. Without well-defined concepts, the interpretations of results may be invalid, leading to potential ambiguities and undermining the overall integrity of the research (Konlechner and Ambrosini 2019).

2.1. Business Sustainability

Ecology, regarded as the foremost scientific framework for comprehending sustainability, emphasizes a growing awareness of human activities' environmental impacts (Quental et al. 2011). It underscores the imperative to manage natural resources in a manner that fulfills current societal needs without compromising those of future generations. This approach seeks to address negative externalities—the adverse effects on parties not directly involved in economic transactions (Pearce 2002). The implementation of this concept in the business world has experienced a notable rise (Klettner et al. 2014). Numerous enterprises are presently embracing environmentally sustainable strategies, including the reduction of carbon emissions, the utilization of eco-friendly products, and active involvement with local communities (Menozzi et al. 2015; Buffa et al. 2018). In addition, an increasing customer desire for goods that exhibit both environmental consciousness and social accountability has resulted in the heightened significance of companies that promote sustainability (Liu et al. 2018; Wu et al. 2021). Also, a meticulous analysis of the functions fulfilled by governments and regulatory bodies underscores the significance of sustainability as a paramount policy objective, suggesting that it will continue to be the prevailing trend in the business environment (Bryant et al. 2018; Peñarroya-Farell et al. 2023).

The sustainable performance of a business reflects its accomplishments across economic, environmental, and social dimensions (Khan et al. 2023). This level of performance results from the collective efforts put forth by employees, relationship networks, and a steadfast dedication to socially responsible practices (Spillan and Parnell 2006). Social performance encompasses actions that contribute to the betterment of society, while environmental performance involves initiatives aimed at reducing emissions and pollution to enhance the environment (Testa et al. 2015). On the other hand, economic performance pertains to the growth in sales and profits (Le 2022). Our research focuses on sustainable performance in a broader sense, extending beyond just green or financial metrics. It aligns with sustainability goals, encompassing the triple bottom line, which encompasses environmental, societal, and economic aspects. For MSMEs, this approach may involve assessing profit growth, resource efficiency, and both environmental and social performance (Le 2022; Khan et al. 2023).

Numerous empirical studies suggest that those indicators, especially profit growth and resource efficiency, are well-suited essential components of sustainability for MSMEs. For instance, Soytas et al. (2019) recognize a reciprocal relationship between sustainability and financial performance. On the one hand, sustainability efforts can enhance a company's reputation, drawing in customers and investors who prioritize environmental and social responsibility, which in turn boosts revenue and investment potential. Conversely, firms with higher financial returns possess greater resources and motivation to invest in sustainability initiatives. Chatzistamoulou and Tyllianakis (2022) explore how European SMEs' dedication to resource efficiency can drive a shift towards sustainability. They demonstrate that such commitment, facilitated through the adoption of innovative technologies, collaborative efforts, and business consulting, will support these enterprises in making a successful transition to more sustainable practices. Meanwhile, as noted earlier, social and environmental performance is fundamentally intertwined with the process of sustainability transformation (Belu 2009).

In conclusion, the literature highlights that sustainable performance encompasses economic, environmental, and social dimensions, where a balanced approach to profit growth, resource efficiency, and social responsibility is essential. Empirical studies further corroborate that sustainability efforts positively influence financial performance and that resource efficiency and innovation are pivotal for MSMEs transitioning to sustainable practices. Collectively, these insights affirm that a comprehensive approach to sustainability, integrating ecological, economic, and social considerations, is not only a key driver of business success but also a necessary strategy for long-term viability and responsibility.

2.2. Business Resilience

Resilience is defined as the capacity of both individuals and organizations to endure, adapt, and progress in the face of challenges, changes, or disruptions (Barasa et al. 2018). The roots of resilience lie in ecology, where it originally described the interaction between human activities and natural systems (Limnios et al. 2014). Conceptually, it reflects the ability of complex systems to restore equilibrium following disturbances (Bhamra et al. 2011). Resilience is indispensable for systems and their components to navigate turbulent external environments, encompassing events of varying impact (Wright et al. 2012). In the current era of globalization and rapid technological advancements, business worlds encounter diverse risks (Lahiri et al. 2008), including economic downturns, climate instability, and swift regulatory transformations. Resilience within the context of businesses refers to the capability of a company to endure, adjust, and advance amidst such situations (Ismail et al. 2011). Another critical facet is their capability to swiftly recover from a negative exogenous shock, including the COVID-19 pandemic, which suddenly hit ongoing business operations.

According to Adobor and McMullen (2018), business resilience surrounds the fundamental processes that foster and utilize organizational adaptive capacity. These processes include readiness, which involves ensuring that businesses are adequately equipped to minimize the likelihood and impact of disruptive events (Ponomarov and Holcomb 2009). Ivanov and Sokolov (2012) argued that in the event of widespread disruptions, managers need to adopt a proactive approach by preparing for the incident and minimizing susceptibility to such disturbances. Organizations that invest significantly in preparedness are better equipped to develop alternative strategies, thereby enhancing their resilience and reducing vulnerabilities (Pettit et al. 2013). Additionally, businesses must have effective response and recovery mechanisms to mitigate the effects of disruptions and rebound from adverse circumstances (Christopher and Peck 2004; Burnard and Bhamra 2011; Hufschmidt 2011). Without developing these capabilities, businesses remain susceptible to significant impacts on their revenues and costs (Ponomarov and Holcomb 2009). In line with the two fundamental phases of managing a crisis suggested by Mitroff et al. (1988), preparedness falls under the proactive category, involving efforts to anticipate and identify potential crises before they emerge. On the other hand, response and recovery are considered reactive measures aimed at mitigating the consequences and managing the aftermath of a crisis. It is important to recognize that readiness, response, and recovery within the business organization are interconnected, as effective preparedness can accelerate both response and recovery (Knemeyer et al. 2009; Grötsch et al. 2013). Therefore, adopting the dimensions of business resilience, encompassing readiness, response, and recovery, is crucial for conducting empirical analysis, both those using quantitative and qualitative approaches.

In line with that notion, Chowdhury and Quaddus (2016) conducted a study on the supply chain resilience within Bangladesh's apparel sector. Their research, based on survey data from 272 firms, demonstrated that the dimensions of supply chain resilience—such as readiness, response, and recovery—exhibit both reliability and validity. Additionally, their findings highlighted that factors such as supply chain orientation, learning and development, and the culture of supply chain risk management have a significant impact on enhancing supply chain resilience. In the same industry, Oxborrow and Brindley (2012) investigated the challenges faced by SMEs in maintaining supply chain resilience amid fluctuating economic conditions caused by recessionary ripples and structural transformations. By employing a longitudinal-focused interview, they revealed that the apparel supply chain has adapted to market fluctuations by either engaging directly with retailers or relocating production to international facilities as a strategy to address market uncertainties. Shifting the focus to other sectors but still within the realm of small enterprises, Hadjielias et al. (2022) investigated the psychological resilience of individual owner–managers during the global COVID-19 crisis. Their study, which included interviews with 35 small business owner-managers conducted between April and December 2020, found that preparedness serves as a crucial protective factor enabling these managers to navigate and potentially excel despite the pandemic's challenges. Lastly, Rodrigues et al. (2021) conducted a descriptive analysis of 254 SMEs in Portugal and found that 28.35% of these companies required up to three months to recover from pandemic-induced losses. It suggests a focus on directing their efforts toward recovery amidst ongoing uncertainty, consistent with the principles of organizational resilience.

In summary, resilience—originating from ecological concepts—is crucial for organizations, including MSMEs, to navigate and thrive amidst disruptions. It involves three key dimensions: readiness, response, and recovery. As MSMEs face increasing risks from economic shifts and environmental changes, effective preparedness and adaptable response mechanisms become vital. Empirical research highlights that these business sectors with strong resilience practices, such as proactive planning and efficient recovery strategies, can better manage disruptions and recover from challenges like the COVID-19 pandemic. Thus, integrating resilience strategies is essential for MSMEs to maintain operational stability and ensure long-term success in a volatile environment.

2.3. Flourishing Business: Linking Sustainability and Resilience

While sustainability and resilience are often examined as two separate and independent topics (Derissen et al. 2011), recent discussions highlight their interconnected nature and mutual reinforcement (Redman 2014; Marchese et al. 2018; Balugani et al. 2020; Weber 2023). This linkage might be attributed to the fact that both concepts are deeply rooted in ecological principles, emphasizing the critical importance of maintaining the functionality and adaptability of dynamic systems (Xu et al. 2015; Marchese et al. 2018). In business contexts, this interrelation becomes particularly salient. Fiksel (2003) argues that resilient businesses inherently possess characteristics that enhance sustainability. As noted by Saad et al. (2021), this perspective posits that businesses that demonstrate high resilience—through effective response and adaptation to challenges—are better positioned to achieve sustainable outcomes. In practical terms, they are likely to produce higher-quality outputs, optimize resource utilization, and uphold the principles of the triple bottom line: economic, social, and environmental performance (Aguiñaga et al. 2018). For instance, Pettit et al. (2010) suggest that with a resilient supply chain, a company can adapt to disruptions and continue delivering value, thereby reducing waste and supporting sustainable practices. In addition, resilient businesses that effectively manage environmental and social stresses are more capable of sustaining their performance growth over time (Fiksel and Bakshi 2023). Eventually, businesses that can integrate resilience into their operational and strategic frameworks are better equipped to anticipate and mitigate potential risks, thereby enhancing their sustainability performance.

Conversely, sustainable businesses adopt a long-term outlook that holistically integrates environmental, social, and economic dimensions, positioning them to better withstand sudden adverse external shocks due to their intrinsic capacity to absorb and adapt to disruptions (Elkington and Rowlands 1999; Schaltegger et al. 2013). This capacity is grounded in their robust systems and practices designed to mitigate the impacts of unexpected challenges and foster resilience (Trabucco and De Giovanni 2021). For example, firms that prioritize sustainable resource management and corporate social responsibility are generally better equipped to endure environmental or economic crises, as their operations are inherently designed to be adaptable and resource-efficient (Ortiz-de-Mandojana and Bansal 2016). Furthermore, the adoption of sustainable practices contributes to the development of strong stakeholder relationships (Chen and Miller 2011) and enhances risk management capabilities (Nobanee et al. 2021). Simeone (2015), in his analysis, emphasized that risk management capabilities bolster an organization's resilience by providing a supportive network and effective strategies for managing and mitigating risks. Liu and Yin (2020) note that sustainable businesses often benefit from improved reputational capital and stakeholder trust, which are critical during times of crisis and recovery. Simeone (2015), in his analysis, emphasized that risk management capabilities bolster an organization's resilience by providing a supportive network and effective strategies for managing and mitigating risks. Accordingly, a strong commitment to sustainability not only secures long-term operational success but also enhances resilience, enabling organizations to effectively manage and rebound from unexpected challenges.

At this point, we can argue that if sustainability represents the overarching objective of a business, then resilience signifies the capability to remain aligned with and adjust to the evolving challenges encountered while pursuing this goal. Consequently, as suggested by Winnard et al. (2014), for businesses to truly flourish, they must embody both high levels of resilience and sustainability. This dual focus is particularly crucial in an uncertain and rapidly changing environment, where it serves as the most effective strategy in minimizing vulnerability and ensuring sustained high-quality performance over time. On the one hand, sustainability ensures that a business operates in a manner that is resource-efficient, socially responsible, and economically viable, creating a strong foundation for long-term success. On the other hand, without resilience, even the most sustainable practices can falter in the face of unexpected disruptions, such as economic crises, natural disasters, or shifts in market dynamics. Organizations with insufficient resilience and sustainability are at a significant disadvantage. Their inflexible structures and inadequate adaptation mechanisms make them highly susceptible to failure in the face of adversity. Such businesses are likely to experience operational disruptions, diminished performance, and, ultimately, an inability to compete effectively. In addition, businesses that possess only one of these attributes—whether resilience or sustainability—may continue to operate, but they do so with a persistent risk of instability.

2.4. Innovation

It is widely acknowledged that for organizations to achieve success and ensure their survival, embracing innovation is essential (Heunks 1998). Innovation enables companies to stand out from their competitors by swiftly adapting to shifts in the market and new trends (Ireland and Webb 2007). This forward-thinking strategy not only allows businesses to seize emerging opportunities but also enhances their brand image and operational efficiency, thereby significantly bolstering their competitive advantage (Anning-Dorson and Nyamekye 2020). Conversely, firms that neglect innovation face considerable risks, including potential bankruptcy, as demonstrated by the case of Nokia (Abetti 2000; Doz and Kosonen 2010). Given its critical role, it is unsurprising that innovation has currently become one of the most prominent topics in discussions about economic advancement and prosperity (Nasierowski and Arcelus 2012; García-Sánchez et al. 2020).

The etymological roots of innovation come from the Latin word innovare, which means to make a modification or something completely new (Clapham 2003). Most definitions of innovation in the literature focus on similar concepts but offer different perspectives. For instance, according to Schumpeter (1934), innovation refers to the introduction of new products or processes that create new markets or significantly improve existing ones. Tidd and Bessant (2018) provide a slightly broader definition, including changes in processes or systems that enhance efficiency and effectiveness within organizations. A more expansive definition includes not only organizational changes but also social impacts. For example, Rogers (2004) defines innovation as an idea, practice, or object perceived as new by an individual or other unit of adoption, which influences both the organization and the broader environment by altering practices, behaviors, or social norms. The most comprehensive definition is offered by the OECD (2005), which encompasses the successful implementation of new or significantly improved products, processes, marketing methods, or organizational methods in business practices, workplace organization, or external relations, with potential impacts on various aspects of society and the economy. Despite the variations in these definitions, they all emphasize the key elements of change and renewal involving people, processes, and products aimed at improving situations (Kamaruddeen et al. 2010).

Building on the definitions provided, Wang and Ahmed (2004) formulated a comprehensive framework for understanding corporate innovation, which encompasses five key dimensions: product innovation, market innovation, process innovation, behavioral innovation, and strategic innovation. Product innovation involves creating new or significantly improved goods or services to meet consumer preferences and capture new market segments (Henard and Szymanski 2001; Danneels and Kleinschmidtb 2001). Market innovation focuses on strategies for entering new markets or targeting different customer demographics, which can include launching cutting-edge technology products or updating marketing strategies for existing products (Kjellberg et al. 2015). Process innovation aims to improve production or delivery methods to enhance efficiency and reduce costs (Jin et al. 2019; Goni and Van Looy 2022). Behavioral innovation entails changes in organizational culture, employee behaviors, or managerial practices to foster creativity and improve performance (Naranjo-Valencia et al. 2017; Tian et al. 2018). Strategic innovation refers to the development of new strategies or business models that significantly alter an organization's direction or competitive stance (Markides 1997; Varadarajan 2018). Several studies on small businesses also explore these dimensions to understand how they drive innovation. For instance, Ramirez-Portilla et al. (2017) investigated how varying levels of openness in open innovation practices and models impact innovation and various aspects of performance within small and medium-sized supercar manufacturers across Europe. Similarly, Kurniawati et al. (2022) devised a sustainability-focused open innovation model tailored to SMEs involved in the production of traditional Indonesian textiles.

Accordingly, we identify five important dimensions of the concept of innovation—product innovation, market innovation, process innovation, behavioral innovation, and strategic innovation. Each of these dimensions plays a crucial role in driving the success of organizations at all levels, with particular significance for MSMEs. Embracing innovation in this business segment is not merely a strategic choice but a necessity for survival and growth. These enterprises often operate with limited resources and face intense competition, making it essential to continuously adapt and evolve. Product and process innovations can help MSMEs improve their offerings and operational efficiencies, while market and strategic innovations enable them to explore new opportunities and adapt to changing market conditions. Furthermore, behavioral innovation fosters a culture of creativity and agility, empowering MSMEs to respond effectively to challenges and capitalize on emerging trends. Thus, for MSMEs, innovation is integral in maintaining competitiveness and driving economic advancement.

2.5. Creative Compliance

The formulation of laws is influenced by the lobbying efforts of diverse community groups and by contemporary social practices. In the meantime, understanding and complying with laws is a subjective endeavor that includes numerous social inferences (i.e., a person's social class, ethnicity, or ostensibly defiant/apologetic attitude). Tax laws are not an exception, as key players can influence them in their area of expertise (Mulligan and Oats 2016), and their implementation can be impacted by numerous social practices (Gracia and Oats 2012). An intriguing issue of the implementation of tax law as a social practice is the situation in which individuals or businesses appear to comply with tax law but with the intention of disregarding its underlying principles. This behavior is referred to as "creative compliance" (McBarnet and Whelan 1999), which stands between the two extremes of tax compliance decisions: compliance and non-compliance.

Conceptually, creative compliance includes tax planning and tax avoidance (Sikka and Willmott 2013). This concept is still under-investigated in the tax compliance literature. One of the barriers may be the fact that there is no clear definition of tax planning and tax avoidance (McBarnet 2004; Picciotto 2007; Christians 2014). However, in Inland Revenue Commissioners vs. Brebner, [1967] 1 All E.R. 779, Lord Upjohn enunciated the basic premise of most appropriate tax planning: "no commercial man in his senses is going to carry out commercial transactions except on the footing of paying the smallest amount of tax involved". In this matter, individuals or businesses seek to regulate financial activities and transactions in such a way that, in accordance with legal restrictions, the amount of tax they must pay can be minimized (Hoffman 1961; Woellner et al. 1997). To achieve this purpose, taxpayers typically take advantage of available deductions, credits, exemptions, and tax incentives provided by tax laws (Fallan et al. 1995). Therefore, it is reasonable that tax planning is considered a legitimate activity—encouraged by tax authorities—as it allows taxpayers to use the tax code to their advantage while remaining in compliance with the law (Murphy 2004). Nevertheless, several companies appear to design tax planning activities more aggressively by exploiting loopholes or making profitable interpretations of ambiguities in tax laws (Rego 2003). This aggressive tax planning is better known as tax avoidance (Cachia 2017). Although this type of tax planning is still considered legal, it can be a controversial topic, as many analysts argue that it is not in line with the spirit of the law. Therefore, it can be assumed that tax avoidance contains elements of tax planning and tax evasion and, therefore, lies between these practices (Alm 2012).

In some cases, tax avoidance is often seen as creative business innovation and a sign of entrepreneurship rather than as an act of fraud (European Commission 2017); for example, by diverting funds to other places with more favorable tax systems, even though it involves monetary transactions that do not make commercial sense (McLaren 2008). The Spotless case reported in the Australian High Court decision in 1996 is an example of such a tax avoidance scheme. The company deposited funds into a bank in the Cook Islands. A reasonable person would find it strange that an Australian company would deposit funds in an Australian bank with a branch in a remote South Pacific country unless they were aware that the Cook Islands were considered a "tax haven" at the time. In other cases, tax avoidance can also be equated with fraud. For example, inserted entities are used to disguise transactions to gain unintended benefits from tax relief provisions (Freedman 2005). It means that there is a binary distinction regarding tax avoidance practices: acceptable and unacceptable practices. These definitions are, in principle, dependent on social conditions and will change in different historical periods or social groups (Picciotto 2007). Ultimately, it is important to think about the boundaries of acceptable and unacceptable practices that are negotiated among the various actors in the tax field at a given time (Gracia and Oats 2012).

Minimizing tax liabilities while adhering to the law, as demonstrated by creative compliance practices, poses a significant challenge for the average taxpayer. Consequently, such practices might appear relevant primarily to a select group of taxpayers who can afford to engage tax advisors to navigate complex tax regulations (Murphy 2004). Tax advisors are generally considered to possess superior technical expertise, extensive knowledge of taxation, and practical experience in tax administration compared to typical taxpayers (Erard 1993). These professionals assist clients in selecting between various strategies to manage their affairs and minimize future tax burdens. Thus, creative compliance—encompassing tax planning and avoidance—represents a proactive approach taken prior to the crystallization of tax obligations. In contrast, tax evasion involves non-compliance with tax requirements after they become due, such as failing to report income to tax authorities, which is unequivocally a criminal offense (Elffers et al. 1987). Supporting this notion, an empirical study conducted by Onu et al. (2019) investigated individual compliance among

330 small business owners and measured creative compliance as instances of individual non-compliance where rules are selectively followed to avoid legal principles. This finding is further supported by Vincent (2021), who developed a scale to measure tax compliance among small enterprises in Nigeria. In summary, tax planning and tax avoidance are key indicators of MSMEs' creative compliance, which is distinct from tax evasion.

2.6. Tax Incentives

Tax incentives are a prevalent strategy across the globe, particularly in developing nations. Governments frequently cite intense international competition as a justification for implementing such incentives (Kazbekova et al. 2024). By offering more favorable tax treatments, these incentives are designed to attract both domestic and foreign capital (Van Parys and James 2010). Examples of these practices include reductions in corporate income tax rates, temporary exemptions known as tax holidays, and various tax reductions through credits or investment allowances (Klemm 2010). Regardless of their specific aims or forms, tax incentives in developing countries are instrumental in easing the operational challenges faced by businesses (Bräutigam and Knack 2004). This facilitation allows firms to allocate resources more effectively across diverse sectors (Smallbone and Welter 2001), thereby supporting broader economic development (Jorgenson 1963).

As mentioned in the introduction section, MSMEs play a pivotal role in achieving such economic development objectives. However, the economic contribution of MSMEs is contingent upon their competitiveness and sustainability, which can be hindered by their inherent weaknesses, including limited access to capital, insufficient economies of scale, and reduced bargaining power compared to larger enterprises. In this regard, governments must provide robust support—like the tax incentives mentioned above—to these businesses, particularly during periods of economic hardship (Deyganto 2022). This support not only assists MSMEs in overcoming immediate difficulties but also strengthens their capacity to drive long-term economic progress (Atawodi and Ojeka 2012; Ahmedova 2015; Twesige and Gasheja 2019). While tax incentives have the potential to lower costs and boost a company's competitive edge, their effectiveness hinges on their awareness and effective utilization of these benefits (Jolley and Lane 2010). Without sufficient knowledge of available tax incentives and the ability to integrate them into financial and strategic planning, businesses may fail to leverage these supports effectively, potentially resulting in wasted resources and increased fiscal burdens on the government (Bartik 2005). Proper awareness and utilization are essential for MSMEs to maximize the benefits of tax incentives and make informed decisions, enabling them to engage in activities such as relocation, expansion, investment, and job creation (Garsous et al. 2017; Slattery and Zidar 2020).

Building on the previously mentioned points, Jolley et al. (2015) surveyed executives from companies in North Carolina that had received statutory tax credits. The survey revealed that many executives were unaware of these credits. Specifically, among executives from companies that had previously benefited from Lee Act tax credits, 29.3% were aware of the incentives, 61.8% did not believe their companies had received them, and 8.9% were uncertain. This significant lack of awareness among executives suggests that such tax credits may not effectively determine corporate strategic decisions. Correspondingly, Pandya (2017), who investigated the awareness and utilization of various incentives among 216 MSME units in India through surveys and interviews, concluded that increasing awareness and simplifying the utilization process for incentives are crucial. The study also indicated a preference among MSMEs for direct fiscal incentives, such as investment and interest rate subsidies, over indirect incentives, like energy assessment and water consumption subsidies. Accordingly, empirical research aiming to assess the effectiveness of tax incentives on MSMEs' performance should focus on both awareness and utilization of these policies. Alkahtani et al. (2020) and Pu et al. (2021), who studied the sustainability of SMEs in Pakistan and Bangladesh, respectively, are examples of studies that adopted the notion. Their research instrument includes several constructs that assess whether respondents agree with the statement that their company receives various incentives from formal institutions, particularly the government.

Hence, it is crucial to emphasize two fundamental aspects concerning tax incentives: MSMEs' awareness of these incentives and their effective utilization. For tax incentives to achieve their intended impact and enhance MSME performance, businesses must not only be informed about the available incentives but also be equipped to utilize them effectively. Awareness ensures that MSMEs can identify and access the benefits designed to alleviate their financial constraints, while effective utilization involves integrating these incentives into strategic planning to maximize their benefits.

3. Theoretical Background and Hypothesis Development

In this section, we provide a comprehensive theoretical framework and develop hypotheses that explore the intricate relationship between creative compliance, tax incentives, innovation, and their impacts on the sustainability and resilience of MSMEs during crises. By integrating insights from contingency theory, entrepreneurial self-efficacy, and institutional theory, this section seeks to elucidate how MSMEs can leverage financial strategies and external support mechanisms to enhance their performance and adaptability. Through a detailed examination of these theories and their application to the challenges faced by MSMEs, we formulate hypotheses that highlight the mediating role of innovation in maximizing the effectiveness of tax planning and incentives. The ultimate goal is to build a robust model that explains how these factors contribute to MSMEs' long-term success and recovery in adverse conditions.

3.1. Contingency, Entrepreneurial Self-Efficacy, and Institutional Theories

When a crisis strikes, leading to reduced demand and declining sales, company liquidity suffers. Financial disturbances can impact both individual organizations and entire industries, creating significant threats to financial stability (Navaretti et al. 2010; Dietrich and Vollmer 2012; Degl'Innocenti et al. 2018; Kim et al. 2020). Conventional financial frameworks often fall short during these times, necessitating more complex financial decision-making processes (Belás et al. 2017). Research into emergency risk management underscores the importance for organizations to develop financial alternative plans, which are crucial to ensuring the resilience and sustainability of essential resources during emerging crises (Carmeli and Markman 2011; Obrenovic et al. 2020). This approach aligns with Fiedler's (1964) contingency theory, which suggests that organizational decisions and actions must be adaptable to the specific circumstances that arise. In this regard, business effectiveness is contingent upon contextual factors, and thus, there is no universal management style that fits all scenarios (Ayman et al. 1995). Companies that follow a contingency approach aim to develop a rational comprehension of evolving situations and adjust their behavior accordingly. They then select the management style that most effectively addresses the specific circumstances at hand (Reeves and Haanaes 2015). In the case of small businesses, an empirical study conducted by Sarkar and Clegg (2021) using a qualitative approach provides evidence that owners responded to the emergence of the COVID-19 pandemic by implementing contingency leadership qualities. These owners adapted to the pandemic's contextual challenges by effectively managing both internal and external factors amid considerable uncertainty. They continuously balanced internal factors, such as resources and expertise, with external factors, including stakeholder expectations, to sustain their businesses.

An in-depth analysis of how these owners adjusted to both internal and external factors influencing their business was documented by Childs et al. (2022). They carried out comprehensive interviews with small retail business owners to investigate how they maintained their operations throughout the pandemic. Internally, these owners focused on stabilizing their strained financial structures by implementing measures such as rigorous cash flow management and cost reduction strategies, including renegotiation of lease terms and supplier contracts. Externally, they fortified their relationships with key stakeholders, including suppliers, investors, and customers. To manage financial pressures, some retailers negotiated revised payment terms with vendors and made early payments when possible. In response to shifting consumer behavior, they implemented curbside delivery and adjusted services to meet new demands. Additionally, they emphasized community support, leveraging local connections to bolster their businesses. This holistic approach allowed these businesses to navigate the severe disruptions caused by the pandemic while maintaining their operations.

The core principle of contingency theory, as discussed earlier, highlights that from an internal standpoint, a company's resilience and sustainability are predominantly shaped by its capability to manage resources effectively. A key strategy for achieving this efficiency is minimizing operational expenses, including reducing tax liabilities. This approach aligns with the concept of entrepreneurial self-efficacy, as articulated by Boyd and Vozikis (1994), which involves a company's confidence in its ability to handle tasks and surmount business challenges effectively. Chen et al. (1998) further elaborates on entrepreneurial self-efficacy, noting that it encompasses self-efficacy in various domains, such as implementing internal controls through financial analysis. These internal controls extend beyond financial reporting to include operational and compliance aspects. For instance, Chen et al. (2020) examined the role of internal controls in tax planning and avoidance, evaluating the efficacy of the Committee of Sponsoring Organizations (COSO) (1992, 2013) framework in managing tax risks within non-financial firms listed on the Shanghai and Shenzhen Stock Exchanges. Their findings reveal that while high-quality internal controls can foster creative compliance in less protected firms, they may restrict it to more protected ones. This body of theoretical and empirical work underscores that creative compliance strategies, including tax planning and avoidance, are vital components of internal control mechanisms that reflect a company's entrepreneurial self-efficacy. Chang et al. (2020) further assert that companies employing intelligent tax avoidance strategies through legal means (creative compliance) can leverage effective internal controls to minimize tax liabilities, thereby advancing shareholder interests and promoting long-term financial security.

From an external standpoint, companies can adapt to the financial challenges posed by the pandemic by aligning business strategies with available government incentives (Bhattacharyya and Thakre 2021). In this context, building strong relationships with stakeholders, especially policymakers and regulatory bodies, is essential (Albareda et al. 2007), as this will keep businesses informed about potential incentives and frequent regulatory changes in difficult times, thereby enabling them to influence and respond effectively to policy developments. This idea is in line with institutional theory, which emphasizes the importance of organizational adaptation and legitimacy within a shifting regulatory environment (Scott 2008). According to institutional theory, organizations must navigate and respond to the pressures and expectations of their institutional environments to maintain legitimacy and ensure survival (DiMaggio and Powell 1983). By fostering these relationships, businesses can better understand and leverage policy changes, thus enhancing their strategic positioning and resilience (Meyer and Rowan 1977; Pfeffer and Salancik 1978). Moreover, proactive engagement with stakeholders helps organizations align their strategies with regulatory expectations, which can lead to competitive advantages and improved performance during uncertainty. This has been empirically demonstrated by Chu et al. (2018, 2019), who utilized survey data from 165 third-party logistics providers in China. Their findings indicate that regulatory changes positively influenced financial performance.

The notion of entrepreneurial self-efficacy and institutional theories, manifested through strategic tax avoidance and the utilization of tax incentives, respectively, can provide significant boosts to a company's internal funding by reducing tax liabilities and enhancing financial flexibility (Fang et al. 2022; Kobbi-Fakhfakh and Bougacha 2023). However, increased internal funding does not automatically guarantee business sustainability and resilience because the role of business innovation heavily contributes to an organization's ability to flourish (Schaltegger and Wagner 2011; Bradley et al. 2012). Innovation is crucial because it translates financial advantages into tangible improvements in products, services, and processes, which are essential for maintaining a competitive edge and adapting to market changes (Rogers 2004). In other words, without a strong emphasis on innovation, the benefits of tax savings and incentives may be short-lived, as businesses might fail to effectively capitalize on their financial resources. For instance, while reduced tax liabilities can provide immediate financial relief, it is the innovative strategies that enable companies to differentiate themselves in a crowded marketplace, respond to evolving consumer demands, and adapt to disruptions (Hughes et al. 2020). Thus, business innovation serves as a critical link between increased internal funding from various management strategies and achieving sustainable growth or operational resilience (Hall and Wagner 2012).

Based on the theories discussed above, the next sub-sections will propose hypotheses that explore the intricate relationship between creative compliance, tax incentives, innovation, business sustainability and resilience among MSMEs during a crisis. Such hypotheses will argue that while creative compliance strategies and tax incentives provide immediate financial relief and operational flexibility, their effectiveness in ensuring long-term business sustainability and resilience is significantly facilitated by a strong focus on innovation. To substantiate our hypotheses, we will integrate findings from empirical research that specifically examine small businesses. By reviewing studies that investigate how these businesses manage financial challenges and implement innovative strategies, we aim to build a comprehensive argument that underscores the critical role of innovation in transforming financial benefits into sustained competitive advantages and operational resilience.

3.2. Creative Compliance, Business Sustainability, and Business Resilience

To ensure success in overcoming a crisis, owners must be encouraged to focus more on financial planning that can increase business resilience and sustainability (Sharma and Rai 2023). Creative compliance, represented by tax planning and tax avoidance, is an integral step in financial planning strategies that business owners must consider (Onu et al. 2019). Specifically related to tax planning, as described earlier, it involves the strategic organization of a taxpayer's financial affairs to minimize tax liabilities while remaining compliant with tax laws and regulations. As pointed out by Ma and Park (2021), this strategy, if focused on sustainability goals, must be implemented by maintaining consistent tax performance in the long term rather than simply reducing the absolute level of tax liabilities. Therefore, Lee and Yoon (2020) emphasize that for corporate sustainability, it is crucial to balance tax planning and financial reporting costs effectively, seeking an optimal cost equilibrium between these two aspects. From the standpoint of business ethics, sustainable corporate tax strategies should incorporate the moral aspects of taxation (Jallai 2020). The literature review by Araújo et al. (2024) highlights that corporate tax policy plays a key role in corporate social responsibility, serving as an important contributor to sustainability efforts. Companies have a responsibility to be both accountable and transparent, ensuring that their tax planning practices are open to public scrutiny and reflect the responsible exercise of corporate power (Gribnau and Jallai 2019). Several empirical studies have identified that tax planning directly affects the sustainable aspects of a company. For instance, De Vito (2024) shows that small companies implement tax planning to generate internal funds to deepen capital in response to external funds that are more difficult or more expensive to access, thus boosting the company's financial performance. Furthermore, Jayanthi and Selvam (2024) have demonstrated that well-structured tax planning plays a crucial role in fostering the social and environmental performance of MSMEs. Based on their findings, the following hypotheses are advanced.

H1a. *Tax planning is positively associated with the sustainable performance of MSMEs.*

H1b. *Tax planning is positively associated with the business resilience of MSMEs.*

With respect to tax avoidance, extensive research has examined the role of this financial strategy in bolstering company performance and, by extension, the sustainability and resilience of businesses. As discussed previously, tax avoidance occurs when taxpayers strictly adhere to the literal interpretation of tax laws but deviate from their intended purpose. The empirical study carried out by Fuadah et al. (2022) involving 211 SMEs in Indonesia revealed that tax avoidance enables managers to reallocate resources more effectively, which enhances company performance. This improvement encompasses various metrics, such as accounting performance, company value, and market value. Similar findings are reported by Khuong et al. (2020), who analyzed listed companies in Vietnam and observed that tax avoidance positively affects economic performance. It suggests that the financial benefits from tax avoidance can lead to increased future dividend flows, which in turn are likely to boost market value as investors respond favorably to enhanced profitability. The relevance of this strategy is particularly pronounced during challenging economic periods, where tax avoidance is often deemed a socially acceptable tactic to alleviate financial strain and sustain competitiveness (Zhu et al. 2023). For SMEs, tax-related financial pressures are a significant source of stress; thus, employing tax concession strategies can play a crucial role in revitalizing their operations (Gautam and Gautam 2024). Furthermore, such strategies did not solely benefit financial outcomes. However, they can positively influence other aspects of a company's sustainability, such as its environmental and social performance during crises, as demonstrated by Khan et al. (2023) through a survey of 375 textile SMEs in Pakistan. Accordingly, the following hypotheses are proposed.

H1c. *Tax avoidance is positively associated with the sustainable performance of MSMEs.*

H1d. *Tax avoidance is positively associated with the business resilience of MSMEs.*

3.3. Tax Incentive, Business Sustainability, and Business Resilience

As highlighted earlier, MSMEs represent the majority of businesses across various countries and play a crucial role in driving economic development. For MSMEs to thrive and contribute to employment and wealth creation, their market performance, including firm survival and sustainable growth, is essential, underscoring the need for government-supported interventions (Chunyun 2003). In this context, the government can enhance MSME development by integrating financial support, such as loans, with non-monetary services, including business management, technical consulting, and mentorship. Research by Park et al. (2019) on small businesses in Korea demonstrated that combining these support types can significantly boost annual asset and sales growth. However, despite their value, non-monetary services are often less effective than financial support because they do not address the core issue of capital access, which is critical for MSME operations and growth (Rosyadi et al. 2020). This challenge is particularly relevant during crises, such as the pandemic, which leads to reduced capital, higher operational costs, and lower turnover (Engidaw 2022; Saptono et al. 2024b). Consequently, financial assistance is paramount for governments aiming to help MSMEs recover from the pandemic's effects. A survey conducted in Indonesia reveals that the perceived worth of COVID-19-related expenditures affects respondents' willingness to pay taxes (Khozen and Setyowati 2023). According to Deyganto (2022), tax incentives—such as reducing tax obligations or offering exemptions for a certain period—are the best financial support provided by the government in supporting MSMEs and maintaining their business continuity during economic downturns. Empirical evidence presented by Picas et al. (2021) justifies this view by concluding that tax incentives positively impact SME profitability, whereas other forms of financial support, like government spending on public goods and direct assistance, have shown limited impact. Beebeejaun (2022) further supports this, emphasizing that MSMEs leveraging tax incentives are better positioned to mitigate the adverse effects of COVID-19. Based on this evidence, we propose the following hypotheses.

H2a. *The tax incentive is positively associated with the sustainable performance of MSMEs.*

H2b. *The tax incentive is positively associated with the business resilience of MSMEs.*

3.4. Innovation, Business Sustainability, and Business Resilience

Due to the competitive nature of their environment, MSMEs need to continually assess their competitive position through sustained innovation efforts (Audretsch and Belitski 2023). Previous studies indicate that the innovativeness of SMEs enhances their performance (Boateng et al. 2020; Valdez-Juárez et al. 2022). In their paper, Chan and Liu (2012) presented evidence to substantiate the idea that business innovation significantly influences organizational productivity, profitability, and competitiveness. They also underscored the vital role of innovation in promoting the integration of sustainable practices within organizations. According to research conducted by Krishnan et al. (2021), collaboration among supply chain partners encouraged numerous innovative practices that yielded economic, social, and environmental benefits in supply chains, ultimately enhancing the sustainability of food supply chains. Similar findings were observed in Saudi Arabia, wherein the innovation capabilities of SMEs facilitated business sustainability and enhanced their competitiveness (Hanaysha et al. 2022). Notably, innovations often arise during crises, providing SMEs with a means to navigate uncertain times (Thukral 2021). Empirical studies have supported this notion throughout various crisis periods. For instance, during the global financial crisis starting in 2007, Pal et al. (2012) explored how Swedish textile SMEs managed the crisis by analyzing qualitative and quantitative data collected from interviews and company annual reports. Their findings revealed that resilient firms exhibited superior short-term crisis management through increased operational innovation, whereas less resilient firms lacked such strategic agility. Ghi et al. (2022) focused on the resilience of Vietnamese SMEs in the pandemic context, noting that innovations such as digital transformation and improved information technology capabilities positively impacted firm performance by enhancing business operations, generating potential value, and providing access to intangible assets. Similarly, Putritamara et al. (2023) studied 388 beekeeping MSMEs in Indonesia, finding that digital transformation played a significant role in strengthening the dynamic capabilities of MSMEs, thereby enhancing their resilience during the COVID-19 pandemic. Based on these findings, the following hypotheses are proposed.

H3a. *Innovation is positively associated with the sustainable performance of MSMEs.*

H3b. *Innovation is positively associated with the business resilience of MSMEs.*

3.5. The Mediating Effect of Innovation

Recent empirical research has demonstrated that innovation serves as a crucial mediating factor in several key variables affecting corporate sustainability performance or resilience in facing economic pressures. Specifically, these variables include the decision-making style of chief executive officers (Kruse et al. 2023), organizational support structures (Okręglicka et al. 2023), corporate social responsibility initiatives (Bonsu et al. 2023), knowledge management practices (Delshab et al. 2022), data analysis capabilities (Tipu and Fantazy 2023), and total quality management systems (Dash 2024). Nevertheless, there is a paucity of research exploring how innovation mediates the relationship between creative tax compliance and the use of tax incentives on businesses flourishing. This gap is quite surprising, considering that there is a literature review providing an overview of studies on the impact of taxation on social innovation and the corresponding implications for achieving sustainable development goals (SDGs). Such a study was conducted by Kouam and Asongu (2022), who examined cases in developing countries and combined methodological, thematic, and chronological approaches to write their literature review. They concluded that most studies agree that high taxes on businesses undermine social innovation and, thus, the achievement of the SDGs. This conclusion is predominantly supported by insights from two distinct sets of empirical studies: one examining the impact of corporate taxation on social innovation and the other exploring how social innovation contributes to achieving SDGs. It indicates that the scarcity of empirical research simultaneously linking taxation, innovation, and sustainability presents a compelling opportunity for further investigation.

There has yet to be an empirical study explicitly examining how innovation mediates the impact of creative compliance on business sustainability and resilience. To explore this mediating role, we build on the framework proposed by Kouam and Asongu (2022), which incorporates insights from two distinct bodies of empirical research. The first body of research investigates the positive influence of tax planning or tax avoidance on business innovation. For instance, Wu (2022) analyzed panel data from publicly listed firms in China between 2015 and 2020 and found that companies engaging in payroll tax planning demonstrated higher levels of innovation. Similarly, Li et al. (2021a) examined US public firms and discovered that firms utilizing intangible assets to transfer taxable income from high-tax to low-tax jurisdictions were more likely to foster corporate innovation. In addition, Sharma and Mitra (2015) presented controversial findings using World Bank survey data on Indian companies, revealing that firms engaging in tax avoidance often paid larger bribes to officials, which, paradoxically, was associated with increased exports and product innovation. The second body of research explores the positive effects of innovation on corporate sustainability and resilience, as detailed in the preceding subsection. Notable studies include those by Hanaysha et al. (2022) in Saudi Arabia and Pal et al. (2012) in Sweden, which focus on small-scale enterprises. Based on these insights, this current study proposes the following hypotheses.

H4a. *Innovation mediates the relationship between tax planning and the sustainable performance of MSMEs.*

H4b. *Innovation mediates the relationship between tax planning and the business resilience of MSMEs.*

H4c. *Innovation mediates the relationship between tax avoidance and the sustainable performance of MSMEs.*

H4d. *Innovation mediates the relationship between tax avoidance and the business resilience of MSMEs.*

In contrast, numerous empirical studies have thoroughly documented how innovation amplifies the beneficial effects of tax incentives on corporate sustainability performance. For example, Zhang and Song (2022) employed an unbalanced panel dataset of Chinese mining firms from 2008 to 2011 to assess the impact of tax incentives for energy conservation and environmental protection. Their findings revealed that such incentives substantially enhanced both economic and environmental performance by driving technological innovation and improving production efficiency. Similarly, Li et al. (2023) analyzed a sample of high-tech companies listed on the China Stock Exchange between 2016 and 2019, discovering that the degree of tax incentives positively influenced firms' sustainable innovation, which in turn promoted sustainable economic growth. Song et al. (2020) examined cross-provincial enterprise-level panel data in China from 2009 to 2017 to explore the effects of environmental regulations and research and development (R&D) tax incentives on green production innovation. Their study uncovered a U-shaped relationship between environmental regulations and green product innovation, indicating that as the intensity of environmental regulations rises, their impact shifts from inhibitory to supportive. These findings not only highlight the factors driving green product innovation but also offer a theoretical framework and practical insights for advancing sustainable industrial development. From the small business sector, Beebeejaun (2022) used survey data from

45 MSMEs in Mauritius and concluded that while tax credits have been provided to large Mauritian companies to purchase products from MSMEs as a form of encouragement, it is also important to implement tax credits for R&D and staff training set by the Indian government, as well as to reduce income tax rates for patent inventors to boost innovation and creativity. Such measures are believed to have helped small businesses on the path to recovery and consolidation during the pandemic. Based on these empirical findings, we propose the following hypotheses.

H5a. *Innovation mediates the relationship between tax incentives and the sustainable performance of MSMEs.*

H5b. *Innovation mediates the relationship between tax incentives and the business resilience of MSMEs.*

3.6. Research Model

Based on the theoretical background and hypothesis development above, several key points are important to note. First, within the context of contingency theory, creative compliance, and tax incentives are identified as internal and external factors, respectively, that guide companies in adapting to the financial challenges posed by the COVID-19 pandemic. Creative compliance, encompassing strategic tax planning and avoidance, reflects the company's internal adaptability, while tax incentives represent external support mechanisms provided by the government. Second, such creative compliance aligns with entrepreneurial self-efficacy, emphasizing the importance of internal confidence and strategic capability in managing business challenges. In contrast, tax incentives are consistent with institutional theory, highlighting the role of external regulatory frameworks in promoting organizational sustainability and resilience. Third, innovation is crucial in amplifying the effectiveness of both creative compliance and tax incentives, enhancing their impact on corporate sustainability and resilience. As innovation transforms financial strategies into operational improvements, it strengthens the link between these factors and overall business performance. Lastly, given that both sustainability and resilience are essential components of business flourishing, it is posited that if creative compliance, tax incentives, and innovation are evidenced to positively affect both concepts, i.e., resilience and sustainability, they are constituted as critical determinants of MSMEs flourishing. Our research model, therefore, is based on these propositions and is visualized in Figure 1.

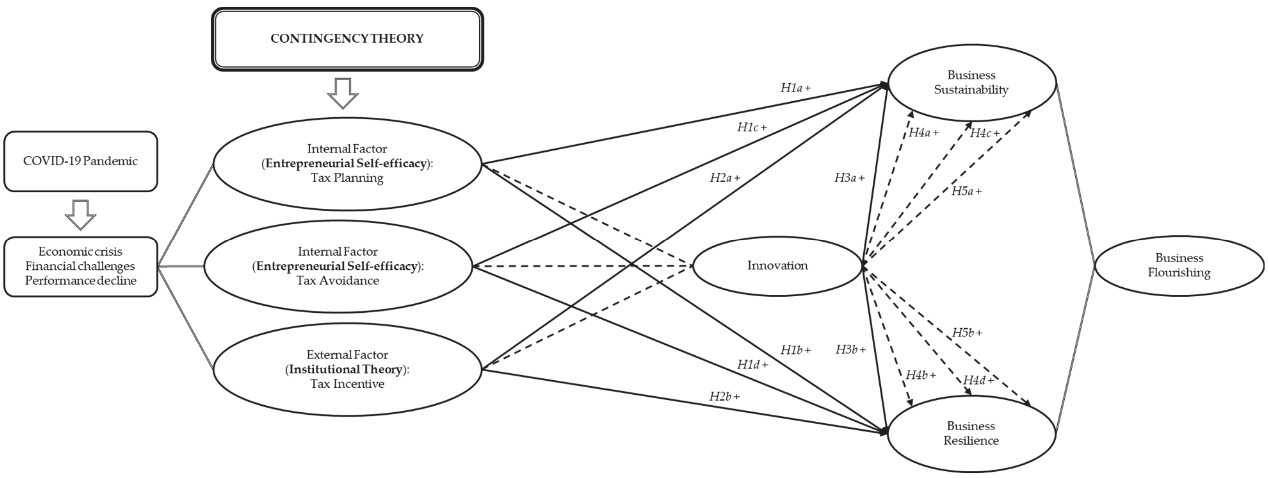

Figure 1. Research model. Notes: H4a, H4b, H4c, H4d, H5a, and H5b depict the role of innovation in mediating the relationship between tax planning, tax avoidance, and tax incentives on business sustainability and resilience, as illustrated by the dashed gray lines.

4. Methods

This section aims to provide a comprehensive overview of the study's methodology, outlining key elements essential for understanding the research framework. It begins by detailing the sample and procedure, including the participant selection process and the steps taken to ensure data integrity. Next, it explains the measurement of variables, highlighting the specific constructs assessed and the rationale behind the chosen instruments. Following this, the section discusses the data analysis techniques employed, emphasizing the appropriateness of using PLS-SEM for this study.

4.1. Sample and Procedure

This study focuses on a population of approximately 3048 MSMEs listed in the Bank Indonesia database. Such a resource provides access to their contact details, including phone numbers and email addresses, which served as the sample frame for our study. Before launching the survey, we conducted preliminary outreach through various digital platforms to assess interest in participation. This initial phase involved distributing tasks among researchers. After a 30-day invitation period, we obtained consent from 1204 MSMEs to participate in the study. The main survey was then conducted with those who agreed to participate. An online questionnaire was distributed via a SurveyMonkey link to the top management, either the owner or a manager, of each participating MSME. In other words, we anticipated receiving only one response per business unit within the sample to preserve the cross-sectional comparability of the data. This survey process spanned about two months, from 10 May 2023 to 28 July 2023. In total, we obtained responses from 386 MSMEs, resulting in a response rate of 32%. It is worth noting that surveys targeting business owners face challenges in achieving high response rates. According to previous research conducted by Watson et al. (2023), response rates typically range from 6% to 50%. Therefore, the attained response rate of 32% in this paper is considered adequate to facilitate robust statistical analysis and derive meaningful insights.

Out of the 386 responses collected, we excluded five responses from the analysis because they were redundant submissions from some MSMEs. As noted earlier, our study only required one response per MSME to ensure each participating business was represented only once. This approach helps maintain the integrity of the data, avoids duplication bias, and ensures that the analysis reflects unique perspectives from each MSME. Moreover, we identified 21 other responses demonstrating a static pattern, suggesting a lack of thorough engagement with the provided statements. A closer inspection revealed that all these responses were completed in under five minutes, significantly shorter than the standard average response time of 10 min. We contend that such responses are not suitable to analyze further, as they are unlikely to accurately reflect the participants' true opinions or understanding of the questions. By doing so, our analysis is less likely to be skewed by data that may result from hasty or disengaged completions, thereby improving the overall quality of the insights drawn from the study. Eventually, a total of 360 responses were considered appropriate for further consideration. This final sample size surpasses the recommended sample size of 200, as suggested by Hair et al. (2017), which is deemed sufficient for conducting robust and reliable structural equation modeling (SEM). Furthermore, in accordance with Su et al. (2017), we conducted a comparison between the 360 usable MSME responses and the 26 deleted MSME responses, revealing no statistically significant differences. Hence, it can be concluded that respondents do not significantly differ from non-respondents. The demographic profile of the 360 respondents is outlined in Table 1.

Table 1. Respondents' profile.

Groups	Subgroups	Numbers	Percentages (%)
Gender	Male	219	60.8
	Female	141	39.2

Table 1. *Cont.*

Groups	Subgroups	Numbers	Percentages (%)
Age	18–30	101	28.1
	31–40	104	28.9
	41–50	106	29.4
	>50	49	13.6
Education	Elementary School	17	4.7
	High School	124	34.4
	Vocational School	106	29.4
	Bachelor's	87	24.2
	Master's/PhD	26	7.2
Place of Business	Jakarta	104	28.9
	Banten	49	13.6
	West Java	86	23.9
	Central Java	18	5.0
	Yogyakarta	14	3.9
	East Java	30	8.3
	Outer Java	59	16.4
Annual Revenue	<2M IDR	122	33.9
	2–15M IDR	129	35.8
	>15M IDR	109	30.3
Number of Employees	<10	138	38.3
	10–30	75	20.8
	31–50	30	8.3
	51–100	35	9.7
	>100	82	22.8
Age of Business	<5 Years	109	30.3
	5–10 Years	55	15.3
	11–15 Years	87	24.2
	16–20 Years	70	19.4
	>20 Years	39	10.8
Product Category	Service	142	39.4
	Retail and Trading	78	21.7
	Plantation	30	8.3
	Livestock and Fisheries	29	8.1
	Agriculture	30	8.3
	Processing Industry	51	14.2

4.2. Measurement of Variables

We employed a closed-response questionnaire to assess the variables under investigation. This questionnaire format was chosen as it allows us to effectively derive average scores for each item, which is a standard approach for statistically analyzing multi-item constructs. Two distinct parts are structured for the questionnaire. The former gathers demographic and business profile information from the respondents: gender, age, educational background, business location, annual revenue, employee count, business age, and product category (see Table 1). The latter measures our variables: tax planning, tax avoidance, tax incentives, innovation, business resilience, and business sustainability. These variables are gauged by multiple items, as presented in Table 2. A Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used to rate the items. Basically, this odd-numbered Likert scale has sparked debate among researchers, as the midpoint existence may lead to longer response times and increase item ambiguity (Kulas and Stachowski 2009). Hence, some of them argue that such an arrangement is suboptimal and does not provide clear benefits (Dalal et al. 2014; Simms et al. 2019). However, Wong et al. (2011) challenged this perspective by showing no significant differences between odd- and even-numbered scales across various measures within organizational behavior research. For this current study, the odd-numbered scale facilitates respondents to convey ambivalence without being coerced into a binary decision (Emerson 2017). This approach is particularly fair, given that we examine the organizational behavior of MSMEs during an uncertain period. Additionally, some simulations consistently show that 5- or 7-point scales offer the highest levels of reliability and validity (Dillman 2007; Dawes 2008; Nadler et al. 2015), corroborating the choice of the questionnaire format of this study.

Table 2. Operationalization of variables.

Variables	Dimensions	Codes	Questionnaire Items	Sources
Business Sustainability	Economic Performance	BS1	My company's income consistently grows year by year.	Le (2022) and Khan et al. (2023)
		BS2	My company has consistently achieved profitable growth.	
		BS3	My company has effectively improved resource efficiency over time.	
		BS4	My company has successfully expanded its market share over time.	
	Social Performance	BS5	My company's impact on enhancing social welfare has grown over time.	
	Environmental Performance	BS6	My company is dedicated to supplying eco-friendly products.	
Business Resilience	Readiness	BR1	My company is well prepared to reduce the probability and effects of disruptive events, including situations like the COVID-19 pandemic.	Chowdhury and Quaddus (2016) and Adobor and McMullen (2018)
	Response	BR2	My company typically navigates challenging periods like the COVID-19 pandemic effortlessly.	
	Recovery	BR3	My company did not take long to recover from the COVID-19 pandemic.	
Innovation	Product Innovation	IN1	My company regularly introduces new or significantly improved products to meet evolving customer needs.	Ramirez-Portilla et al. (2017) and Kurniawati et al. (2022)
		IN2	My company incorporates cutting-edge technology into its product offerings on a regular basis.	
	Market Innovation	IN3	My company actively seeks out and enters new markets or targets different customer groups.	
		IN4	My company regularly updates our marketing strategies to stay relevant in changing market conditions.	
	Process Innovation	IN5	My company effectively implements changes to improve our production delivery methods.	
		IN6	My company invests in new tools or processes to reduce costs and enhance operational efficiency.	
	Behavioral Innovation	IN7	My company has made important changes in our workplace culture and employee practices to encourage creativity and boost performance.	
	Strategic Innovation	IN8	My company is proactive in developing and applying new strategies or business models to improve our competitive edge.	
Tax Planning		TP1	My company would study tax regulations in detail on its own if it could lead to tax savings.	Onu et al. (2019) and Vincent (2021)
		TP2	My company would attend a course on tax savings if it were available.	
		TP3	My company would use a trusted tax advisor's service, even if it costs 20% of the tax savings.	

Table 2. *Cont.*

Variables	Dimensions	Codes	Questionnaire Items	Sources
Tax Avoidance		TA1	My company would buy low-value assets to reduce the basic tax calculation amount.	Onu et al. (2019) and Vincent (2021)
		TA2	My company would use a tax advisor's recommended scheme involving payments through an overseas intermediary if it could save substantial tax.	
		TA3	My company would consider using a tax advisor's services if they could save a significant amount by exploiting a tax law loophole.	
		TA4	My company would consider adjusting my salary to cover actual needs and taking the remainder as dividends for tax efficiency.	
Tax Incentives	Awareness	TI1	My company is well informed about the various tax incentives available specifically for MSMEs during the COVID-19 pandemic.	Pandya (2017), Alkahtani et al. (2020), and Pu et al. (2021)
	Utilization	TI2	My company actively takes advantage of the tax incentives that are available for MSMEs during the COVID-19 pandemic.	

Building on the extensive literature review detailed in Section 2, this study defines business sustainability as the firm's performance in achieving triple-bottom-line outcomes, covering environmental, social, and economic aspects. This variable is evaluated using six items adapted from Le (2022) and Khan et al. (2023), which focus on sustainable performance in small firms within Vietnam and Pakistan, respectively. Our other primary dependent variable, business resilience, pertains to the MSMEs' ability to prepare for, respond to, and recover from adverse events, such as the COVID-19 pandemic. This variable is therefore assessed using three items adapted from Chowdhury and Quaddus (2016) and Adobor and McMullen (2018). Innovation, as our independent and mediating variable, is gauged through five dimensions: product, market, process, behavioral, and strategic innovations. We developed eight items for this construct, drawing from Ramirez-Portilla et al. (2017) and Kurniawati et al. (2022). For creative compliance variables—tax planning and tax avoidance—we adapted measurements from Onu et al. (2019) and Vincent (2021), with adjustments made to fit the Indonesian context and the addition of one extra item for each variable. Lastly, tax incentives were measured with two items focusing on MSMEs' awareness and utilization of these government supports, based on prior research (Pandya 2017; Alkahtani et al. 2020; Pu et al. 2021).

4.3. Data Analysis

In this study, SEM was chosen as the data analysis technique due to its ability to address complex relationships among variables. SEM's growing popularity in social science research is well documented, as it provides a more nuanced and sophisticated framework compared to traditional multiple regression approaches (Nunkoo and Ramkissoon 2012). One of the key advantages of SEM over multiple regression is its consideration of measurement errors associated with observed variables, while multiple regression analysis often assumes that the variables are measured without error. Given that this study relies on indicators to represent the variables of interest—acknowledging that these indicators are only approximations of reality—multiple regression would likely lead to statistical inaccuracies and biased results (Nunkoo and Ramkissoon 2012). Furthermore, SEM offers notable potential for advancing theoretical development (Dash and Paul 2021). Cheng (2001) highlights that while multiple regression is effective in predicting the relationships between predictor variables and outcomes, it falls short in proposing and validating new theoretical relationships within the model based on empirical data. SEM's ability to integrate and update estimates, reassess the model, and propose new theoretically sound relationships is particularly valuable for our research. It is especially pertinent given our focus on exploring the theoretical links between creative compliance, tax incentives, and innovation in the context of MSMEs' business success—an area not yet thoroughly investigated in the existing literature. Our study aims to introduce a novel estimation of these relationships, providing new empirical insights where previous research is lacking.

In the realm of SEM, two predominant approaches are frequently employed: Partial Least Squares (PLS-SEM) and Covariance-Based (CB-SEM) methods (Dash and Paul 2021). Both of these approaches offer distinct advantages depending on the research context and objectives. To determine which statistical method is more suitable, several key criteria must be carefully assessed. In this paper, we have chosen to utilize PLS-SEM for several compelling reasons. First, the data distribution of the variables under examination shows skewness values ranging from −1.210 to 3.236 and kurtosis values ranging from −1.218 to 8.517. According to Hair et al. (2017), data exhibiting skewness and kurtosis values beyond the absolute thresholds of +1 and −1 are considered non-normally distributed. PLS-SEM is especially effective in such scenarios, as it is designed to handle latent constructs robustly even when data deviates from normality, as noted by Chin and Newsted (1999). Second, our study involves a relatively modest sample size of 360 respondents, which is small compared to the larger population of 6 million MSMEs. PLS-SEM has demonstrated a higher degree of consistency and reliability in studies with limited sample sizes, as evidenced by Chin and Newsted (1999). It makes PLS-SEM particularly well suited to our research context, ensuring that the analysis remains robust and dependable despite the smaller sample size. Given these factors, we are confident that PLS-SEM will offer the most accurate and insightful analysis of the relationships between the latent constructs in our model. We utilize SmartPLS software to implement the PLS-SEM technique in our analysis.

5. Results

SmartPLS provides a comprehensive assessment of our research model through three distinct stages. The first stage, known as the outer model evaluation, involves a thorough assessment of the model's reliability and validity, ensuring that the indicators accurately reflect the latent constructs. The subsequent stage is descriptive statistics, where we examine the data distributions, central tendencies, and variances to understand the overall patterns and characteristics of questionnaire items. The final stage is the evaluation of the inner model, which is conducted to test the hypotheses and assess the relationships between latent variables. This stage involves analyzing path coefficients, R-squared values, and effect sizes to determine the strength and significance of the proposed relationships, thereby providing insights into the validity of the research model.

5.1. Outer Model Evaluation

To assess the validity and reliability of the indicators used for our latent variables, we conducted a series of assessments for the outer model, as summarized in Table 3. The results presented a comprehensive picture of its psychometric robustness. First, all factor loadings exceed the 0.7 threshold, indicating that each indicator has a strong correlation with its respective latent variable, which underscores the indicators' effectiveness in representing the latent constructs (Hair et al. 2017). Additionally, the Average Variance Extracted (AVE) values exceed the critical threshold of 0.5. This supports the construct's convergent validity, demonstrating that the indicators collectively and adequately reflect the underlying latent variables (Fornell and Larcker 1981). The internal consistency of the model is further validated by Cronbach's Alpha (CA) and composite reliability (CR) values, both of which surpass the recommended threshold of 0.7. These metrics indicate a high degree of reliability and consistency across the measurement scales, reinforcing the stability and accuracy of the constructs being measured (Hair et al. 2017). Furthermore, the Variance Inflation Factor (VIF) values remain well below the threshold of 3.3 (Kock 2015), which addresses concerns about multicollinearity within the model and suggests that the predictor variables are not excessively correlated. It is crucial to maintain the integrity of structural relationships under investigation and ensure that the results are not distorted by redundant information (Kline 2023). Collectively, these findings affirm that the model exhibits strong reliability and validity, providing a robust foundation for further analysis and interpretation.

Table 3. Validity and reliability of questionnaire items.

Variables	Codes	Factor Loading	CA	CR	AVE	VIF
Business Sustainability	BS1	0.853	0.915	0.934	0.702	1.436
	BS2	0.840				
	BS3	0.862				
	BS4	0.754				
	BS5	0.819				
	BS6	0.892				
Business Resilience	BR1	0.894	0.895	0.935	0.826	1.283
	BR2	0.924				
	BR3	0.909				
Innovation	IN1	0.822	0.939	0.950	0.704	1.575
	IN2	0.790				
	IN3	0.776				
	IN4	0.842				
	IN5	0.842				
	IN6	0.871				
	IN7	0.888				
	IN8	0.873				
Tax Planning	TP1	0.874	0.814	0.890	0.731	1.283
	TP2	0.911				
	TP3	0.773				
Tax Avoidance	TA1	0.844	0.823	0.878	0.643	1.385
	TA2	0.866				
	TA3	0.750				
	TA4	0.741				
Tax Incentive	TI1	0.955	0.906	0.955	0.914	1.482
	TI2	0.957				

In addition to the assessments above, we also verify that our model adheres to the standards of discriminant validity. Assessing the discriminant validity of a model is essential to confirm that each latent variable uniquely captures distinct aspects of the construct and is not excessively correlated with other variables in the model (Hair et al. 2017). It ensures that each construct contributes uniquely to the model, thus validating the theoretical framework and preventing overlap between constructs. To evaluate discriminant validity, we employed both the Fornell–Larcker criterion and the Heterotrait–Monotrait (HTMT) ratios, as these methods provide comprehensive insights into the uniqueness of each construct. The results are presented in Table 4. The Fornell–Larcker criterion requires that the square root of the AVE for each latent variable must be greater than its correlations with other latent variables, demonstrating that the construct explains more variance in its indicators than in those of other constructs (Fornell and Larcker 1981). Our results indicate that the top values in each column of the Fornell–Larcker criterion (square root of the AVE) are higher than the other values in the same column, meeting the required standard and affirming the discriminant validity of our constructs. Additionally, the HTMT ratio, which should ideally be less than 0.85, was used to further verify discriminant validity by assessing the extent to which constructs are distinct from each other. Our findings show that all HTMT ratios are below this threshold, reinforcing that the constructs are sufficiently separate from one another (Henseler et al. 2015). Together, these results confirm that our model exhibits strong discriminant validity, ensuring that each construct is accurately and uniquely represented.

Table 4. Discriminant validity.

Variables	Fornell–Larcker Criterion						Heterotrait–Monotrait (HTMT) Ratios				
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**
Business Sustainability (1)	0.838										
Business Resilience (2)	0.615	0.909					0.678				
Innovation (3)	0.782	0.468	0.839				0.836	0.509			
Tax Planning (4)	0.301	0.137	0.337	0.855			0.344	0.162	0.383		
Tax Avoidance (5)	0.299	0.196	0.371	0.493	0.802		0.320	0.204	0.401	0.648	
Tax Incentive (6)	0.408	0.193	0.408	0434	0.368	0.956	0.448	0.215	0.440	0.508	0.445

5.2. Descriptive Statistics

Table 5 presents the means and standard deviations for the Likert scale responses across all questionnaire items. The means offer a concise summary of the central tendency of the responses, while the standard deviations reflect the degree to which the average response represents the variability in the data (Field 2009). As previously discussed, an odd-point scale was selected for this questionnaire to address potential respondent confusion and uncertainty, which was particularly pertinent given the context of the pandemic crisis. The inclusion of a midpoint in the scale is intended to reflect and accommodate the respondents' hesitations or indecision when evaluating the statements presented, allowing them to express a neutral or uncertain stance. Nonetheless, this decision introduces specific challenges in the process of dichotomizing responses into binary categories such as positive or negative (Johns 2005). To address this, we use a threshold of 5 out of 7 to classify responses as indicative of a high positive sentiment towards the questionnaire items. This threshold is strategically chosen to account for the tendency of negative or less favorable responses to gravitate toward the midpoint in an odd-point scale (Garland 1991). Accordingly, applying this threshold allows us to provide a clearer picture of respondents' overall attitudes and perceptions.

The findings presented in Table 5 reveal that MSMEs' performance during the crisis, from both economic and environmental perspectives, generally received negative feedback. Conversely, the social dimension (BS5) was associated with a more positive response. This observation aligns with the empirical research by Moneva-Abadía et al. (2019), which indicates that social responsibility is frequently leveraged by small businesses to enhance their competitiveness amid economic downturns. Among the various dimensions assessed, only business resilience in terms of readiness (BR1) showed a positive response. All forms of innovation were viewed positively, except for process innovation, particularly concerning the methods of delivering production results (IN5). It is consistent with the constraints imposed by physical restrictions during the pandemic, which affected certain production and logistics processes (Ambrogio et al. 2022; Sugianto et al. 2023). Consequently, advancing innovation in this area may present significant challenges. In contrast, the responses to questions related to tax planning and tax incentives were universally positive, reflecting the integral role of tax incentives in tax planning strategies (Onu et al. 2019). Lastly, while some items on tax avoidance (TA1 and TA2) received negative feedback, others were met with positive responses. Since the standard deviations for all questionnaire items were notably lower than the means, we can argue that most responses clustered around the average value (Field 2009). Accordingly, the summarized data provides a representative overview of the entire dataset.

Table 5. Summary statistics of questionnaire items.

Variables	Dimensions	Codes	Min.	Max.	Mean	Std. Deviation
Business Sustainability	Economic Performance	BS1	1	7	4.964	1.334
		BS2	1	7	4.919	1.311
		BS3	1	7	4.953	1.310
		BS4	1	7	5.242	1.271
	Social Performance	BS5	1	7	5.250	1.240
	Environmental Performance	BS6	1	7	4.983	1.295
Business Resilience	Readiness	BR1	1	7	5.669	1.152
	Response	BR2	1	7	4.372	1.791
	Recovery	BR3	1	7	4.672	1.607
Innovation	Product Innovation	IN1	1	7	5.275	1.171
		IN2	1	7	5.039	1.231
	Market Innovation	IN3	1	7	5.192	1.204
		IN4	1	7	5.117	1.334
	Process Innovation	IN5	1	7	4.803	1.442
		IN6	1	7	5.128	1.293
	Behavioral Innovation	IN7	1	7	5.117	1.330
	Strategic Innovation	IN8	1	7	5.231	1.269
Tax Planning		TP1	1	7	5.750	1.115
		TP2	1	7	5.828	1.082
		TP3	1	7	5.458	1.168
Tax Avoidance		TA1	1	7	4.800	1.420
		TA2	1	7	4.792	1.449
		TA3	1	7	5.125	1.374
		TA4	1	7	5.206	1.349
Tax Incentive	Awareness	TI1	1	7	5.542	1.024
	Utilization	TI2	1	7	5.567	1.025

5.3. Hypothesis Testing: Direct Effects

In this study, the assessment of the inner model and the hypothesis testing regarding the relationship between latent variables was conducted using a bootstrapping procedure with 5000 subsamples in accordance with the guidelines set by Hair et al. (2017). The results, detailed in Table 6 and Figure 2, illustrate the SmartPLS outputs for the direct effects of independent variables—namely, tax planning, tax avoidance, tax incentives, and innovation—on the dependent variables of business sustainability and business resilience. The analysis reveals that innovation ($\beta = 0.755$, p-value < 1%; $\beta = 0.438$, p-value < 1%) is the only independent variable with a significant impact on both business sustainability and business resilience, highlighting its crucial role in flourishing MSMEs. This finding supports hypotheses *H3a* and *H3b*. Conversely, the independent variables related to corporate compliance, such as tax planning ($\beta = 0.013$, p-value > 5%; $\beta = -0.004$, p-value > 5%) and tax avoidance ($\beta = -0.031$, p-value > 5%; $\beta = 0.039$, p-value > 5%), do not show significant direct effects on either business sustainability or resilience, providing limited support for hypotheses *H1a*, *H1b*, *H1c*, and *H1d*. Lastly, tax incentives ($\beta = 0.080$, p-value > 5%) do not seem to necessarily help Indonesian MSMEs in facing difficult times, given their insignificant direct impact on business resilience. Thus, *H2b* is rejected. However, such government support ($\beta = 0.117$, p-value < 1%) is evidenced to be effective in boosting the sustainability performance of MSMEs in Indonesia. In other words, *H2a* is accepted.

Table 6. Hypothesis testing of direct effects.

Hypotheses	Relationships	β	Std. Deviation	t-Statistics	Decisions
H1a	Tax Planning → Business Sustainability	0.013	0.044	0.305	Rejected
H1b	Tax Planning → Business Resilience	−0.004	0.063	0.071	Rejected
H1c	Tax Avoidance → Business Sustainability	−0.031	0.040	0.767	Rejected
H1d	Tax Avoidance → Business Resilience	0.039	0.061	0.634	Rejected
H2a	Tax Incentive → Business Sustainability	0.117	0.046	2.556 **	Accepted
H2b	Tax Incentive → Business Resilience	0.080	0.066	1.206	Rejected
H3a	Innovation → Business Sustainability	0.755	0.030	25.026 **	Accepted
H3b	Innovation → Business Resilience	0.438	0.057	7.642 **	Accepted

Note(s): ** represents statistical significance at the 1% level.

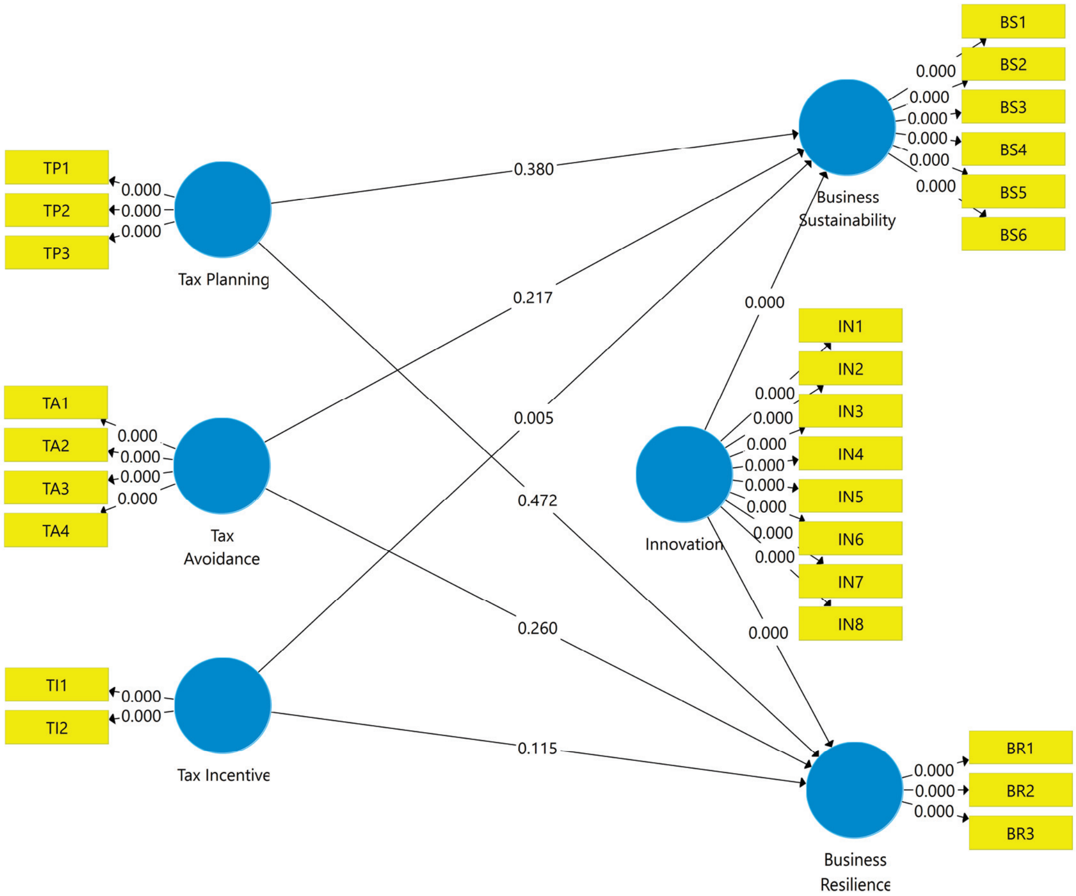

Figure 2. Path model of direct effects. Note(s): this figure reports the *p*-values of the inner and outer models.

5.4. Hypothesis Testing: Mediation Effects

As previously discussed, we propose that innovation amplifies the impact of creative compliance and tax incentives on the sustainability and resilience of MSMEs in Indonesia. To explore this hypothesis, we conduct a thorough analysis of the mediation effect of innovation, with the results detailed in Table 7 and Figure 3. We report both the path coefficients for the direct effects and the total indirect effects in Table 7 to elucidate the nature of the mediation. As recommended by Hair et al. (2021), if the significant relationship between the variables is observed exclusively through the indirect path, it suggests that innovation serves as a full mediator in the relationship between the exogenous and endogenous variables. This scenario aligns perfectly with the proposed theoretical background. In cases where both direct and indirect effects are significant, it implies that innovation has a partial mediation role. Nitzl et al. (2016) further classify partial mediation into two distinct types: complementary and competitive. In complementary partial mediation, both direct and indirect effects move in the same direction, whether positive or negative. In contrast, competitive partial mediation occurs when the indirect effect opposes the direction of the direct effect. Lastly, if the analysis reveals that only the direct effect is significant or if neither direct nor indirect effects are significant, this would indicate that innovation does not serve as a mediator. This detailed examination helps clarify the precise role of innovation and its influence on the overall model.

Table 7. Hypothesis testing of mediation effects.

		Path Coefficients		Total Indirect Effects			
Hypotheses	**Relationships**	β	*t*-**Statistics**	β	**Std. Deviation**	*t*-**Statistics**	**Decisions**
H4a	TP → BS	0.014	0.313	0.091	0.050	1.828 *	Accepted (1)
	TP → IN	0.121	1.832 *				
	IN → BS	0.755	25.794 **				
H4b	TP → BR	−0.004	0.068	0.053	0.031	1.719 *	Accepted (1)
	TP → IN	0.121	1.832 *				
	IN → BR	0.438	7.538 **				
H4c	TA → BS	−0.032	0.798	0.170	0.052	3.269 **	Accepted (1)
	TA → IN	0.226	3.348 **				
	IN → BS	0.755	25.794 **				
H4d	TA → BR	0.037	0.603	0.099	0.030	3.300 **	Accepted (1)
	TA → IN	0.226	3.348 **				
	IN → BR	0.438	7.538 **				
H5a	TI → BS	0.118	2.571 **	0.172	0.045	3.826 **	Accepted (2)
	TI → IN	0.227	3.804 **				
	IN → BS	0.755	25.794 **				
H5b	TI → BR	0.080	1.194	0.100	0.032	3.119 **	Accepted (1)
	TI → IN	0.227	3.804 **				
	IN → BR	0.438	7.538 **				

Note(s): TP = Tax Planning, TA = Tax Avoidance, TI = Tax Incentive, IN = Innovation, BS = Business Sustainability, and BR = Business Resilience. * and ** represent statistical significance at the 5% and 1% levels, respectively. (1) and (2) represent full and complementary partial mediation effects, respectively.

Our findings indicate that, in the absence of innovation as a mediator, there is no significant direct effect of tax planning on the sustainable performance or resilience of MSME businesses. However, the indirect effects of tax planning through innovation are significant ($\beta = 0.019$, p-value < 5%; $\beta = 0.053$, p-value < 5%). It suggests that innovation fully mediates the relationship between tax planning and MSME business flourishing, thereby supporting *H4a* and *H4b*. Similarly, the mediating role of innovation in the relationship between tax avoidance and the two endogenous variables reveals that while tax avoidance does not significantly impact sustainable performance or resilience directly, its indirect effects through innovation are both significant and positive ($\beta = 0.170$, p-value < 1%; $\beta = 0.099$, p-value < 1%). This finding confirms the full mediation effect of innovation, supporting *H4c* and *H4d*. On the other hand, the direct effects of tax incentives on innovation ($\beta = 0.227$, p-value < 1%), innovation on sustainable performance ($\beta = 0.755$, p-value < 1%), and tax incentives on sustainable performance ($\beta = 0.118$, p-value < 1%) are all positive and significant. Similar to the direct effect, the indirect effect of tax incentives on sustainable performance through innovation is significant ($\beta = 0.172$, p-value < 1%), which indicates partial mediation in the model. The consistent direction of these direct and indirect effects suggests a complementary partial mediation effect, thereby validating *H5a*. Finally, the indirect effect of tax incentives on business resilience, mediated by innovation, shows a full mediation role, as evidenced by the insignificant direct effect and significant indirect effect ($\beta = 0.100$, p-value < 1%). Consequently, *H5b* is supported.

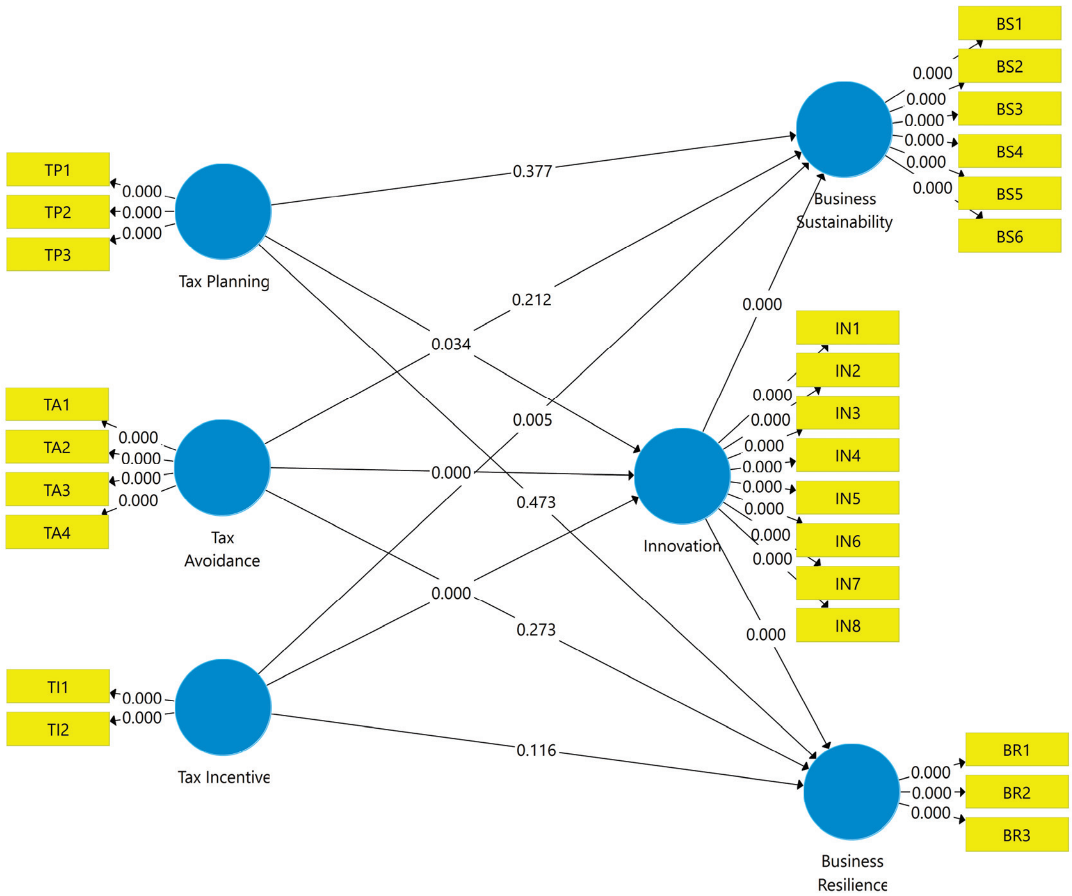

Figure 3. Path model of mediation effects. Note(s): this figure reports the *p*-values of the inner and outer models.

5.5. Structural Model Analysis

In addition to evaluating the statistical significance of the relationship between variables, it is crucial to assess the magnitude of the impact by calculating the effect size (f^2). Cohen (1988) categorizes f^2 values of 0.02, 0.15, and 0.35 as indicative of small, medium, and large effects, respectively, of an exogenous latent variable on an endogenous latent variable. An f^2 value below 0.02 suggests a negligible effect. According to Table 8, the direct impact of creative compliance variables and tax incentives on MSME business resilience and sustainability is trivial, as the f^2 values are well below the 0.02 threshold. However, when innovation is incorporated as a mediator, the relationship between tax avoidance and tax incentives with the endogenous constructs becomes more pronounced, though the effect size remains small (with f^2 values ranging from 0.02 to 0.15). The notable enhancement in the impact of tax avoidance and tax incentives on our endogenous variables through innovation may be attributed to innovation's notable direct effects on business sustainability and resilience. Table 8 reveals that innovation has a large effect on business resilience ($f^2 = 1.245$) and a medium effect on business sustainability ($f^2 = 0.200$). On the other hand, tax planning still shows no effect, even with innovation as a mediator. Furthermore, in our evaluation of the R-square, we find that the determinants of business sustainability and business resilience are 0.633 and 0.230, respectively. It indicates that the exogenous constructs account for 63% of the variance in sustainability and 23% in resilience. After accounting for innovation's mediating role, the coefficient of determination for the exogenous variables is 0.201. Lastly, the model's predictive relevance was also assessed using the blindfolding technique, and the positive Q^2 values confirm that the model demonstrates adequate predictive relevance (Hair et al. 2017).

Table 8. Coefficient of determination, predictive relevance, and relative effect size.

	Relationships	f^2	Assessments	R-Square	Q^2
Direct Effect	Tax Planning → Business Sustainability	0.0003	No Effect	0.633	0.424
	Tax Avoidance → Business Sustainability	0.002	No Effect		
	Tax Incentive → Business Sustainability	0.028	Small		
	Innovation → Business Sustainability	1.245	Large		
	Tax Planning → Business Resilience	0.00002	No Effect	0.230	0.157
	Tax Avoidance → Business Resilience	0.001	No Effect		
	Tax Incentive → Business Resilience	0.006	No Effect		
	Innovation → Business Resilience	0.200	Medium		
Mediation Effect	Tax Planning → Innovation	0.012	No Effect	0.201	0.144
	Tax Avoidance → Innovation	0.047	Small		
	Tax Incentive → Innovation	0.050	Small		

6. Robustness Checks: Nonlinear Effects and Endogeneity

Robustness checking has become a fundamental practice in empirical studies that utilize regression-based methodologies, where researchers examine how the coefficients of baseline regressions respond to modifications in the regression model, typically by adding or removing variables (Lu and White 2014; Saptono et al. 2024a). Despite its prevalence in traditional regression analysis, this approach is not commonly applied in PLS-SEM studies (Sharma et al. 2019). Additionally, the use of specification checks, such as those involving ant colony optimization (Marcoulides and Drezner 2003), remains underdeveloped in the PLS-SEM context (Callaghan et al. 2007). Nevertheless, there have been some efforts within PLS-SEM research to assess the robustness of structural models in evaluating relationships among latent variables. For instance, Rasoolimanesh et al. (2018) highlight the importance of accounting for potential nonlinearities in model relationships, arguing that failing to recognize nonlinear effects can lead to underestimations of the true relationships and potentially misrepresent the strength or significance of these effects. Similarly, Hult et al. (2018) propose methods to detect and address endogeneity issues, which, if left unaddressed, can severely compromise the validity of the findings. Latan (2018) underscores the necessity of promptly addressing these issues and incorporating them into PLS-SEM reports. In this section, we present the results of our tests for nonlinear effects and endogeneity within our structural model, following the steps recently outlined by Sarstedt et al. (2020). Detailed discussions of each of these tests are provided in the subsequent subsections.

6.1. Nonlinear Effects

In estimating path models, researchers often assume that the relationships between constructs are linear. Although linear approximations generally align well with real-world relationships, this assumption does not always hold true (Ahrholdt et al. 2019). When relationships between constructs exhibit nonlinearity, the impact of changes in an exogenous construct on a latent variable depends not only on the magnitude of the change but also on the value of the exogenous construct itself (Hair et al. 2019). To identify potential nonlinearities, researchers can evaluate whether including nonlinear effects yields significant results. It involves creating quadratic terms for the exogenous variables to incorporate polynomial modeling (Hair et al. 2023). These quadratic terms, which represent self-interactions of the exogenous constructs, help in examining the nature of the relationship. If the interaction term is significant and positive (or negative), it indicates that the effect of the exogenous variable increases (or decreases) at higher values of the construct. Conversely, a non-significant interaction term suggests that the linear effect remains robust. The quadratic effect functionality in SmartPLS facilitates this testing process. Additionally, researchers can utilize the Regression Equation Specification Error Test (RESET) proposed by Ramsey (1969), which defaults to considering quadratic effects, and sometimes cubic effects, to detect misspecifications (Sarstedt et al. 2020). In PLS-

SEM, this test is conducted using latent variable scores obtained after the linear effects model converges. Software like Stata can be employed for this purpose (Mooi et al. 2018). Following the approach used by Svensson et al. (2018) in their study of sustainability aspects, we applied both tests, and the results are detailed in Table 9.

Table 9. Assessment of nonlinear effects.

Nonlinear Relationships	β	t-Statistics	f^2	Assessments	Ramsey's RESET
$TP \times TP \rightarrow BS$	−0.021	0.634	0.001	No Effect	F (3, 352) = 1.54, p-value = 0.204
$TA \times TA \rightarrow BS$	−0.041	1.078	0.005	No Effect	
$TI \times TI \rightarrow BS$	−0.035	1.265	0.005	No Effect	
$IN \times IN \rightarrow BS$	0.064	2.551 **	0.021	Small	
$TP \times TP \rightarrow BR$	−0.066	1.482	0.007	No Effect	F (3, 352) = 0.49, p-value = 0.687
$TA \times TA \rightarrow BR$	−0.076	1.372	0.008	No Effect	
$TI \times TI \rightarrow BR$	−0.033	0.793	0.002	No Effect	
$IN \times IN \rightarrow BR$	0.081	1.191	0.004	No Effect	
$TP \times TP \rightarrow IN$	−0.092	1.353	0.005	No Effect	F (3, 353) = 2.26, p-value = 0.081
$TA \times TA \rightarrow IN$	0.084	1.235	0.004	No Effect	
$TI \times TI \rightarrow IN$	0.047	1.138	0.004	No Effect	

Note(s): TP×TP = Squared Tax Planning, TA×TA = Squared Tax Avoidance, TI×TI = Squared Tax Incentive, IN×IN = Squared Innovation, BS×BS = Squared Business Sustainability, and BR×BR = Squared Business Resilience. ** represents statistical significance at the 1% level.

Initially, our analysis revealed that the partial regressions of business sustainability on its independent variables (F (3, 352) = 1.54, p-value = 0.204), business resilience on its determinants (F (3, 352) = 0.49, p-value = 0.687), and innovation on its drivers (F (3, 353) = 2.26, p-value = 0.081) did not exhibit nonlinear effects. However, these findings may be less reliable as they are based solely on construct scores derived from a linear effects model. To gain a more accurate understanding, we introduced an interaction term to capture potential quadratic effects between exogenous and endogenous variables. Employing bootstrapping with 5000 samples and excluding sign changes, we found that, while most nonlinear effects were insignificant, the quadratic effect of innovation on business sustainability was significant ($\beta = 0.064$, p-value < 1%) but had a small effect size ($f^2 = 0.021$). Consequently, we determine that, apart from the innovation–sustainability relationship, the linear effect model remains robust. This result suggests that the relationship between innovation and business sustainability is not purely linear. Instead, it indicates a more intricate dynamic characterized by a U-shaped relationship. Specifically, while the initial impact of innovation on sustainability may decrease, it eventually increases as the level of innovation continues to rise.

6.2. Endogeneity

Endogeneity arises when a predictor variable correlates with the error terms of the estimation model (Bascle 2008). Various factors can contribute to endogeneity (Papies et al. 2017; Ebbes et al. 2021), but it primarily stems from excluding relevant explanatory variables from the model (Wooldridge 2010). These omitted variables become part of the error terms, potentially correlating with the independent variables being analyzed, which violates the exogeneity assumption in regression analysis (Kennedy 2008). Consequently, standard regression estimates may be biased, rendering them difficult to interpret and potentially leading to flawed statistical inferences (Papies et al. 2017). Although endogeneity is a crucial concern in regression studies (e.g., Ebbes et al. 2011; Park and Gupta 2012; Rossi 2014), discussions surrounding it in the context of PLS-SEM remain scarce (Hult et al. 2018). Some researchers argue that PLS-SEM cannot adequately address endogeneity (e.g., Antonakis et al. 2010; McIntosh et al. 2014; Rönkkö and Evermann 2013), which is surprising and misleading, given that PLS-SEM employs regression techniques to estimate its structural parametric model where endogeneity is indeed pertinent (Sarstedt et al. 2020). Moreover, numerous statistical methods are available for addressing endogeneity, with some using instrumental variables (IVs) and others not (Papies et al. 2017). The IV approach can be particularly challenging due to the difficulty of identifying appropriate instruments (Wintoki et al. 2012; Rossi 2014). As a result, researchers often recommend using IV-free methods, among which the Gaussian copula method is the most widely utilized. Introduced by Park and Gupta (2012), this technique controls for endogeneity by directly modeling the correlation between endogenous variables and the error term through a copula of independent variables. Essentially, the coefficient of the copula term represents the estimated correlation between the explanatory variables and the error term, adjusted for the variance of the error. The outcomes of this method are summarized in Table 10.

Table 10. Assessment of endogeneity problem using the Gaussian copula approach.

Models	Variables	β	*t*-Statistics	β	*t*-Statistics
Original Model (Copied from Table 6)	TP	0.013	0.305	−0.004	0.071
	TA	−0.031	0.767	0.039	0.634
	TI	0.117	2.556 **	0.080	1.206
	IN	0.755	25.026 **	0.438	7.642 **
Gaussian Copula of Model 1 (Endogenous Explanatories; TP)	TP	0.103	1.038	0.058	0.429
	TA	−0.027	0.693	0.041	0.659
	TI	0.118	2.582 **	0.080	1.222
	IN	0.754	25.119 **	0.437	7.636 **
	^{C}TP	−0.080	0.918	−0.056	0.484
Gaussian Copula of Model 2 (Endogenous Explanatories; TA)	TP	0.015	0.338	−0.004	0.059
	TA	0.189	1.109	0.188	0.753
	TI	0.117	2.612 **	0.079	1.220
	IN	0.765	26.387 **	0.445	7.758 **
	^{C}TA	−0.214	1.260	−0.145	0.595
Gaussian Copula of Model 3 (Endogenous Explanatories; TI)	TP	0.018	0.414	−0.001	0.014
	TA	−0.035	0.882	0.035	0.571
	TI	0.252	2.308 *	0.192	1.039
	IN	0.757	25.403 **	0.440	7.679 **
	^{C}TI	−0.115	1.275	−0.095	0.642
Gaussian Copula of Model 4 (Endogenous Explanatories; IN)	TP	0.014	0.323	−0.003	0.051
	TA	−0.043	1.072	0.014	0.225
	TI	0.112	2.466 *	0.069	1.063
	IN	0.504	4.329 **	0.382	3.441 **
	^{C}IN	0.243	2.378 *	0.516	3.255 **
Gaussian Copula of Model 5 (Endogenous Explanatories; TP, TA)	TP	0.071	0.675	0.037	0.260
	TA	0.158	0.888	0.165	0.644
	TI	0.117	2.613 **	0.079	1.221
	IN	0.762	25.628 **	0.443	7.669 **
	^{C}TP	−0.051	0.551	−0.036	0.303
	^{C}TA	−0.180	1.017	−0.121	0.480
Gaussian Copula of Model 6 (Endogenous Explanatories; TP, TI)	TP	0.085	0.810	0.042	0.300
	TA	−0.031	0.791	0.038	0.618
	TI	0.225	1.960	0.174	0.898
	IN	0.755	25.034 **	0.439	7.644 **
	^{C}TP	−0.061	0.652	−0.039	0.313
	^{C}TI	−0.091	0.962	−0.080	0.503
Gaussian Copula of Model 7 (Endogenous Explanatories; TA, TI)	TP	0.018	0.412	−0.001	0.015
	TA	0.160	0.889	0.161	0.630
	TI	0.222	1.945	0.172	0.918
	IN	0.765	26.203 **	0.445	7.735 **
	^{C}TA	−0.187	1.045	−0.121	0.482
	^{C}TI	−0.090	0.936	−0.079	0.518

Table 10. *Cont.*

Models	Variables	β	t-Statistics	β	t-Statistics
Gaussian Copula of Model 8 (Endogenous Explanatories; TP, IN)	TP	0.145	1.371	0.142	1.005
	TA	−0.038	0.956	0.020	0.330
	TI	0.112	2.469 *	0.068	1.065
	IN	0.467	3.751 **	0.321	2.892 **
	^{C}TP	−0.118	1.292	−0.131	1.085
	^{C}IN	0.277	2.551 *	0.554	3.397 **
Gaussian Copula of Model 9 (Endogenous Explanatories; TA, IN)	TP	0.016	0.367	−0.001	0.015
	TA	0.382	1.987 *	0.539	1.986 *
	TI	0.108	2.480 *	0.063	1.018
	IN	0.394	2.948 **	0.270	2.432 *
	^{C}TA	−0.416	1.420	−0.513	1.917
	^{C}IN	0.368	2.992 **	0.670	3.737 **
Gaussian Copula of Model 10 (Endogenous Explanatories; TI, IN)	TP	0.020	0.454	0.003	0.051
	TA	−0.048	1.215	0.008	0.136
	TI	0.295	2.626 **	0.278	1.437
	IN	0.476	3.995 **	0.351	3.250 **
	^{C}TI	−0.156	1.709	−0.179	1.152
	^{C}IN	0.272	2.616 **	0.549	3.428 **
Gaussian Copula of Model 11 (Endogenous Explanatories; TP, TA, TI)	TP	0.057	0.532	0.024	0.169
	TA	0.141	0.770	0.149	0.575
	TI	0.209	1.775	0.164	0.838
	IN	0.763	25.557 **	0.444	7.651 **
	^{C}TP	−0.036	0.379	−0.023	0.182
	^{C}TA	−0.166	0.912	−0.108	0.422
	^{C}TI	−0.079	0.801	−0.072	0.447
Gaussian Copula of Model 12 (Endogenous Explanatories; TP, TA, IN)	TP	0.092	0.864	0.076	0.539
	TA	0.343	1.770	0.499	1.843
	TI	0.108	2.478 *	0.063	1.019
	IN	0.383	2.801 **	0.291	2.771 **
	^{C}TP	−0.069	0.755	−0.069	0.582
	^{C}TA	−0.375	1.925	−0.472	1.755
	^{C}IN	0.376	3.006 **	0.678	3.732 **
Gaussian Copula of Model 13 (Endogenous Explanatories; TP, TI, IN)	TP	0.122	1.125	0.116	0.812
	TA	−0.043	1.106	0.014	0.236
	TI	0.257	2.239	0.236	1.186
	IN	0.452	3.603 **	0.341	3.045 **
	^{C}TP	−0.093	0.982	−0.102	0.809
	^{C}TI	−0.124	1.324	−0.144	0.877
	^{C}IN	0.294	2.679 **	0.573	3.486 **
Gaussian Copula of Model 14 (Endogenous Explanatories; TP, TA, TI, IN)	TP	0.075	0.686	0.056	0.390
	TA	0.325	1.647	0.479	1.758
	TI	0.233	1.997 *	0.206	1.040
	IN	0.373	2.723 **	0.316	2.633 **
	^{C}TP	−0.049	0.528	−0.047	0.377
	^{C}TA	−0.361	1.822	−0.456	1.683
	^{C}TI	−0.107	1.124	−0.122	0.748
	^{C}IN	0.386	3.084 **	0.690	3.776 **

Note(s): ^{C} indicates the copula term in the model. TP = Tax Planning, TA = Tax Avoidance, TI = Tax Incentive, and IN = Innovation. * and ** represent statistical significance at the 5% and 1% levels.

Our evaluation of potential endogeneity, utilizing the Gaussian copula method proposed by Park and Gupta (2012), adheres to the systematic approach outlined by Hult et al. (2018). The process begins by generating latent variable scores from the estimates of the original model (see Table 6). We evaluate the distribution of potential endogenous independent variables—tax planning, tax avoidance, tax incentives, and innovation—using the Kolmogorov–Smirnov test with Lilliefors correction (Sarstedt and Mooi 2019) to check if they deviate from normality. Using SPSS, we found that none of these constructs show normally distributed scores, thus permitting us to proceed with the Gaussian copula analysis in SmartPLS. We construct several model variations that incorporate one, two, three, or all copula terms for each independent variable concurrently, resulting in a total of 14 distinct models (see Table 10). The findings reveal that only one Gaussian copula (i.e., ^{C}IN) is significant (p-value < 5%) across all models, indicating a potential endogeneity issue related to innovation. The presence of this significant Gaussian copula in the model that considers one endogenous explanatory variable (see model 4) alters the impact of innovation on business sustainability and resilience by 0.251 and 0.056 units, respectively (from 0.755 to 0.504 and from 0.438 to 0.382, respectively). This trend persists in other models that combine the innovation copula term with the copula terms of the remaining exogenous variables. On the other hand, we found that tax planning, tax avoidance, and tax incentives can be treated as exogenous variables, as evidenced by the insignificance (p-value > 5%) of their respective copula coefficients (i.e., ^{C}TP, ^{C}TA, and ^{C}TI) across all models. Thus, we conclude that, aside from innovation, endogeneity is not a concern in this study, reinforcing the robustness of the original findings.

7. Discussion

The pandemic has posed significant hurdles for MSMEs. As outlined by contingency theory, businesses must adjust by seeking out alternative financial strategies by exploring alternative financial strategies—carefully considering both internal and external factors. On the internal front, organizations can reduce operational challenges by managing tax obligations, which is in line with the notion of entrepreneurial self-efficacy through a thorough financial assessment. Externally, building robust relationships with stakeholders, especially policymakers, is vital for remaining aware of potential governmental incentives that may emerge during hardships. This perspective resonates with institutional theory, indicating that strong stakeholder ties can assist organizations in aligning their strategies with regulatory changes, ultimately fostering competitive advantages and improved performance amid uncertainty. Nonetheless, it is important to recognize that while such endeavors can enhance financial flexibility for MSMEs, they do not guarantee business resilience or long-term sustainability. The literature highlights the necessity of innovation in linking those financial strategies to the flourishing business of MSMEs. This theoretical foundation has prompted us to undertake an empirical investigation, utilizing cross-sectional data from a survey of MSMEs in Indonesia and applying the PLS-SEM approach for our primary data analysis method. This section therefore provides a more comprehensive discussion related to the results of this current study.

Our research indicates that the direct impact of creative tax compliance—encompassing both tax planning and tax avoidance—on the resilience and sustainability of MSMEs in Indonesia is not evident. This result is inconsistent with the findings of earlier studies (Khuong et al. 2020; Fuadah et al. 2022; Khan et al. 2023; De Vito 2024; Jayanthi and Selvam 2024). A plausible explanation for our observation is that effectively minimizing tax liabilities while remaining compliant with legal requirements is not an easy job for many taxpayers (McBarnet 2001). Successfully navigating the intricate tax regulation landscape is crucial before it can be integrated into an appropriate corporate financial strategy, thereby mitigating the risk of engaging in illegal tax practices (Saptono et al. 2024a). However, achieving this requires personnel within the company to have a strong understanding of tax regulations (Kirchler et al. 2003). In fact, many MSMEs in Indonesia face a shortage of highly skilled workers (Tambunan 2021), a situation further compounded by the low levels of financial literacy and managerial knowledge among their managers (Iramani et al. 2018; Susan 2020). Consequently, only MSMEs capable of engaging tax advisors—who bring exceptional technical proficiency, comprehensive knowledge of tax regulations, and practical experience in tax compliance—are likely to employ creative compliance strategies (Erard 1993; Murphy 2004). Thus, both tax planning and avoidance represent costly strategic alternatives. While creative compliance has the potential to enhance the financial capabilities of MSMEs (Sánchez-Ballesta and Yagüe 2023), in the Indonesian context, the expenses associated with hiring such experts may overshadow the potential benefits. This justification may elucidate why creative tax compliance does not directly influence the resilience and sustainable performance of MSMEs in the country under study.

In addition, our study found that tax incentives did not have a significant direct impact on the resilience of MSMEs during the pandemic crisis in Indonesia. This outcome contrasts with previous research, which suggests that government support, such as grants and technology-related tax incentives, typically enhances the ability of both large firms (Feng and Xue 2023) and MSMEs (Lestari et al. 2024) to respond to uncertainties. Beebeejaun (2022) also indicated that small businesses leveraging tax incentives were better equipped to mitigate COVID-19's negative effects. However, our findings align with Nakandala et al. (2024), who reported that government support did not improve the resilience of MSME supply chains, even among those with strong digital capabilities. It suggests that proactive and reactive investments are critical for supply chain resilience (Mackay et al. 2020). While tax incentives may not directly enhance resilience, they significantly contribute to the sustainability performance of MSMEs in Indonesia, consistent with the views of Picas et al. (2021) and Deyganto (2022). This discrepancy in the results can be explained by the different ways these incentives function. For instance, MSMEs faced immediate challenges, such as cash flow issues and operational inefficiencies during the crisis, which may have diminished the effectiveness of tax relief. Over time, however, these incentives enabled businesses to reinvest and strengthen their market positions, enhancing long-term sustainability. This gradual accumulation of benefits underscores the importance of prioritizing long-term strategies over mere immediate resilience during a crisis. Nevertheless, the lack of a direct impact on resilience remains a concern, particularly given the weak institutional environment in developing countries (Demetriades and Hook Law 2006; Saptono and Mahmud 2022), which likely undermines the economic benefits of any financial support (Marcelin et al. 2022). Complex regulatory frameworks and bureaucratic hurdles can impose additional costs without increasing output, creating barriers for MSMEs (Dabla-Norris et al. 2020; Nakandala et al. 2024). Consequently, entrepreneurs may find themselves reallocating resources to address these regulatory challenges, which is particularly burdensome during hardship periods (Saifurrahman and Kassim 2024).

As expected, this paper confirms the direct nexus between innovation and the resilience and sustainability of MSMEs in Indonesia, demonstrating that innovation is a key determinant in ensuring business flourishing. It aligns with previous studies from both developing (Chan and Liu 2012; Boateng et al. 2020; Valdez-Juárez et al. 2022; Hanaysha et al. 2022; Putritamara et al. 2023) and developed countries (Pal et al. 2012; Ghisetti and Rennings 2014; Wang et al. 2021; Kyrdoda et al. 2023), as well as cross-national research (Filippetti et al. 2020; Ebersberger and Kuckertz 2021). Therefore, when the MSME environment encourages the generation of fresh ideas for innovative products, services, or technology, it increases the likelihood of achieving sustainable performance. By promoting an innovative culture that encourages employee participation in innovation, nurtures individual creativity, and fosters a learning-oriented environment, organizations can survive their performance in a challenging business environment (Rumanti et al. 2023). However, it is crucial to recognize that innovation is not a cost-effective endeavor (Kelley 2009), and many companies often feel pressured to innovate (Niu et al. 2023). This concern is especially pertinent in Indonesia, where approximately one-third of businesses engage in innovative activities (The Central Bureau of Statistics 2021), predominantly large enterprises (Hartono and Rafik 2022). The limited innovation among smaller firms is likely attributed to funding limitations, which have significantly impacted MSMEs during the pandemic (Baldwin and Mauro 2020; Cao and Leung 2020). Accordingly, businesses should develop financial strategies to stimulate innovation, such as reducing production costs and potentially lowering tax burdens (Brophy and Shulman 1993). Furthermore, governmental initiatives are crucial for overcoming MSMEs' innovation stagnation, such as implementing tax reductions that lower R&D costs, thereby facilitating more effective resource allocation aligned with potential returns (Tassey 2007).

The insights drawn from the results above closely correspond with the role of innovation as a mediator between creative compliance and tax incentives on business resilience and sustainability—an area that has been largely overlooked in the literature. We observed that innovation connects creative compliance with the resilience and sustainability of MSMEs in Indonesia, supporting the conclusions of Kouam and Asongu (2022). Given that the direct impact of creative compliance on the dependent variables is insignificant, we propose that innovation is a key element in entrepreneurial self-efficacy, demonstrated through how creative compliance is channeled to enhance MSME success. By strategically leveraging tax loopholes, MSMEs can ease financial constraints and increase investments in innovation (Okręglicka et al. 2023), ultimately aiding their survival during economic downturns (Pal et al. 2012) and promoting sustainable practices (Hanaysha et al. 2022). Additionally, innovation is found to fully mediate the impact of tax incentives on resilience and partially mediate it for sustainability, consistent with prevailing views in the literature (Song et al. 2020; Beebeejaun 2022; Zhang and Song 2022; Li et al. 2023). For business resilience, it is insufficient for MSMEs to simply exploit available tax incentives; they must prioritize producing more advanced innovations (Najib et al. 2021). While tax reductions can promote sustainability, innovative practices facilitated by such flexible regulations enhance their impact (Ramanathan et al. 2017). Our result supports Gande et al. (2020) framework, which builds on key aspects of institutional theory highlighted by Henisz and Swaminathan (2008), emphasizing how legal systems establish the "rules of the game" that influence firms' innovation policies aimed at achieving their objectives. Eventually, we contend that innovation is central to applying contingency theory in helping MSMEs navigate managerial challenges in uncertain environments (Childs et al. 2022).

To adhere to the rigorous PLS-SEM estimation procedures, we perform robustness tests that concentrate on nonlinear effects and endogeneity. Our results reveal that the linear relationships among the latent variables are generally robust, except for the association between innovation and sustainability performance, which establishes a nonlinear U-shaped effect. It suggests that initial investments in innovation may involve trade-off costs that offer limited immediate benefits. However, once a certain threshold is crossed, firms can mitigate these costs, resulting in a significantly enhanced positive impact on business sustainability. Such a mechanism reflects the complex dynamics inherent in innovation processes. Similar outcomes have been observed by Li et al. (2021b) in China and Lee and Kim (2017) in the US. These results underscore the importance of firms planning innovation in stages across various domains, such as product, market, and process, while carefully considering their resources and business model (Boons et al. 2013). Consequently, MSMEs must adopt efficient innovation strategies to effectively achieve their sustainability objectives (Klewitz and Hansen 2014). In addition, we observe that endogeneity is largely absent, except for the variable of innovation, which is expected since it functions as a mediator in our structural model. As Antonakis et al. (2010) discuss, a variable is considered endogenous—rather than exogenous—when researchers aim to correlate predictors with it to forecast the outcome of interest. Therefore, our analysis demonstrates that in this empirical setting, taking endogeneity into account, does not alter the conclusions drawn from our estimation results from a theory-testing standpoint.

8. Conclusions

This study investigates how tax incentives, creative compliance, and innovation contribute to enhancing business resilience and sustainability. The analysis utilizes cross-sectional data from a survey of 360 MSMEs in Indonesia. Based on the results of hypothesis testing using the PLS-SEM approach, we found that creative compliance—encompassing tax planning and tax avoidance—does not directly influence resilience or sustainability. Additionally, we observed that while tax incentives did not significantly enhance resilience during the crisis, they contributed directly to long-term sustainability. Furthermore, our analysis demonstrates the central role of innovation in driving the flourishing of MSMEs in Indonesia, as it has a significant direct impact on both resilience and sustainability. Innovation also emerged as an important factor linking creative compliance to the success of MSMEs. It underscores that entrepreneurial self-efficacy through internal funding must be paired with an innovative agenda for companies to survive and thrive. Moreover, we found that innovation fully mediates the effects of tax incentives on resilience, indicating that government support can improve financial flexibility but may not help MSMEs withstand negative shocks without fostering innovation. At this point, we can conclude that innovation should be prioritized by MSMEs applying the contingency theory to navigate economic challenges. To ensure the robustness of our results, we examined nonlinear effects and endogeneity. It was observed that innovation and sustainability demonstrate a U-shaped relationship. Initially, innovation may decrease a company's performance due to high costs, but at a certain level, it ultimately enhances sustainability. Our endogeneity analysis shows that innovation cannot be treated as an exogenous variable, reinforcing its pivot position in our structural model, while other independent variables do not present endogeneity issues. In summary, our empirical conclusions remain intact after robustness checks.

This study makes a significant contribution to the literature by integrating two often-separate concepts—resilience and sustainability—that are essential for achieving a thriving business. By situating these concepts within the context of a crisis, we explore the specific roles of taxation and innovation as antecedents to resilience and sustainability, addressing a gap in the literature where the relationship between these variables remains underexplored. We emphasize the necessity for organizations to develop alternative financial strategies that align with contingency theory, ensuring access to vital resources amid emerging crises. This approach encompasses both internal and external considerations. Internally, businesses can implement creative compliance strategies to optimize tax savings and boost internal funding, reflecting entrepreneurial self-efficacy. Externally, companies must adapt to changes in regulatory frameworks, in line with institutional theory, such as tax reductions, which can significantly impact their financial landscape. Our findings enrich those theories by demonstrating that MSMEs' efforts to enhance resilience and sustainability are most effective when coupled with consistent innovation processes. From a methodological standpoint, our study employs rigorous techniques to examine nonlinear effects and endogeneity within our structural model. This attention to detail serves as a valuable guide for PLS-SEM practitioners, who often overlook the robustness of their analyses (Sharma et al. 2019). Overall, this multifaceted approach provides a valuable contribution to the business literature, particularly that which is focused on resilience and sustainability in the MSME business segment.

The results of this study also lead to several policy implications. First, MSMEs looking to implement creative compliance strategies should hire qualified professionals with strong tax knowledge who can accurately interpret complex tax regulations. To ensure the effectiveness of these financial strategies, there needs to be a systematic integration of tax regulations with the company's business processes. It could involve developing specific tax standard operating procedures. MSMEs should prioritize these long-term steps rather than relying on costly external personnel, such as tax consultants. However, MSMEs with excess capital should seek advice from tax practitioners on potential tax-saving options. Second, MSMEs must actively pursue innovative approaches to achieve their business goals, especially in the face of external challenges that create market uncertainty. This includes adopting cost-effective and environmentally friendly methods, as well as introducing new products or services that promote innovation among the workforce and within local communities, thereby strengthening their competitive advantage. Third, based on our findings regarding the mediating role of innovation capability, managers and business owners should focus on ensuring that their tax practices encourage creativity and innovation to support sustainable growth. MSMEs should efficiently utilize tax incentives while fostering a culture of innovation in their operations, as innovation is the primary channel through which the benefits of tax incentives translate into significant positive impacts on resilience. Finally, to cultivate an innovative business environment, the government should provide various incentives related to innovation implementation. However, this should be paired with simplified regulatory requirements and streamlined administrative processes to ensure that these incentives can be utilized more effectively.

Despite its significant contributions, this study has several limitations that warrant acknowledgment. First, we have opted for SEM analysis because it offers advantages over multiple regression analysis when dealing with complex relationships between variables. However, there is an ongoing debate among researchers in the social sciences about SEM analysis. One of the limitations is the difficulty of including control variables such as gender, age, education, annual income, and firm age, which are commonly used in SME research. These variables are rarely modeled in SEM studies because SEM requires the variables to be measured on interval or ratio scales, which limits the use of ordinal or nominal data. If these variables are neglected in SEM analysis, their importance in explaining respondent profiles may be overlooked. Consequently, future research should investigate alternative approaches that allow for the inclusion of control variables in the analysis. Second, a cross-sectional approach was adopted in this current study so that the long-term effects of creative tax compliance, incentives, and innovativeness on sustainable performance remain unclear. Replication of the framework in subsequent studies could reveal different results. Third, the sample size in this study is relatively small compared to the total population of MSMEs, which could result in distorted conclusions, even if some hypotheses are rejected with high *t*-statistic values. Given the possibilities of data collection, future research should utilize larger, more representative samples. Fourth, future research should investigate various domains of innovation and other forms of financial support, such as subsidies and interest rate discounts, and their effects on business resilience and sustainability. It could lead to more comprehensive empirical findings. Lastly, researchers should investigate additional variables that mediate or moderate the relationship between exogenous variables and sustainable performance. To achieve this goal, the integration of qualitative and quantitative methods could provide insights into the relationship between sustained performance and its antecedents, particularly those associated with internal funding strategy and government support.

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References

Abetti, Pier A. 2000. Critical success factors for radical technological innovation: A five case study. *Creativity and Innovation Management* 9: 208–21. [CrossRef]

Adobor, Henry, and Ronald S. McMullen. 2018. Supply chain resilience: A dynamic and multidimensional approach. *The International Journal of Logistics Management* 29: 1451–71. [CrossRef]

Agarwal, Vernika, K. Mathiyazhagan, Snigdha Malhotra, and Busayamas Pimpunchat. 2023. Building resilience for sustainability of MSMEs post COVID-19 outbreak: An Indian handicraft industry outlook. *Socio-Economic Planning Sciences* 85: 101443. [CrossRef] [PubMed]

Aguiñaga, Eduardo, Irene Henriques, Carlos Scheel, and Andrea Scheel. 2018. Building resilience: A self-sustainable community approach to the triple bottom line. *Journal of Cleaner Production* 173: 186–96. [CrossRef]

Ahmedova, Sibel. 2015. Factors for increasing the competitiveness of small and medium-sized enterprises (SMEs) in Bulgaria. *Procedia-Social and Behavioral Sciences* 195: 1104–12. [CrossRef]

Ahrholdt, Dennis C., Siegfried P. Gudergan, and Christian M. Ringle. 2019. Enhancing loyalty: When improving consumer satisfaction and delight matters. *Journal of Business Research* 94: 18–27. [CrossRef]

Albareda, Laura, Josep M. Lozano, and Tamyko Ysa. 2007. Public policies on corporate social responsibility: The role of governments in Europe. *Journal of Business Ethics* 74: 391–407. [CrossRef]

Alkahtani, Asem, Norfarah Nordin, and Rizwan Ullah Khan. 2020. Does government support enhance the relation between networking structure and sustainable competitive performance among SMEs? *Journal of Innovation and Entrepreneurship* 9: 1–16. [CrossRef]

Alm, James. 2012. Measuring, explaining, and controlling tax evasion: Lessons from theory, experiments, and field studies. *International Tax and Public Finance* 19: 54–77. [CrossRef]

Ambrogio, Giuseppina, Luigino Filice, Francesco Longo, and Antonio Padovano. 2022. Workforce and supply chain disruption as a digital and technological innovation opportunity for resilient manufacturing systems in the COVID-19 pandemic. *Computers & Industrial Engineering* 169: 108158.

Anning-Dorson, Thomas, and Michael Boadi Nyamekye. 2020. Engagement capability, innovation intensity and firm performance: The role of competitive intensity. *Journal of African Business* 21: 493–508. [CrossRef]

Antonakis, John, Samuel Bendahan, Philippe Jacquart, and Rafael Lalive. 2010. On making causal claims: A review and recommenda tions. *The Leadership Quarterly* 21: 1086–120. [CrossRef]

Araújo, Lurdes, Sérgio Ravara Cruz, Luís Lima Santos, and Lucília Cardoso. 2024. Mapping Corporate Tax Planning and Corporate Social Responsibility: A Hybrid Method of Category Analysis. *Journal of Risk and Financial Management* 17: 333. [CrossRef]

Atawodi, Ojochogwu Winnie, and Stephen Aanu Ojeka. 2012. Relationship between tax policy, growth of SMEs and the Nigerian economy. *International Journal of Business and Management* 7: 125. [CrossRef]

Audretsch, B. David, and Maksim Belitski. 2023. The limits to open innovation and its impact on innovation performance. *Technovation* 119: 102519. [CrossRef]

Ayman, Roya, Martin M. Chemers, and Fred Fiedler. 1995. The contingency model of leadership effectiveness: Its levels of analysis. *The Leadership Quarterly* 6: 147–67. [CrossRef]

Baldwin, Richard, and B. Weder Di Mauro. 2020. Economics in the time of COVID-19: A new eBook. *Vox CEPR Policy Portal* 2: 105–9.

Balugani, Elia, Maria Angela Butturi, Delroy Chevers, David Parker, and Bianca Rimini. 2020. Empirical evaluation of the impact of resilience and sustainability on firms' performance. *Sustainability* 12: 1742. [CrossRef]

Barasa, Edwine, Rahab Mbau, and Lucy Gilson. 2018. What is resilience and how can it be nurtured? A systematic review of empirical literature on organizational resilience. *International journal of health policy and management* 7: 491. [CrossRef]

Bartik, Timothy J. 2005. Solving the problems of economic development incentives. *Growth and Change* 36: 139–66. [CrossRef]

Bascle, Guilhem. 2008. Controlling for endogeneity with instrumental variables in strategic management research. *Strategic Organization* 6: 285–327. [CrossRef]

Beebeejaun, Ambareen. 2022. Ensuring resilience through fiscal responses to COVID-19; an empirical study of Mauritian micro small medium enterprises (MSMEs). *Journal of Entrepreneurship and Public Policy* 11: 292–308. [CrossRef]

Beech, Nick, David Devins, Jeff Gold, and Susan Beech. 2020. In the family way: An exploration of family business resilience. *International Journal of Organizational Analysis* 28: 160–82. [CrossRef]

Belás, Jaroslav, Mária Mišanková, Jaroslav Schönfeld, and Beáta Gavurová. 2017. Credit risk management: Financial safety and sustainability aspects. *Journal of Security and Sustainability Issues* 7: 79–94. [CrossRef]

Belu, Constantin. 2009. Ranking corporations based on sustainable and socially responsible practices. A data envelopment analysis (DEA) approach. *Sustainable Development* 17: 257–68. [CrossRef]

Ben Hassen, Tarek, and Hamid El Bilali. 2022. Impacts of the Russia-Ukraine war on global food security: Towards more sustainable and resilient food systems? *Foods* 11: 2301. [CrossRef]

Bhamra, Ran, Samir Dani, and Kevin Burnard. 2011. Resilience: The concept, a literature review and future directions. *International Journal of Production Research* 49: 5375–93. [CrossRef]

Bhattacharyya, Som Sekhar, and Shreyash Thakre. 2021. Coronavirus pandemic and economic lockdown; study of strategic initiatives and tactical responses of firms. *International Journal of Organizational Analysis* 29: 1240–68. [CrossRef]

Boateng, Henry, Ramanah Visnupriyan, Kwame Simpe Ofori, and Robert Ebo Hinson. 2020. Examining the link between social capital, knowledge quality, SMEs innovativeness and performance. *Business Information Review* 37: 167–75. [CrossRef]

Bonsu, Mandella Osei-Assibey, Yongsheng Guo, and Xiaoxian Zhu. 2023. Does green innovation mediate corporate social responsibility and environmental performance? Empirical evidence from emerging markets. *Journal of Applied Accounting Research* 25: 221–39. [CrossRef]

Boons, Frank, Carlos Montalvo, Jaco Quist, and Marcus Wagner. 2013. Sustainable innovation, business models and economic performance: An overview. *Journal of Cleaner Production* 45: 1–8. [CrossRef]

Boyd, Nancy G., and George S. Vozikis. 1994. The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice* 18: 63–77. [CrossRef]

Bradley, Steven W., Jeffery S. McMullen, Kendall Artz, and Edward M. Simiyu. 2012. Capital is not enough: Innovation in developing economies. *Journal of Management Studies* 49: 684–717. [CrossRef]

Bräutigam, Deborah A., and Stephen Knack. 2004. Foreign aid, institutions, and governance in sub-Saharan Africa. *Economic Development and Cultural Change* 52: 255–85. [CrossRef]

Brophy, David, and Joel Shulman. 1993. Financial factors which stimulate innovation. *Entrepreneurship Theory and Practice* 17: 61–75. [CrossRef]

Bryant, Scott T., Karla Straker, and Cara Wrigley. 2018. The typologies of power: Energy utility business models in an increasingly renewable sector. *Journal of Cleaner Production* 195: 1032–46. [CrossRef]

Buffa, Federica, Mariangela Franch, and Dina Rizio. 2018. Environmental management practices for sustainable business models in small and medium sized hotel enterprises. *Journal of Cleaner Production* 194: 656–64. [CrossRef]

Burnard, Kevin, and Ran Bhamra. 2011. Organisational resilience: Development of a conceptual framework for organisational responses. *International Journal of Production Research* 49: 5581–99. [CrossRef]

Cachia, Franklin. 2017. Aggressive tax planning: An analysis from an EU perspective. *EC Tax Review* 26: 257–73. [CrossRef]

Callaghan, William, Bradley Wilson, Christian M. Ringle, and Jörg Henseler. 2007. Exploring causal path directionality for a marketing model: Using Cohen's path method. Paper presented at the 5th International Symposium on PLS and Related Methods, Ås, Norway, September 5–7.

Cao, Shutao, and Danny Leung. 2020. Credit constraints and productivity of SMEs: Evidence from Canada. *Economic Modelling* 88: 163–80. [CrossRef]

Carmeli, Abraham, and Gideon D. Markman. 2011. Capture, governance, and resilience: Strategy implications from the history of Rome. *Strategic Management Journal* 32: 322–41. [CrossRef]

Chan, Isabelle Y. S., and Anita M. M. Liu. 2012. Antecedents of innovation climate in construction firms in Hong Kong. *International Journal of Construction Management* 12: 37–46. [CrossRef]

Chang, Hsihui, Xin Dai, Yurun He, and Maolin Wang. 2020. How internal control protects shareholders' welfare: Evidence from tax avoidance in China. *Journal of International Accounting Research* 19: 19–39. [CrossRef]

Chatzistamoulou, Nikos, and Emmanouil Tyllianakis. 2022. Commitment of European SMEs to resource efficiency actions to achieve sustainability transition. A feasible reality or an elusive goal? *Journal of Environmental Management* 321: 115937. [CrossRef]

Chen, Chao C., Patricia Gene Greene, and Ann Crick. 1998. Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing* 13: 295–316. [CrossRef]

Chen, Hanwen, Daoguang Yang, Xinmin Zhang, and Nan Zhou. 2020. The moderating role of internal control in tax avoidance: Evidence from a COSO-based internal control index in China. *The Journal of the American Taxation Association* 42: 23–55. [CrossRef]

Chen, Ming-Jer, and Danny Miller. 2011. The relational perspective as a business mindset: Managerial implications for East and West. *Academy of Management Perspectives* 25: 6–18.

Cheng, Eddie W. L. 2001. SEM being more effective than multiple regression in parsimonious model testing for management development research. *Journal of Management Development* 20: 650–67. [CrossRef]

Childs, Michelle, Tom Turner, Christopher Sneed, and Ann Berry. 2022. A contingency theory approach to understanding small retail business continuity during COVID-19. *Family and Consumer Sciences Research Journal* 50: 216–30. [CrossRef]

Chin, Wynne W, and Peter R Newsted. 1999. Structural equation modeling analysis with small samples using partial least squares. In *Statistical Strategies for Small Sample Research*. Edited by Rick Hoyle. Thousand Oaks: Sage Publications Ltd., pp. 307–41.

Chowdhury, Md Maruf Hossan, and Mohammed Quaddus. 2016. Supply chain readiness, response and recovery for resilience. *Supply Chain Management: An International Journal* 21: 709–31. [CrossRef]

Christians, Allison. 2014. Avoidance, evasion, and taxpayer morality. *Wash. UJL & Pol'y* 44: 39.

Christopher, Martin, and Helen Peck. 2004. Building the resilient supply chain. *International Journal of Logistics Management* 15: 1–14. [CrossRef]

Chu, Zhaofang, Bo Feng, and Fujun Lai. 2018. Logistics service innovation by third party logistics providers in China: Aligning guanxi and organizational structure. *Transportation Research Part E: Logistics and Transportation Review* 118: 291–307. [CrossRef]

Chu, Zhaofang, Linlin Wang, and Fujun Lai. 2019. Customer pressure and green innovations at third party logistics providers in China: The moderation effect of organizational culture. *The International Journal of Logistics Management* 30: 57–75. [CrossRef]

Chunyun, Fan. 2003. Government support for small and medium-sized enterprises in China. *Problems of Economic transition* 45: 51–58.

Clapham, Maria M. 2003. The development of innovative ideas through creativity training. In *The international Handbook on Innovation*. Edited by Larisa V Shavinina. Oxford: Elsevier Science Ltd., pp. 366–76.

Cohen, Jacob. 1988. *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. Hillsdale: Erlbaum.

Committee of Sponsoring Organizations by the Treadway Commission (COSO). 2013. *The Internal Control–Integrated Framework*. Available online: http://www.coso.org/ (accessed on 7 August 2024).
Committee of Sponsoring Organizations of the Treadway Commission (COSO). 1992. *Internal Control–Integrated Framework*. Available online: http://www.coso.org/ (accessed on 7 August 2024).
Coordinating Ministry for Economic Affairs of the Republic of Indonesia. 2021. *Dukungan Pemerintah Kepada Masyarakat dan Usaha Kecil melalui Program PEN 2021*. Available online: https://ekon.go.id/publikasi/detail/3163/dukungan-pemerintah-kepada-masyarakat-dan-usaha-kecil-melalui-program-pen-2021 (accessed on 15 June 2024).
Dabla-Norris, Era, Florian Misch, Duncan Cleary, and Munawer Khwaja. 2020. The quality of tax administration and firm performance: Evidence from developing countries. *International Tax and Public Finance* 27: 514–51. [CrossRef]
Dalal, Dev K., Nathan T. Carter, and Christopher J. Lake. 2014. Middle response scale options are inappropriate for ideal point scales. *Journal of Business and Psychology* 29: 463–78. [CrossRef]
Danneels, Erwin, and Elko J. Kleinschmidtb. 2001. Product innovativeness from the firm's perspective: Its dimensions and their relation with project selection and performance. *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association* 18: 357–73.
Dash, Ajitabh. 2024. Do customer centricity and innovativeness mediate the relationship between total quality management and the corporate success of SaaS companies? *Benchmarking: An International Journal* 31: 903–19. [CrossRef]
Dash, Ganesh, and Justin Paul. 2021. CB-SEM vs. PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change* 173: 121092. [CrossRef]
Dawes, John. 2008. Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International journal of market research* 50: 61–104. [CrossRef]
De Vito, Antonio. 2024. Minority shareholders and tax avoidance. *Journal of Accounting and Public Policy* 44: 107179. [CrossRef]
Degl'Innocenti, Marta, Kevin Grant, Aleksandar Šević, and Nickolaos G. Tzeremes. 2018. Financial stability, competitiveness and banks' innovation capacity: Evidence from the Global Financial Crisis. *International Review of Financial Analysis* 59: 35–46. [CrossRef]
Dell'Ariccia, Giovanni, Paolo Mauro, Antonio Spilimbergo, and Jeronim Zettelmeyer. 2020. *Economic Policies for the COVID-19 War*. IMF Blog. Available online: https://www.imf.org/en/Blogs/Articles/2020/04/01/blog040120-economic-policies-for-the-covid19-war (accessed on 19 September 2024).
Delshab, Vahid, Mathieu Winand, Saeed Sadeghi Boroujerdi, Larena Hoeber, and Abed Mahmoudian. 2022. The impact of knowledge management on performance in nonprofit sports clubs: The mediating role of attitude toward innovation, open innovation, and innovativeness. *European Sport Management Quarterly* 22: 139–60. [CrossRef]
Demetriades, Panicos, and Siong Hook Law. 2006. Finance, institutions and economic development. *International journal of finance & economics* 11: 245–60.
Derissen, Sandra, Martin F. Quaas, and Stefan Baumgärtner. 2011. The relationship between resilience and sustainability of ecological-economic systems. *Ecological Economics* 70: 1121–28. [CrossRef]
Deyganto, Kanbiro Orkaido. 2022. The effect of tax incentives practices on the sustainability of micro, small and medium enterprises in Ethiopia during the outbreak of corona virus pandemic. *Journal of Innovation and Entrepreneurship* 11: 8. [CrossRef]
Dietrich, Diemo, and Uwe Vollmer. 2012. Are universal banks bad for financial stability? Germany during the world financial crisis. *The Quarterly Review of Economics and Finance* 52: 123–34. [CrossRef]
Dillman, Don A. 2007. *Mail and Internet Surveys: The Tailored Design Method*, 2nd ed. Hoboken: John Wiley & Sons, Inc.
DiMaggio, Paul J., and Walter W. Powell. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review* 48: 147–60. [CrossRef]
Doz, Yves L., and Mikko Kosonen. 2010. Embedding strategic agility: A leadership agenda for accelerating business model renewal. *Long Range Planning* 43: 370–82. [CrossRef]
Dyreng, Scott D., Michelle Hanlon, and Edward L. Maydew. 2008. Long-run corporate tax avoidance. *The accounting review* 83: 61–82. [CrossRef]
Ebbes, Peter, Dominik Papies, and Harald J. Van Heerde. 2011. The sense and non-sense of holdout sample validation in the presence of endogeneity. *Marketing Science* 30: 1115–22. [CrossRef]
Ebbes, Peter, Dominik Papies, and Harald J. van Heerde. 2021. Dealing with endogeneity: A nontechnical guide for marketing researchers. In *Handbook of Market Research*. Edited by Christian Homburg, Martin Klarmann and Arnd Vomberg. Cham: Springer International Publishing, pp. 181–217.
Ebersberger, Bernd, and Andreas Kuckertz. 2021. Hop to it! The impact of organization type on innovation response time to the COVID-19 crisis. *Journal of Business Research* 124: 126–35. [CrossRef]
Edwards, Alexander, Casey Schwab, and Terry Shevlin. 2016. Financial constraints and cash tax savings. *The Accounting Review* 91: 859–81. [CrossRef]
Elbannan, Mohamed A., and Omar Farooq. 2020. Do more financing obstacles trigger tax avoidance behavior? Evidence from Indian SMEs. *Journal of Economics and Finance* 44: 161–78. [CrossRef]
Elffers, Henk, Russell H. Weigel, and Dick J. Hessing. 1987. The consequences of different strategies for measuring tax evasion behavior. *Journal of Economic Psychology* 8: 311–37. [CrossRef]
Elkington, John, and Ian H. Rowlands. 1999. Cannibals with forks: The triple bottom line of 21st century business. *Alternatives Journal* 25: 42. [CrossRef]

Emerson, Robert Wall. 2017. Likert scales. *Journal of Visual Impairment & Blindness* 111: 488–88.
Engidaw, Abriham Ebabu. 2022. Small businesses and their challenges during COVID-19 pandemic in developing countries: In the case of Ethiopia. *Journal of Innovation and Entrepreneurship* 11: 1. [CrossRef]
Erard, Brian. 1993. Taxation with representation: An analysis of the role of tax practitioners in tax compliance. *Journal of Public Economics* 52: 163–97. [CrossRef]
European Commission. 2017. *Aggressive Tax Planning Indicators: Final Report*. Office of the European Union Working Paper No 71. Luxembourg: Publications Office of the European Union.
Fairlie, Robert, Frank M. Fossen, Reid Johnsen, and Gentian Droboniku. 2023. Were small businesses more likely to permanently close in the pandemic? *Small Business Economics* 60: 1613–29. [CrossRef] [PubMed]
Falavigna, Greta, and Roberto Ippoliti. 2023. SMEs' behavior under financial constraints: An empirical investigation on the legal environment and the substitution effect with tax arrears. *The North American Journal of Economics and Finance* 66: 101903. [CrossRef]
Fallan, Lars, Randi Hammervold, and Kjell Grønhaug. 1995. Adoption of tax planning instruments in business organizations: A structural equation modelling approach. *Scandinavian Journal of Management* 11: 177–90. [CrossRef]
Fang, Hongsheng, Yunqing Su, and Weijun Lu. 2022. Tax incentive and corporate financial performance: Evidence from income tax revenue sharing reform in China. *Journal of Asian Economics* 81: 101505. [CrossRef]
Feng, Ting, and Zhongyi Xue. 2023. The impact of government subsidies on corporate resilience: Evidence from the COVID-19 shock. *Economic Change and Restructuring* 56: 4199–221. [CrossRef]
Fiedler, Fred Edward. 1964. Contingency Model of leadership effectiveness. In *Advances in Experimental Social Psychology*, 1st ed. Edited by Leonard Berkowitz. New York: Academic Press.
Field, Andy. 2009. *Discovering Statistics Using SPSS*, 3rd ed. London: Sage Publications Ltd.
Fiksel, Joseph. 2003. Designing resilient, sustainable systems. *Environmental Science & Technology* 37: 5330–39.
Fiksel, Joseph, and Bhavik R. Bakshi. 2023. Designing for resilience and sustainability: An integrated systems approach. In *Engineering and Ecosystems: Seeking Synergies Toward a Nature-Positive World*. Edited by Bhavik R. Bakshi. Cham: Springer International Publishing, pp. 469–500.
Filippetti, Andrea, Petros Gkotsis, Antonio Vezzani, and Antonio Zinilli. 2020. Are innovative regions more resilient? Evidence from Europe in 2008–16. *Economia Politica* 37: 807–32. [CrossRef]
Fornell, Claes, and David F. Larcker. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18: 39–50. [CrossRef]
Freedman, Judith. 2005. Defining taxpayer responsibility: In support of a general anti-avoidance principle. *British Tax Review* 4: 332.
Fuadah, Luk Luk, Kencana Dewi, Mukhtaruddin Mukhtaruddin, Umi Kalsum, and Anton Arisman. 2022. The relationship between sustainability reporting, E-commerce, firm performance and tax avoidance with organizational culture as moderating variable in small and medium enterprises in palembang. *Sustainability* 14: 3738. [CrossRef]
Gande, Amar, Kose John, Vinay B. Nair, and Lemma W. Senbet. 2020. Taxes, institutions, and innovation: Theory and international evidence. *Journal of International Business Studies* 51: 1413. [CrossRef] [PubMed]
García-Sánchez, Isabel-María, Isabel Gallego-Álvarez, and José-Luis Zafra-Gómez. 2020. Do the ecoinnovation and ecodesign strategies generate value added in munificent environments? *Business Strategy and the Environment* 29: 1021–33. [CrossRef]
Garicano, Luis. 2020. *The COVID-19 bazooka for jobs in Europe*. VOXEU CEPR Working Paper. Available online: https://cepr.org/voxeu/columns/covid-19-bazooka-jobs-europe (accessed on 20 July 2024).
Garland, Ron. 1991. The mid-point on a rating scale: Is it desirable. *Marketing Bulletin* 2: 66–70.
Garsous, Grégoire, David Corderi, Mercedes Velasco, and Andrea Colombo. 2017. Tax incentives and job creation in the tourism sector of Brazil's SUDENE area. *World Development* 96: 87–101. [CrossRef]
Gautam, Dhruba Kumar, and Prakash Kumar Gautam. 2024. Stress and resilience to migrant entrepreneur-managers of small and medium enterprises during COVID-19 pandemic. *Benchmarking: An International Journal* 31: 2129–50. [CrossRef]
Ghi, Tran Nha, Nguyen Quang Thu, Ngo Quang Huan, and Nguyen Tan Trung. 2022. Human capital, digital transformation, and firm performance of startups in Vietnam. *Management* 26: 1–18. [CrossRef]
Ghisetti, Claudia, and Klaus Rennings. 2014. Environmental innovations and profitability: How does it pay to be green? An empirical analysis on the German innovation survey. *Journal of Cleaner Production* 75: 106–17. [CrossRef]
Goni, Joklan Imelda Camelia, and Amy Van Looy. 2022. Process innovation capability in less-structured business processes: A systematic literature review. *Business Process Management Journal* 28: 557–84. [CrossRef]
González-López, María José, María Carmen Pérez-López, and Lázaro Rodríguez-Ariza. 2021. From potential to early nascent entrepreneurship: The role of entrepreneurial competencies. *International Entrepreneurship and Management Journal* 17: 1387–417. [CrossRef]
Gourinchas, Pierre-Olivier. 2020. *Flattening the Pandemic and Recession Curves*. VOXEU CEPR Working Paper. Available online: https://cepr.org/voxeu/columns/flattening-pandemic-and-recession-curves (accessed on 20 July 2024).
Gracia, Louise, and Laynee Oats. 2012. Boundary Work and Tax Regulation: A Bourdieusian View. *Accounting, Organizations and Society* 37: 304–21. [CrossRef]
Gribnau, Hans. 2015. Corporate social responsibility and tax planning: Not by rules alone. *Social & Legal Studies* 24: 225–50.
Gribnau, Hans, and Ave-Geidi Jallai. 2019. Sustainable tax governance and transparency. In *Challenges in Managing Sustainable Business: Reporting, Taxation, Ethics and Governance*. Berlin and Heidelberg: Springer, pp. 337–69.

Grötsch, Volker M., Constantin Blome, and Martin C. Schleper. 2013. Antecedents of proactive supply chain risk management–a contingency theory perspective. *International Journal of Production Research* 51: 2842–67. [CrossRef]

Hadjielias, Elias, Michael Christofi, and Shlomo Tarba. 2022. Contextualizing small business resilience during the COVID-19 pandemic: Evidence from small business owner-managers. *Small Business Economics* 59: 1351–80. [CrossRef] [PubMed]

Hair, Joseph F., Christian M. Ringle, Siegfried P. Gudergan, Andreas Fischer, Christian Nitzl, and Con Menictas. 2019. Partial least squares structural equation modeling-based discrete choice modeling: An illustration in modeling retailer choice. *Business Research* 12: 115–42. [CrossRef]

Hair, Joseph F., G. Tomas M. Hult, Christian M. Ringle, and Marko Sarstedt. 2017. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed. Thousand Oaks: Sage Publications Ltd.

Hair, Joseph F., G. Tomas M. Hult, Christian M. Ringle, Marko Sarstedt, Nicholas P. Danks, and Soumya Ray. 2021. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Cham: Springer.

Hair, Joseph F., Marko Sarstedt, Christian M. Ringle, and Siegfried P. Gudergan. 2023. *Advanced Issues in Partial Least Squares Structural Equation Modeling*. Thousand Oaks: Sage Publications Ltd.

Hall, Jeremy, and Marcus Wagner. 2012. Integrating sustainability into firms' processes: Performance effects and the moderating role of business models and innovation. *Business Strategy and the Environment* 21: 183–96. [CrossRef]

Hanaysha, Jalal Rajeh, Mohammed Emad Al-Shaikh, Shanmugan Joghee, and Haitham M. Alzoubi. 2022. Impact of innovation capabilities on business sustainability in small and medium enterprises. *FIIB Business Review* 11: 67–78. [CrossRef]

Hartono, Arif, and Abdur Rafik. 2022. Linking open innovation, innovation barriers and performance of Indonesian firms. *International Journal of Innovation Science* 14: 713–32. [CrossRef]

Henard, David H., and David M. Szymanski. 2001. Why some new products are more successful than others. *Journal of Marketing Research* 38: 362–75. [CrossRef]

Henisz, Witold, and Anand Swaminathan. 2008. Institutions and international business. *Journal of International Business Studies* 39: 537–39. [CrossRef]

Henseler, Jörg, Christian M. Ringle, and Marko Sarstedt. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science* 43: 115–35. [CrossRef]

Heunks, Felix J. 1998. Innovation, creativity and success. *Small Business Economics* 10: 263–72. [CrossRef]

Himmelberg, Charles P., and Bruce C. Petersen. 1994. R & D and internal finance: A panel study of small firms in high-tech industries. *The Review of Economics and Statistics* 76: 38–51.

Hoffman, William H., Jr. 1961. The Theory of Tax Planning. *Accounting Review* 36: 274.

Hufschmidt, Gabi. 2011. A comparative analysis of several vulnerability concepts. *Natural Hazards* 58: 621–43. [CrossRef]

Hughes, Paul, Robert E. Morgan, Ian R. Hodgkinson, Yiannis Kouropalatis, and Adam Lindgreen. 2020. A diagnostic tool to determine a strategic improvisation Readiness Index Score (IRIS) to survive, adapt, and thrive in a crisis. *Industrial Marketing Management* 88: 485–99. [CrossRef]

Hult, G. Tomas M., Joseph F. Hair, Jr., Dorian Proksch, Marko Sarstedt, Andreas Pinkwart, and Christian M. Ringle. 2018. Addressing endogeneity in international marketing applications of partial least squares structural equation modeling. *Journal of International Marketing* 26: 1–21. [CrossRef]

Ibidunni, Ayodotun Stephen, Oyebisi Mary Ibidunni, Obaloluwa Obed Oyewo, and Henry Iloka. 2024. External Versus Internal Funding: Entrepreneurial Competencies as a Mediator of Financing Strategies for Informal Economy SMEs. In *Exploring Entrepreneurship: Unpacking the Mosaic of Entrepreneurship Across Africa*. Edited by Hakeem Adeniyi Ajonbadi, Susan Sisay and Seun Oladele. Cham: Springer Nature Switzerland, pp. 73–98.

Iramani, Abu Amar Fauzi, Dewi Ayu Wulandari, and Lutfi. 2018. Financial literacy and business performances improvement of micro, small, medium-sized enterprises in East Java Province, Indonesia. *International Journal of Education Economics and Development* 9: 303–23. [CrossRef]

Ireland, R. Duane, and Justin W. Webb. 2007. Strategic entrepreneurship: Creating competitive advantage through streams of innovation. *Business Horizons* 50: 49–59. [CrossRef]

Ismail, Hossam S., Jenny Poolton, and Hossein Sharifi. 2011. The role of agile strategic capabilities in achieving resilience in manufacturing-based small companies. *International Journal of Production Research* 49: 5469–87. [CrossRef]

Ivanov, Dmitry, and Boris Sokolov. 2012. Dynamic supply chain scheduling. *Journal of Scheduling* 15: 201–16. [CrossRef]

Jallai, Ave-Geidi. 2020. Ethical standards for tax planning by corporations. *Ethics and Taxation*, 207–31.

Jansson, Johan, Jonas Nilsson, Frida Modig, and Gabriella Hed Vall. 2017. Commitment to sustainability in small and medium-sized enterprises: The influence of strategic orientations and management values. *Business Strategy and the Environment* 26: 69–83. [CrossRef]

Jayanthi, G, and V. Selvam. 2024. Sustainable Development of MSMEs through a Well-Structured Tax Plan-Special reference to Goods and Service Tax. *International Management Review* 20: 49–58.

Jin, Byoungho Ellie, Elena Cedrola, and Naeun Kim. 2019. Process innovation: Hidden secret to success and efficiency. In *Process Innovation in the Global Fashion Industry*. Edited by Byoungho Ellie Jin and Elena Cedrola. London: Palgrave Macmillan, pp. 1–23.

Johns, Robert. 2005. One size doesn't fit all: Selecting response scales for attitude items. *Journal of Elections, Public Opinion & Parties* 15: 237–64.

Jolley, G. J., and E. B. Lane. 2010. The limitations of state economic development tax credits. *International Journal of Business Research* 10: 181–86.

Jolley, G. Jason, Mandee Foushee Lancaster, and Jiang Gao. 2015. Tax incentives and business climate: Executive perceptions from incented and nonincented firms. *Economic Development Quarterly* 29: 180–86. [CrossRef]

Jorgenson, Dale W. 1963. Capital theory and investment behavior. *The American Economic Review* 53: 247–59.

Kamaruddeen, Ahmed Mohammed, Noor Aini Yusof, and I. Said. 2010. Innovation and Innovativeness: Difference and Antecedent Relationship. *The Icfai University Journal of Architecture* 2: 66–78.

Kazbekova, Damira, Mariana Petrova, Olena Sushchenko, Anargul Belgibayeva, and Milen Mitkov. 2024. Mechanisms of stimulation of small- and medium-sized entrepreneurship: The experience of Kazakhstan. *Journal of Risk and Financial Management* 17: 257. [CrossRef]

Kelley, Donna. 2009. Adaptation and organizational connectedness in corporate radical innovation programs. *Journal of Product Innovation Management* 26: 487–501. [CrossRef]

Kennedy, Peter. 2008. *A Guide to Econometrics*. Malden: John Wiley & Sons, Inc.

Khan, Mukaram Ali, Syed Sohaib Zubair, Kashif Rathore, Maryam Ijaz, Sumreen Khalil, and Muhammad Khalil. 2021. Impact of entrepreneurial orientation dimensions on performance of small enterprises: Do entrepreneurial competencies matter? *Cogent Business & Management* 8: 1943241.

Khan, Safi Ullah. 2022. Financing constraints and firm-level responses to the COVID-19 pandemic: International evidence. *Research in International Business and Finance* 59: 101545. [CrossRef] [PubMed]

Khan, Syed Abdul Rehman, Adnan Ahmed Sheikh, and Zeeshan Ahmad. 2023. Developing the interconnection between green employee behavior, tax avoidance, green capability, and sustainable performance of SMEs through corporate social responsibility. *Journal of Cleaner Production* 419: 138236. [CrossRef]

Khanam, Tahmina, and Md Nazmus Sakib. 2020. A conceptual research model for studying the relationship between entrepreneurial competences and the performances of small and medium size enterprises in Bangladesh. *Jahangirnagar University Journal of Management Research* 3: 75–88.

Khozen, Ismail, and Milla Sepliana Setyowati. 2023. Managing taxpayer compliance: Reflections on the drivers of willingness to pay taxes in times of crisis. *Cogent Business & Management* 10: 2218176.

Khuong, Nguyen Vinh, Nguyen Thanh Liem, Phung Anh Thu, and Thai Hong Thuy Khanh. 2020. Does corporate tax avoidance explain firm performance? Evidence from an emerging economy. *Cogent Business & Management* 7: 1780101.

Kim, Hakkon, Jonathan A. Batten, and Doojin Ryu. 2020. Financial crisis, bank diversification, and financial stability: OECD countries. *International Review of Economics & Finance* 65: 94–104.

Kirchler, Erich, Boris Maciejovsky, and Friedrich Schneider. 2003. Everyday representations of tax avoidance, tax evasion, and tax flight: Do legal differences matter? *Journal of Economic Psychology* 24: 535–53. [CrossRef]

Kisubi, Moses Kisame, Francis Aruo, Aziz Wakibi, Veronica Mukyala, and Kassim Ssenyange. 2022. Entrepreneurial competencies and performance of Ugandan SMEs: The mediating role of firm capabilities. *Cogent Business & Management* 9: 2115622.

Kjellberg, Hans, Frank Azimont, and Emma Reid. 2015. Market Innovation Processes: Balancing Stability and Change. *Industrial Marketing Management* 44: 4–12. [CrossRef]

Klemm, Alexander. 2010. Causes, benefits, and risks of business tax incentives. *International Tax and Public Finance* 17: 315–36. [CrossRef]

Klettner, Alice, Thomas Clarke, and Martijn Boersma. 2014. The governance of corporate sustainability: Empirical insights into the development, leadership and implementation of responsible business strategy. *Journal of Business Ethics* 122: 145–65. [CrossRef]

Klewitz, Johanna, and Erik G. Hansen. 2014. Sustainability-oriented innovation of SMEs: A systematic review. *Journal of Cleaner Production* 65: 57–75. [CrossRef]

Kline, Rex B. 2023. *Principles and Practice of Structural Equation Modeling*, 5th ed. New York: Guilford Publications, Inc.

Knemeyer, A. Michael, Walter Zinn, and Cuneyt Eroglu. 2009. Proactive planning for catastrophic events in supply chains. *Journal of Operations Management* 27: 141–53. [CrossRef]

Kobbi-Fakhfakh, Sameh, and Fatma Bougacha. 2023. The impact of the COVID-19 pandemic on corporate tax avoidance: Evidence from S&P 500 firms. *Journal of Financial Reporting and Accounting* 21: 847–66.

Kobe, K. 2012. *Small Business GDP: Update 2002–10*. Washington, DC: Economic Consulting Services, LLC.

Kock, Ned. 2015. Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration* 11: 1–10. [CrossRef]

Konlechner, Stefan, and Véronique Ambrosini. 2019. Issues and trends in causal ambiguity research: A review and assessment. *Journal of Management* 45: 2352–86. [CrossRef]

Kouam, Jean C., and Simplice A. Asongu. 2022. Effects of taxation on social innovation and implications for achieving sustainable development goals in developing countries: A literature review. *International Journal of Innovation Studies* 6: 259–75. [CrossRef]

Krishnan, Ramesh, Phi Yen, Renu Agarwal, K. Arshinder, and Christopher Bajada. 2021. Collaborative innovation and sustainability in the food supply chain-evidence from farmer producer organisations. *Resources, Conservation and Recycling* 168: 105253. [CrossRef]

Kruse, Sebastian, David Bendig, and Malte Brettel. 2023. How does CEO decision style influence firm performance? The mediating role of speed and innovativeness in new product development. *Journal of Management Studies* 60: 1205–35. [CrossRef]

Kulas, John T., and Alicia A. Stachowski. 2009. Middle category endorsement in odd-numbered Likert response scales: Associated item characteristics, cognitive demands, and preferred meanings. *Journal of Research in Personality* 43: 489–93. [CrossRef]

Kurniawati, Amelia, Indryati Sunaryo, Iwan Inrawan Wiratmadja, and Dradjad Irianto. 2022. Sustainability-oriented open innovation: A small and medium-sized enterprises perspective. *Journal of Open Innovation: Technology, Market, and Complexity* 8: 69. [CrossRef]

Kyrdoda, Yuliia, Marco Balzano, and Giacomo Marzi. 2023. Learn to survive crises: The role of firm resilience, innovation capabilities and environmental dynamism. *Technology in Society* 74: 102285. [CrossRef]

Lahiri, Somnath, Liliana Pérez-Nordtvedt, and Robert W. Renn. 2008. Will the new competitive landscape cause your firm's decline? It depends on your mindset. *Business Horizons* 51: 311–20. [CrossRef]

Latan, Hengky. 2018. PLS path modeling in hospitality and tourism research: The golden age and days of future past. In *Applying Partial Least Squares in Tourism and Hospitality Research*. Edited by Faizan S. Ali, Mostafa Rasoolimanesh and Cihan Cobanoglu. Bingley: Emerald, pp. 53–84.

Le, Thanh Tiep. 2022. How do corporate social responsibility and green innovation transform corporate green strategy into sustainable firm performance? *Journal of Cleaner Production* 362: 132228. [CrossRef]

Lee, Jegoo, and Sang-Joon Kim. 2017. Curvilinear relationship between corporate innovation and environmental sustainability. *Sustainability* 9: 1267. [CrossRef]

Lee, KangYoung, and SungMan Yoon. 2020. Managerial ability and tax planning: Trade-off between tax and nontax costs. *Sustainability* 12: 370. [CrossRef]

Lestari, Elissa Dwi, Nadiah Abd Hamid, Roszilah Shamsuddin, Florentina Kurniasari, and Zalilawati Yaacob. 2024. Investigating the factors of SMEs' business resilience in the post-pandemic crisis of COVID-19 with technology adoption as a quasi-moderator: A multigroup analysis of Indonesian and Malaysian SMEs. *Cogent Business & Management* 11: 2301135.

Li, Ning, Junwen Feng, and Ce Zhang. 2023. Macro tax incentives and corporate sustainable innovation: Evidence from Chinese Enterprises. *Environmental Science and Pollution Research* 30: 101546–64. [CrossRef]

Li, Qin, Mark Ma, and Terry Shevlin. 2021a. The effect of tax avoidance crackdown on corporate innovation. *Journal of Accounting and Economics* 71: 101382. [CrossRef]

Li, Wei, Mohammed Elheddad, and Nadia Doytch. 2021b. The impact of innovation on environmental quality: Evidence for the non-linear relationship of patents and CO_2 emissions in China. *Journal of Environmental Management* 292: 112781. [CrossRef]

Limnios, Elena Alexandra Mamouni, Tim Mazzarol, Anas Ghadouani, and Steven GM Schilizzi. 2014. The resilience architecture framework: Four organizational archetypes. *European Management Journal* 32: 104–16. [CrossRef]

Liu, Ting, Shenglang Jin, Hongbing Zhu, and Xinzheng Qi. 2018. Construction of revised TPB model of customer green behavior: Environmental protection purpose and ecological values perspectives. *IOP Conference Series: Earth and Environmental Science* 167: 012021.

Liu, Yuhuan, and Juelin Yin. 2020. Stakeholder relationships and organizational resilience. *Management and Organization Review* 16: 986–90. [CrossRef]

Lonergan, Mike, and James D. Chalmers. 2020. Estimates of the ongoing need for social distancing and control measures post-"lockdown" from trajectories of COVID-19 cases and mortality. *European Respiratory Journal* 56: 1. [CrossRef]

Lu, Xun, and Halbert White. 2014. Robustness checks and robustness tests in applied economics. *Journal of econometrics* 178: 194–206. [CrossRef]

Lutfi, Abdalwali, Adi Alsyouf, Mohammed Amin Almaiah, Mahmaod Alrawad, Ahmed Abdullah Khalil Abdo, Akif Lutfi Al-Khasawneh, Nahla Ibrahim, and Mohamed Saad. 2022. Factors influencing the adoption of big data analytics in the digital transformation era: Case study of Jordanian SMEs. *Sustainability* 14: 1802. [CrossRef]

Ma, Hee Young, and Sung Jong Park. 2021. Relationship between Corporate Sustainability Management and Sustainable Tax Strategies. *Sustainability* 13: 7429. [CrossRef]

Mackay, Jonathon, Albert Munoz, and Matthew Pepper. 2020. Conceptualising redundancy and flexibility towards supply chain robustness and resilience. *Journal of Risk Research* 23: 1541–61. [CrossRef]

Marcelin, I., W. Sun, M. Teclezion, and E. Junarsin. 2022. Financial inclusion and bank risk-taking: The effect of information sharing. *Finance Research Letters* 50: 103182. [CrossRef]

Marchese, Dayton, Erin Reynolds, Matthew E. Bates, Heather Morgan, Susan Spierre Clark, and Igor Linkov. 2018. Resilience and sustainability: Similarities and differences in environmental management applications. *Science of the Total Environment* 613: 1275–83. [CrossRef]

Marcoulides, George A., and Zvi Drezner. 2003. Model specification searches using ant colony optimization algorithms. *Structural Equation Modeling* 10: 154–64. [CrossRef]

Markides, Constantinos. 1997. Strategic innovation. *Sloan Management Review* 38.

McBarnet, Doreen. 2001. *When Compliance Is Not the Solution but the Problem: From Changes in Law to Changes in Attitude*. Working Paper 18. Canberra: Centre for Tax System Integrity Research School of Social Sciences Australian National University.

McBarnet, Doreen. 2004. Human rights, corporate responsibility and the new accountability. In *Human Rights and the Moral Responsibilities of Corporate and Public Sector Organisations*. Edited by Tom Campbell and Seumas Miller. Dordrecht: Springer Netherlands, vol. 20, pp. 63–80.

McBarnet, Doreen, and Chris Whelan. 1999. *Creative Accounting and the Cross-Eyed Javelin Thrower*. Chichester, NY: John Wiley & Sons Inc.

McIntosh, Cameron N., Jeffrey R. Edwards, and John Antonakis. 2014. Reflections on partial least squares path modeling. *Organizational Research Methods* 17: 210–51. [CrossRef]

McLaren, John. 2008. The distinction between tax avoidance and tax evasion has become blurred in Australia: Why has it happened? *J. Australasian Tax Tchrs. Ass'n* 3: 141.

Menozzi, Davide, Martina Fioravanzi, and Michele Donati. 2015. Farmer's motivation to adopt sustainable agricultural practices. *Bio-based and Applied Economics* 4: 125–47.

Meyer, John W., and Brian Rowan. 1977. Institutionalized organizations: Formal structure as myth and ceremony. *American journal of Sociology* 83: 340–63. [CrossRef]

Ministry of Cooperatives and SMEs. 2019. *Data UMKM Tahun 2019*. Available online: https://www.kemenkopukm.go.id/ (accessed on 1 June 2024).

Mitroff, Ian I., Terry C. Pauchant, and Paul Shrivastava. 1988. The structure of man-made organizational crises: Conceptual and empirical issues in the development of a general theory of crisis management. *Technological Forecasting and Social Change* 33: 83–107. [CrossRef]

Moneva-Abadía, José M., Dolores Gallardo-Vázquez, and M. Isabel Sánchez-Hernández. 2019. Corporate social responsibility as a strategic opportunity for small firms during economic crises. *Journal of Small Business Management* 57: 172–99. [CrossRef]

Mooi, Erik, Marko Sarstedt, and Irma Mooi-Reci. 2018. *Market research: The Process, Data, and Methods Using Stata*. Singapore: Springer.

Mulligan, Emer, and Lynne Oats. 2016. Tax Professionals at Work in Silicon Valley. *Accounting, Organizations and Society* 52: 63–76. [CrossRef]

Murphy, Kristina. 2004. Aggressive tax planning: Differentiating those playing the game from those who don't. *Journal of Economic Psychology* 25: 307–29. [CrossRef]

Nadler, Joel T., Rebecca Weston, and Elora C. Voyles. 2015. Stuck in the middle: The use and interpretation of mid-points in items on questionnaires. *The Journal of General Psychology* 142: 71–9. [CrossRef]

Najib, Mukhamad, Abdul Aziz Abdul Rahman, and Farah Fahma. 2021. Business survival of small and medium-sized restaurants through a crisis: The role of government support and innovation. *Sustainability* 13: 10535. [CrossRef]

Najib, Mukhamad, and Akira Kiminami. 2011. Innovation, cooperation and business performance: Some evidence from Indonesian small food processing cluster. *Journal of Agribusiness in Developing and Emerging Economies* 1: 75–96. [CrossRef]

Nakandala, Dilupa, Jiahe Chen, and Tendai Chikweche. 2024. SME supply chain resilience in disruptive times: The effects of supply chain robustness, access to government assistance and disruption intensity. *Business Process Management Journal ahead-of-print*. [CrossRef]

Naranjo-Valencia, Julia C., Daniel Jimenez-Jimenez, and Raquel Sanz-Valle. 2017. Organizational Culture and Radical Innovation: Does Innovative Behavior Mediate This Relationship? *Creativity and Innovation Management* 26: 407–17. [CrossRef]

Nasierowski, W., and F. J. Arcelus. 2012. About efficiency of innovations: What can be learned from the innovation union scoreboard index. *Procedia-Social and Behavioral Sciences* 58: 792–801. [CrossRef]

Navaretti, Giorgio Barba, Giacomo Calzolari, Alberto Franco Pozzolo, and Micol Levi. 2010. Multinational banking in Europe–financial stability and regulatory implications: Lessons from the financial crisis. *Economic Policy* 25: 703–53. [CrossRef]

Nitzl, Christian, Jose L. Roldan, and Gabriel Cepeda. 2016. Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems* 116: 1849–64.

Niu, Yuhao, Wen Wen, Sai Wang, and Sifei Li. 2023. Breaking barriers to innovation: The power of digital transformation. *Finance Research Letters* 51: 103457. [CrossRef]

Nobanee, Haitham, Fatima Youssef Al Hamadi, Fatma Ali Abdulaziz, Lina Subhi Abukarsh, Aysha Falah Alqahtani, Shayma Khalifa AlSubaey, Sara Mohamed Alqahtani, and Hamama Abdulla Almansoori. 2021. A bibliometric analysis of sustainability and risk management. *Sustainability* 13: 3277. [CrossRef]

Nunkoo, Robin, and Haywantee Ramkissoon. 2012. Structural equation modelling and regression analysis in tourism research. *Current Issues in Tourism* 15: 777–802. [CrossRef]

Oakey, Ray. 1991. High technology small firms: Their potential for rapid industrial growth. *International Small Business Journal* 9: 30–42. [CrossRef]

Obrenovic, Bojan, Jianguo Du, Danijela Godinic, Diana Tsoy, Muhammad Aamir Shafique Khan, and Ilimdorjon Jakhongirov. 2020. Sustaining enterprise operations and productivity during the COVID-19 pandemic: Enterprise Effectiveness and Sustainability Model. *Sustainability* 12: 5981. [CrossRef]

OECD. 2005. *Oslo Manual*, 3rd ed. Paris: OECD Publishing.

OECD. 2020. Evaluating the impact of COVID-19 containment measures on activity and spending. In *OECD Economic Outlook*. Paris: OECD Publishing, vol. 2020.

Okręglicka, Małgorzata, Prabhat Mittal, and Valentinas Navickas. 2023. Exploring the mechanisms linking perceived organizational support, autonomy, risk taking, competitive aggressiveness and corporate sustainability: The mediating role of innovativeness. *Sustainability* 15: 5648. [CrossRef]

Onu, Diana, Lynne Oats, Erich Kirchler, and Andre J. Hartmann. 2019. Gaming the System: An Investigation of Small Business Owners' Attitudes to Tax Avoidance, Tax Planning, and Tax Evasion. *Games* 10: 46. [CrossRef]

Ortiz-de-Mandojana, Natalia, and Pratima Bansal. 2016. The long-term benefits of organizational resilience through sustainable business practices. *Strategic Management Journal* 37: 1615–31. [CrossRef]

Oxborrow, Lynn, and Clare Brindley. 2012. Regional resilience in recessionary times: A case study of the East Midlands. *International Journal of Retail & Distribution Management* 40: 882–99.

Pal, Rudrajeet, Roy Andersson, and Håkan Torstensson. 2012. Organisational resilience through crisis strategic planning: A study of Swedish textile SMEs in financial crises of 2007–11. *International Journal of Decision Sciences, Risk and Management* 4: 314–41. [CrossRef]

Pandya, Falguni H. 2017. Study about awareness and availing of various direct and indirect fiscal incentives and its impact on financial and strategic decisions of MSMEs. *Business Perspectives and Research* 5: 36–68. [CrossRef]

Papies, Dominik, Peter Ebbes, and Harald J. Van Heerde. 2017. Addressing endogeneity in marketing models. In *Advanced Methods for Modeling Markets*. Edited by Peter S.H. Leeflang, Jaap E. Wieringa, Tammo HA Bijmolt and Koen H. Pauwels. Cham: Springer International Publishing, pp. 581–627.

Park, Sungho, and Sachin Gupta. 2012. Handling endogenous regressors by joint estimation using copulas. *Marketing Science* 31: 567–86. [CrossRef]

Park, Won, Chang Soo Sung, and Chung Gyu Byun. 2019. Impact of unlisted small and medium-sized enterprises' business strategies on future performance and growth sustainability. *Journal of Open Innovation: Technology, Market, and Complexity* 5: 60. [CrossRef]

Pearce, David. 2002. An intellectual history of environmental economics. *Annual Review of Energy and the Environment* 27: 57–81. [CrossRef]

Peñarroya-Farell, Montserrat, Francesc Miralles, and Maryam Vaziri. 2023. Open and sustainable business model innovation: An intention-based perspective from the Spanish cultural firms. *Journal of Open Innovation: Technology, Market, and Complexity* 9: 100036. [CrossRef]

Pettit, Timothy J., Joseph Fiksel, and Keely L. Croxton. 2010. Ensuring supply chain resilience: Development of a conceptual framework. *Journal of Business Logistics* 31: 1–21. [CrossRef]

Pettit, Timothy J., Keely L. Croxton, and Joseph Fiksel. 2013. Ensuring supply chain resilience: Development and implementation of an assessment tool. *Journal of Business Logistics* 34: 46–76. [CrossRef]

Pfeffer, Jeffrey, and Gerald Salancik. 1978. *The External Control of Organizations*. New York: Harper and Row.

Picas, Sara, Pedro Reis, António Pinto, and José Luís Abrantes. 2021. Does tax, financial, and government incentives impact long-term portuguese smes' sustainable company performance? *Sustainability* 13: 11866. [CrossRef]

Picciotto, Sol. 2007. Constructing Compliance: Game Playing, Tax Law, and the Regulatory State. *Law & Policy* 29: 11–30.

Ponomarov, Serhiy Y., and Mary C. Holcomb. 2009. Understanding the concept of supply chain resilience". *The International Journal of Logistics Management* 20: 124–43. [CrossRef]

Pu, Ganlin, Md. Qamruzzaman, Ahmed Muneeb Mehta, Farah Naz Naqvi, and Salma Karim. 2021. Innovative finance, technological adaptation and smes sustainability: The mediating role of government support during COVID-19 pandemic. *Sustainability* 13: 16. [CrossRef]

Pulka, Buba Musa, Azahari Ramli, and Armanurah Mohamad. 2021. Entrepreneurial competencies, entrepreneurial orientation, entrepreneurial network, government business support and SMEs performance. The moderating role of the external environment. *Journal of Small Business and Enterprise Development* 28: 586–618. [CrossRef]

Putritamara, Jaisy Aghniarahim, Budi Hartono, Hery Toiba, Hamidah Nayati Utami, Moh Shadiqur Rahman, and Dewi Masyithoh. 2023. Do dynamic capabilities and digital transformation improve business resilience during the COVID-19 pandemic? Insights from beekeeping MSMEs in Indonesia. *Sustainability* 15: 1760. [CrossRef]

Quental, Nuno, Júlia M. Lourenço, and Fernando Nunes Da Silva. 2011. Sustainability: Characteristics and scientific roots. *Environment, Development and Sustainability* 13: 257–76. [CrossRef]

Ramanathan, Ramakrishnan, Qile He, Andrew Black, Abby Ghobadian, and David Gallear. 2017. Environmental regulations, innovation and firm performance: A revisit of the Porter hypothesis. *Journal of Cleaner Production* 155: 79–92. [CrossRef]

Ramirez-Portilla, Andres, Enrico Cagno, and Terrence E. Brown. 2017. Open Innovation in Specialized SMEs: The Case of Supercars. *Business Process Management Journal* 23: 1167–95. [CrossRef]

Ramsey, James Bernard. 1969. Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society Series B: Statistical Methodology* 31: 350–71. [CrossRef]

Rasoolimanesh, S. Mostafa, Faizan Ali, and Mastura Jaafar. 2018. Modeling residents' perceptions of tourism development: Linear versus non-linear models. *Journal of Destination Marketing & Management* 10: 1–9.

Redman, Charles L. 2014. Should sustainability and resilience be combined or remain distinct pursuits? *Ecology and Society* 19: 37. [CrossRef]

Reeves, Martin, and Knut Haanaes. 2015. *Your Strategy Needs a Strategy: How to Choose and Execute the Right Approach*. Harvard: Harvard Business Review Press.

Rego, Sonja Olhoft. 2003. Tax-Avoidance Activities of US Multinational Corporations. *Contemporary Accounting Research* 20: 805–33. [CrossRef]

Rodrigues, Margarida, Mário Franco, Nuno Sousa, and Rui Silva. 2021. COVID 19 and the business management crisis: An empirical study in SMEs. *Sustainability* 13: 5912. [CrossRef]

Rogers, Mark. 2004. Networks, firm size and innovation. *Small Business Economics* 22: 141–53. [CrossRef]

Rossi, Peter E. 2014. Even the rich can make themselves poor: A critical examination of IV methods in marketing applications. *Marketing Science* 33: 655–72. [CrossRef]

Rosyadi, Slamet, Ayusia Sabhita Kusuma, Elpeni Fitrah, Agus Haryanto, and Wiwiek Adawiyah. 2020. The multi-stakeholder's role in an integrated mentoring model for SMEs in the creative economy sector. *SAGE Open* 10: 2158244020963604. [CrossRef]
Rönkkö, Mikko, and Joerg Evermann. 2013. A critical examination of common beliefs about partial least squares path modeling. *Organizational Research Methods* 16: 425–48. [CrossRef]
Rumanti, Augustina Asih, Afrin Fauzya Rizana, and Fandi Achmad. 2023. Exploring the role of organizational creativity and open innovation in enhancing SMEs performance. *Journal of Open Innovation: Technology, Market, and Complexity* 9: 100045. [CrossRef]
Saad, Muhammedamin Hussen, Geoffrey Hagelaar, Gerben Van Der Velde, and S. W. F. Omta. 2021. Conceptualization of SMEs' business resilience: A systematic literature review. *Cogent Business & Management* 8: 1938347.
Saifurrahman, Adi, and Salina Hj Kassim. 2024. Regulatory issues inhibiting the financial inclusion: A case study among Islamic banks and MSMEs in Indonesia. *Qualitative Research in Financial Markets* 16: 589–617. [CrossRef]
Saptono, Prianto Budi, and Gustofan Mahmud. 2022. Institutional environment and tax performance: Empirical evidence from developing economies. *Public Sector Economics* 46: 207–37. [CrossRef]
Saptono, Prianto Budi, Gustofan Mahmud, Fauzilah Salleh, Intan Pratiwi, Dwi Purwanto, and Ismail Khozen. 2024a. Tax Complexity and Firm Tax Evasion: A Cross-Country Investigation. *Economies* 12: 97. [CrossRef]
Saptono, Prianto Budi, Gustofan Mahmud, Intan Pratiwi, Dwi Purwanto, Ismail Khozen, Lambang Wiji Imantoro, and Maria Eurelia Wayan. 2024b. Book-Tax Differences during the Crisis: Does Corporate Social Responsibility Matter? *Sustainability* 16: 7271. [CrossRef]
Sarkar, Soumodip, and Stewart R. Clegg. 2021. Resilience in a time of contagion: Lessons from small businesses during the COVID-19 pandemic. *Journal of Change Management* 21: 242–67. [CrossRef]
Sarstedt, Marko, and Erik Mooi. 2019. *A Concise Guide to Market Research the Process, Data, and Methods Using IBM SPSS Statistics*. Heidelberg: Springer.
Sarstedt, Marko, Christian M. Ringle, Jun-Hwa Cheah, Hiram Ting, Ovidiu I. Moisescu, and Lacramioara Radomir. 2020. Structural model robustness checks in PLS-SEM. *Tourism Economics* 26: 531–54. [CrossRef]
Sayal, Amber, and Saikat Banerjee. 2022. Factors influence performance of B2B SMEs of emerging economies: View of owner-manager. *Journal of Research in Marketing and Entrepreneurship* 24: 112–40. [CrossRef]
Sánchez-Ballesta, Juan Pedro, and José Yagüe. 2023. Tax avoidance and the cost of debt for SMEs: Evidence from Spain. *Journal of Contemporary Accounting & Economics* 19: 100362.
Schaltegger, Stefan, and Marcus Wagner. 2011. Sustainable entrepreneurship and sustainability innovation: Categories and interactions. *Business Strategy and the Environment* 20: 222–37. [CrossRef]
Schaltegger, Stefan, Markus Beckmann, and Erik G. Hansen. 2013. Transdisciplinarity in corporate sustainability: Mapping the field. *Business Strategy and the Environment* 22: 219–29. [CrossRef]
Schmitt, Antje, Kathrin Rosing, Stephen X. Zhang, and Michael Leatherbee. 2018. A dynamic model of entrepreneurial uncertainty and business opportunity identification: Exploration as a mediator and entrepreneurial self-efficacy as a moderator. *Entrepreneurship Theory and Practice* 42: 835–59. [CrossRef]
Schumpeter, Joseph Alois. 1934. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Cambridge: Harvard University Press.
Scott, W. Richard. 2008. *Institutions and Organizations: Ideas and Interests*. Thousand Oaks: Sage Publications Ltd.
Seidu, Baba Adibura, Yaw Ndori Queku, and Emmanuel Carsamer. 2023. Financial constraints and tax planning activity: Empirical evidence from Ghanaian banking sector. *Journal of Economic and Administrative Sciences* 39: 1063–87. [CrossRef]
Sharma, Akhilesh Kumar, and Sushil Kumar Rai. 2023. Understanding the Impact of COVID-19 on MSMEs in India: Lessons for Resilient and Sustained Growth of Small Firms. *Journal of Small Business Strategy* 33: 70–83. [CrossRef]
Sharma, Chandan, and Arup Mitra. 2015. Corruption, governance and firm performance: Evidence from Indian enterprises. *Journal of Policy Modeling* 37: 835–51. [CrossRef]
Sharma, Pratyush, Marko Sarstedt, Galit Shmueli, Kevin H. Kim, and Kai Oliver Thiele. 2019. PLS-based model selection: The role of alternative explanations in information systems research. *Journal of the Association for Information Systems* 20: 4. [CrossRef]
Sikka, Prem, and Hugh Willmott. 2013. The Tax Avoidance Industry: Accountancy Firms on the Make. *Critical Perspectives on International Business* 9: 415–43. [CrossRef]
Simeone, Cynthia L. 2015. Business resilience: Reframing healthcare risk management. *Journal of Healthcare Risk Management* 35: 31–37. [CrossRef] [PubMed]
Simms, Leonard J., Kerry Zelazny, Trevor F. Williams, and Lee Bernstein. 2019. Does the number of response options matter? Psychometric perspectives using personality questionnaire data. *Psychological Assessment* 31: 557. [CrossRef] [PubMed]
Slattery, Cailin, and Owen Zidar. 2020. Evaluating state and local business incentives. *Journal of Economic Perspectives* 34: 90–118. [CrossRef]
Smallbone, David, and Friederike Welter. 2001. The distinctiveness of entrepreneurship in transition economies. *Small Business Economics* 16: 249–62. [CrossRef]
Song, Malin, Shuhong Wang, and Hongyan Zhang. 2020. Could environmental regulation and R&D tax incentives affect green product innovation? *Journal of Cleaner Production* 258: 120849.
Soytas, Mehmet Ali, Meltem Denizel, and Damla Durak Usar. 2019. Addressing endogeneity in the causal relationship between sustainability and financial performance. *International Journal of Production Economics* 210: 56–71. [CrossRef]

Spillan, John, and John Parnell. 2006. Marketing resources and firm performance among SMEs. *European Management Journal* 24: 236–45. [CrossRef]

Su, Zhongfeng, Hai Guo, and Wei Sun. 2017. Exploration and firm performance: The moderating impact of competitive strategy. *British Journal of Management* 28: 357–71. [CrossRef]

Sugianto, Ira Margaritha, I. Nyoman Pujawan, and Jerry Dwi Trijoyo Purnomo. 2023. A study of the Indonesian trucking business: Survival framework for land transport during the COVID-19 pandemic. *International Journal of Disaster Risk Reduction* 84: 103451. [CrossRef]

Susan, Marcellia. 2020. Financial literacy and growth of micro, small, and medium enterprises in west java, indonesia. In *Advanced Issues in the Economics of Emerging Markets*. Edited by William A. Barnett and Bruno S. Sergi. Bingley: Emerald Publishing Limited, pp. 39–48.

Svensson, Göran, Carlos Ferro, Nils Høgevold, Carmen Padin, Juan Carlos Sosa Varela, and Marko Sarstedt. 2018. Framing the triple bottom line approach: Direct and mediation effects between economic, social and environmental elements. *Journal of Cleaner Production* 197: 972–91. [CrossRef]

Tambunan, Tulus. 2021. Micro, small and medium enterprises in times of crisis: Evidence from Indonesia. *Journal of the International Council for Small Business* 2: 278–302. [CrossRef]

Tassey, Gregory. 2007. Tax incentives for innovation: Time to restructure the R&E tax credit. *The Journal of Technology Transfer* 32: 605–15.

Testa, F., F. Iraldo, A Vaccari, and E. Ferrari. 2015. Why eco-labels can be effective marketing tools: Evidence from a study on Italian consumers. *Business Strategy and the Environment* 24: 252–65. [CrossRef]

The Central Bureau of Statistics. 2021. *Statistics on Business Characteristics for 2021*. Jakarta: Central Bureau of Statistics.

Thukral, Esha. 2021. COVID-19: Small and medium enterprises challenges and responses with creativity, innovation, and entrepreneurship. *Strategic Change* 30: 153–58. [CrossRef]

Tian, Mu, Ping Deng, Yingying Zhang, and Maria Paz Salmador. 2018. How does culture influence innovation? A systematic literature review. *Management Decision* 56: 1088–107. [CrossRef]

Tidd, Joe, and John Bessant. 2018. Innovation management challenges: From fads to fundamentals. *International Journal of Innovation Management* 22: 1840007. [CrossRef]

Tipu, Syed Awais Ahmad, and Kamel Fantazy. 2023. Linking big data analytics capability and sustainable supply chain performance: Mediating role of innovativeness, proactiveness and risk taking. *International Journal of Productivity and Performance Management* 73: 1587–608. [CrossRef]

Trabucco, Matteo, and Pietro De Giovanni. 2021. Achieving resilience and business sustainability during COVID-19: The role of lean supply chain practices and digitalization. *Sustainability* 13: 12369. [CrossRef]

Twesige, Daniel, and Faustin Gasheja. 2019. Effect of tax incentives on the growth of small and medium-sized enterprises (SMEs) in Rwanda: A case study of SMEs in Nyarugenge district. *Journal of Accounting and Taxation* 11: 89–98.

Valdez-Juárez, Luis Enrique, Mauricio Castillo-Vergara, and Elva Alicia Ramos-Escobar. 2022. Innovative business strategies in the face of COVID-19: An approach to open innovation of SMEs in the sonora region of Mexico. *Journal of Open Innovation: Technology, Market, and Complexity* 8: 47. [CrossRef]

Van Parys, Stefan, and Sebastian James. 2010. The effectiveness of tax incentives in attracting investment: Panel data evidence from the CFA Franc zone. *International Tax and Public Finance* 17: 400–29. [CrossRef]

Varadarajan, Rajan. 2018. Innovation, innovation strategy, and strategic innovation. In *Innovation and strategy*. Edited by Rajan Varadarajan and Satish Jayachandran. Bingley: Emerald Publishing Limited, vol. 15, pp. 143–66.

Vincent, Olusegun. 2021. The development of a scale to measure SMEs tax compliance in Nigeria: An adaptation of Fischers model. *Journal of Accounting and Taxation* 13: 132–43.

Wacker, John G. 2004. A theory of formal conceptual definitions: Developing theory-building measurement instruments. *Journal of Operations Management* 22: 629–50. [CrossRef]

Wang, Catherine L., and Pervaiz K. Ahmed. 2004. The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management* 7: 303–13. [CrossRef]

Wang, Mingyue, Yingming Li, Junqiang Li, and Zitong Wang. 2021. Green process innovation, green product innovation and its economic performance improvement paths: A survey and structural model. *Journal of Environmental Management* 297: 113282. [CrossRef]

Watson, Maria, Charlotte Brown, John Handmer, Cynthia Kroll, Anne Wein, Jennifer Helgeson, Adam Rose, Noah Dormady, and Juri Kim. 2023. Methods and lessons for business resilience and recovery surveys. *International Journal of Disaster Risk Reduction* 93: 103743. [CrossRef]

Weber, Max M. 2023. The Relationship between Resilience and Sustainability in the Organizational Context—A Systematic Review. *Sustainability* 15: 15970. [CrossRef]

Winnard, Julie, Andy Adcroft, Jacquetta Lee, and David Skipp. 2014. Surviving or flourishing? Integrating business resilience and sustainability. *Journal of Strategy and Management* 7: 303–15. [CrossRef]

Wintoki, M. Babajide, James S. Linck, and Jeffry M. Netter. 2012. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics* 105: 581–606. [CrossRef]

Woellner, Richard C., Samuel Hall, Ian Greaves, and William F. Schoenwetter. 1997. Epidemic of asthma in a wood products plant using methylene diphenyl diisocyanate. *American Journal of Industrial Medicine* 31: 56–63. [CrossRef]

Wolff, James A., Timothy L. Pett, and J. Kirk Ring. 2015. Small firm growth as a function of both learning orientation and entrepreneurial orientation: An empirical analysis. *International Journal of Entrepreneurial Behavior & Research* 21: 709–30.

Wong, Chi-Sum, Kelly Z. Peng, Junqi Shi, and Yina Mao. 2011. Differences between odd number and even number response formats: Evidence from mainland Chinese respondents. *Asia Pacific Journal of Management* 28: 379–99. [CrossRef]

Wooldridge, Jeffrey M. 2010. *Econometric Analysis of Cross Section and Panel Data*. Cambridge: MIT Press.

World Bank. 2022. *Indonesia's Economy Sees Rebound in 2022 following Post-Covid Reopening*. World Bank Press Release. Available online: https://www.worldbank.org/en/news/press-release/2022/12/15/indonesia-s-economy-sees-rebound-in-2022-following-post-covid-reopening (accessed on 20 July 2024).

Wright, Margaret O'Dougherty, Ann S. Masten, and Angela J. Narayan. 2012. Resilience processes in development: Four waves of research on positive adaptation in the context of adversity. In *Handbook of Resilience in Children*, 2nd ed. Edited by Sam Gold and Robert B. Brooks. Boston: Springer US, pp. 15–37.

Wu, Chao, Shuling Liang, Weijiong Wu, and Yuxiang Hong. 2021. Practicing green residence business model based on TPB perspective. *Sustainability* 13: 7379. [CrossRef]

Wu, Jie. 2022. The Impact of Payroll Tax Planning on Corporate Innovation–Panel Data Analysis with Stata. Paper presented at 2022 3rd International Conference on Education, Knowledge and Information Management (ICEKIM), Harbin, China, January 21–23.

Xie, Xuemei, Yuhang Han, Alistair Anderson, and Samuel Ribeiro-Navarrete. 2022. Digital platforms and SMEs' business model innovation: Exploring the mediating mechanisms of capability reconfiguration. *International Journal of Information Management* 65: 102513. [CrossRef]

Xu, Li, Dora Marinova, and Xiumei Guo. 2015. Resilience thinking: A renewed system approach for sustainability science. *Sustainability Science* 10: 123–38. [CrossRef]

Zhang, Yijun, and Yi Song. 2022. Tax rebates, technological innovation and sustainable development: Evidence from Chinese micro-level data. *Technological Forecasting and Social Change* 176: 121481. [CrossRef]

Zhu, Jun, Kung-Cheng Ho, Sijia Luo, and Langchuan Peng. 2023. Pandemic and tax avoidance: Cross-country evidence. *Economic Modelling* 124: 106300. [CrossRef]

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Exploring the Role of AI in Improving VAT Reporting Quality: Experimental Study in Emerging Markets

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Abstract: In recent years, artificial intelligence has increasingly been interesting for its role in improving accounting practices. This research investigates whether there is a significant difference in value-added tax (VAT) reporting quality between traditional methods and those assisted by artificial intelligence (AI) in emerging markets. The experiment introduces an AI intervention using ChatGPT-4 to analyze data for accounting errors. The results demonstrate that AI-assisted reporting significantly improves reporting quality, as the AI effectively identified accounting errors that were missed in traditional reporting. This study makes a valuable contribution by providing novel, practical insights into the role and capabilities of AI in tax reporting, employing a rarely used experimental methodology to explore this topic.

Keywords: artificial intelligence; accounting errors; value-added tax; tax reporting quality; ChatGPT

1. Introduction

Ensuring high tax reporting quality is essential for all stakeholders influenced by the firm's reputation and financial position (Wibowo 2024). While corporate governance (CG) plays a crucial role in enhancing the quality of information and reporting, eliminating accounting errors remains challenging (Sinaga et al. 2022). This difficulty is especially evident in emerging markets, where enhancing tax reporting quality is still limited due to the lack of resources, complicated laws, and administrative problems, like corruption (Shahrour et al. 2022). Financial data can still contain errors, even with advancements that still threaten tax reporting quality, which calls for reliable technological and practical solutions (Henk 2020).

Responding to the requests for improving tax reporting quality, the tax control framework (TCF) was defined as a part of the internal control system that improves tax information's accuracy, completeness, and compliance with tax laws; also, the principles of the TCF were determined, raising the need for its development (OECD 2016). Those principles were adopted by BDO in 2020 to develop the TCF, considering a VAT as a priority to increase its reporting quality (BDO 2020). Despite the fact that the TCF improved tax reporting quality, several challenges still stand for a strong TCF, according to the developer, which are reaching zero tax errors in tax reports, businesses requesting practical solutions to improve tax reporting quality, and managing the risks of low tax reporting quality that harm firms (OECD 2016).

Moreover, a significant problem for VAT reporting quality refers to the fact that companies' VAT reports do not reflect the actual amounts of their business, which would be worth 8% of Lebanon's gross domestic product (GDP) in 2021 (International Monetary Fund (IMF) 2017).

In the past, the accounting procedure was largely manual in nature, which made the accounting process suffer from weaknesses in controlling accounting errors, leading to less quality when reporting for tax (Kanaparthi 2024). The breakthrough of artificial intelligence (AI) has become a notable change that may enhance the quality of financial information and improve tax reporting quality by reducing accounting errors (Faccia and Mosteanu 2019). Automation and applying advanced technologies, like Robotic Process Automation (RPA) and real-time data sharing via Blockchain technology (BCT), reduces human errors and increases the accounting process efficiency, and such adoption is significant for improving tax reporting quality (Mihai and Duţescu 2022; Ajayi-Nifise et al. 2024)

Accounting is currently undergoing a transformation due to the growing adoption of AI, which is attracting attention in the industry for its ability to enhance accuracy and streamline tasks that improve tax reporting quality (Hasan 2022). Chukwuani and Egiyi (2020) suggest that AI, as a sophisticated algorithm, enables accountants to identify and rectify errors efficiently. These capabilities of AI can lead to improved error detection and correction, ultimately resulting in better tax reporting quality (Tandiono 2023).

The global development of chatbots with AI is becoming interesting, and they are developed based on the large language model (LLM), which has the potential to transform the way accounting professionals operate by offering enhanced productivity, greater efficiency, and insightful information (Alshurafat 2023). Also, chatbots are recommended for their abilities in data analysis for task verification, like identifying duplicate transactions, vouching, and tracing transactions, and comparing data from one table to another (Street and Wilck 2023). PwC (2024) invested heavily to develop its own chatbots to ease its procedures and enhance its efficiency, and its investments were in collaboration with the most known global firms, such as Microsoft, Oracle, and OpenAI.

The trend of AI development is being led by machine learning (ML), which offers improvement for security and more effective accounting procedures (Geirhos et al. 2020; Shahrour and Dekmak 2023). BCT is known as a “distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties”. Any adjustment in the database applying BCT requires the confirmation of all relevant parties. Since its introduction in 2008, BCT has increased in popularity due to its efficiency and security in transaction recording (Demirkan et al. 2020).

The adoption of sophisticated accounting software has yielded different outcomes worldwide in terms of lowering errors and improving tax reporting quality. AI is reshaping accounting practices and solving issues, such as in the Czech Republic (Paseková et al. 2019). In emerging markets, like Oman and Jordan, accounting is still suffering from errors existence (Muneerali 2020; Al-Zaqeba et al. 2022). Building on earlier research findings by Al Najjar et al. (2024), which explored several accounting errors that reduce tax reporting quality in emerging markets, this research explores how AI application can improve the quality of VAT reporting in emerging markets. Thus, the problem of low VAT reporting quality in emerging markets derived from accounting errors forms the study problem.

The contribution of this research can be viewed from two perspectives. Practically, it enhances understanding of AI’s capabilities through an experimental approach, using real-life simulations in emerging markets through applying an experimental approach, which might be lacking in the literature. Academically, it addresses a gap in the literature by introducing an experimental study focused on emerging markets, where such research is currently lacking, and this type of methodology provides a real-life simulation for understanding and practicing AI in accounting rather than general theoretically speaking. This work strengthens the existing body of knowledge and provides an original foundation for future studies and experiments in this field.

The remainder of this research is structured as follows. Section 2 presents the literature review and hypothesis development. Section 3 describes the research methodology and sample. Section 4 presents the findings and discussions. Section 5 concludes. Section 6 mentions the limitations and future research opportunities.

2. Conceptual Framework

A number of theories, most notably the modernization theory and the technology acceptance model (TAM), are important for understanding the adoption of AI in accounting software. Davis, in 1989, developed the technology acceptance model (TAM), which provides a foundational framework for analyzing how individuals and organizations adopt technology (Taib et al. 2022). The TAM explains the acceptance of new technologies through two primary factors: perceived usefulness and perceived ease of use (Gangwar et al. 2014; Carr et al. 2010). These elements have an important effect on how individuals and organizations decide whether to adopt new technologies, like AI. (Khafit et al. 2020; Lazim et al. 2021). In summary, organizations and individuals are more likely to adopt AI if they believe it can improve output quality by detecting errors and enhancing information quality and if it is easy to use without requiring complex skills.

According to Uyar et al. (2021), modernization theory is concerned with the macroeconomic effects of adopting new technologies. According to this theory, the advantages that modernization brings about for businesses are mirrored in more general macroeconomic growth. According to Chyzhevska et al. (2021), modernization, which is characterized as the adoption of new technologies, leads to higher rates of growth at the corporate and macroeconomic levels. According to this theory, businesses are motivated to implement modern technologies, like AI, because of the expected advantages, which include lowering risks by avoiding fines and harming their reputation (Cooper and Nguyen 2020).

In conclusion, modernization theory posits that technological adoption is driven by the expected advantages, including risk reduction and enhanced growth. Meanwhile, the TAM indicates that if AI adoption is perceived as useful and easy to implement, it is more likely to be embraced by organizations and individuals. Together, these theories provide a comprehensive framework for understanding the factors influencing the adoption of AI in accounting software.

For the outstanding literature, several studies have explored the impact of AI on tax reporting quality (Nurhayati et al. 2023; Zhang 2023; Marta and Shahrour 2024), others explored its ability from the practical perspective (Heye 2021; Eulerich et al. 2023), and others stated the challenges and limitations for AI application (Widjaja 2021; Korinek and Stiglitz 2021). Then, the key point between the studies is the AI abilities in accounting and tax reporting.

A comparison was performed between two of the most known AI generative models, Gemini 1.5 and ChatGPT, to compare both effectiveness and functionality based on several tasks, and the results showed that AI generative models are efficient in tax calculations, with a slight difference between both models (Rane et al. 2024). The abilities of AI generative models, such as ChatGPT, are said to be significant for improving the accounting process by automating repetitive tasks and improving tax accounting practices by helping accountants through deep data analysis (Zhao and Wang 2024).

Moreover, ChatGPT was examined for major accounting certification exams, including the CPA, CMA, CIA, and EA, and the ChatGPT 3.5 model was unable to pass any exam, while the ChatGPT-4 model showed significant improvement, which enabled it to pass all the exams after several training procedures (Eulerich et al. 2023).

Other studies have explored the application of AI among big public accounting firms. Heye (2021) applied a descriptive case study regarding the investment in AI among one of the Big 4 accounting firms; the study concluded that EY developed an AI project having the ability to analyze lease contracts and unstructured data, and such abilities enabled EY to extract information more accurately from papers, reduce resource expenditure in terms of time and labor, and minimize human errors by automating document review processes, thereby improving the quality of the accounting process and information by reducing errors.

A platform was developed by Deloitte for automated document review that reads a collection of documents and uses AI to find relevant data automatically, and such an investment helps in reducing the human errors that could be unavoidable when processing thousands of contracts and invoices. The platform offers many benefits, enabling the teams to handle unstructured data of any kind more quickly and accurately (Deloitte 2024).

Also, PwC investment in AI exceeded USD 1 billion, with leading vendors such as Google, Microsoft, OpenAI, and Oracle. The PwC's AI gains in accounting and tax are by data analysis and document summarization and generation, which help them create drafts or extract data and analyze important information from even unstructured data within seconds (PwC 2024). KPMG over five periods allocated more than USD 5 billion in tech investments with Microsoft Azure to develop the KPMG digital gateway and USD 1 billion specifically for tax tech. One of the digital gateways in action is the digital gateway for tax, which helps users accurately calculate and report tax (KPMG 2023).

The benefits of integrating ML into PEYG's accounting software since 2017 have been identified by Yang et al. (2021) through an interview coding case study at one of the Big Four Australian accounting firms, PEYG. These benefits include enhanced data analysis, mathematical accuracy tests, information extraction from PDFs, transaction matching, risk assessment, account classification, and lease document analysis.

To sum up, the previous studies explored the application and the role of AI in accounting from a practical perspective, which may increase the accuracy and efficiency of the financial information and tax reporting quality.

Several previous studies were interested in studying the role of AI in general with no specification for the AI domain in accounting. Since they have significant roles in automating routine accounting tasks to eliminate human roles at the entry level, AI tools offer significant advantages, such as avoiding complexities in data processing, improving information monitoring, and preventing errors, thereby enhancing information accuracy and tax reporting quality (Ruan et al. 2019; Bakas and Kontoleon 2020; Kumar Doshi et al. 2020; Lee and Tajudeen 2020; Mohammad et al. 2020; Ucoglu 2020; Osaloni et al. 2022; Pavlova and Knyazeva 2022; Rahmi and Gangodawilage 2022; Saragih et al. 2022; Fjord and Schmidt 2023; Nurhayati et al. 2023; Zhang 2023; Marta and Shahrour 2024).

Accuracy is a challenge in the accounting processes due to the labor-intensive nature of manual data entry into spreadsheets or accounting software, and these challenges can be overcome by incorporating AI into accounting software, which automates tasks, enhances security, and offers advanced analytical capabilities (Han et al. 2023). Robotic Process Automation (RPA) may enhance the quality of tax reports by automating data input, processing, and output, thereby eliminating human involvement at the entry level, which may harm the quality of inputs and will impact the output of tax and financial information (Chukwuani and Egiyi 2020; Huettinger and Boyd 2020; Zhang et al. 2020; Faúndez et al. 2020; Hasan 2022).

Additionally, the quality of tax reporting is enhanced by the ability of Deep Neural Networks (DNNs) to analyze both structured and unstructured data, which assists accountants in identifying errors in records and transactions. Accountants that such tools are truly valuable and beneficial to enhance the quality of VAT reporting, and such beliefs are influenced by DNN's ability to analyze the interacted transactions between parties and identify any inconveniences associated with the same transaction (Mehta et al. 2020; Coita et al. 2021; Raikov 2021; Xavier et al. 2022; Delgado et al. 2023).

Blockchain Technology (BCT) enhances the quality of tax reporting by creating a secured database of the financial records of transactions, and such records cannot be adjusted without detection, thereby preventing manipulation, period shifting, and unauthorized record adjustments. Moreover, the shared database ensures transparency and accuracy among relevant parties, which improves data accuracy, reduces errors, and ensures compliance, and such abilities reduce the risk of errors in tax reporting, which improves its quality (Bonsón and Bednárová 2019; Cristea 2020; Rahayu 2021; Van Hoa et al. 2022; Prasad et al. 2023).

Although there have been some interesting studies on AI in accounting, most of them still rely on how users and developers perceive the technology's capabilities, which makes it difficult to generalize and present relevant practical knowledge. Furthermore, despite regional variations, no significant contributions to the methodologies used or the outcomes were made in the prior studies, which creates a significant gap and contribution for the current research. Such gaps lead to several arguments as follows.

While many studies support the positive role of AI in improving tax reporting quality, Cooper et al. (2019) argued that resistance to technological transformation may result from a lack of knowledge about AI's useful applications in tax accounting, and such difficulties may be more appearing among the lower levels of employees.

According to Gotthardt et al. (2020), accountants' use of AI in tax services is less effective due to practical difficulties in implementing advanced technology, and such implementation requires training and personal technological skills for accountants; also, it may require complicated and costly tangible infrastructure for successful implementation.

Widjaja (2021) and Korinek and Stiglitz (2021) stated that the limited examination and complicated tax requirements may be one of the major challenges for implementation since their abilities are not explored enough; even though AI can streamline tax filing and reporting, errors may still occur.

There are notable gaps in the literature regarding the role of AI in improving tax reporting quality in emerging markets, particularly concerning VAT. There is a lack of experimental studies testing the effectiveness of AI in improving VAT reporting quality in emerging markets in the literature, especially through applications like chatbots. Additionally, the existing literature has not sufficiently focused on VAT, despite its significant impact on firms' tax liabilities.

Based on the reviewed literature, while some studies support the role of AI in accounting, others highlight its limitations. To further explore the role of AI in improving VAT reporting quality, this research aims to experiment with the influence of AI applications on VAT reporting quality. Therefore, our main research question is as follows: Does AI improve tax reporting quality in emerging markets? Throughout this research, we aim to answer this question by examining the formulated hypothesis below.

H1. *There is a significant difference in VAT reporting quality between reporting the VAT in assistance with AI tools and reporting VAT traditionally.*

3. Research Methodology

This research examines the impact of AI on accounting errors that compromise tax reporting quality in emerging markets, specifically in Lebanon. This study employs an experimental approach to compare outcomes with and without AI support. The pre-test and post-test control group design, as outlined by Sekaran and Bougie (2016), is utilized to enhance the experiment's validity. In this design, the same group of participants serves as both the control and experimental group, ensuring a more robust and valid comparison of the results.

AI support in this research will use one of the most known AI chatbots, is ChatGPT-4. The abilities of ChatGPT-4 were proven as superior when compared with other similar known chatbots, such as Bard, which is developed by Google. Several studies highlighted its exceptional performance positioning as a leader in the industry due to its vast parameters regarding pre-training, its ability for continuous training and development, and its variety of services, making it applicable in several fields (Ahmed et al. 2023; Bhardwaz and Kumar 2023; Kumari et al. 2023; Singh et al. 2023; Salloum et al. 2024).

Moreover, others compared ChatGPT-4 with Gemini, which is developed by Microsoft, and the results support ChatGPT-4's extraordinary performance by providing more relevant and accurate answers (Budda and Budda 2024; Makrygiannakis et al. 2024; Shukla et al. 2024). Others compared ChatGPT-4 with other AI chatbots, such as Perplexity, supporting the previous results of such outstanding performance of ChatGPT-4 (Shukla et al. 2024). Then, based on the capabilities of ChatGPT-4, it will be adopted in the current research using its outputs as the intervention in the experiment.

The data prepared are used to simulate the transactions of a Lebanese firm that is separated into two sets: the original (without errors) and the manipulated or treated (with errors). Moreover, the data consisted of details from eight purchasing invoices and their corresponding journal entries in an Excel sheet, which was generated by the accounting software used for VAT reporting preparation. For reporting purposes, taxpayers are required to declare their tax deductions based on their purchasing transactions. The intervention in the experiment will be performed by providing a real report from ChatGPT-4 that analyzes the data to determine if any accounting errors exist within the treated data. The data provided to ChatGPT-4 consists of two data sets, and each contains invoice details and journal vouchers. The first set refers to the original data according to the invoices from suppliers and the second data set is the recorded data in the firm, which is manipulated with six accounting errors that were found to be significant for reducing VAT reporting quality according to Al Najjar et al. (2024). They are tax rate errors, cutoff period errors, errors of principle, hiding transactions errors, mathematical errors, and overreporting expenses errors.

Moreover, before launching the experiment, the ChatGPT-4 report Appendix A is confirmed by a tax expert to ensure that no errors occur in analyzing the data, and the report produced. The participants chosen for the experiment are accountants registered in the Lebanese association of certified public accountants (LACPA), and they may be certified public accountants (CPAs) or trainees but must meet the criteria of having experience in VAT reporting.

Random sampling is to be applied by the researchers to conduct the experiment through communicating with the participants through the official channels of the LACPA, inviting them to join the experiment and giving each of the total population who are interested the chance to participate in such an original experiment in the region. The invitation period will last for one week. After this period, those who confirm their participation will be grouped together. Subsequently, the experimental process will be explained to the participants, detailing the problem, the steps involved (as outlined below), and the estimated time for completion, which is a maximum of 30 min. Once participants have confirmed their understanding and agreement, a one-time experiment will be scheduled. Moreover, before launching the experiment, a group of participants will be asked to determine the VAT using the error-free data, which forms the benchmark for comparing the experiment outputs; the results show that the accurate VAT value must be USD 1721.

The experiment details are clarified as follows:

- Step 1: Participants are reintroduced to the experiment problem and purpose, clarifying the process and the time required.
- Step 2: Participants received a Microsoft quiz form to record the amounts of VAT outputs that will be asked later with and without AI support.
- Step 3: Participants received the original and the manipulated data, each consisting of invoice details and journal entries in an Excel sheet. They were notified that the manipulated data contain errors with respect to the original.
- Step 4: Participants are asked to calculate and fill in the first VAT amount based on the data provided.
- Step 5: Participants are given a ChatGPT-4 report that analyzes the manipulated data for any accounting errors, which is the intervention in the experiment.
- Step 6: Participants are asked to determine the VAT amount utilizing the ChatGPT-4 report provided.

To answer the research question and examine the developed hypothesis, two statistical tests are employed. The repetitive measures ANOVA technique will be applied to measure the difference between the several outputs by the participants, which are the two VAT values that are required to be reported before utilizing the ChatGPT-4 report. After, the one-sample *t*-test will be applied to compare the difference with the benchmark of the VAT reported from the control group using error-free data and the values between the VAT reported.

4. Findings and Discussion

The total number of participants who joined the group was 89, while 12 participants did not complete both steps of the experiment, resulting in a net of 77 participants. Table 1 shows the two factors within the experiment, which are VAT 1, which represents the VAT reported before the AI intervention, and VAT 2, which represents the VAT reported after the AI intervention and having the support of the ChatGPT-4 report.

Table 1. Within-subject factors.

Factors	Dependent Variable
1	VAT 1
2	VAT 2

The next tables show the description of the participants. Table 2 shows the gender diversity among participants. A total of 87% of the total participants are men, with 67 participants, while women were 13%, with 10 participants. Table 3 shows that 79.2% of the participants hold a bachelor's degree in accounting, with a frequency of 61, 20.8% hold a master's degree, with a frequency of 16, and there are no PhD holders among the participants.

Table 2. Gender.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	67	87.0	87.0	87.0
	Female	10	13.0	13.0	100.0
	Total	77	100.0	100.0	

Table 3. Education.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelors	61	79.2	79.2	79.2
	Masters	16	20.8	20.8	100.0
	Total	77	100.0	100.0	

Table 4 shows that the participants from the LACPA are divided into eight CPAs, and the remaining sixty-nine participants are trainees. Moreover, Table 5 shows that the participants have a minimum of 1 year and maximum of 9 years of experience and an average of 3.25 years.

Table 4. CPA or trainee.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CPA	8	10.4	10.4	10.4
	Trainee	69	89.6	89.6	100.0
	Total	77	100.0	100.0	

Table 5. Experience.

	N	Minimum	Maximum	Mean	Std. Deviation
Exp	77	1.00	9.00	3.2597	1.81661
Valid N (listwise)	77				

Table 6 shows that the total number of participants is 77. They have a mean of 2184 for VAT 1 computed before AI intervention and a mean of 2184 for VAT 2 after AI intervention through the experiment.

Table 6. Descriptive statistics of the experiment.

	Mean	Std. Deviation	N
VAT 1	2184.0779	237.86876	77
VAT 2	1723.5455	14.74926	77

Table 7 shows the results of the multivariate tests, which assess the significant influence of the intervention through the experiment, which represents the influence of AI intervention on VAT reporting quality. The results show that Wilk's Lambda *p*-value is 0.000 < 0.05, meaning that AI has a significant influence on VAT reporting quality; moreover, the low value of Lambda, which is 0.206, shows a high impact of AI on VAT reporting quality.

Table 7. Multivariate tests [a].

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power [c]
Factor 1	Pillai's Trace	0.794	1110.321 [b]	1.000	76.000	0.000	0.794	293.1894	1.000
	Wilks' Lambda	0.206	1110.321 [b]	1.000	76.000	0.000	0.794	293.1894	1.000
	Hotelling's Trace	3.858	1110.321 [b]	1.000	76.000	0.000	0.794	293.1894	1.000
	Roy's Largest Root	3.858	1110.321 [b]	1.000	76.000	0.000	0.794	293.1894	1.000

[a] Design: intercept. Within-subject design: factors; [b] exact statistic; [c] computed using alpha = 0.05.

Then, the results of the multivariate tests show that all tests have a *p*-value < 0.01, meaning that the results reject the null hypothesis and confirm that VAT reporting quality is significantly impacted when AI tools are used, which was conducted in the experiment through intervening with an AI chatbot report to analyze the accounting errors among the records using ChatGPT-4 compared to traditional manual reporting. Therefore, H1 is accepted, as there is a statistically significant difference between the quality of VAT reporting in assistance with AI reports and reporting traditionally.

While the previous results showed a significant change in VAT reporting quality before and after using AI between VAT 1 and VAT 2, it is still unknown whether it is an improvement or reduction in VAT reporting quality. To answer this doubt, the researchers conducted a one-sample *t*-test to test the significance of the difference between the experiment's outputs and the benchmark determined previously, which refers to error-free data reporting of USD 1721.

Table 8 shows the examination of the significance of the difference between VAT 1, which reports a VAT without using AI, and the control benchmarks (USD 1721). The results showed a *p*-value 0.000 < 0.05, which means that it rejects the null hypotheses and shows a significant difference between the benchmark and VAT 1, meaning that VAT reporting quality before using AI is significantly different from the correct value, leading to a low reporting quality.

Table 8. One-sample test with a VAT before AI.

	Test Value = 1721					
	t	df	Sig. (Two-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAT 1	17.083	76	0.000	463.07792	409.0883	517.0675

Table 9 shows the examination of the significance of the difference between VAT 2, which reports the VAT using AI and the control benchmarks (USD 1721). The results showed a *p*-value 0.134 > 0.05, which means that it fails to reject the null hypotheses and shows no significant difference between the benchmark and VAT 2, meaning that VAT reporting quality after using AI is not different from the correct value, which improves the quality of the VAT reported.

Table 9. One-sample test with a VAT after AI.

	Test Value = 1721					
	t	df	Sig. (Two-Tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAT 2	1.514	76	0.134	2.54545	−0.8022	5.8931

The previous examinations through the experiment and statistical analysis proved that AI has a significant impact on improving VAT reporting quality in emerging markets, which, with no doubt, will hold big advantages for firms and accountants.

These results are consistent with previous studies regarding the role of AI in improving tax reporting quality at both levels in emerging markets (e.g., Saragih et al. 2022; Nurhayati et al. 2023; Zhang 2023) and advanced markets, such as the European Union (e.g., Pavlova and Knyazeva 2022; Marta and Shahrour 2024), which showed advantages of automation and AI in avoiding accounting errors and improving tax reporting quality, which are clear and not restricted to a single region.

Referring to the arguments made in previous studies about the role of AI, the results may be crucial for making it clear through an experimental approach that such arguments may refer to the lack of experience with AI abilities in accounting, which is covered in this research.

5. Conclusions

Referring to the research question "Does AI improve tax reporting quality in emerging markets?", the problem is clearly stated, and a practical solution is suggested. The methodology conducted, which is an experiment practically exploring the role of AI in tax accounting, proves that such an application may attract huge benefits. Moreover, since VAT reporting quality is one of the major practical problems among firms that requires practical solutions, the results of this research suggest that applying AI in accounting may have significant improvements in accounting and tax reporting quality.

The practical implications of these results are significant. The integration of AI tools can significantly improve tax reporting quality by helping accountants explore undiscoverable accounting errors through human efforts when they have to check large volumes of data and records and reduce costly tax errors. According to the current experiment, errors may lead to outflow resources more than they should be.

Moreover, this suggests that firms may benefit from investing in AI solutions in accounting not just to improve the quality but also to ensure higher levels of risk management through avoiding suing for false reporting, which may lead to severe regulatory challenges and heavy financial penalties.

In addition, accounting professionals and the accounting industry must be aware of such capabilities, which are highly considered among the large accounting firms, such as the Big 4, which are investing heavily in this area. Such advancement requires real efforts to adopt such advanced techs, strengthen the individual's IT skills, update the training courses to fit the new accounting era requirements, and consider the power and risks of such technologies in the accounting industry. Furthermore, accounting regulators must be aware of such capabilities when developing and updating relevant standards to encourage and help the development and adoption of such tools that may improve tax reporting quality.

The application of AI in the accounting industry may still be considered new since such applications are still in the development stage and under improvement, meaning that it is still risky to rely solely on them without robust checks. So, firms, mainly public accounting firms, must benefit from such techs but must implement the best practices and internal control systems to ensure that they minimize the occurrence of the errors since the failure of AI to improve tax reporting quality may put the firms in a challenging position that they were in before AI application.

It appears that the application of AI in accounting is still new, which requires additional extended examination regarding its real-life application rather than the general theoretical speaking. Examinations regarding other relevant factors that impact tax reporting quality include internal control systems, application costs, and individual behaviors with such applications.

Overall, the research confirms that AI tools significantly improve VAT reporting quality through their ability to discover accounting errors among the financial records, reduce errors, and improve the accuracy of tax computations, leading to better tax reporting quality. These results not only suggest practical benefits for businesses and tax authorities but also reinforce the growing importance of AI in accounting generally and tax accounting specifically.

6. Limitations and Further Research

While the findings are very important and significant, it is essential to acknowledge limitations. The experiment was conducted online, which may impact the control over the participants and could be better if conducted as a closed control laboratory experiment. Also, the experiment applied one specific type of AI tool, ChatGPT-4, even though the researchers tested for other apps' ability to be used, such as Gemini, which was found not able, but some other unknown apps can be useful.

Based on these research findings and the methodology applied, future studies could build on and expand this analysis to other forms of tax reporting or explore the effects of different AI technologies in different markets and different accounting fields.

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Appendix A

The report applied and intervened to detect accounting errors through the experiment can be found using the following link (https://chatgpt.com/share/27a5e647-9894-4674-9eab-417848f2ac96). Access date, 2 October 2024.

References

Ahmed, Imtiaz, Ayon Roy, Mashrafi Kajol, Uzma Hasan, Partha Protim Datta, and Rokonuzzaman Reza. 2023. ChatGPT vs. Bard: A comparative study. *Engineering Reports* 8: e12890. [CrossRef]

Ajayi-Nifise, Adeola Olusola, Olubusola Odeyemi, Noluthando Zamanjomane Mhlongo, Chidera Victoria Ibeh, Oluwafunmi Adijat Elufioye, and Kehinde Feranmi Awonuga. 2024. The future of accounting: Predictions on automation and AI integration. *World Journal of Advanced Research and Reviews* 21: 399–407. [CrossRef]

Al Najjar, Moustafa, Mohamed Gaber Ghanem, and Wagdi Higazi. 2024. Accounting errors that influence value added tax reporting quality: A study of accounting and regulation. *Journal of Governance & Regulation* 13: 189–97.

Alshurafat, Hashem. 2023. The Usefulness and Challenges of Chatbots for Accounting Professionals: Application on ChatGPT. Available at SSRN 4345921. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4345921 (accessed on 9 October 2024).

Al-Zaqeba, Murad Ali Ahmad, Baker Akram Falah Jarah, Nehad Ibrahim Ineizeh, Zeyad Almatarneh, and Mufleh Amin Jarrah. 2022. The effect of management accounting and blockchain technology characteristics on supply chains efficiency. *Uncertain Supply Chain Management* 10: 973–82. [CrossRef]

Bakas, I., and K. Kontoleon. 2020. Artificial Intelligence (AI) Approaches for The Assessment of Building Elements Thermal Performance Under Fire Conditions. *International Conference on Environmental Design* 1: 173–80.

BDO. 2020. Enhancing Performance Through the Development of a Best in Class Tax Control Framewor. Available online: https://www.bdo.co.za/getattachment/Services/Tax/Corporate-Tax-Consulting/Developing-An-OECD-Tax-Control-Framework/Global-Tax-Assurance-Developing-anOECD-Tax-Control-Framework.pdf.aspx?lang=en-ZA&ext=.pdf (accessed on 30 September 2023).

Bhardwaz, Saumyamani, and Jitender Kumar. 2023. An Extensive Comparative Analysis of Chatbot Technologies—ChatGPT, Google BARD and Microsoft Bing. Paper present at 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, May 4–6; pp. 673–79. [CrossRef]

Bonsón, Enrique, and Michaela Bednárová. 2019. Blockchain and its implications for accounting and auditing. *Meditari Accountancy Research* 27: 725–40. [CrossRef]

Budda, Navadeep, and Naveen Budda. 2024. A Comparative Analysis of ChatGPT-4, ChatGPT-3.5, and Bard (Gemini Pro) in Sarcasm Detection. *Journal of Student Research* 13: 1–10. [CrossRef]

Carr, Amelia, Man Zhang, Inge Klopping, and Hokey Min. 2010. RFID technology: Implications for healthcare organizations. *American Journal of Business* 25: 25–40. [CrossRef]

Chukwuani, Victoria Nnenna, and Modesta Amaka Egiyi. 2020. Automation of Accounting Processes: Impact of Artificial Intelligence. *International Journal of Research and Innovation in Social Science* 4: 444–49.

Chyzhevska, Lyudmyla, Lidiia Voloschuk, Liubov Shatskova, and Liudmyla Sokolenko. 2021. Digitalization as a vector of information systems development and accounting system modernization. *Studia Universitatis Vasile Goldiș Arad, Seria Științe Economice* 31: 18–39. [CrossRef]

Coita, Ioana Florina, Laura Camelia Filip, and Eliza-Angelika Kicska. 2021. Tax Evasion and Financial Fraud in The Current Digital Context. The Annals of The University of Oradea. *Economic Sciences* 30: 187–94.

Cooper, Lauren A., D. Kip Holderness, Jr., Trevor L. Sorensen, and David A. Wood. 2019. Robotic process automation in public accounting. *Accounting Horizons* 33: 15–35. [CrossRef]

Cooper, Maggie, and Quyen T. K. Nguyen. 2020. Multinational enterprises and corporate tax planning: A review of literature and suggestions for a future research agenda. *International Business Review* 29: 101692. [CrossRef]

Cristea, Lavinia Mihaela. 2020. Emerging IT technologies for accounting and auditing practice. *Audit Financiar* 18: 731–51. [CrossRef]

Delgado, Francisco J., Elena Fernández-Rodríguez, Roberto García-Fernández, Manuel Landajo, and Antonio Martínez-Arias. 2023. Tax avoidance and earnings management: A neural network approach for the largest European economies. *Financial Innovation* 9: 9–19. [CrossRef]

Deloitte. 2024. Automated Document Review, Innovation with Natural Language Processing. Available online: https://www2.deloitte.com/us/en/pages/about-deloitte/articles/business-innovation-automated-document-review.html (accessed on 17 July 2024).

Demirkan, Sebahattin, Irem Demirkan, and Andrew McKee. 2020. Blockchain technology in the future of business cyber security and accounting. *Journal of Management Analytics* 7: 189–208. [CrossRef]

Eulerich, Marc, Aida Sanatizadeh, Hamid Vakilzadeh, and David A. Wood. 2023. Is It All Hype? ChatGPT's Performance and Disruptive Potential in the Accounting and Auditing Industries. Available online: https://ssrn.com/abstract=4452175 (accessed on 19 September 2024).

Faccia, Alessio, and Narcisa Roxana Mosteanu. 2019. Tax Evasion Information System and Blockchain. *Journal of Information Systems & Operations Management* 13: 65–74.

Faúndez, Antonio, Rafael Mellado, and Eduardo Aldunate. 2020. Use of artificial intelligence by tax administrations: An analysis regarding taxpayers' rights in Latin American countries. *Computer Law & Security Review* 38: 1–13.

Fjord, Louise Blichfeldt, and Peter Koerver Schmidt. 2023. The Digital Transformation of Tax Systems Progress, Pitfalls, and Protection in a Danish Context. *Indiana Journal of Global Legal Studies* 30: 227–72. [CrossRef]

Gangwar, Hemlata, Hema Date, and A. D. Raoot. 2014. Review on IT adoption: Insights from recent technologies. *Journal of Enterprise Information Management* 27: 488–502. [CrossRef]

Geirhos, Robert, Jörn-Henrik Jacobsen, Claudio Michaelis, Richard Zemel, Wieland Brendel, Matthias Bethge, and Felix A. Wichmann. 2020. Shortcut learning in deep neural networks. *Nature Machine Intelligence* 2: 665–73. [CrossRef]

Gotthardt, Max, Cornelius Saramo, Minna Martikainen, and Othmar Lehner. 2020. Current state and challenges in the implementation of smart robotic process automation in accounting and auditing. *ACRN Journal of Finance and Risk Perspectives* 9: 90–102. [CrossRef]

Han, Hongdan, Radha K. Shiwakoti, Robin Jarvis, Chima Mordi, and David Botchie. 2023. Accounting and auditing with blockchain technology and artificial Intelligence: A literature review. *International Journal of Accounting Information Systems* 48: 100598. [CrossRef]

Hasan, Ahmed Rizvan. 2022. Artificial Intelligence (AI) in Accounting & Auditing: A Literature Review. *Open Journal of Business and Management* 10: 440–65.

Henk, Oliver. 2020. Internal control through the lens of institutional work: A systematic literature review. *Journal of Management Control* 31: 239–73. [CrossRef]

Heye, Alexander Michael. 2021. The Future of Auditing: An Analysis of AI Implementation in the Big Four Accounting Firms. Available online: https://scholars.unh.edu/cgi/viewcontent.cgi?article=1571&context=honors (accessed on 22 June 2024).

Huettinger, Maik, and Jonathan Andrew Boyd. 2020. Taxation of robots—What would have been the view of Smith and Marx on it? *International Journal of Social Economics* 47: 41–53. [CrossRef]

International Monetary Fund (IMF). 2017. *Selected Issues (IMF Staff Country Reports, No. 17/20)*. Lebanon: IMF. [CrossRef]

Kanaparthi, Vijaya. 2024. Exploring the Impact of Blockchain, AI, and ML on Financial Accounting Efficiency and Transformation. Available online: https://arxiv.org/abs/2401.15715 (accessed on 13 May 2024).

Khafit, Abdul, Sulastri Sulastri, and Slamet Fauzan. 2020. Technology Acceptance Model (TAM): Measurement of e-learning use by accounting students at Malang State University. *Asia Pacific Journal of Management and Education* 3: 64–72. [CrossRef]

Korinek, Anton, and Joseph Stiglitz. 2021. Artificial intelligence, globalization, and strategies for economic development. *National Bureau of Economic Research* 1: 1–41.

KPMG. 2023. KPMG Digital Gateway the Single Platform Solution That Gives You Access to the Full Suite of KPMG Tax & Legal Technologies You Use. Available online: https://kpmg.com/xx/en/home/insights/2020/04/kpmg-digital-gateway.html (accessed on 19 September 2024).

Kumar Doshi, Harisai Anil, Suresh Balasingam, and Dhamayanthi Arumugam. 2020. Artificial Intelligence as a Paradoxical Digital Disruptor in the Accounting Profession: An Empirical Study amongst Accountants. *International Journal of Psychosocial Rehabilitation* 24: 873–85. [CrossRef]

Kumari, Amita, Anita Kumari, Amita Singh, Sanjeet K. Singh, Ayesha Juhi, Anup Kumar D. Dhanvijay, Mohammed Jaffer Pinjar, and Himel Mondal. 2023. Large Language Models in Hematology Case Solving: A Comparative Study of ChatGPT-3.5, Google Bard, and Microsoft Bing. *Cureus* 15: e43861. [CrossRef]

Lazim, Che Siti Lazrina Md, Nur Diyana Ismail, and Mohd danial afiq khamar Tazilah. 2021. Application of technology acceptance model (TAM) towards online learning during COVID-19 pandemic: Accounting students' perspective. *International Journal of Business, Economics and Law* 24: 13–20.

Lee, Cheah Saw, and Farzana Parveen Tajudeen. 2020. Usage and Impact of Artificial Intelligence on Accounting: 213 Evidence from Malaysian Organisations. *Asian Journal of Business and Accounting* 13: 213–40. [CrossRef]

Makrygiannakis, Miltiadis A., Kostis Giannakopoulos, and Eleftherios G. Kaklamanos. 2024. Evidence-based potential of generative artificial intelligence large language models in orthodontics: A comparative study of ChatGPT, Google Bard, and Microsoft Bing. *European Journal of Orthodontics* 46: cjae017. [CrossRef] [PubMed]

Marta, Alin-Flavius, and Mohamad H. Shahrour. 2024. Curbing Tax Evasion in the Digital Marketplace: A Multifaceted Approach. *Review of International Comparative Management* 25: 211–28.

Mehta, Priya, Ch. Sobhan Babu, S. V. Kasi Visweswara Rao, and Sandeep Kumar. 2020. DeepCatch: Predicting return defaulters in taxation system using example-dependent cost-sensitive deep neural networks. Paper present at 2020 IEEE International Conference on Big Data Big Data, Atlanta, GA, USA, December 10–13; pp. 4412–19. Available online: https://ieeexplore.ieee.org/iel7/9377717/9377728/09377805.pdf (accessed on 13 May 2024).

Mihai, Mirela Simina, and Adriana Duţescu. 2022. How cloud accounting and integrated services based on AI can impact accounting companies? Paper present at International Conference on Business Excellence, Bucharest, Romania, March 24–26, vol. 16, pp. 849–58.

Mohammad, Suleiman Jamal, Amneh Khamees Hamad, Hela Borgi, Phung Anh Thu, Muhammad Safdar Sial, and Ali Abdallah Alhadidi. 2020. How Artificial Intelligence Changes the Future of Accounting Industry. *International Journal of Economics and Business Administration* 8: 478–88.

Muneerali, Mohammed Thottoli. 2020. Impact of accounting software among SMEs accountants in Oman. *Financial Markets, Institutions and Risks* 4: 25–33.

Nurhayati, Nurhayati, Iskandar Muda, and Sambas Ade Kusuma. 2023. Building Block in Digital Tax Administration: Literature Review. *International Journal of Social Service and Research* 3: 566–76. [CrossRef]

OECD. 2016. *Co-Operative Tax Compliance: Building Better Tax Control Frameworks*. Paris: OECD Publishing. Available online: https://read.oecd-ilibrary.org/taxation/co-operative-tax-compliance_9789264253384-en (accessed on 30 September 2023).

Osaloni, Bankole, Olusola Igbekoyi, Oluyinka Ogungbade, and James Akpan. 2022. Information Technology And Tax Evasion Practice In Nigeria. *Information Technology* 81: 51–72.

Paseková, Marie, Eva Kramná, Bohumila Svitáková, and Miroslava Dolejšová. 2019. Relationship between legislation and accounting errors from the point of view of business representatives in the Czech Republic. *Oeconomia Copernicana* 10: 193–210. [CrossRef]

Pavlova, K. S., and N. V. Knyazeva. 2022. Artificial Intelligence Technologies in Tax Consulting and Forensic Tax Expertise. *Digital Technologies in the New Socio-Economic Reality* 304: 291–300.

Prasad, Sumit, Rakesh Kumar, Shweta Pandey, Anita Gehlot, Aadidevam Dhyani, and Purnendu Shekhar Pandey. 2023. Imperative Role of Blockchain in The Taxation System. Paper present at 2023 International Conference on Computational Intelligence, Communication Technology and Networking, Ghaziabad, India, April 20–21; pp. 92–95. Available online: https://ieeexplore.ieee.org/iel7/10140171/10140201/10141416.pdf (accessed on 12 May 2024).

PwC. 2024. How PwC Is Using Generative AI to Deliver Business Value. Available online: https://www.pwc.com/us/en/tech-effect/ai-analytics/generative-ai-impact-on-business.html (accessed on 17 October 2024).

Rahayu, Siti Kurnia. 2021. Utilization of artificial intelligence in tax audit in Indonesia. *Management and Accounting Review* 20: 135–57.

Rahmi, Notika, and Damith Gangodawilage. 2022. SWOT Analysis of Indonesian Tax Administration Innovation in the Digitalization Era. *Ilomata International Journal of Tax and Accounting* 3: 22–34. [CrossRef]

Raikov, A. 2021. Decreasing tax evasion by artificial intelligence. *IFAC-PapersOnLine* 541: 172–77. [CrossRef]
Rane, Nitin, Saurabh Choudhary, and Jayesh Rane. 2024. Gemini or ChatGPT? Efficiency, Performance, and Adaptability of Cutting-Edge Generative Artificial Intelligence (AI) in Finance and Accounting. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4731283 (accessed on 16 July 2024).
Ruan, Jianfei, Zheng Yan, Bo Dong, Qinghua Zheng, and Buyue Qian. 2019. Identifying suspicious groups of affiliated-transaction-based tax evasion in big data. *Information Sciences* 477: 508–32. [CrossRef]
Salloum, Said A., Raghad Alfaisal, Rana Saeed Al-Maroof, Rima Shishakly, Mohammed Almaiah, and Romel Al-Ali. 2024. A comparative analysis between ChatGPT & Google as learning platforms: The role of mediators in the acceptance of learning platform. *International Journal of Data and Network Science* 8: 2151–62.
Saragih, Arfah Habib, Qaumy Reyhani, Milla Sepliana Setyowati, and Adang Hendrawan. 2022. The potential of an artificial intelligence AI) application for the tax administration system's modernization: The case of Indonesia. *Artificial Intelligence and Law* 1: 491–514. [CrossRef]
Sekaran, Uma, and Roger Bougie. 2016. *Research Methods for Business: A Skill Building Approach*. Hoboken: John Wiley & Sons.
Shahrour, Mohamad Hassan, and Mostafa Dekmak. 2023. Intelligent stock prediction: A neural network approach. *International Journal of Financial Engineering* 10: 2250016. [CrossRef]
Shahrour, Mohamad Hassan, Isabelle Girerd-Potin, and Ollivier Taramasco. 2022. Corporate Social Responsibility and Firm Default Risk Mitigation: The Moderating Role of the Legal Context. *Finance Contrôle Stratégie* 25: 1–30.
Shukla, Manali, Ishika Goyal, Bhavya Gupta, and Jhanvi Sharma. 2024. A Comparative Study of ChatGPT, Gemini, and Perplexity. *International Journal of Innovative Research in Computer Science & Technology* 12: 10–15.
Sinaga, Judith Gallena, Hamfri Djajadikerta, and Amelia Setiawan. 2022. Factors Affecting Corporate Governance and Its Implication on Accounting Information Quality: Indonesia Trusted Company Awardees. *International Journal of Family Business Practices* 5: 1–30. [CrossRef]
Singh, Shashi Kant, Shubham Kumar, and Pawan Singh Mehra. 2023. Chat GPT & Google bard AI: A review. Paper present at 2023 International Conference on IoT, Communication and Automation Technology (ICICAT), Gorakhpur, India, June 23–24; pp. 1–6.
Street, Daniel, and Joseph Wilck. 2023. 'Let's Have a Chat': Principles for the Effective Application of ChatGPT and Large Language Models in the Practice of Forensic Accounting. *Journal of Forensic and Investigative Accounting* 1: 1–57. [CrossRef]
Taib, Azuraidah, Yunita Awang, Shazalina Mohamed Shuhidan, Norfadzilah Rashid, and Mohd Sidki Hasan. 2022. Digitalization in Accounting: Technology Knowledge and Readiness of Future Accountants. *Universal Journal of Accounting and Finance* 10: 348–57. [CrossRef]
Tandiono, Rosaline. 2023. The Impact of Artificial Intelligence on Accounting Education: A Review of Literature. *E3S Web of Conferences* 426: 02016. [CrossRef]
Ucoglu, Derya. 2020. Current Machine Learning Applications in Accounting and Auditing. *Pressacademia* 12: 1–7. [CrossRef]
Uyar, Ali, Khalil Nimer, Cemil Kuzey, Muhammad Shahbaz, and Friedrich Schneider. 2021. Can e-government initiatives alleviate tax evasion? The moderation effect of ICT. *Technological Forecasting and Social Change* 196: 1–14. [CrossRef]
Van Hoa, Nguyen, Nguyen Thi Hanh Duyen, Vu Ngoc Huyen, Hoang Vu Quang, Nguyen Van Huong, Nguyen Thi Cam Tu, and Bui Thi Minh Nguyet. 2022. Impact of trained human resources, adoption of technology and international standards on the improvement of accounting and auditing activities. *AgBioForum* 24: 59–71.
Wibowo, Imam. 2024. Tax Management Strategy for Company Operational Effectiveness. *Atestasi: Jurnal Ilmiah Akuntansi* 7: 1–12. [CrossRef]
Widjaja, Gunawan. 2021. Understanding the Trend of Digitisation of Tax Services in Indonesia: Review of Publication Systematic. *Annals of the Romanian Society for Cell Biology* 25: 3004–12.
Xavier, Otávio Calaça, Sandrerley Ramos Pires, Thyago Carvalho Marques, and Anderson da Silva Soares. 2022. Tax evasion identification using open data and artificial intelligence. *Revista de Administração Pública* 56: 426–40. [CrossRef]
Yang, Jiaqi, Yvette Blount, and Alireza Amrollahi. 2021. Adoption of AI in the Auditing Practice: A Case Study of a Big Four Accounting Firm. Available online: https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1025&context=acis2021 (accessed on 21 June 2024).
Zhang, Jing. 2023. Optimization of the environmental protection tax system design based on artificial intelligence. *Frontiers in Environmental Science* 10: 1–12. [CrossRef]
Zhang, Yingying, Feng Xiong, Yi Xie, Xuan Fan, and Haifeng Gu. 2020. The impact of artificial intelligence and blockchain on the accounting profession. *IEEE Access* 8: 110461–77. [CrossRef]
Zhao, Joanna, and Xinruo Wang. 2024. Unleashing efficiency and insights: Exploring the potential applications and challenges of ChatGPT in accounting. *Journal of Corporate Accounting & Finance* 35: 269–76.

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An Empirical Analysis of Tax Evasion among Companies Engaged in Stablecoin Transactions

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Abstract: This research investigates the relationship between stablecoin usage and tax evasion. We present a model that includes variables related to transactions such as intensity, frequency, environment on-chain (P2P) vs. off-chain (IntraVasp), and company characteristics such as age, sector, and size. Our model was empirically tested using a logistic regression based on data from the Brazilian Federal Revenue Service (Receita Federal do Brasil (RFB)) in 2021. This novel approach aims to understand the tax behaviours associated with stablecoin use in corporate financial practices. Our results indicate that the intensity, frequency, environment of transactions (specifically IntraVasp and P2P transactions), age, sector, and size are factors significantly associated with tax evasion behaviour. However, we found no evidence to suggest that firms engaging in only P2P transactions have a higher propensity for tax evasion than those engaging only in IntraVasp transactions. Our findings reveal that younger and medium-sized companies with intensive use of stablecoin, with high stablecoin transaction frequency, engaging in IntraVasp and P2P transactions, and belonging to the service sector are more likely to evade tax. Therefore, our research provides a detailed understanding of how digital financial practices with crypto assets (blockchain-based technology) intersect with corporate tax strategies, which can offer valuable insights for regulators, industry practitioners, and policymakers.

Keywords: stablecoin; tax evasion; Vasp; CARF; digital economy; IN 1888

1. Introduction

Blockchain technology, which comprises a decentralised digital ledger that records transactions across many computers, has revolutionised digital transactions, ensuring security and transparency (Zhang et al. 2023). Within this innovative ecosystem, stablecoins, a form of crypto asset, have emerged as a significant development (Allen et al. 2022; Baur and Hoang 2021; Li et al. 2024; Pernice et al. 2019). Unlike other crypto assets, generally known for their volatility, stablecoins aim to maintain stable values by staying pegged to a reserve asset, such as the USD, gold, or other crypto assets (Allen et al. 2022; Hampl and Gyönyörová 2021; Li et al. 2024; Pernice et al. 2019; Waerzeggers et al. 2023; G.-J. Wang et al. 2020). This stability has made them an attractive transaction medium and a bridge between traditional fiat currencies and crypto assets, enhancing their utility in the digital or traditional economy (Li et al. 2024; Tarasova et al. 2020). For example, companies involved in international trade can use stablecoins or decentralised finance to facilitate cross-border payments (Chainalysis 2023; Harvey and Rabetti 2024; IMF 2020). In addition, those who operate in environments with unstable banking systems or economies with high inflation may prefer to carry out transactions in stablecoins or other crypto assets (Chainalysis 2023; IMF 2020; Waerzeggers et al. 2023). Additionally, as a store of value, stablecoins present an opportunity for investors to preserve capital within the volatile crypto markets, acting as a safe haven during periods of high fluctuation (Baur and Hoang 2021; Grobys et al. 2021; Travkina et al. 2022; G.-J. Wang et al. 2020).

While stablecoins have legitimate benefits, companies engaging with stablecoins may have specific reasons to bypass traditional financial oversight. Considering that stablecoin payments can resemble cash payments (Moura de Carvalho et al. 2022; Son et al. 2022), and cash payments are strongly associated with tax evasion since they are not traceable and facilitate the under-reporting of sales, in addition to their association with usage in illegal activities (Aurazo 2020; Immordino and Russo 2018; Madzharova 2014), stablecoin payments might similarly facilitate tax evasion. One scenario is a company receiving stablecoins in exchange for goods or services and intentionally omitting these transactions from their taxable records. In addition, the ease of transferring stablecoins across borders without the typical financial oversight or regulatory reporting requirements further complicates the ability of tax authorities to track, trace, and tax these assets effectively.

Recent studies have addressed tax evasion with crypto assets. For instance, Cong et al. (2023) utilised off-chain data (transactions executed internally on a centralised platform) to demonstrate that crypto traders harvest tax loss as an alternative to non-compliance, especially during increased IRS tax scrutiny. On the other hand, De Simone et al. (2024) found that traders evade taxes by pledging their assets on DeFi lending platforms. Furthermore, a comprehensive study by Meling et al. (2024), which merged de-anonymised trading data of crypto assets with individual tax returns, survey data, and records from tax enforcement actions from the Norwegian Tax Administration, revealed widespread tax non-compliance among crypto investors. This is notable even among those trading on exchanges that provide identifiable data to tax authorities. The study also highlighted that males and younger and urban individuals are more likely to invest in crypto assets. However, despite the prevalence of stablecoin transactions in the crypto asset market (Chainalysis 2023), no study has investigated the tax evasion behaviour of companies engaging in stablecoin transactions. This gap in research is particularly concerning regarding whether factors—such as a company's size, age, sector, or the intensity, frequency, and environment of transactions—might be associated with tax evasion behaviour. Our research addresses these gaps by empirically analysing the tax evasion behaviours of small and medium enterprises (SMEs) engaged in stablecoin transactions in Brazil during 2021, based on confidential RFB data.

To achieve this goal, we applied quantitative methodology through logistic regression. We explored six key questions to deepen our understanding of the factors associated with tax evasion behaviours in the stablecoin market. First, we investigated whether the intensity of stablecoin use is associated with a higher propensity for tax evasion. Second, we analysed if companies engaged in high-frequency stablecoin transactions are more likely to evade taxes than those with low-frequency transactions. Third, we considered whether companies engaging in on-chain transactions are more prone to tax evasion than those involved only in off-chain transactions. Fourth, we assessed the relationship between a company's age and its propensity to engage in tax evasion. Fifth, we examined if service sector companies are more likely to evade taxes than those in the commercial sector. Finally, we explored whether medium-sized companies have a higher probability of tax evasion than smaller ones. The main results reveal that younger and medium-sized companies with intensive use of stablecoin and high stablecoin transaction frequency, engaging in off-chain and on-chain transactions and belonging to the service sector, are likelier to evade taxes.

The relevance of this study stems from the increasing prominence of stablecoins in cryptocurrency transactions within Brazil (RFB 2023) and other emerging countries (Chainalysis 2023), suggesting a global trend towards their use in electronic commerce, international remittances, and as gateways into the broader crypto asset market. This rise in stablecoin utilisation underscores the need for comprehensive research to understand the tax behaviours associated with these transactions, mainly since data gaps currently prevent regulatory bodies from fully grasping the extent and nature of stablecoin usage in developing economies (Financial Stability Board—FSB 2024). Additionally, the scarcity of robust evidence regarding tax evasion within the crypto asset sector (Baer et al. 2023; Meling et al. 2024) makes this study particularly crucial. By shedding light on how stablecoins are incorporated into business practices, the findings of this study also offer valuable insights for policymakers and researchers focused on enhancing stablecoin auditing and compliance frameworks.

In addition, considering that tax-evasive practices are one of the main problems of emerging and transition economies (Pedroni et al. 2022) and that they deprive the state of billions of dollars that could be used for education, healthcare, infrastructure, or social services (Korndörfer et al. 2014), our research complements studies on tax evasion in emerging economies. For example, Clemente et al. (2021) investigated the differences observed in the rate of tax evasion between Global North and South countries, with a particular focus on Brazil, by comparing critical parameters of their tax systems. Their findings pointed to shortcomings in the tax systems of Latin American countries as creating an avenue for high tax evasion. Additionally, McGee et al. (2022), in a study about attitudes towards tax evasion of sample populations in Brazil, Russia, India, and China, identified that Brazilians show less opposition to tax evasion than Chinese and Indian respondents, albeit showing more opposition than Russians. Notably, Brazilian opposition to tax evasion has diminished over time. Therefore, our study may inspire the strategies of governments and policymakers towards preventing tax evasion schemes, which can increase public revenue.

This article is structured as follows: First, the conceptual background addresses the basic concepts of stablecoin, the environment of stablecoin transactions (on- and off-chain), the Crypto Assets Transactions Report in Brazil—IN 1888/2019, and the Crypto Asset Reporting Framework—CARF. Second, we formulate the research hypothesis. Next, the data sample, measurement of tax evasion, and empirical model are presented. Then, the results are presented and discussed. The last section presents the main conclusions, limitations, and future works.

2. Conceptual Background

2.1. Stablecoin

Stablecoins represent a significant innovation within digital currencies, building directly upon the foundational technologies of blockchain and smart contracts. Stablecoin values are pegged to more stable assets, like fiat currencies, to counteract the high volatility typically associated with cryptocurrencies. There are three main types of stablecoins: fiat-backed, crypto-backed, and algorithmic (Moura de Carvalho et al. 2022; Grobys et al. 2021; Oefele et al. 2024).

The fiat-backed stablecoins are the most common and straightforward. They are pegged to traditional fiat currencies such as the USD, EUR, or JPY, typically at a 1:1 ratio. They maintain reserves of these currencies as collateral to ensure the value remains stable (Grobys et al. 2021; Hampl and Gyönyörová 2021). Examples of fiat-backed stablecoins include USDC and Tether (USDT), which promise easy conversion between the digital token and the fiat currency it represents. Fiat-backed stablecoins offer stability and ease of use, but there are issues associated with their structure and reliance on traditional financial systems. One primary concern is their centralisation; unlike decentralised crypto assets, fiat-backed stablecoins depend on centralised entities to manage the fiat reserves that back them (Catalini et al. 2022). This centralisation introduces potential risks, including the possibility of mismanagement or fraud by the controlling entity. Another critical issue is the need for transparency and regularity in audits. Ensuring stablecoins are fully backed by fiat reserves requires transparent and frequent audits (Arner et al. 2020). Liquidity risks are also associated with fiat-backed stablecoins, particularly during market stress or financial panic. If many users attempt to redeem their stablecoins simultaneously, enough liquid assets might not be available to promptly satisfy these demands (Catalini et al. 2022). This situation can lead to delays in redemption and impact the stablecoin's ability to maintain its tie to the fiat currency. Lastly, the dependence on the traditional banking system to hold and manage fiat reserves introduces several risks, mainly those associated with the custodial bank's financial health (Galati and Capalbo 2024). This dependence can pose significant risks, suggesting a need for careful oversight, rigorous management practices, and strict regulatory compliance to maintain the advantages of fiat-backed stablecoins.

Crypto-backed stablecoins are another type where the value is secured by other cryptocurrencies rather than fiat money (Moura de Carvalho et al. 2022; Grobys et al. 2021). These stablecoins are over-collateralised to account for the volatility of the backing assets (Catalini et al. 2022); for instance, if a stablecoin is pegged to the USD but backed by Ethereum, the amount of Ethereum held as collateral will be worth more than the number of stablecoins issued. This buffer helps to absorb fluctuations in the underlying crypto's market value, ensuring the stability of the stablecoin. DAI is an example of a stablecoin backed by crypto that can be minted with sufficient collateral in other cryptocurrencies (Catalini et al. 2022).

Algorithmic stablecoins, the third category, attempt to maintain their peg through a working mechanism managed by algorithms and smart contracts without relying on traditional collateral (Briola et al. 2023; Lee et al. 2023; Morgan 2023). However, this model carries significant risks, as illustrated by the Terra Luna collapse (Briola et al. 2023; Cho 2023; Lee et al. 2023). Terra's stablecoin (UST) was meant to stay pegged to the USD algorithmically but failed, leading to a dramatic loss in value and severe market consequences.

Stablecoins emerge as a critical innovation in the digital asset space, offering a bridge between the volatility of cryptocurrencies and the stability of fiat currencies (Li et al. 2024). Whether fiat-backed, crypto-backed, or algorithm-driven, each type of stablecoin leverages the unique benefits of blockchain technology, smart contracts, and innovative economic models to provide users with stable value in the digital realm (Moura de Carvalho et al. 2022).

2.2. On- and Off-Chain Stablecoin Transaction

A simplified bifurcation was established in our scientific investigation of stablecoin transactions, classifying transactions as either on-chain or off-chain (Moura de Carvalho et al. 2022). On-chain transactions are recorded on the blockchain and involve a peer-to-peer (P2P) exchange. This encompasses decentralised transactions that can occur directly between companies or individuals or between a company or individual and decentralised finance platforms. On-chain transactions are characterised by transparency, as they are permanently recorded on a distributed ledger. However, while the transaction record itself is public, the participants' identities are often pseudonymous, providing a level of privacy and making it challenging for auditors to trace and verify the parties involved in the transactions (Moura de Carvalho et al. 2022).

Off-chain transactions, by contrast, refer to those that are conducted internally within a centralised crypto asset[1] exchange (known as a Virtual Asset Service Provider, VASP, as denominated by the Financial Action Task Force [FATF] (2021)) and not transmitted to the blockchain (AICPA 2022). In this paper, we classified these transactions as 'IntraVasp'. These IntraVasp transactions do not have the same level of transparency as on-chain transactions. Nevertheless, they are conducted under the auspices of a centralised entity that can require user identification for compliance with regulatory standards, such as Know Your Customer (KYC) and Anti-Money Laundering (AML) procedures. Thus, IntraVasp transactions, while less public, can be subject to oversight, and the participants are known to the VASP. IntraVasp transactions can provide a clearer picture of the participants involved, enabling auditors to identify and verify transaction details more easily (Moura de Carvalho et al. 2022).

Our study categorises companies based on their engagement in either or both transaction types. Companies engaging in IntraVasp and P2P transactions are considered to be utilising the full spectrum of what stablecoins can offer in terms of transactional flexibility. This dual-use approach suggests that these companies are navigating both regulated and less regulated spaces, maximising the benefits of stablecoins' versatility. It reflects a comprehensive use of digital financial systems, exploiting the advantages of both the transparency and trust offered by blockchain technology and the convenience and familiarity of traditional financial services provided by VASPs.

2.3. Crypto Assets Transactions Report in Brazil—IN 1888/2019

The data regarding company transactions with stablecoin (IntraVasp and P2P) were obtained from the RFB. Since August 2019, the RFB has accessed transaction histories from local crypto asset exchanges in Brazil to combat money laundering and tax evasion. RFB Normative Instruction N° 1888, dated to 3 May 2019, represents an important regulatory framework in Brazil by establishing guidelines for declaring transactions with crypto assets to the RFB. This regulation aims to increase transparency and fiscal control over transactions with virtual assets, such as Bitcoin, Ethereum, and stablecoin, which have gained popularity and significant economic relevance in recent years.

This regulation requires VASPs in Brazil to disclose specific transaction data, including information about the parties involved. IN 1888 details the obligation to provide monthly information by two main agents: VASPs that operate and are domiciled for tax purposes in Brazil; and individuals or legal entities resident or domiciled in the country that carry out transactions with crypto assets on exchanges abroad or directly with another party via P2P. Brazil's VASPs must report all transactions carried out IntraVasp to the RFB monthly. Individuals or legal entities must report when the volume of transactions in the month exceeds BRL 30,000.00 (thirty thousand reais[2]) carried out in VASP domiciled abroad or P2P transactions (RFB 2019).

The scope of Instruction 1888 extends to a wide range of operations with crypto assets. This expansion includes a diverse list of transactions such as purchase and sale, exchange, donation, transfer of crypto assets to and from the exchange, temporary assignment (rent), dation in payment, issuance, and other operations involving transferring crypto assets (RFB 2019). This specification aims to cover all possible forms of financial movements that can occur in the crypto asset ecosystem. The mention of 'other operations that involve the transfer of crypto assets' serves as an open clause, allowing the RFB to maintain the relevant regulations even in the face of the emergence of new types of transactions. This flexibility is crucial in a rapidly evolving environment, such as crypto assets, where new operations and uses for crypto assets are constantly being developed. For each transaction, the RFB is informed of the following details: type of transaction, identification of the parties involved, types of crypto assets involved, number of units transacted per type of crypto asset, and value of the transaction in BRL.

For comparison purposes, the scope of information in IN 1888 is similar to that of the definitions in the Crypto Asset Reporting Framework (CARF). The CARF is a model of rules developed and approved by the OECD (2022) for collecting information on crypto assets transacted through intermediaries intending to automatically exchange this information between jurisdictions. We identified similarities between the Brazilian (IN 1888) and the CARF models: the definitions of the crypto asset are aligned; concerning transactions, both scopes cover purchase and sale transactions, exchange, donation, transfer of crypto assets to the exchange, withdrawal of crypto assets from the exchange, dation in payment, and other operations that imply transfers of crypto assets. However, there are differences between the Brazilian and CARF models. One difference between the models is the granularity of the information provided. IN1888 adopts the transaction-by-transaction approach. In CARF, the information is provided in aggregate form by type of crypto asset for each user. Another difference is that only IntraVasp information is provided in the CARF. In the Brazilian model, if there is no intermediary, the information must be provided by the user of the crypto asset domiciled or residing in the country, thus reaching the so-called P2P transactions.

Therefore, Brazil's Normative Instruction 1888/2019 established a regulatory framework for overseeing crypto asset transactions within the country, predating similar global initiatives such as the OECD's CARF[3]. Despite these differences, with some adaptations, researchers or regulators can use data from tax administrations in countries that join CARF to reproduce and compare the results obtained in our research.

3. Hypothesis Development

Tax evasion is an individual's illegal and deliberate act to reduce tax obligations (Alm 2012). This can involve under-reporting income, profits, and gains, overstating deductions, failing to file tax returns, concealing assets, engaging in fraudulent transfers, or using complex offshore structures to hide taxable income. According to Economic Deterrence Theory, individuals and organisations make rational decisions based on a cost–benefit analysis, weighing the potential benefits of evading taxes, such as increased profits and cash flow, against the costs, which include the probability of being detected, the severity of penalties, and the legal and reputational risks (Allingham and Sandmo 1972). In the digital economy, the obscurity of transactions involving stablecoins or other crypto assets may reduce perceived detection risks, potentially encouraging evasion. Meling et al. (2024) found that 80% of the investors trading on domestic crypto exchanges fail to declare their cryptos, even though these exchanges share identifiable trading data with the Norwegian Tax Administration. However, in line with the Economic Deterrence Theory and building on the premise that tax-loss harvesting using crypto assets also indicates tax reporting compliance, Cong et al. (2023) found improvements in tax compliance for crypto assets due to enhanced IRS enforcement.

To develop effective strategies to mitigate tax evasion and increase compliance and risk perception, the tax administration must understand the behaviour of taxpayers engaging in transactions with stablecoins or other crypto assets. In this sense, based on empirical analysis of RFB data, we formulated hypotheses, described below, to verify whether the intensity, frequency, and environment of stablecoin transactions, together with company characteristics, such as size, age, and sector, can be significantly associated with evasive tax behaviour. The proposed hypotheses aim to systematically explore these relationships, providing a comprehensive view of the factors influencing potential tax evasion in the context of stablecoin usage.

3.1. Intensity

The hypothesis related to the intensity of stablecoin use offers a nuanced understanding of how the depth of engagement with stablecoin can influence corporate tax behaviours. The ratio between stablecoin purchases and sells and bank deposits indicates the intensity of stablecoin use by companies. Supposing that a significant portion of a company's financial transactions are directed towards acquiring stablecoin, it is reasonable to infer that it is used for commercial transactions, such as paying suppliers. The same reason may indicate that companies receive stablecoin payment for their products or services. In this case, 'buying' stablecoin would be equivalent to receiving it in exchange for goods or services. Intensive use of stablecoins could facilitate financial transactions that still need to be fully captured in traditional banking or reporting systems, potentially leading to tax evasion due to under-reported revenues or taxes. The relationship between the intensity of stablecoin use and the propensity to evade taxes is based on the premise that stablecoins offer a digital, borderless, and potentially less regulated medium of exchange.

Any other traceable payment method makes evasion more complicated (Immordino and Russo 2018). Adhikari et al. (2021), using the information available on Form 1099-K, various tax returns, and IRS information reports, developed an index of the intensity of payment card use equal to the ratio of receipts via card credit and total receipts. The authors' research hypothesis was that in locations where the use of payment cards by consumers is high, companies receive a greater part of their revenue through payment cards and, therefore, have a greater part of their revenue reported to the IRS through Form 1099-K. Hence, companies that use credit cards more intensively are less prone to tax evasion.

Based on these assumptions, this study intended to test hypothesis 1:

H1. *The intensity of stablecoin use is associated with the propensity for companies to engage in tax evasion behaviours.*

3.2. Frequency

Expanding on the frequency of stablecoin transactions offers an opportunity to explore how the regularity of engagements with digital currencies impacts corporate tax behaviour. This dimension can reveal insights into operational practices and their potential alignment with tax evasion strategies. The rationale behind this hypothesis is that frequent transactions may reflect higher volumes of crypto activity and suggest a more systemic integration of stablecoins into the company's financial practices, potentially facilitating tax evasion strategies through complexity and transaction volume. Conversely, less frequent (low-frequency) transactions might be sporadic or opportunistic and do not align with attempts to minimise tax liabilities in less transparent ways. To investigate this economic phenomenon, we hypothesised:

H2. *Companies engaged in high-frequency stablecoin transactions are likelier to evade taxes than those with low-frequency stablecoin transactions.*

3.3. IntraVasp (Off-Chain) and P2P (On-Chain) Stablecoin Transactions

The environment in which stablecoin transactions occur (whether within a VASP, P2P, or a combination of both) can significantly influence the probability of companies engaging in tax evasion. IntraVasp transactions balance convenience and compliance, while P2P transactions could be preferred for their directness and potential for anonymity (Moura de Carvalho et al. 2022). Engaging in both might indicate a sophisticated approach to leveraging the strengths of each for operational or strategic benefits, including tax considerations. Therefore, the probability of evading tax can vary significantly across different transaction modes. Companies engaging exclusively in P2P transactions show the highest propensity towards tax evasion, followed by those engaged in IntraVasp and P2P transactions and those operating solely within crypto asset exchanges (IntraVasp). As such, we formulated two hypotheses to test whether the mode of stablecoin transactions affects the probability of tax evasion:

H3a. *Companies engaging in IntraVasp and P2P transactions have a higher propensity to evade tax than those engaging only in IntraVasp transactions.*

H3b. *Companies engaging in P2P transactions have a higher propensity to evade tax than those engaging only in IntraVasp transactions.*

This hypothesis stems from the assumption that the degree of regulatory oversight decreases from IntraVasp to P2P transactions (FATF 2021), thereby increasing the ease with which companies can evade taxes. These hypotheses aim to illuminate the complex dynamics between stablecoin transactions and corporate tax behaviour, contributing to the growing literature on digital currencies and fiscal governance.

3.4. Company Age

Per Parisi and Federici (2023), in a study on tax aggressiveness, it is challenging to anticipate the correlation between the age of a company and its tax behaviour. As companies age, they typically establish more robust internal controls, gain experience navigating regulatory environments, and face greater stakeholder scrutiny, which may lead to more accurate and transparent financial reporting. Moreover, older companies might prioritise maintaining their reputation and minimising legal risks, which could reduce the likelihood of under-reporting tax revenue. However, these firms may also be more skilled at hiding their financial reporting (Parisi and Federici 2023). Regarding the tax evasion literature, Pedroni et al. (2022) and Wang (2012) found that evasive corporate behaviour through sales under-reporting is negatively linked with company age. Thus, we propose the following hypothesis:

H4. *The company's age is associated with the propensity for companies to engage in tax evasion behaviours.*

3.5. Sector

The service sector often involves intangible goods, knowledge-based services, and non-standardised pricing mechanisms, which may provide more opportunities for financial opacity or discretion in reporting revenues and taxes. In contrast, the commercial sector, characterised by tangible goods and inventory, might need more flexibility. According to Abdixhiku et al. (2017), the service industry tends to be more tax evasive than wholesale and retail companies. Pedroni et al. (2022)'s findings show that service companies are more likely to under-report their sales than commercial companies. The nature of the two sectors justifies the hypothesis that companies in the service sector have a higher incidence of tax evasion compared to those in the commercial sector:

H5. *Companies in the service sector are likelier to evade taxes than those in the commercial sector.*

3.6. Size

The literature addresses the relationship between company size and tax evasion. Two studies by Ngah et al. (2020) and Mohamad et al. (2016) found that company size significantly impacts positive tax evasion practices. However, Azrina Mohd Yusof et al. (2014) research found the opposite; they discovered a negative relationship between company size and tax non-compliance of SMEs. As SMEs become larger, they become more compliant. Additionally, Pedroni et al. (2022) research revealed that the size factor is negatively associated with revenue under-reporting, especially when measured by annual sales. However, we point out that in our study, the variable that represents the size of the company is the total bank deposits, as described in the methodology section. Thus, based on the literature, we formulated the following hypothesis:

H6. *Medium companies are likelier to evade tax than small companies.*

4. Methodology

4.1. Sample and Data

RFB has been collecting information on tax transactions involving crypto assets since August 2019. According to data from August 2019 to January 2023 (shown in Figure 1), the volume of transactions carried out by firms and individuals involving crypto assets peaked at around USD 5 billion monthly in May 2021, considering the average dollar exchange rate of USD 1/BRL 5 (Brazilian real). This study considered stablecoins such as Tether (USDT), USD Coin (USDC), Binance USD (BUSD), Gemini Dollar (GUSD), TrueUSD (TUSD), and DAI, which have gained immense popularity and account for approximately 90% of all crypto transactions in Brazil as of December 2022.

According to data from the RFB, in 2021, 26,393 companies in Brazil carried out transactions with stablecoin. We selected only domestic SMEs from the commercial and service sectors with bank deposits ranging from USD 100,000 to USD 20,000,000. Additionally, all companies in the sample were operationally active in 2023 and did not include any VASP companies. This resulted in a sample of 1858 companies.

The choice of 2021 and 2021 only is because the data were collected in April 2023. On that date, there was no complete information on bank deposits for the year 2022. By law, banks in Brazil must report the volume of deposits and withdrawals from their customers' current accounts in the year following the year in which the banking transactions occurred. In addition, the selection criteria for our study include companies with substantive economic activities and bank deposits ranging between USD 100,000 and USD 20,000,000.

This range ensures that the sample includes only companies that are not too small to be negligible nor so large that they are outliers. The study also recognises the commerce and service sectors where stablecoin use is more relevant.

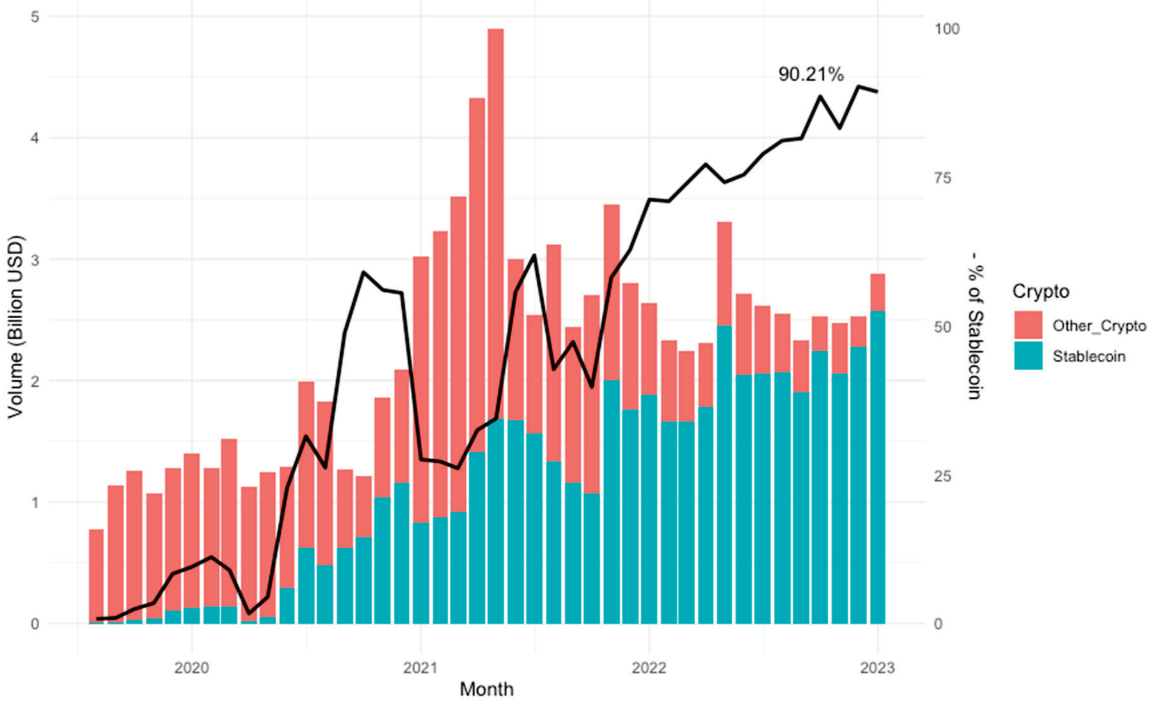

Figure 1. Monthly volume of crypto assets transactions. Source: RFB[4].

4.2. Measuring Tax Evasion

Collecting sufficient and trustworthy data is a primary challenge in researching and finding solutions to evasion behaviour and related questions. Obtaining concrete, dependable, and easily observable data on evasion behaviour is difficult (Alm 2012; Korndörfer et al. 2014; Lietz 2013). Scientific research to estimate the prevalence and extent of tax evasion has used various measurement methods (Alm 2012; Korndörfer et al. 2014). Several research studies employ data from surveys by the World Bank. The questionnaire in this survey provides indirect reasonable measures of tax evasion (Abdixhiku et al. 2017; Alm et al. 2019; Pedroni et al. 2022). This measurement is derived from a single survey question: 'Recognising the difficulties many enterprises face in fully complying with taxes and regulations, what percentage of total sales would you estimate the typical establishment in your area of activity reports for tax purposes?'. This approach is intended to be a reliable replacement as respondents often hesitate to disclose their compliance. The answer given by the respondents is believed to be influenced by their personal experiences and is, therefore, regarded as a reasonable representation of their conduct (Abdixhiku et al. 2017; Alm et al. 2019; Pedroni et al. 2022).

The most accurate source of information is obtained through direct measurement of evasion, which involves actual audits of individual returns (Alm 2012). For example, Mohamad et al. (2016) examined factors influencing tax evasion in SMEs. The dependent variable was the total amount of tax evasion obtained from Inland Revenue Board of Malaysia (IRBM) data. Using data from the IRBM, Ngah et al. (2020) measured the total amount of tax evasion activities through fraudulent financial reporting practices uncovered during tax audits. DeBacker et al. (2015) used confidential Internal Revenue Service (IRS) audit data in another study. They measured a firm's tax evasion using the ratio of IRS-determined tax deficiency over total income. The IRS-determined tax deficiency is the amount of positive adjustment to the firm's tax liability following the audit. However, the authors argued that the tax adjustment used in this study is not strictly tax evasion but instead the best measure for tax evasion.

Our method, in line with studies like those of DeBacker et al. (2015), Mohamad et al. (2016), and Ngah et al. (2020), utilises objective data from tax records, contrasting them with the subjective estimates of self-reported surveys. We measured tax evasion by directly examining tax declarations to authorities, specifically identifying companies that reported zero tax revenue in the sample year. A binary classification, where '1' indicates revenue was declared and '0' indicates none was declared, provides a clear and quantifiable metric of tax evasion derived from actual tax authority interactions, thereby offering a more accurate reflection of real-world tax behaviour than indirect methods. This measure is consistent with the fact that it is unlikely that a company's main activities, including those involving stablecoins, do not generate any reportable revenue. This approach was integrated into our logistic regression model to study tax evasion effectively.

4.3. Empirical Model

We applied a logistic regression model, which is suitable for predicting the probability of a binary categorical dependent variable (EVASION) based on the values of the independent variables. This model is considered as follows:

$$\ln\left(\frac{P_{EVASION_i}}{1-P_{EVASION_i}}\right) = \beta_0 + \beta_1 \mathrm{INTENSITY_i} + \beta_2 \mathrm{FREQUENCY(High)_i} + \beta_3 \mathrm{ON\_OFFCHAIN(P2P)_i} + \beta_4 \mathrm{ON\_OFFCHAIN(IntraVasp\_P2P)_i} + \beta_5 \mathrm{AGE_i} + \beta_6 \mathrm{SECTOR(Service)_i} + \beta_7 \mathrm{SIZE(Medium)_i} + \varepsilon_i$$

where i represents each company; β_j represents the coefficients; ε_i is the error term.

The logistic regression model presented is designed to analyse the binary outcome of tax evasion (EVASION) among companies engaging in stablecoin transactions. The model incorporates a mix of continuous and categorical variables, offering a nuanced view of how various factors may influence the chance of a company to evade taxes.

Specifically, as described in Table 1, it includes INTENSITY (the natural logarithm of the ratio of stablecoin transactions to bank deposits), FREQUENCY (the number of stablecoin transactions), ON_OFFCHAIN (the mode of stablecoin transactions, whether within a virtual asset service provider, peer-to-peer, or both), AGE (the natural logarithm of the company's age), SECTOR (the economic sector of operation, service or commercial), and SIZE (the size of the company, small or medium, based on bank deposit volume).

Table 1. Variable descriptions.

Variable	Description
EVASION	A dependent categorical variable representing companies that declared zero tax revenue to the tax administration in the sample year, 'YES', otherwise, 'NO'.
INTENSITY	A continuous variable representing the natural logarithm of the ratio between the purchase and sale volume of stablecoin and the volume of bank deposits.
FREQUENCY	A categorical variable representing two levels of quantity stablecoin transactions. Companies performing above 15 transactions are categorised as 'High' and those not meeting this threshold are categorised as 'Low'.
ON_OFFCHAIN	A categorical variable representing three categories: 'IntraVasp', for companies that only carried out transactions with stablecoin through a VASP; 'P2P', for companies that only transacted directly with another counterparty without VASP intermediation; and 'IntraVaspandP2P', for companies that carried out transactions either through a VASP or directly with another counterparty (P2P).
AGE	A continuous variable that represents the company's natural logarithm of age.
SECTOR	A categorical variable representing the economic sector to which the company belongs based on its main activity: 'Service' or 'Commercial'.
SIZE	A categorical variable representing the company's size: 'Small' or 'Medium'. Due to the lack of accounting information, we performed categorisation based on the volume of bank deposits: a 'Small' company was below BRL 10 million (~USD 2 million); a 'Medium' company was above this value until BRL 100 million (~USD 20 million).

5. Results Analysis

5.1. Descriptive Statistics of Variables

This section presents the descriptive statistics of the variables considered in the empirical models. Descriptive statistics offer a quantitative summary of the variables for a sample. Table 2 summarises descriptive statistics of the continuous variables used in the logistic regression, such as the minimum–maximum values, median, mean, standard deviation (SD), and interquartile range. Table 2 also shows the frequency and percentage of dummy variables.

Table 2. Descriptive statistics of the variables.

Variable		Mean	SD	Median (IQR)	Min–Max
Continuous variables:					
INTENSITY		−2.44	1.447	−2.55 (−3.325 to −1.71)	−7.03–6.84
AGE		1.51	0.871	1.39 (0.693 to 2.08)	0.00–3.91
Dummy variables:	**Level**	**Counts**	**% of Total**		
EVASION	No	1081	58.2 %		
	Yes	777	41.8 %		
FREQUENCY	High	907	48.8 %		
	Low	951	51.2 %		
ON_OFFCHAIN	IntraVasp	442	23.8 %		
	P2P	387	20.8 %		
	IntraVaspandP2P	1029	55.4 %		
SECTOR	Commercial	1224	65.9 %		
	Service	634	34.1 %		
SIZE	Medium	802	43.2 %		
	Small	1056	56.8 %		

SD: standard deviation; Max: maximum value; Min: minimum value; IQR: interquartile range; Q1: first quartile (25th percentile); Q3: third quartile (75th percentile).

Regarding the dependent variable EVASION, within the scope of this sample, from the 1858 observations, over 41% of companies declared zero tax revenue. This expressive proportion suggests a potentially high tax evasion rate within the sample.

Concerning the independent variables, this descriptive analysis shows that INTENSITY presents a range of values with significant variability, from −7.03 to 6.84, with a mean value of around −2.44 and a standard deviation of 1.447. These values reveal the significant variability concerning the intensive use of stablecoin in the sample. The mean (−2.44) of INTENSITY is negative, demonstrating that, on average, the volume of stablecoin transactions relative to bank deposits is less than 1 on a logarithmic scale. The median (−2.55) being close to the mean demonstrates a symmetrical distribution, and the negative IQR (−3.325 to −1.71) shows that most companies operate with lower transaction volumes using stablecoin than their volumes of bank deposits. The wide range (−7.03 to 6.84) confirms that there are outliers with very high or very low stablecoin activity relative to bank deposits.

Regarding FREQUENCY, the distribution of stablecoin transactions is almost equal between the high and low frequencies. However, low-frequency transactions make up a slight majority (51.2%).

In the context of ON_OFFCHAIN, more than half of the companies (55.4%) engage in IntraVasp and P2P transactions, indicating a preference for diversified transaction methods. Those exclusively using IntraVasp or P2P are significantly fewer, suggesting a tendency towards mixed transactional behaviour.

Concerning AGE, the range from 0 (newly established companies) to 3.91 log years indicates various company ages. The variable has a mean slightly above 1.5 log-years, indicating that the average company in the sample is relatively young, as it is the logarithm of age in years. The distribution is positively skewed since the mean is greater than the median (1.39), suggesting that some relatively older companies are in the sample.

Regarding the variable SECTOR, most companies (65.9%) operate in the commercial sector. This may be due to the sector's significant size within the overall economy or a greater inclination of commercial companies to use stablecoins.

Regarding SIZE, more than half of the companies (56.8%) are classified as small based on bank deposits. This indicates that the sample is skewed towards smaller enterprises.

5.2. Model Results Presentation and Discussion

5.2.1. Model Validation

This section presents the results of the statistical tests for the Generalized Linear Model (GLM) logistic regression to validate the model's estimates and aspects related to the model's efficiency and multicollinearity. In this sense, Table 3 presents the results of the statistical tests carried out for the model.

Table 3. Generalised linear model (binomial distribution and logit link).

Independent Variables	OR	CI 95%	*p*-Value	VIF
Intercept	0.872	0.599; 1.270	0.476	
INTENSITY	1.115	1.027; 1.210	0.009	1.18
AGE	0.544	0.481; 0.615	<0.001	1.03
FREQUENCY:				1.15
High—Low	1.242	0.988; 1.561	0.064	
ON_OFFCHAIN:				1.03
P2P—IntraVasp	1.253	0.918; 1.709	0.155	
IntraVaspandP2P— IntraVasp	1.661	1.289; 2.139	<0.001	
SECTOR:				1.04
Service—Commercial	1.510	1.218; 1.873	<0.001	
SIZE:				1.09
Medium—Small	2.349	1.890; 2.920	<0.001	
Pseudo $R^2_{Nagelkerke}$ = 0.182				
$\chi^2(7) = 269$, $p < 0.001$				

Note. Estimates represent the log odds of 'Evasion = Yes' vs. 'Evasion = No'; OR: odds ratio; CI: confidence interval. In all inferences, a significance level of 5% was considered.

The model as a whole is statistically significant ($\chi^2(7) = 269$, $p < 0.001$). The model's Chi-squared value is highly significant, indicating that the set of predictors together are useful in distinguishing between companies that do and do not evade tax. The Nagelkerke's Pseudo R-squared value of 0.182, while not particularly high, is typical for logistic regression models in social sciences and suggests that the model explains a modest but meaningful proportion of the variance in tax evasion.

Another perspective on analysis is the absence of multicollinearity. It was checked by calculating the Variance Inflation Factor (VIF). Table 3 summarises the VIF for all independent variables in this study, indicating no multicollinearity between the variables for this model.

Thus, considering the joint analysis of the statistical tests performed, including the VIF check, the Chi-squared value, and the Pseudo R-squared, the results suggest that this model explains the dependent variable for this GLM logistic regression in the context of these sample data. However, the model does not necessarily imply causation, instead revealing patterns that could warrant further investigation by policymakers and economists.

5.2.2. Empirical Model Results and Discussions

This section seeks to answer the research hypotheses based on the estimation results of the GLM models. The objective was to evaluate the relationship between the binary dependent variable EVASION and the independent variables related to the companies' characteristics that used stablecoin in 2021. The predictors in the model provide insight into how different attributes of companies correlate with their likelihood of tax evasion. In reporting the logistic regression analysis findings according to Table 3, we interpreted the significance of each variable to address the stated hypotheses as follows.

The companies' engagement in stablecoin transactions relative to their bank deposits, measured by INTENSITY, has a statistically significant positive association with the odds of tax evasion. With each log-unit increase in INTENSITY, the odds of a company evading taxes (declaring zero tax revenue) increase by 11.5% (p = 0.009). Given that the p-value is below 0.05, we are confident that this result is not due to random chance. Hypothesis H1 posits that a significant positive relationship exists between the intensity of stablecoin transactions (INTENSITY) and the likelihood of a company engaging in tax evasion. The results from the regression analysis support this hypothesis. Thus, Hypothesis H1 is accepted. This relationship suggests that as companies integrate stablecoin transactions more intensively into their financial activities, the complexity and opacity of these transactions may provide greater opportunities or incentives to minimise tax liabilities through evasion. The positive relationship with tax evasion could be explained by the anonymity and lesser regulatory oversight often associated with crypto assets, which may facilitate tax evasion behaviours. Economically, companies with higher stablecoin transactions might seek to minimise transaction costs or bypass certain financial restrictions, which could correlate with a propensity to under-report revenues.

Concerning the FREQUENCY factor, companies with a high number of transactions have 24.2% higher odds of evading tax than those with a low number of transactions. However, this result is only marginally significant (p = 0.064). This finding leads us to reject H2. High-frequency stablecoin transactions may indicate greater risk appetite or a more assertive approach to financial management, which could align with a higher willingness to engage in tax evasion.

The ON_OFFCHAIN variable represents the transaction methods used by companies, with three possible categories. For Hypothesis H3a, the results indicate that companies engaging in both off-chain (IntraVasp) and on-chain (P2P) transactions (IntraVaspandP2P) are significantly more likely to evade tax, with an odds ratio of 1.661 and a p-value of less than 0.001. This finding leads us to accept H3a. The significant positive relationship here might be explained by the increased complexity and reduced traceability when companies engage in centralised and decentralised financial transactions. Companies using VASPs and P2P might have more opportunities to obscure financial transactions, potentially facilitating tax evasion.

However, the results do not support Hypothesis H3b, which suggests that companies transacting exclusively P2P transactions have a higher propensity for tax evasion than those who engage exclusively in IntraVasp transactions. The odds ratio for P2P compared to IntraVasp was 1.253 with a p-value of 0.155, indicating no statistically significant difference. Thus, H3b is rejected. The lack of significance could be due to a smaller sample size or less pronounced effects. Although not significant, the positive direction of the relationship suggests that P2P transactions, known for their decentralisation and potential anonymity, might theoretically be associated with tax evasion.

Hypothesis H4 suggests an association between company age (AGE) and the propensity to engage in tax evasion. The results confirm this relationship. As a company's age increases, the odds of evading tax decrease substantially (about 45.6% for each unit increase in the logarithm of age), suggesting that older companies are less likely to evade taxes. This is statistically significant ($p < 0.001$). Therefore, Hypothesis H4 is accepted. These results corroborate those of Pedroni et al. (2022) and Wang (2012). Pedroni et al. (2022) and Wang (2012) found that companies that under-report sales (commit tax evasion) have a negative correlation with company age. Older companies may have more established financial processes and greater scrutiny from tax authorities, leading to a negative association with tax evasion. They may also have a reputation to maintain, which tax evasion allegations could severely damage.

Hypothesis H5 states that service sector companies have a higher incidence of tax evasion than those in the commercial sector. The regression results show a significant difference between the sectors, with service companies having a 51% increase in the odds of tax evasion with a *p*-value of less than 0.001. This supports the alternative hypothesis; therefore, H5 is accepted. These results corroborate Abdixhiku et al. (2017) and Pedroni et al. (2022). Abdixhiku et al. (2017) found that firms operating in business services are more evasive than wholesale and retail firms. Pedroni et al. (2022) also found that service companies have a greater propensity to under-report sales (a type of tax evasion) than commercial companies. Service sectors may have a higher tendency for tax evasion due to the nature of their transactions, which are often less tangible than commercial sectors dealing in physical goods. The invisibility of services can make revenues harder to track. Economically, the service sector often has more flexibility in accounting for income and expenses, which could be exploited for tax benefits.

Finally, Hypothesis H6 addresses the relationship between company size and tax evasion, suggesting that medium-sized companies would be more likely to evade tax than small companies. The odds ratio for SIZE (Medium vs. Small) was 2.349, with a *p*-value of less than 0.001, which strongly indicates that medium-sized companies are more likely to engage in tax evasion than small companies. Hence, H6 is accepted. The statistical significance indicates a robust size effect, with larger companies in the defined categories more prone to tax evasion. These results corroborate those of Ngah et al. (2020) and Mohamad et al. (2016) but are contrary to those of Azrina Mohd Yusof et al. (2014), Pedroni et al. (2022), and DeBacker et al. (2015). Ngah et al. (2020) also found that company size has a statistically significant positive relationship with tax evasion practices detected during tax audits. Similarly, Mohamad et al. (2016) found that SME taxpayers are more likely to become non-compliant with their tax obligations as their businesses expand. Oppositely, Azrina Mohd Yusof et al. (2014) found an adverse relationship between company size and SME tax non-compliance; as SME size grows, the SMEs become more compliant. In addition, Pedroni et al. (2022) found that the size factor is negatively associated with revenue under-reporting. Based on data from the IRS, DeBacker et al. (2015) found that corporations owned by individuals from countries with higher corruption norms tend to avoid more taxes in the United States. This trend is particularly noticeable among small corporations and becomes less significant as the corporation's size increases.

6. Conclusions

We examined the relationship between the use of stablecoins and tax evasion behaviour among companies based on Brazilian Federal Revenue data through a logistic regression model that predicts tax evasion, considering various operational characteristics such as transaction intensity, frequency, environment (on-chain and off-chain), company age, sector, and size. The results suggest that INTENSITY, AGE, ON_OFFCHAIN (specifically IntraVaspandP2P), SECTOR, and SIZE are all significant predictors of tax evasion, as defined in this context. However, the regression analysis provided no support for the hypothesis that firms engaging in only P2P transactions have a higher propensity to evade tax than those engaging only in IntraVasp transactions; this hypothesis was rejected due to a lack of significant findings. In summary, the analysis of the results revealed that younger and medium-sized companies with higher stablecoin transaction intensity that engage in IntraVasp and P2P transactions and belong to the service sector are likelier to evade taxes.

The main limitation of this study is the sample selection criteria. The selection of companies that have used stablecoins and have bank deposits ranging between USD 100,000 and USD 20 million ensures a focus on entities with substantive economic activities and financial transactions. Considering this range as criteria for selection, the sample includes companies that are neither too small to be negligible nor so large that they are outliers. However, this excludes the extremes of the economic spectrum—microenterprises and large corporations—which could have distinct approaches to tax compliance and evasion. Furthermore, by including companies from the commerce and service sectors, this study recognises the sectors where stablecoin use is potentially more relevant. While this provides insight into the tax behaviours of companies in these sectors, it might also skew the findings towards sector-specific practices and norms, which might not apply to industries like manufacturing or agriculture. The sample, therefore, might miss out on evasion patterns unique to these excluded groups.

Further investigation and future research could examine the qualitative aspects of why companies with different transaction frequencies might exhibit varying tax behaviours, including the role of internal controls, the impact of regulatory awareness, and the influence of corporate culture on compliance attitudes. We intend to expand the sample from 2019 (the beginning of the collecting information about stablecoin transactions in Brazil) until 2023 and include other variables so that the analysis of the results may correspond as closely as possible to reality regarding the relationship between the use of stablecoin and tax evasion. Additionally, advanced machine learning techniques could be employed to identify and predict tax evasion propensity.

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Notes

1. To simplify our research, we use the same nomenclature for virtual and crypto assets despite differences.
2. ~USD 6000.
3. Similarly, the Internal Revenue Service (IRS) has published final regulations on gross proceeds and basis reporting requirements for brokers, specifically addressing digital asset transactions. Brokers must report gross proceeds from sales of digital assets for transactions occurring on or after 1 January 2025. Optional reporting rules exist for qualifying stablecoins, allowing aggregate proceeds reporting instead of transaction-by-transaction reporting. Source: https://www.irs.gov/newsroom/final-regulations-and-related-irs-guidance-for-reporting-by-brokers-on-sales-and-exchanges-of-digital-assets (accessed on 10 July 2024).
4. Available online: https://www.gov.br/receitafederal/pt-br/assuntos/orientacao-tributaria/declaracoes-e-demonstrativos/criptoativos/arquivos/criptoativos_dados_abertos_25092023.xls (accessed on 10 November 2023)

References

Abdixhiku, Lulzim, Besnik Krasniqi, Gjergj Pugh, and Ilir Hashi. 2017. Firm-level determinants of tax evasion in transition economies. *Economic Systems* 41: 354–66. [CrossRef]

Adhikari, Binay, James Alm, and Timothy F. Harris. 2021. Small business tax compliance under third-party reporting. *Journal of Public Economics* 203: 104514. [CrossRef]

AICPA. 2022. Accounting For and Auditing of Digital Assets. Available online: https://www.aicpa.org/resources/download/accounting-for-and-auditing-of-digital-assets-practice-aid-pdf (accessed on 20 June 2024).

Allen, Franklin, Xian Gu, and Jingyi Jagtiani. 2022. Fintech, Cryptocurrencies, and CBDC: Financial Structural Transformation in China. *Journal of International Money and Finance* 124: 102625. [CrossRef]

Allingham, Michael G., and Agnar Sandmo. 1972. Income tax evasion: A theoretical analysis. *Journal of Public Economics* 1: 323–38. [CrossRef]

Alm, James. 2012. Measuring, explaining, and controlling tax evasion: Lessons from theory, experiments, and field studies. *International Tax and Public Finance* 19: 54–77. [CrossRef]

Alm, James, Yongzheng Liu, and Kevin Zhang. 2019. Financial constraints and firm tax evasion. *International Tax and Public Finance* 26: 71–102. [CrossRef]

Arner, Douglas W., Raphael Auer, and Jon Frost. 2020. Stablecoins: Risks, Potential and Regulation. Available online: https://www.bis.org/publ/work905.pdf (accessed on 29 April 2024).

Aurazo, José. 2020. Merchant internalization and tax evasion. *Research in Economics* 74: 273–76. [CrossRef]

Azrina Mohd Yusof, Nurul, Lee Ming Ling, and Yap Bee Wah. 2014. Tax non-compliance among SMCs in Malaysia: Tax audit evidence. *Journal of Applied Accounting Research* 15: 215–34. [CrossRef]

Baer, Katherine, Ruud De Mooij, Shafik Hebous, and Michael Keen. 2023. Taxing cryptocurrencies. *Oxford Review of Economic Policy* 39: 478–97. [CrossRef]

Baur, Dirk G., and Le Thai Hoang. 2021. A crypto safe haven against Bitcoin. *Finance Research Letters* 38: 101431. [CrossRef]

Briola, Andrea, Daniel Vidal-Tomás, Yang Wang, and Tiziana Aste. 2023. Anatomy of a Stablecoin's failure: The Terra-Luna case. *Finance Research Letters* 51: 103358. [CrossRef]

Catalini, Christian, Alonso de Gortari, and Nihar Shah. 2022. Some Simple Economics of Stablecoins. *Annual Review of Financial Economics* 14: 117–35. [CrossRef]

Chainalysis. 2023. The 2023 Geography of Cryptocurrency Report: Everything You Need to Know about Regional Trends in Crypto Adoption. Available online: https://www.chainalysis.com/wp-content/uploads/2024/06/the-2023-geography-of-cryptocurrency-report-release.pdf (accessed on 30 April 2024).

Cho, Jaewoo. 2023. A Token Economics Explanation for the De-Pegging of the Algorithmic Stablecoin: Analysis of the Case of Terra. *Ledger* 8: 27–36. [CrossRef]

Clemente, Felippe, Viviani Silva Lírio, and Temidayo James Aransiola. 2021. Brazilian evidence on tax evasion and enforcement: A case study of Global North–South comparison. *Criminal Justice Review* 46: 450–65. [CrossRef]

Cong, Lihong W., W. Bruce Landsman, Edward L. Maydew, and Daniel Rabetti. 2023. Tax-loss harvesting with cryptocurrencies. *Journal of Accounting and Economics* 76: 101607. [CrossRef]

DeBacker, Jason M., Bradley T. Heim, and Anh Tran. 2015. Importing corruption culture from overseas: Evidence from corporate tax evasion in the United States. *Journal of Financial Economics* 117: 122–38. [CrossRef]

De Simone, Luca, Peng Jin, and Daniel Rabetti. 2024. Tax Avoidance with DeFi Lending. Available online: https://ssrn.com/abstract=4764605 (accessed on 30 April 2024).

FATF. 2021. Updated Guidance for a Risk-Based Approach Virtual Assets and Virtual Asset Service Providers. Available online: https://www.fatf-gafi.org/content/dam/fatf-gafi/guidance/Updated-Guidance-VA-VASP.pdf.coredownload.inline.pdf (accessed on 10 January 2024).

FSB. 2024. Cross-Border Regulatory and Supervisory Issues of Global Stablecoin Arrangements in EMDEs. Available online: https://www.fsb.org/wp-content/uploads/P230724.pdf (accessed on 2 August 2024).

Galati, Lorenzo, and Francesco Capalbo. 2024. Silicon Valley Bank bankruptcy and Stablecoins stability. *International Review of Financial Analysis* 91: 103001. [CrossRef]

Grobys, Klaus, Juha Junttila, James W. Kolari, and Niranjan Sapkota. 2021. On the stability of stablecoins. *Journal of Empirical Finance* 64: 207–23. [CrossRef]

Hampl, Filip, and Lucia Gyönyörová. 2021. Can Fiat-backed Stablecoins Be Considered Cash or Cash Equivalents Under International Financial Reporting Standards Rules? *Australian Accounting Review* 31: 233–55. [CrossRef]

Harvey, Campbell R., and Daniel Rabetti. 2024. International business and decentralized finance. *Journal of International Business Studies* 55: 840–63. [CrossRef]

Immordino, Giovanni, and Francesco Flaviano Russo. 2018. Cashless payments and tax evasion. *European Journal of Political Economy* 55: 36–43. [CrossRef]

Instrução Normativa RFB Nº 1888, Publicada no DOU de 07/05/2019, seção 1, página 14. 2019. Available online: http://normas.receita.fazenda.gov.br/sijut2consulta/link.action?idAto=100592 (accessed on 13 January 2024).

International Monetary Fund. 2020. Digital Money Across Borders: Macro-Financial Implications. Policy Paper 2020/050. Available online: https://www.imf.org/en/Publications/Policy-Papers/Issues/2020/10/17/Digital-Money-Across-Borders-Macro-Financial-Implications-49823 (accessed on 12 January 2024).

Korndörfer, Martin, Ingrid Krumpal, and Stefan C. Schmukle. 2014. Measuring and explaining tax evasion: Improving self-reports using the crosswise model. *Journal of Economic Psychology* 45: 18–32. [CrossRef]

Lee, Sanghyun, Jonghyun Lee, and Yeonjeong Lee. 2023. Dissecting the Terra-LUNA crash: Evidence from the spillover effect and information flow. *Finance Research Letters* 53: 103590. [CrossRef]

Li, Dong, Dong Han, Tsung-Hui Weng, Zheng Zheng, Hua Li, and Kuo-Chen Li. 2024. On Stablecoin: Ecosystem, architecture, mechanism and applicability as payment method. *Computer Standards and Interfaces* 87: 103747. [CrossRef]

Lietz, Georg Michael. 2013. Tax Avoidance vs. Tax Aggressiveness: A Unifying Conceptual Framework. Available online: https://ssrn.com/abstract=2363828 (accessed on 20 January 2024).

Madzharova, Boryana. 2014. The impact of cash and card transactions on VAT collection efficiency. In *The Usage, Costs and Benefits of Cash-Revisited, Proceedings of the 2014 International Cash Conference*. Frankfurt: Deutsche Bundesbank, pp. 521–59.

McGee, Robert W., Yiannis Petrides, and Jun Zhou. 2022. Attitude toward tax evasion in Brazil, Russia, India and China (BRIC). *Philosophy, Economics and Law Review* 2: 70–84.

Meling, Tom, Magne Mogstad, and Aina Vestre. 2024. Crypto Tax Evasion. Available online: https://ssrn.com/abstract=4932685 (accessed on 29 August 2024).

Mohamad, Azhar, Mohd Hafiz Zakaria, and Zaiton Hamid. 2016. Cash economy: Tax evasion amongst SMEs in Malaysia. *Journal of Financial Crime* 23: 974–86. [CrossRef]

Morgan, Jamie. 2023. Systemic stablecoin and the brave new world of digital money. *Cambridge Journal of Economics* 47: 215–60. [CrossRef]

Moura de Carvalho, Rui, Helder C. Inácio, and Ricardo P. F. Marques. 2022. Ledger to ledger: Off- and on-chain auditing of stablecoin. *The International Journal of Digital Accounting Research* 22: 129–61. [CrossRef]

Ngah, Zainab Abu, Norhani Ismail, and Norhashimah Abd Hamid. 2020. Tax evasion through fraudulent financial reporting amongst SMEs in Malaysia. *Journal of Financial Crime* 28: 214–27. [CrossRef]

OECD. 2022. Crypto-Asset Reporting Framework and Amendments to the Common Reporting Standard. Available online: http://www.oecd.org/tax/exchange-of-tax-information/crypto-asset-reporting-framework-and-amendments-to-the-common-reporting-standard.pdf (accessed on 13 January 2024).

Oefele, Norbert, Dirk G. Baur, and Luke A. Smales. 2024. Flight-to-quality—Money market mutual funds and stablecoins during the March 2023 banking crisis. *Economics Letters* 234: 111464. [CrossRef]

Parisi, Valentina, and Davide Federici. 2023. Family Firms' Aggressive Tax Planning: An Empirical Evaluation for Italy. *Italian Economic Journal* 9: 1299–327. [CrossRef]

Pedroni, Fernanda Victoria, Andrea Briozzo, and Guillermo Pesce. 2022. Firm-level determinants of business tax evasion in emerging economies: The case of Argentina [Determinantes microeconómicos de la evasión tributaria empresarial en economías emergentes: El caso de Argentina]. *Revista de Métodos Cuantitativos Para La Economía y La Empresa= Journal of Quantitative Methods for Economics and Business Administration* 34: 83–117.

Pernice, Ingolf G. A., Sebastian Henningsen, Roman Proskalovich, Martin Florian, Hermann Elendner, and Björn Scheuermann. 2019. Monetary stabilization in cryptocurrencies—Design approaches and open questions. Paper presented at the 2019 Crypto Valley Conference on Blockchain Technology (CVCBT), Rotkreuz, Switzerland, June 24–26; pp. 47–59. [CrossRef]

Receita Federal do Brasil. 2023. *Criptoativos: Receita Federal Detecta Crescimento Vertiginoso na Movimentação de Stablecoins*; Brasília: Receita Federal do Brasil. Available online: https://www.gov.br/receitafederal/pt-br/assuntos/noticias/2023/outubro/criptoativos-receita-federal-detecta-crescimento-vertiginoso-na-movimentacao-de-stablecoins (accessed on 11 January 2024).

Son, Joon, Mehmet Huseyin Bilgin, and Dongnyoung Ryu. 2022. Consumer choices under new payment methods. *Financial Innovation* 8: 82. [CrossRef]

Tarasova, Tatyana, Oleksandr Usatenko, Andriy Makurin, Vladyslav Ivanenko, and Andriy Cherchata. 2020. Accounting and features of mathematical modeling of the system to forecast cryptocurrency exchange rate. *Accounting* 6: 357–64. [CrossRef]

Travkina, Elena V., Andrey B. Fiapshev, and Maria T. Belova. 2022. Stablecoin-Based Digital Trading and Investment Platforms and Their Potential in Overcoming Sanctions Restrictions. *Economies* 10: 246. [CrossRef]

Waerzeggers, Christian, Isaac Aw, and Jiaqi Cheng. 2023. Taxing Stablecoins. Available online: https://www.imf.org/en/Publications/fintech-notes/Issues/2023/05/25/Taxing-Stablecoins-528041 (accessed on 10 January 2024).

Wang, Geng-Jin, Xiao Ma, and Hao Wu. 2020. Are stablecoins truly diversifiers, hedges, or safe havens against traditional cryptocurrencies as their name suggests? *Research in International Business and Finance* 54: 101225. [CrossRef]

Wang, Y. Peter. 2012. Competition and Tax Evasion: A Cross Country Study. *Economic Analysis and Policy* 42: 189–208. [CrossRef]

Zhang, Yufan, Zichao Chen, Yutong Sun, Yulin Liu, and Luyao Zhang. 2023. Blockchain Network Analysis: A Comparative Study of Decentralized Banks. In *Intelligent Computing*. Edited by Kohei Arai. SAI 2023. Lecture Notes in Networks and Systems. Cham: Springer, vol. 711. [CrossRef]

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The Impact of Audit Oversight Quality on the Financial Performance of U.S. Firms: A Subjective Assessment

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Abstract: Audit committees are appointed by the board of directors of corporations to oversee the financial reporting process, monitor financial control processes, hire and assess independent auditors, and communicate findings with management and auditors. We propose two new measures of audit oversight quality. The first measure is purely subjective, in that it scores audit committees on a scale based on their ability to fulfill one or more of their responsibilities, as mentioned in annual reports, Form 10-K and DEF 13A. The second measure concerns audit committee activity, as it measures the number of times the term 'audit committee' is mentioned in these documents. Both measures were obtained for U.S. pharmaceutical companies and energy companies from 2010 to 2022. The audit oversight quality measures were regressed in regard to profitability (measured by return on assets and return on equity), debt capacity (measured by equity multiplier), and firm value (measured by Tobin's q and economic value added). Audit oversight quality, using both measures, reduces the return on equity. Audit oversight quality, using both measures, had a disciplining effect on debt. Increases in the oversight of increasing debt discourage the propensity to increase borrowing using collateral (debt capacity), and reduce investor returns through investment in debt-financed projects (return on equity). Audit oversight quality, using both measures, exhibited a size effect on the firm's value, in that an increase in the firm size with high audit oversight quality increases the firm's value. However, it is possible that only the first measure of audit oversight quality significantly increased the firm's value, as only the first measure exhibited robustness to the endogeneity effect of size.

Keywords: audit quality; audit quality and earnings; audit quality and debt; audit quality and firm size; audit measure; audit oversight

1. Introduction

Corporate boards of directors are the leading managerial oversight bodies in U.S. corporations. Stewardship theory (Davis et al. 1997) may be used to explain the roles of corporate boards. Members of corporate boards are stewards of the firm, acting in the best interests of the firm, by setting a strategic direction for the firm, while working in conjunction with management to position resources profitably. Given the overarching goal of shareholder wealth maximization, the board of directors directs its skills toward the achievement of this goal. Intuitively, the board is responsible for the monitoring and surveillance of management. Boards may appoint audit committees to oversee the financial reporting process, monitor financial control processes, hire and assess independent auditors, and communicate regularly with management and auditors (Keinath and Walo 2008). Some of these responsibilities include reviewing quarterly statements with management and auditors, while reviewing earnings press releases and earnings guidance. Monitoring control processes includes monitoring risk assessments, regulatory compliance, and reviewing balance sheet financing. Communicating with management and auditors, by having separate meetings with each party, is expected. An audit committee reduces the ill effects as presented by agency theory (Jensen and Meckling 1976). Agency theory postulates that managers may engage in actions that extract private benefits, to the detriment of overall firm performance. For example, the firm may engage in non-synergistic mergers and acquisitions that create an illusion of productivity, while depressing firm profitability. The literature documents numerous studies of managerial malpractice arising from a lack of effective control and monitoring techniques (Ika and Ghazali 2015). An audit committee that effectively monitors management decisions may prevent such actions from being taken, to the benefit of the firm.

Elmarzouky et al. (2023) provide a systematic review that may be used to justify the value of audit oversight quality. Audit oversight is provided by audit committees, who employ auditing firms to conduct audits of the firm under consideration. Audit reports often contain critical audit matters (henceforth, KAMs). Several studies document that KAMs increase audit quality (Li 2020; Kittiwong and Sarapaivanich 2020). Positive investor reactions to KAMs (Alves Júnior and Galdi 2020; Li et al. 2019) were supplemented by the discovery that a reduction in the volatility of earnings forecasts (Bens et al. 2019) and a decreased loan spread (Porumb et al. 2021) occurred in firms adopting KAMs. The authors recommend controlling for industry, to obtain consistency in the results on the benefits, or lack thereof, of KAMs on audit quality. The authors call for U.S.-based samples, such as those employed in this study. They wish to see studies that evaluate incremental information contained in external audit reports (EARs). They argue that such incremental information reveals potential threats, which in turn may have an impact on a firm's valuation. In this study, we employ the content of audit reports to determine their impact on corrected profitability estimates (measured by the return on assets and return on equity), their impact on the prediction of debt capacity with increasing debt usage, and their impact on the firm's value as the firm size increases. In effect, we are measuring the effect on the firm's performance of the incremental information in audit reports, in keeping with Elmarzouky et al.'s (2023) directive for future research.

We distinguish between audit oversight quality and audit quality. Audit quality is provided by an auditing firm that examines financial reports for accuracy. Audit oversight quality is the responsibility of the audit committee that hires the audit firm and uses the audit firm's findings as input into strategic decision-making. The audit firm does not perform a managerial finance function. The audit committee is engaged in managerial finance, as it reviews audit committee findings, locates information that may affect growth and profitability, then alerts management to corrective action based on negative information, and alerts management to opportunities based on positive information (emphasis added). The literature measures audit oversight quality primarily in terms of the presence of an auditor, from a Big N auditing firm, on the audit committee. The presence of an auditor has been uncertain in regard to its effect on earnings management. The scrutiny of accruals by the Big N auditor may prevent accrual earnings management, which involves increasing accruals abnormally to overstate the net income (Francis et al. 1999). Firms may switch to real earnings management (Antle et al. 2006). Real earnings management involves abnormal cash flows, abnormal discretionary expenses, and abnormal production costs, which influence earnings (Chi et al. 2011). Chi et al. (2011) observed that the presence of a Big N auditor increased real earnings management.

We suggest that audit oversight quality is measured in terms of actual decision-making by audit committee members. We take this position, as such a direct measure of audit committee actions provides more information about the extent of the oversight provided by audit committee members. Accordingly, we add to the literature on measures of audit oversight quality. We propose two measures. The first measure is a subjective rating of a dichotomous 0–1 variable on the extent of the impact of audit committee actions described in public documents, including annual reports and Form 10-Ks. For example, a score of 1 is given to firms in which the audit committee uses financial reports to engage management in discussions that set a strategic direction for the firm. A score of 0 is given to firms whose audit committee just oversees audit reporting, with no effort to use this information in strategic decision-making. The second measure also measures audit oversight quality, but does not assess any decisions. It records the frequency of issues brought before an audit committee. For example, critical matters of different types may come before an audit committee. Each one is counted in regard to the second measure. A typical second measure may have >500 different matters. The matters are not rated in terms of oversight quality, they are merely counted. We consider this measure to be an alternative form of assessment of audit oversight quality, as it measures the frequency in regard to which matters are brought before an audit committee. The rationale is that an audit committee that reviews more items is making a greater contribution to audit oversight quality, than a counterpart that assesses fewer issues.

We measure the effect of audit oversight quality on firm profitability. We conjecture that the oversight of financial reports, provided by engaged audit committees, increases transparency in reporting sufficiently to curb counterproductive behaviors, such as earnings management and earnings misstatements. A reduction in the overstatement of income will have an adverse effect on measures of profitability in regard to the return on assets and return on equity, as these profitability measures will be reduced from inflated levels. Audit oversight quality's positive effect arises from its ability to use accurate information to restate profitability, followed by making better decisions based on more accurate values of profits. The restoration of income from an inflated level to its true level through audit quality may reduce the net income, but has the long-term effect of being an accurate input into decision-making. Effective strategic decisions can only be made with true expectations on a company's profit.

We use a comprehensive set of outcomes to assess audit oversight quality. In addition to profitability, we wish to observe the effect of audit oversight quality on debt capacity and firm value. There is a paucity of literature on the effect of audit quality with increasing usage of debt. A few studies have observed that audit quality reduces the cost of debt, suggesting that the confidence that creditors have in high quality audit reports will lead them to reduce the cost of debt. This paper explores the managerial finance decision on the expansion of debt capacity, or the ability to acquire debt. The equity multiplier is a measure of debt capacity. The higher the value, the greater the ability of a firm to borrow funds. For example, a large retail store has considerable amounts of inventory, which may be used as collateral to increase borrowing. We conjecture that audit oversight quality has a disciplining effect on debt. Auditors will report total liabilities and short-term liabilities. An engaged audit committee will compute debt ratios from these levels of debt. As debt ratios increase, effective audit oversight quality will detect the increase in the financial reports. If there is the free flow of information from the audit committee to management, management may act to limit further increases due to rising bankruptcy costs.

We also measure audit oversight quality's effects on the firm's value. Regarding Tobin's q measure of firm value, a firm's value increases with market valuations of the firm's assets at a higher rate than the replacement level, suggesting that the assets are being used productively to generate higher sales. An alternative measure of firm value is economic value added. Economic value added is the excess of the net operating profit after tax, over the product of the invested capital and the weighted average cost of capital. Hence, the economic value added is a measure of residual wealth. The rationale is that firms take funds from investors at the cost of capital. The productive use of this capital will increase the wealth of stockholders by increasing sales, expanding markets, and producing new products. The positive effect of audit oversight quality on a firm's value may depend on the firm's size. As the firm's size grows, audit reports become more complex. Financial information about multiple departments, divisions, and products may be expected in the audit reports of large firms. Strategic decisions will benefit if audit findings from a large number of divisions are used, as threats and opportunities may be found in any of the divisions within a company. The continuous identification of threats and opportunities will lead to corrective action in response to threats, and investment in opportunities, creating shareholder wealth. The firm's value is positively affected. The literature provides very little evidence of the effects of the association between audit committee oversight and the growing size of a firm. A few studies suggest that audit quality reduces earnings management as the firm size increases (Fakhfah and Jarboui 2021; Saftiana et al. 2017), as large firms hire large audit firms with the capability to detect inflated accruals and inflated discretionary costs. Yet, there is a paucity of literature about the ability to use accurate profit estimates to further a firm's long-term goals. For example, using a sample of Malaysian firms, Shamsul and Ismail (1999) found that audit committee oversight increased with the firm size, due to the greater financial expertise of the audit committee members. However, we do not know whether the revised profit figures were used to plan for future market expansions and to hire the talent needed for future shareholder wealth maximization. That is the line of inquiry addressed by this study.

Accordingly, the purpose of this paper is to evaluate the performance of U.S. firms in the pharmaceutical industry and energy industry, to determine the effectiveness of audit committee performance by measuring audit committee performance. We selected these two industries due to their prominence and visibility in the U.S. economic environment. The pharmaceutical industry is diverse, with large, established firms, with global customers, and locations in upwards of 100 countries, and small, low-cap, innovators. The energy industry is a major employer and contributor to wealth in regard to certain stocks.

2. Review of the Literature

2.1. Agency Theory as the Basis for Audit Committee Oversight

A typical corporation has shareholders who invest funds through the purchase of stock. The firm employs managers, who, as agents, are engaged in the strategic decisions that generate operating profitability, resulting in shareholder wealth maximization. The conflict between the goals of shareholders, as principals, and managers, as agents, gives rise to agency theory. The principals are owners, who invest their funds with the objective of increasing wealth. They delegate the responsibility of creating that wealth to managers, as agents, who are expected to hire talent, create products, and expand markets. Yet, managers may not share the same goals as shareholders. They may have short-term goals, such as wage increases, bonuses, rewards, and perks. As Jensen and Meckling (1976) observed, idle cash was spent on low-NPV projects, as managers wished to impress their superiors by making successive investments, which created the illusion that they were industrious. Information asymmetry abounds, as managers have true knowledge of the consequences of their actions to yield private benefits, while shareholders are less familiar with the impact of managerial actions on wealth creation.

Agency theory has a specific application to audit committee oversight. Watts and Zimmerman (1986) hold that the contract specifying the managerial responsibilities may reduce agency costs, as principals detail their expectations of managerial actions, while fulfilling the goal of shareholder wealth maximization. Auditors are external agents, who evaluate progress in the fulfillment of contracts, by assessing the accuracy of financial reports. Auditors are the independent third party that holds management accountable (Halim 2013). As audit committees on boards are charged with hiring auditors, it follows that appropriate oversight in the selection and training of auditors by audit committees may reduce agency costs by increasing the transparency of financial reporting. Consequently, such oversight may improve financial performance.

The cost of audits rises with the presence of KAMs. Elmarzouky et al. (2022a) used a sample of FTSE all-share non-financial U.K. firms, finding that the presence of KAMs was positively related to audit costs, particularly in the presence of independent directors. This finding suggests that while including KAMs in audit reports may reduce the ill effects posited by agency theory, this inclusion comes with increased audit costs. There is a need to balance the desire for improved corporate governance through enhanced audit quality, with the increased costs associated with this effort.

2.2. The Literature on the Impact of Audit Oversight on Managerial Decisions

Audit committee oversight has been found to positively influence managerial decisions, so that greater oversight results in improved financial performance. Several studies support this assertion. Muniandy (2007) used a sample of Malaysian publicly listed companies, finding that the presence of CEO duality resulted in a strong positive relationship with audit fees. The presence of independent directors on the audit committee weakened this relationship, suggesting that the diminishing of corporate governance due to CEO duality was partly reduced by the effective audit committee oversight provided by independent directors on the audit committee. Audit committee oversight discouraged the hiring of auditors with links to management, so that corrective action could be taken with regard to poor managerial decisions. Shatnawi et al. (2021) used a sample of Jordanian firms to observe ownership concentration, whereby families and managers were large shareholders. Ownership concentration interacted positively with audit committee oversight to increase the ROA and ROE. Large shareholders joined together with audit committees to demand greater management accountability, resulting in increased ROA and ROE. Al-Jaifi et al. (2017) used a Malaysian sample to determine that audit committee oversight strengthened the internal monitoring mechanisms used to evaluate management. This action revealed the firms with truly superior financial performance. Traders selected the stocks of these firms, boosting stock market liquidity.

2.3. The Literature on the Impact of Audit Committee Characteristics on Firm Performance

The literature on audit committees in a variety of settings sets forth that the audit committee size, audit committee independence, and the frequency of audit committee meetings have a positive impact on firm performance (see Habtoor 2022, for a review). Large committees have the breadth of skills and experience that permit them to effectively monitor multiple dimensions of audit committee performance. Independence arises from objectivity in the assessment of management and auditors by external audit committee members, who are not members of management. The benefit derived from the frequency of meetings has been surmised, rather than directly measured. Ghafran and O'Sullivan (2013) set forth that a high frequency of meetings indicates that the members of the audit committee are actively engaged in discussing management's performance and are assessing the feasibility of strategic decisions. If these discussions are sufficiently detailed, so that they occur over multiple sessions, requiring maximum participation from audit committee members, they could have a positive impact on firm performance. Empirical studies supporting the improvement in financial performance caused by the audit committee size, independence, and frequency of meetings in developed countries include Alzeban's (2023) examination of UK non-financial firms, Gani et al.'s (2017) study of materials firms in Australia, and Barka and Legendre's (2017) study on the French equity index. Similar studies in developing countries include Nawafly and Alarussi's (2018) examination of Malaysian financial firms, and Rahman and Ali's (2022) study of non-financial firms in Pakistan.

A few papers detail results to the contrary, with Altass (2021) finding significant negative effects of the audit committee size, independence, and meeting frequency, on the firm's performance, for Saudi Arabian firms. Cultural reasons may underlie these aberrations. The negative effects of board independence on the return on assets, and the audit committee size on the firm's value, were found for a sample of Bangladeshi banks (Rifat et al. 2022). The authors attribute the adverse effects to widespread corruption in the banking system, which reverses the positive effects of corporate governance mechanisms on profitability and the firm's value. Corruption placed external members with personal agendas on the audit committee, who did not uphold shareholder wealth maximization. Audit committee independence was compromised, as corrupt external members failed to perform the requisite monitoring of auditor reports to support profitability. Likewise, an excessive number of corrupt audit committee members expanded the size, without the additional expertise to ensure accuracy of financial reporting, thereby depressing the firm's value.

Velte (2023) concluded that conflicting findings regarding the value of the audit committee size and frequency of meetings could be resolved by the finding of a non-linear relationship between these variables and firm performance. Both the audit committee size and frequency of meetings rise, level off, and then decline, suggesting that there is an optimal level for both variables to improve firm performance.

The actions of audit committee members: Alodat et al. (2023) analyzed annual reports to locate evidence of audit chair expertise in monitoring management, maintaining regular meetings, providing feedback to auditors, and setting high standards for the accuracy and relevance of audited reports. The chairs that met these standards were able to significantly improve financial performance. Ghafran and Yasmin (2018) added to these findings by demonstrating that the lengthy tenure of the audit committee chair with the firm, along with specialized knowledge of auditing and expertise in accounting, significantly improved the firm's financial performance.

Velte's (2023) examination of 64 archival studies on audit committee activity in European firms underscored the importance of financial expertise. It is apparent that financial expertise is necessary for the evaluation of financial reports in internal audits and external audits, as well as the effective monitoring of management, as financial expertise can be used to detect inaccuracies in the reporting of earnings (Bilal and Komal 2018). Both auditors hired by audit committees and audit committees with financial expertise have detected earnings management. Earnings management may occur through the overstatement of current earnings (Hill and Jones 1992). A financially knowledgeable audit committee will examine the excess of accruals over operating cash flows. If they find an increase in accruals, they will investigate whether the current income is being overstated, as the payment of accruals will reduce the income. In other studies, high-quality audits from prominent auditing firms have found earnings management. Fakhfah and Jarboui (2021) observed that audit quality moderated the audit opinion–earnings management decision. High-quality audits detected earnings management, resulting in modified audit opinions. Garcia et al. (2012) found that earnings manipulation was reduced by audit quality for a non-financial sample of Spanish companies. It is the position of this paper that while either the auditing firm or the audit committee may detect earnings management, it is the audit committee that must take corrective action to ensure that decisions are made based on accurate earnings reports. Inflated earnings reports may result in the acceptance of projects that yield low NPV, as unrealistically high earnings may lead to inflated cash flow projections for projects that may never be realized.

The association of debt with audit quality has been confined to assessments of the cost of debt. Audit quality assessments in regard to indebted firms, in the literature, have been conducted by auditing firms. Orazalin and Ahmetzhanov (2019) evaluated the audit reports of public firms in Kazakhstan. They found that audit quality reduced the cost of debt. A similar study of Finnish firms yielded identical results, with audit quality reducing the cost of debt (Karjalainen 2011). Firms with Big 4 audits and more than one responsible auditor had a reduced cost of debt. The effect of high-quality audits is to reduce information asymmetry, according to which the lender has insufficient information about the borrower. Given the additional, accurate, credible information, creditors may become more confident that the borrowing firm will honor its payment commitments in regard to loan interest and loan repayment (Karjalainen 2011). Ahmadi and Grayhi (2017) evaluated the effect of audit quality on the lender's propensity to extend debt maturities, finding that the lender's confidence in high-quality audits led them to extend debt maturities in Iranian firms. We note that while high-quality audits have been associated with reduced borrowing costs, we find no evidence that audit committees use the lower, revised estimates on earnings to influence further borrowing.

We measure the effect of audit oversight quality on firm value in firms that are increasing in size. There may be some evidence that the size of the audited firm is associated with increased audit oversight quality. To the extent that audit reports of such large firms are evaluated by audit committee members with financial expertise who disseminate the need to restate earnings to other board members (Shamsul and Ismail 1999), audit oversight quality is increased. In contrast, Saftiana et al. (2017) found no independent effect of the firm size on earnings management. However, the firm size reduced earnings management in conjunction with institutional ownership, managerial ownership, the frequency of board meetings, and the frequency of audit committee meetings. We surmise that restated earnings will lead to the reporting of accurate net income, from these studies. However, they do not assess the consequences of accurate net income on the firm's value. This study argues that the accurate reporting of earnings will result in the accurate reporting of retained earnings, which are a component of shareholders' equity. Shareholders' equity is the book value of the firm's wealth, so that the firm's size may result in accurate computations of the firm's size, thus increasing the accuracy of measurement of the firm's value. It is the intent of this study to assess the joint effect of audit oversight quality and firm size on the firm's value.

A few studies have directly measured the impact of corporate governance mechanisms on firm value. Most of them find that the presence of independent directors on the audit committee increases the firm's value. Kam and Li (2008) observed that independent directors with financial expertise improved the firm's value five times more than independent directors without financial expertise. Faura et al. (2017) and Chan and Li (2013) observed increases in the firm's value upon implementation of compliance with the requirement that audit committee members be independent in 41-country and single-country (Korean) contexts. In one of the few studies that include the firm's size as a predictor of share value, large firms exhibited larger increases in stock price following compliance with the requirement that the audit committee is made up of 50% independent directors (Black and Kim 2012).

3. Hypotheses Development

Spence (2002) set forth signaling theory as a means of reducing information asymmetry. There is information asymmetry in hiring situations. The applicant has much more information about his or her skills and capabilities than the hiring manager. Spence's (2002) model of a job applicant's attempt to reduce information asymmetry consisted of the applicant describing their exclusive educational qualifications. Their exclusive education gives more information to the hiring manager about the applicant's suitability for the job. Likewise, signaling theory may be used to explain the reduction in information asymmetry between audit committees and management.

Earnings management results in inflated reports of earnings through the overstatement of accruals or the overstatement of discretionary costs. The audit firm hired by the audit committee may detect earnings management and submit an opinion with revised earnings figures. The strongly positive signal from inflated earnings figures, due to earnings management, is reduced to a negative signal concerning the need to restate the earnings. Restatement of earnings causes uncertainty about the accuracy of the measurement of the net income and cash flows. Stakeholders, such as institutions and other investors, will have difficulty making investment decisions with earnings figures that change. For example, an institution may decide to purchase a security based on the original positive value of the earnings. Upon the downward revision of the net income, the institution may withdraw the purchase. Managers are frequently rewarded on the basis of the quarterly net income. Revised net income, which is lower than the original amount, may result in the withdrawal of rewards, causing conflict between the management team and the labor force. Revised earnings figures are used to compute the return on assets and the return on equity, which measure returns. The return on assets is a measure of the profitability that emanates from the firm's investment in assets, while the return on equity is the return on the shareholders' equity. The revision of these values by an audit committee will send a negative signal to management that the firm has lower returns, which prevents it from investing for growth. We hypothesize that audit oversight quality will result in reduced profitability, as measured by the reduced return on assets and reduced return on equity, due to adverse stakeholder reactions to the reversal of the initial positive signal to a negative signal.

Hypothesis 1: *Audit oversight quality reduces profitability in pharmaceutical companies and energy companies, where profitability is measured by the return on assets and return on equity.*

Audit quality enhanced by KAMs may act as an early warning system for future corporate bankruptcy by highlighting risks. Elmarzouky et al. (2022a) present a list of studies that show that audit reports with KAMs predict bankruptcy due to the auditor's educational background (Elmarzouky et al. 2022b; Ruiz-Barbadillo et al. 2004), the Altman Z score of the firm (Munoz-Izquieredo et al. 2019), and the audit's reliability (Caserio et al. 2014). Elmarzouky et al. (2022a) used a qualitative case study approach to uncover predictors that may not have been revealed by these earlier studies. They found that risks, such as operational risks, macroeconomic risks, and interest and financing costs, were frequently omitted from audit reports. They concluded that the communication of all such risks may be needed to increase risk disclosure and, in turn, improve the firm's financial performance. In a related paper, Elmarzouky et al. (2022b) observed congruence between the risk disclosures of auditors and corporate managers, underscoring the value of this risk information from diverse information sources, i.e., auditors and managers, in improving financial performance.

Audit quality has been observed to reduce the cost of debt, due to a reduction in information asymmetry between creditors and borrowers. Auditing firms employed by audit committees may report the debt burden of a firm, which creditors may find so credible that any uncertainty about the firm's debt values diminishes. The emanating signal from the audit report is expected to be strongly positive, due to the reduction in creditors' information asymmetry. However, this positive signal may be reversed if debt accumulates. Excessive debt will increase bankruptcy costs, emitting a negative signal. The audit committee may recommend the strategic decision to limit additional debt. Audit oversight quality in conjunction with increasing leverage will reduce the debt capacity, which concerns the potential to acquire additional debt.

The aforementioned increase in debt may have another consequence. Debt service capability is concomitant with the accumulation of debt. An increase in debt will be accompanied by an increased interest expense, so that the net income declines. Decreases in net income have an adverse effect on the return on assets (net income/total assets) and the return on equity (net income/stockholders' equity). The audit committee may communicate the negative impact on profitability to the rest of the board of directors and other stakeholders. This negative signal about reduced profitability may stimulate management to take corrective action, including determining the cause of the rising debt and instituting control measures to curb further increases. We hypothesize that audit oversight quality in conjunction with rising debt will result in a reduction in profitability.

Hypothesis 2: *Audit oversight quality in conjunction with leverage will have adverse effects on debt capacity and profitability.*

Firm value is the excess of the market value of assets over the book value (Tobin's q), or the excess of the net operating profit over the cost of capital (economic value added). It is essentially a measure of the firm's wealth. The audit committee may provide effective oversight if it generates information that supports shareholder wealth maximization. The audit committee may contribute to the firm's value as the firm grows in size.

Large firms may involve numerous divisions, markets, suppliers, and locations. Their complexity imposes significant demands on auditing firms, who have to evaluate multiple reports to detect earnings management, excessive debt, sharp increases in costs, and other adverse conditions. Audit committees may communicate these conditions to management, prioritizing corrective action. If the areas of concern have significant long-term effects on the firm, the ability of the firm to create wealth for shareholders may be compromised. This leads to a reduction in the firm's value. For example, a large multinational pharmaceutical firm may have locations in 100 countries. Operations in one country, concerning local medicine production, may be facing increasing costs due to labor unrest and supply chain bottlenecks. The company's financial reports will reflect this information, to be communicated by the audit committee to the senior management of the division. The management of the division will be advised to obtain labor agreements and resolve the supply chain issues.

Hypothesis 3: *Audit oversight quality in conjunction with the firm's size will increase the firm's value measured by Tobin's q and economic value added.*

4. Methods and Materials

4.1. Data Collection

Two measures of audit quality were created. The underlying rationale for the methods was the need to measure the extent of engagement by the audit committee in using the findings of audit reports to act as input into strategic decision-making. The first measure was dichotomized into a 0, 1 categorical variable. A score of 0 indicated minimal involvement by the board in using audit report findings for strategic decision-making, such as simply approving the financial reports. A score of 1 was awarded to audit committees that met with other board members and management to revise the initial measures of profitability and discuss the effect of the audit report findings on debt usage, market expansion, and new product development. In a case where earnings were being revised to a lower level, the firm could decide to postpone market expansion or reduce investment in products with low NPVs. In these cases, audit oversight quality made a valuable contribution to decision-making. A search for the term 'audit committee' in the SeekEdgar database was conducted for 7762 pharmaceutical industry and energy industry stocks' firm–year observations from 2010 to 2022. The database contains annual reports, Form 10-K and DEF 13A. Every mention of audit committee for these stocks was logged by the researchers, per firm. A score of 0 represented the least involvement by the audit committee, such as the review of financial reports and the hiring of auditing firms. A score of 1 indicated involvement in strategic decision-making, with audit committee members closely working with management in gleaning information from the financial reports and setting the strategic direction for the firm. For example, a certain pharmaceutical firm had an audit committee that would reveal earnings management and debt usage to management and other board members, resulting in the revision of earnings and the postponement of capital investment due to increasing debt. We gave this firm an audit oversight quality score of 1 under the first measure, suggesting a high level of engagement. Another firm had an audit committee that was only involved in financial reporting, suggesting a low level of engagement, or a score of 0.

The second measure required a similar scanning of reports, with the caveat that the total number of mentions of audit committee activity formed the basis of the measurement. The rationale was that the more frequently the term 'audit committee' was mentioned, the higher the level of engagement of committee members, as a larger number of financial reporting discrepancies were being brought before them. For example, for a pharmaceutical firm, there was 1 mention of the statement, "Based on my knowledge the report does not contain any untrue statement of material fact." There were 152 mentions of a statement pertaining to the audit committee's responsibility for approving all third-party transactions. There were 233 mentions of the board's role in terms of risk oversight. The sum of these mentions formed the second measure score of 385 for the pharmaceutical firm. A different pharmaceutical firm had only 50 mentions of audit committee approval, and 123 mentions of the board's role in regard to risk oversight. The total score was 173.

4.2. Data Analysis

The following regressions were performed for the full sample and subsamples.

$$y = a = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 \quad (1)$$

$$y = a + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_1\ x_2 \quad (2)$$

$$y = a + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_1\ x_3 \quad (3)$$

The variables are described in Table 1, below.

Table 1. Definition of Variables.

Variable	Definition
Y_1 = dependent variable in all regressions	Return on Assets Return on Equity Equity Multiplier Economic Value Added Tobin's q
x_1 = independent variable in all regressions	Measure 1 of Audit Oversight Quality Measure 2 of Audit Oversight Quality
x_2 = independent variable in all regressions	Firm Size
x_3 = independent variable in all regressions	Leverage
x_4 = control variable in all regressions	Tangibility
x_5 = control variable in all regressions	COVID-19 dummy

The method of data analysis was fixed effects panel data regressions, for all regressions on the audit oversight quality on the firm's performance. An individual fixed effects model was used. This model assumes that security-specific, unobserved heterogeneity is time invariant. By taking the differences in the same security's audit oversight quality observations between 2 time periods, the unobserved variables were removed, leaving a consistent OLS estimator. However, for the robustness check, two-stage least squares regressions were employed, as it was necessary to test whether audit oversight quality was an unbiased predictor of profitability, debt capacity, and firm value. By measuring the effect of the predictors of audit oversight quality in the first stage of the two-stage least squares model, we were able to examine whether we were measuring audit oversight quality's effects on firm performance, or the effects of its predictors, such as the firm size, independence, frequency of meetings, and financial expertise. These variables (firm size, and others) are not the subject of this study, so it was necessary to test whether they were adding bias to the measures of audit oversight quality.

Robustness checks were performed. A composite governance measure was used, i.e., the Institutional Shareholder Services (ISS) governance quality score. The index has values of 1–10, with 1 indicating low governance risk and 10 indicating high governance risk. The governance score replaced audit oversight quality in all regressions. Governance quality was then regressed in regard to the return on assets, return on equity, equity multiplier, economic value added, and Tobin's q.

The endogeneity of audit oversight quality was assessed using a two-stage least squares model. This method permits the prediction of audit oversight quality using exogeneous variables. Then, audit oversight quality is used to predict firm performance. The endogeneity of audit oversight quality exists if the coefficient in the second regression is a significant predictor of any of the criteria.

In the first stage, possible predictors of audit oversight quality, including the firm size, audit committee independence, frequency of audit committee meetings, and audit committee financial expertise, are tested as predictors of audit oversight quality by both measures. In the second stage, the segment of audit oversight quality attributed to these predictors is tested as a predictor of the return on assets, return on equity, equity multiplier, economic value added, and Tobin's q. The endogeneity of audit oversight quality exists if the coefficient in the second regression is a significant predictor of any of the criteria.

5. Results

The descriptive statistics and correlations for the full sample are presented in Tables 2 and 3.

Table 2. Descriptive statistics for the full sample of U.S. firms, 2010–2022.

Variable	Mean	Standard Deviation	Skewness	Kurtosis
Audit Oversight Quality Composite	0.17	17.25	12.07	940
Leverage Ratio	0.07	15.43	−13.45	1169.38
Firm Size (USD millions)	3298	14,789	7.17	58.19
COVID-19	1.15	0.36	1.91	1.68
Tangibility (USD millions)	1952	88.70	7.22	59.75
Return on Assets (ROA)	−3.09	111.74	−56.60	3583.61
Return on Equity (ROE)	0.41	24.41	22.31	1358
Equity Multiplier (EQ)	−0.18	1.54	−31.84	1449
Economic Value Added (EVA)	26.92	89.45	−1.27	22.74
Tobin's q (q)	138.70	14.71	43.62	2722
N firm–year observations	6184			

Table 3. Correlation matrix of variables.

** Variable	Audit Oversight Quality	Leverage Ratio	Firm Size	COVID-19	Tangibility	ROA	ROE	EQ	EVA	Q
Audit Oversight Quality Composite	1									
Leverage	−0.007	1								
Firm Size	0.21	0.005	1							
COVID-19	0.86	−0.005	0.20	1						
Tangibility	0.21	−0.005	1.0	0.20	1					
ROA	−0.02	−0.00007	0.0006	−0.02	0.00006	1				
ROE	0.01	−0.45	0.0003	−0.01	−0.00003	−0.10	1			
EQ	−0.004	0.89	−0.003	0.004	−0.003	0.00009	−0.58	1		
EVA	−0.01	0.008	−0.03	−0.02	−0.03	0.001	0.002	0.01	1	
Q	0.03	−0.0005	0.00004	0.03	0.0004	−0.022	0.002	−0.00005	0.00	1
R^2		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

** $p < 0.01$.

Some of the measures show evidence of high kurtosis. This may be a function of the sample employed. Both the pharmaceutical industry and the energy industry have small firms. Small firms have revenue, income, and assets that differ from typical firms. As kurtosis is the fourth power of deviations from the mean [(observation-mean)^4/standard deviation], deviations from the mean are raised to the fourth power, magnifying their values. Small firms cannot be excluded from the sample, as they are veritable members of the industry.

Table 4 shows the results of the regressions listed in Equations (1)–(3), using the first measure of audit oversight quality. Table 5 shows the results of the regressions listed in Equations (1)–(3), using the second measure of audit oversight quality. Table 6 shows the results of the regressions listed in Equations (1)–(3), using governance quality as the main predictor of financial performance. Tables 7–10 show the results from the endogeneity analysis.

Table 4. Regressions concerning audit oversight quality (Measure 1) on the firm's performance for the full sample, 2010–2023. Only significant outcomes reported.

Variable	ROE	ROE	ROE	EQ	EQ	EQ	EVA	EVA	EVA
Constant	0.78	0.78	0.78	0.47	0.47	0.47	−8.86	−8.86	−8.86
Audit Oversight Quality Composite	−0.24 *	−0.24 *	−0.24 *	−0.44	−0.44	−0.44	**147.36 *****	**147.36 *****	**147.36 *****
Firm Size	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.003	0.003	0.003
Leverage	**−0.36 *****	**−0.36 *****	**−0.36 *****	**1.71 *****	**1.71 *****	**1.71 *****	0.112	0.112	0.112
Tangibility	−0.0006	−0.0006	−0.0006	−0.0007	−0.0007	−0.0007	−0.06	−0.06	−0.06
COVID-19	0.00001	0.00001	0.00001	−0.14	−0.14	−0.14	37.73	37.73	37.73
Audit Oversight Quality Composite * Firm Size		0.00001			0.00002			**0.06 *****	
Audit Oversight Quality Composite * Leverage			**−1.63 *****			−1.88 ***			0.18
N firm–year observations	6099	6099	6099	6099	6099	6099	6099	6099	6099
R^2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Significant predictors are in bold. * $p < 0.05$, *** $p < 0.001$.

Table 5. Regressions concerning audit oversight quality (Composite Measure 2) on firm performance for the full sample, 2010–2022. Only significant outcomes reported.

Variable	ROE	ROE	ROE	EQ	EQ	EQ	EVA	EVA	EVA
Constant	−0.39	−0.39	−0.39	0.84	0.84	0.84	−1.64	−1.64	−1.64
Audit Oversight Quality Composite	−0.000006 ***	−0.000006 ***	0.000006 ***	0.0001	0.0001	0.0001	**0.01 ***	**0.01 ***	**0.01 ***
Firm Size	−0.00002	−000002	−0.00002	0.00002	0.00002	0.00002	**0.01 ***	**0.01 ***	**0.01 ***
Leverage	0.01	0.01	0.01	**1.73 *****	**1.73 *****	**1.73 *****	0.14	0.14	0.14
Tangibility	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVID-19	0.53	0.53	0.53	−0.43	−0.43	−0.43	−55.10	−55.10	−55.10
Audit Oversight Quality Composite * Firm Size		0.0000004			0.00			**−0.000006 *****	
Audit Oversight Quality Composite * Leverage			**−0.0001 *****			**−0.00005 *****			0.00005
N firm–year observations	1997	1997	1997	1997	1997	1997	1997	1997	1997
R^2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Significant predictors are in bold. * $p < 0.05$, *** $p < 0.001$.

Table 6. Regressions concerning corporate governance scores on the firm's performance for the full sample, 2010–2022. Only significant outcomes reported.

Variable	ROE	ROE	ROE	EQ	EQ	EQ	EVA	EVA	EVA
Constant	−0.09	−0.09	−0.09	1.52 *	1.52 *	1.52 *	−51.77	−51.77	−51.77
Corporate Governance	−0.10	−0.10	−0.10	0.05	0.05	0.05	6.36	6.36	6.36
Firm Size	0.0006	0.0006	0.0006	0.0002	0.0002	0.0002	−0.04	−0.04	−0.04
Leverage	**−1.37 *****	**−1.37 *****	**−1.37 *****	**2.29 *****	**2.29 *****	**2.29 *****	0.44	0.44	0.44
Tangibility	−0.001	−0.001	−0.001	−0.0004	−0.0004	−0.0004	0.07	0.07	0.07
COVID-19	0.65	0.65	0.65	−1.31	−1.31	−1.1	18.47	18.47	18.47
Corporate Governance * Firm Size		0.000003			0.000009			**0.001 ****	
Corporate Governance * Leverage			**−0.40 *****			**−0.14 *****			−0.02
N firm–year observations	6092	6092	6092	6092	6092	6092	6092	6092	6092
R^2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Significant predictors are in bold. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7. Endogeneity analysis for Measure 1 of audit oversight quality using a two-stage least squares model for the full sample (N = 7762).

Variable	Audit Quality Measure 1	ROE	EQ	EVA
Constant	0.00002.17 ***			
Firm Size	**0.00002175 *****			
Independence	−0.0000189			
Frequency of Meetings	0.00004.31			
Financial Expertise	**−0.00000111 ***			
N	5903			
R^2	0.82			
Constant		1.58	−5.06	**−5.52 *****
Audit Quality Due to Predictors in Stage 1		0.78	4.09	**3.78 *****
N		5940	5940	5940
R^2		0.000404	0.57	0.20

Significant predictors are in bold. * $p < 0.05$, *** $p < 0.001$.

Hypothesis 1 tested the significance of audit oversight quality on profitability measured by the return on assets and return on equity. Hypothesis 1 was not supported, as audit oversight quality according to both measures had no significant effect on the return on assets or return on equity. Hypothesis 2 was supported, as audit oversight quality significantly decreased the equity multiplier (coefficient = −1.88, $p < 0.001$ for Measure 1, and Coefficient = −0.00005, $p < 0.001$ for Measure 2). Hypothesis 2 was partly supported, as audit oversight quality significantly decreased the return on equity (coefficient = −0.24, $p < 0.05$ for Measure 1, and coefficient = −0.000006, $p < 0.001$ for Measure 2). Hypothesis 3 was supported, as audit oversight quality in conjunction with the firm's size significantly increased the firm value measured by economic value added (coefficient = 0.06, $p < 0.001$ for Measure 1, and coefficient = 0.000006, $p < 0.001$ for Measure 2). All the subsamples showed similar results as the full samples.

Table 8. Endogeneity analysis for Measure 2 of audit oversight quality using a two-stage least squares model for the full sample (N = 7762).

Variable	Audit Quality Measure 2	ROE	EQ	EVA
Constant	1.31			
Firm Size	−0.03			
Independence	**0.02** ***			
Frequency of Meetings	**0.00954** ***			
Financial Expertise	−0.01			
N	7762			
R^2	0.25			
Constant		0.80	−1.71	**−1.29** ***
Audit Quality Due to Predictors in Stage 1		−0.000213	0.00164	**0.92** ***
N		7762	7762	7762
R^2		0.000402	0.000723	0.12

Significant predictors are in bold. *** $p < 0.001$.

Table 9. Elimination of endogeneity effect of Measure 1 for the full sample.

Variable	EVA
Constant	15.59 ***
Audit Oversight Quality	**1.50** ***
Firm Size	**−9.13** ***

Significant predictors are in bold. *** $p < 0.001$.

Table 10. Endogeneity effect of Measure 2 for the full sample.

Variable	EVA
Constant	−1.07 ***
Audit Oversight Quality	0.00182
Firm Size	**0.02** ***

Significant predictors are in bold. *** $p < 0.001$.

Low R^2 values in the regressions may be explained by the presence of small firms. The net income, assets, and shareholders' equity in these firms is dependent on excluded variables, thereby reducing the R^2 of the regressions. Some of these variables include the cost of capital, limited availability of capital, higher volatility of the net income, and higher equity due to a lack of access to debt financing.

As a robustness check, audit oversight quality was substituted with a measure of corporate governance, as quality oversight by audit committees is a form of governance that permits the use of audit findings in decision-making. Accordingly, measures of corporate governance replaced audit oversight quality in regressions. See Table 6 for the results of corporate governance as a predictor of firm performance. The results were identical to those obtained by both audit oversight quality measures, suggesting that the two audit oversight quality measures are robust measures of corporate governance.

The endogeneity tests are presented in Tables 7 and 8. In both tables, the second stage measure of prediction due to the firm size, audit committee independence, frequency of meetings, and financial expertise, was significant in reducing audit oversight quality, suggesting that audit oversight quality may be endogenous in regard to these predictors. However, Table 9 reports that endogenous effects do not exist for the firm size, as audit oversight quality explains the economic value added beyond any explanatory power of the firm size, using the first measure of audit oversight quality. Tables 9 and 10 report that endogenous effects may exist for the firm size, as audit oversight quality does not explain the variance in economic value added beyond the firm size.

6. Discussion of the Results

This paper created measures of audit oversight quality that establish this quantity as distinct from audit quality. Audit quality is the output from financial reports. Audit firms examine financial reports thoroughly. They present their findings to the audit committee within the board of directors. The audit committee uses that information to alert management in two key areas. The first area is debt capacity. As firms increase their debt, their potential for bankruptcy increases. Their debt becomes riskier as creditors reassess the initial loan terms, with the consideration of ceasing further borrowing or demanding additional verification of financial soundness. The findings of this study suggest that audit oversight quality may have a disciplining effect on debt. As debt increases, the audit committee may act in conjunction with management to reduce further increases in debt. This leads to this study's finding that audit oversight quality reduces the equity multiplier.

Alternatively, audit oversight quality with increasing leverage may highlight the risk of the increased interest expense on profitability. Rising debt increases the interest expense, reducing the net income. The reduction in the return on equity harms shareholders by reducing the return on their security holdings in the firm.

Audit oversight quality increases the firm's value for larger firms. As firms grow, their operations become complex. The ability of audit firms to identify financial information that could have adverse effects on shareholder wealth creation acts as an input into the strategic decision-making process. Audit committee members discuss the implications of the information obtained by auditing firms. As the firms are large, and dispersed throughout the globe, the financial information may pertain to one country or one market. When the audit committee highlights the need to overcome challenges or take advantage of opportunities in this area, reputational capital increases. The firm may attract more customers, retain existing customers, and strengthen partnerships with suppliers and distributors. This value is firm value, suggesting that audit oversight quality increases the firm's value for larger firms.

7. Conclusions

7.1. Practical Implications

Audit committee functions are frequently focused on hiring auditors and verifying the accuracy of the financial information contained in their reports. While the transparency offered by this basic level of oversight is useful in reducing agency costs of self-serving conduct by managers, this study has shown that the audit committee plays a more important role on the board. Audit committees take information on the net income, leverage, and firm value, and use them as input into strategic decision-making. This is a novel insight of this paper.

Measures of audit committee oversight included the frequency of meetings, audit committee independence, size of the audit committee, diversity of audit committee members, and financial expertise of audit committee members (Rahman and Ali 2022; Alzeban 2023; Gani et al. 2017), We support these measures; however, they are indirect measures of audit committee activity. We have added to the knowledge by proposing two direct measures of audit committee oversight. For example, 'Based on my knowledge, the report does not contain any untrue statement of material fact,' is an actual assessment of the reporting of material facts. Also, the audit committee's responsibility for approving third-party transactions and conflict of interest situations were contained in an annual report. This responsibility requires action on the part of audit committee members. If audit committee members had just positive attributes, such as financial expertise and independence, we could suspect that they were engaged in reducing conflicts of interest. However, we would not have any evidence that these attributes translated into audit committee action. The direct measures used in this study provide evidence of audit committee actions that have entered into the decision-making process, which result in managerial action to increase shareholder wealth.

The literature is comprehensive in its description of the finding that earnings management and earnings misstatements are revealed by auditing firms. Bilal and Komal (2018) observed that audit quality detected an increase in accruals to reduce the net income. The restatement of the net income to accurate, reduced levels was a testament to the audit quality's ability to reduce earnings management. Likewise, Fakhfah and Jarboui (2021), and Fenoller-Cortes et al. (2021), observed a reduction in earnings management through modified audit opinions. The transparency of this exposure reduces agency costs as a result of managerial manipulation of net income for personal benefit. This paper provides additional information that the revelation of manipulation leads to accurate statements of net income, leading to a downward revision in profitability estimates. Investors may view this reduction in their returns favorably if they accept that the reduction was due to the removal of price manipulation.

Orazalin and Ahmetzhanov (2019) and Karjalainen (2011) observed that the cost of debt was reduced by audit quality, as quality audit reports reduced information asymmetry by providing detailed information about the borrower's past payment history. We add to these findings by showing a disciplining effect of audit oversight quality on debt, as audit committee oversight reduces the propensity for excessive borrowing by reducing the equity multiplier.

Likewise, Saftiana et al. (2017) found that the firm size reduced earnings management due to audit quality. This study found that for large firms, oversight by the audit committee increases the firm's value. As there is no reference to audit oversight quality on the firm's value, we provide pioneering results showing that audit oversight quality increases the firm's value for large firms. Firm value may be considered to be a measure of shareholder wealth. The economic value added is a practitioner measure of firm value concerning the excess of the net operating profits above the cost of capital. The ability of audit committees to identify key financial measures in complex financial reports for multi-country and multi-division firms can provide the strategic direction for decision-making that increases investor wealth in these firms.

Members of audit committees must strive to work with the board and management to make strategic decisions on new product development. This study used a sample of pharmaceutical firms and energy firms. Pharmaceutical firms make strategic decisions to produce new medicines, hire scientific talent, and expand into new markets. Energy firms must decide on new drilling locations and locate partners for joint projects in oil-producing countries. Such decisions are consequential in that they require considerable investment. The audit committee's ability to restrain debt may assist pharmaceutical firms in prioritizing the production of certain drugs. Debt restraints may result in energy firms drilling for oil in certain locations and not in other locations. The identification by audit committees of financial information about divisions in certain countries and product lines may be used to expand production and sales in regard to those product lines, in large firms.

The higher level of engagement in decision-making by audit committees suggests that the selection and assessment of audit committee members must reflect the skills and cognitive qualities needed for strategic thinking. Financial expertise and auditor experience with a prominent auditing firm would be useful. Personal qualities may be more significant in that they provide the motivation needed to actively collaborate with other board members and management to use information about debt, firm value, and profitability in decision-making. Commitment, a sense of responsibility, and work ethic are some of the qualitative measures that must be assessed in regard to audit committee members.

7.2. Research Limitations and Recommendations for Future Research

This study examined audit committees in the pharmaceutical industry and the energy industry. The study should be replicated in order to determine whether the results are generalizable across industries, such as retail, automobiles, aircraft, airlines, and restaurants. Further, as the study was confined to the pharmaceutical industry and the energy industry, it should be replicated with sector-specific factors that influence the impact of audit oversight quality on financial performance.

Measures of audit oversight quality were subjective measures. More objective, quantifiable measures may supplement these measures to provide a comprehensive assessment of the effect of audit oversight quality on financial performance.

Outcome measures were confined to measures obtained from financial statements. The study may be repeated with market measures, such as the price to book and price earnings ratio. Values > 1 of both measures suggest the overvaluation of securities, while values < 1 suggest the undervaluation of securities. The key issue to be resolved is whether transparency about the net income, debt, and firm value, through the vigilance of audit committees, results in accurate predictions of security values.

Stock returns were not measured as an outcome of audit oversight quality. Audit oversight quality may increase the accuracy of reporting of financial variables to the point of increasing contemporaneous stock returns and long-term stock returns.

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References

Ahmadi, Mobiria, and Mehdi Safari Grayhi. 2017. Hiring a high-quality auditor and debt maturity structure: Evidence from Iranian firms. *Journal of Economic and Social Studies* 7: 5–15. [CrossRef]

Al-Jaifi, Hamdan Amer, Ahmed Hussein Al-rassas, and Adel Ali Al-Qadasi. 2017. Corporate governance strength and stock market liquidity in Malaysia. *International Journal of Managerial Finance* 13: 592–610. [CrossRef]

Alodat, Yuosef Alodat, Hamzeh Al Amash, Saleh F. A. Khatib, and Marwan Mansour. 2023. Audit committee chair effectiveness and firm performance: The mediating role of sustainability disclosure. *Cogent Business & Management* 10: 2181156.

Altass, Sultan. 2021. The impact of audit committee effectiveness on corporate performance: Evidence from Saudi Arabia. In *Research Association for Interdisciplinary Studies Conference Proceedings*. Princeton: Research Association for Interdisciplinary Studie, pp. 29–35.

Alves Júnior, Edison Divino, and Fernando Caio Galdi. 2020. The informational relevance of key audit matters: Empirical evidence from Jordan. *International Business Research* 12: 50–57.

Alzeban, Abdulaziz. 2023. Internal audit findings, audit committees, and firm performance: Evidence from UK. *Asia-Pacific Journal of Accounting and Economics* 30: 868–89. [CrossRef]

Antle, Rick, Elizabeth Gordon, and Ganapathi Narayanamoorthy. 2006. The joint determination of audit fees, non-audit fees, and abnormal accruals. *Review of Quantitative Finance and Accounting* 27: 235–66. [CrossRef]

Barka, Hazar Ben, and Francois Legendre. 2017. Effect of the board of directors and audit committee on firm performance. *Journal of Management and Governance* 21: 737–55. [CrossRef]

Bens, Daniel, Woo-Jin Chang, and Sterling Huang. 2019. *The Association Between the Expanded Audit Report and Financial Reporting Quality*. Working Paper. Singapore: Singapore Management University.

Bilal, Songsheng Chen, and Bushra Komal. 2018. Audit committee financial expertise and earnings quality: A meta-analysis. *Journal of Business Research* 84: 253–70. [CrossRef]

Black, Bernard, and Woodchan Kim. 2012. The effect of board structure on firm value: A multiple identification strategies approach using Korean data. *Journal of Financial Economics* 104: 203–26. [CrossRef]

Caserio, Carlo, Delio Panaro, and Sears Trucco. 2014. A statistical analysis of reliability of audit opinions as bankruptcy predictors. *Journal of Modern Accounting and Auditing* 10: 917–31.

Chan, Feng, and Yue Li. 2013. Voluntary adoption and more stringent governance policy on audit committee: Theory and empirical evidence. *Accounting Review* 88: 1939–69. [CrossRef]

Chi, Wuchun, Ling Lei Lisic, and Mikhail Pevzner. 2011. Is enhanced audit quality associated with greater real earnings management? *Accounting Horizons* 25: 315–35. [CrossRef]

Davis, James H., David Schoorman, and Lex Donaldson. 1997. Toward a stewardship theory of management. *Academy of Management Review* 22: 20–47. [CrossRef]
Elmarzouky, Mahmoud, Khaled Hussainey, and Tarek Abdelfattah. 2022a. Do key audit matters signal corporate bankruptcy? *Accounting and Management Information Systems* 21: 315–34. [CrossRef]
Elmarzouky, Mahmoud, Khaled Hussainey, Tarek Abdelfattah, and Atm Enayet Karim. 2022b. Corporate risk disclosure and key audit matters: The egocentric theory. *International Journal of Accounting & Information Management* 30: 230–51.
Elmarzouky, Mahmoud, Khaled Hussainey, and Tarek Abdelfattah. 2023. The key audit matters and the audit cost: Does governance matter? *International Journal of Accounting and Information Management* 31: 195–217. [CrossRef]
Fakhfah, Iman, and Anis Jarboui. 2021. The moderating role of audit quality on the relationship between auditor reporting and earnings management: Evidence from Tunisia. *EuroMed Journal of Business* 16: 416–30.
Faura, Larry, Mingaji Hung, Xi Li, and Alvaro G. Taboada. 2017. Board reforms and firm value: Worldwide evidence. *Journal of Financial Economics* 125: 120–42.
Fenoller-Cortes, Javier, Oliver Jimenez, Antonio Ruiz-Garcia, and Davinia M. Resurreccion. 2021. Gender differences in psychological impact of the confinement during the Covid-19 outbreak in Spain: A longitudinal study. *Frontiers in Psychology* 12: 20. [CrossRef]
Francis, Jere R., Edward L. Maydew, and H. Charles Sparks. 1999. The role of Big 6 auditors in the credible reporting of accruals. *Auditing* 18: 17–34. [CrossRef]
Gani, Ismail, Albert Wijeweera, and Ian Eddie. 2017. Audit committee compliance and firm performance nexus: Evidence from ASX listed companies. *Business and Economic Research* 7: 135–45. [CrossRef]
Garcia, Laura Sierra, Emiliano Ruiz Barbadillo, and Manuel Orta Perez. 2012. Audit committee and internal audit and the quality of earnings: Empirical evidence from Spanish companies. *Journal of Management and Governance* 16: 305–31. [CrossRef]
Ghafran, Chaudhry, and Noel O'Sullivan. 2013. The governance role of the audit committees: Reviewing a decade of evidence. *International Journal of Management Reviews* 15: 381–407. [CrossRef]
Ghafran, Chaudhry, and Sofia Yasmin. 2018. Audit committee chair and financial reporting timeliness: A focus on financial, experiential, and monitoring expertise. *International Journal of Auditing* 22: 13–24. [CrossRef]
Habtoor, Omer Saeed. 2022. The impact of audit committee characteristics on Saudi bank performance. *Research in Business & Social Science* 11: 388–401.
Halim, Abdul. 2013. Pengaruh Kompetensi dan Independensi Auditor terhadap dan kualitas audit dengan Anggaran Waktu Audit Dan Komitmen Profesional sebagai Variabel Moderasi. Unpublished Ph.D. dissertation, University Brawjiaya Malang, Jawa Timur, Indonesia.
Hill, Charles W. L., and Thomas M. Jones. 1992. Stakeholder-agency theory. *Journal of Management Studies* 29: 131–54. [CrossRef]
Ika, Siti R., and Nazli A. Mohd Ghazali. 2015. Audit committee effectiveness and timeliness of reporting: Indonesian evidence. *Managerial Auditing Journal* 27: 403–24.
Jensen, Michael C., and William H. Meckling. 1976. Theory of the firm, managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics* 3: 305–60. [CrossRef]
Kam, Chan, and Joanne Li. 2008. Audit committee and firm value: Evidence on outside top executives as expert-independent directors. *Corporate Governance: An International Review* 16: 16–31.
Karjalainen, Jukka. 2011. Audit quality and cost of debt capital for private firms: Evidence from Finland. *International Journal of Auditing* 15: 88–108. [CrossRef]
Keinath, Annemarie, and Judith C. Walo. 2008. Audit committee responsibilities disclosed since Sarbanes-Oxley. *CPA Journal* 78: 32–37.
Kittiwong, Weerapong, and Naruanard Sarapaivanich. 2020. Consequences of the implementation of expanded audit reports with key audit matters (KAMs) on audit quality. *Managerial Auditing Journal* 35: 1095–119. [CrossRef]
Li, Hong, David Hay, and David Lau. 2019. Assessing the impact of the new auditor's report. *Pacific Accounting Review* 31: 110–32. [CrossRef]
Li, Lina. 2020. Book review of disruption in the audit market: The future of the Big Four, financial failures and scandals: From Enron to Carillon and the future of auditing. *International Journal of Auditing* 24: 431–35. [CrossRef]
Muniandy, Balachandran. 2007. CEO duality, audit committee effectiveness and audit risks. *Managerial Auditing Journal* 23: 716–28.
Munoz-Izquieredo, Nora, Maria-del-Mar Camacho-Minano, Maria Jesus Segovia-Vargas, and David Pascual-Ezama. 2019. Is the external audit report useful for bankruptcy prediction ? Evidence using artificial intelligence. *International Journal of Financial Studies* 7: 20. [CrossRef]
Nawafly, Ali Thamer Mutasher, and Ali Saleh Ahmed Alarussi. 2018. Board of directors, audit committee and the financial performance of listed companies in Malaysia. *Journal of Social Sciences Research* 6: 951–57. [CrossRef]
Orazalin, Nurlan, and Russauf Ahmetzhanov. 2019. Earnings management, audit quality, and cost of debt: Evidence from a Central Asian economy. *Managerial Auditing Journal* 34: 696–721. [CrossRef]
Porumb, Vlad-Andrei, Yasmini Zengin-Karairaghimoglu, Gerald J. Lobo, Reggy Hooghiemstra, and Dick De Ward. 2021. Expanded auditors report disclosures and loan contracting. *Contemporary Accounting Research* 38: 3214–53. [CrossRef]
Rahman, Habib Ur, and Asif Ali. 2022. Revisiting the role of audit and compensation 'committees' characteristics in the financial performance of the non-financial sector through the lens of the difference generalized method of moments. *Cogent Business and Management* 9: 2085365. [CrossRef]

Rifat, Fariha, Md. Mukarrom Hossain, and Ratan Ghosh. 2022. Board characteristics, audit committee attributes and firm performance: Empirical evidence from emerging economy. *Asian Journal of Accounting Research* 7: 84–92.

Ruiz-Barbadillo, Emiliano, Nieves Gomez-Aguilar, Cristina De-Fuentes-Barbera, and M. A. Garcia-Benau. 2004. Audit quality and the going-concern decision-making process: Spanish evidence. *European Accounting Review* 13: 597–620. [CrossRef]

Saftiana, Yulia, Mukhtaruddin Mukhtaruddin, Kristina Winda Putri, and Ike Sasti Ferina. 2017. Corporate governance quality, firm size, and earnings management: Empirical study in Indonesian Stock Exchange. *Investment Management and Financial Innovations* 14: 105–20. [CrossRef]

Shamsul, Nahar Abdullah, and Nor Izah Ku Ismail. 1999. Audit Committee effectiveness among Malaysian listed companies. *Malaysian Management Journal* 3: 1–13.

Shatnawi, Saddam Ali, Ahmad Marei, Mustafa Mohd Hanefah, Monther Eldaia, and Saad Alaaraj. 2021. Audit committee and financial performance in Jordan: The moderating effect of ownership concentration. *Montnegrin Journal of Economics* 17: 45–53.

Spence, Michael. 2002. Signaling in retrospect and the informational structure of markets. *American Economic Review* 92: 434–59. [CrossRef]

Velte, Patrick. 2023. Which attributes of audit committees are most beneficial for European companies ? Literature review and research recommendations. *Journal of Global Responsibilities* 14: 2041–68. [CrossRef]

Watts, Ross L., and Jerold L. Zimmerman. 1986. *Positive Accounting Theory*. Upper Saddle River: Prentice Hall.

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Article

Tax Compliance in Slovenia: An Empirical Assessment of Tax Knowledge and Fairness Perception

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Abstract: Complex tax systems can result in tax evasion, which further impacts the revenues necessary to achieve sustainable development goals. Enhancing taxpayer education, tax knowledge, and tax fairness perception is essential for boosting revenues to support societal sustainability. The aim of this study was to assess the levels of tax knowledge and tax fairness perception within the Slovene taxpayer population, with a specific focus on the differences related to gender and settlement size. Further, the connections between tax knowledge and various aspects of tax fairness were explored. The Kruskal–Wallis test was used to assess the statistical significance of gender and settlement size differences and the Kendall's coefficient of rank to determine the association between the tax knowledge and fairness perception dimensions. The results provide evidence that highlights disparities in tax knowledge between male and female taxpayers (p-value = 0.0116). Additionally, this study demonstrates that settlement size does not significantly impact tax knowledge perception among Slovene taxpayers (p-value = 0.2067). However, tax fairness encompasses various dimensions, and our research reveals no disparities based on gender (p-value = 0.7263) or settlement size (p-value = 0.2786). When assessing the correlation between tax knowledge and tax fairness perception, the results indicate statistically significant but weak correlations in both directions, depending on the specific fairness dimension.

Keywords: tax compliance; tax evasion; tax fairness; tax knowledge; gender; settlement size; Slovenia

1. Introduction

Tax systems are complex and complicated, and taxpayers with limited or no prior tax knowledge may struggle to grasp their tax obligations. This can result in unintentional or intentional non-compliance (Carley et al. 2010), leading to the loss of entitled benefits and reduced state revenues, particularly affecting the most vulnerable in society. A valuable tool for helping raise the tax revenues necessary to achieve sustainable development goals is improving taxpayer education, their tax knowledge (OECD 2015, 2021), and the equality of the tax systems (OECD 2022). This approach aims to achieve higher tax compliance, involving the concept of "reciprocity", which encompasses both the "public goods provided by the state" and the perception of fairness within the tax system (Saad 2010, 2014).

Tax education has been a key component of the OECD's priorities (as indicated in the 2015 and 2021 surveys). To build a new tax culture centered on a "culture of tax compliance" means educating taxpayers to perceive tax payments as an integral part of their relationship with the government, built upon rights and responsibilities (OECD 2021). Tax education plays a critical role in promoting voluntary tax compliance, enhancing taxpayer understanding of the tax system, improving their perceptions of the tax system's fairness, and building trust in tax authorities, leading to more effective compliance and enforcement (Mukhlis et al. 2015; Gunaasih 2022; Kumi and Kwasi 2023). Merely informing taxpayers about their tax obligations falls short (Moore 2019; Craig and Slemrod 2022). Therefore, new communication strategies via social networks and social media are becoming important (Juliobenedrick et al. 2023; Puklavec et al. 2023), even in raising tax compliance awareness.

The potential for a gap in public tax knowledge exists alongside the financial tax gap, which represents the disparity between budgeted and actual government tax revenues and is a substantial concern from a social justice standpoint and in the public interest (Edgley and Holland 2021). Increasing levels of financial and tax literacy could yield a dual benefit: not only would enhanced financial and tax literacy positively affect tax morale, but this impact might be amplified through the influence of fairness (Phyllis and Balavac-Orlic 2022). Higher education levels lead to increased tax knowledge (Kumi and Kwasi 2023; Gunaasih 2022; Fauziati et al. 2016; Saad 2014; Eriksen and Fallan 1996). Conversely, low levels of tax knowledge have been linked to negative attitudes toward tax payment (Inasius 2019a, 2019b; Ali and Ahmad 2014; Lewis 1982). Tax knowledge exhibits a positive correlation with tax compliance (Mukhlis et al. 2015). The level of knowledge is important in the way people comprehend the reality underlying taxation and the associated attitude toward taxation that is expressed (Eriksen and Fallan 1996). A solid understanding of taxation is essential for boosting tax awareness (Palil 2010) as higher tax knowledge leads to higher tax compliance and poor tax knowledge leads to higher tax non-compliance (Kirchler et al. 2008). Tax knowledge is important as it can significantly change attitudes toward the fairness of the tax system (Fallan 1999). Prior studies tend to focus on the effect of tax knowledge on the overall fairness of the tax system, even though there is evidence that fairness is a multi-dimensional construct of general, exchange, horizontal, vertical, retributive, personal, and administrative fairness (Saad 2010; Gilligan and Richardson 2005). The prevailing theory in the tax compliance literature suggests that taxpayers' perceived fairness in the tax system enhances their trust in the government, exerting a positive influence on compliance (Jimenez and Iyer 2016). If taxpayers perceive fairness and equity in taxation, they tend to be more compliant; conversely, when they believe they do not receive any benefits, they are more inclined to engage in tax evasion (Amin et al. 2022). Perceptions of the tax fairness dimensions might vary between countries (Saad 2012). Tax education positively impacts tax knowledge, which, in turn, influences tax fairness positively, and this significantly contributes to tax compliance (Mukhlis et al. 2013, 2015). Insufficient tax knowledge (Inasius 2019a, 2019b) stands as a significant challenge for numerous tax authorities, knowing that taxpayer education is linked to local economic, social, and cultural realities. There are many factors linked to tax knowledge and the perception of tax fairness. Although authors highlight economic, psychological, and socio-demographic factors in tax compliance, research on the gender and settlement size impact on taxpayers' tax knowledge and tax fairness perception is limited (Saad 2010, 2012; Mohamad et al. 2013). Gender differences are driven by various mechanisms, including income disparities, occupational disparities, family responsibilities, tax knowledge and financial literacy, legal and regulatory factors, risk aversion, enforcement and penalties, social and cultural norms, and access to resources (Coelho et al. 2022). Fallan (1999) identified a higher level of tax literacy among males, while Formanova et al. (2021) could not find a gender effect on the level of tax literacy. The results are mixed and country-specific. Besides gender differences, Williams (2020) argues that on the European level, taxpayers in villages and rural areas are more likely to be non-compliant. Altering the tolerance for tax non-compliance can be achieved through educational efforts and awareness-raising campaigns.

Each country possesses distinctive cultural, social, economic, and legal characteristics (Singh et al. 2023); it is expected that these contexts shape taxpayers' perceptions, behaviors, and tax compliance differently by geographic area. Citizens in the EU and OECD countries possess some of the highest education levels globally (Dayioğlu Erul 2020). Therefore, they may use their advanced education and knowledge to exploit legal loopholes for non-compliance. Alternatively, they might choose to relocate their investments to countries with lower tax rates or less stringent audits, using their knowledge as a strategic advantage instead of emphasizing greater compliance (Dayioğlu Erul 2020). On the other hand, Vincent's (2023) findings indicate that a lack of tax knowledge tends to worsen the negative impacts of sub-national taxing authority and discretionary control over tax authorities on tax compliance. A comparative analysis conducted by the European Commission (2019) on non-compliance among EU Member States (period 2001–2016) reveals that Slovenia is among the 14 Member States with the lowest estimated lost revenue regarding tax non-compliance (accounting for less than 5% of the EU-28 total). An additional integrative analysis on tax compliance by Surugiu et al. (2021) utilized unbalanced panel data for the European Union (EU28), including Slovenian data, covering the period from 2007 to 2017. This analysis demonstrated a positive and significant influence of the quality of the education system on tax compliance, similar to findings in studies by Dayioğlu Erul (2020) and Tilahun (2019). The design of tax policies in all Member States should always consider the gender gaps prevailing (Nerudova et al. 2019), and European institutions and Member States are required to analyze and assess tax policies concerning socioeconomic gender gaps (Gunnarsson et al. 2017). Slovenia belongs to the economy, being a member of the EU and OECD, a country with a high influence on international tax regulations and guidelines. According to the data from the Statistical Office of the Republic of Slovenia (SURS 2023), females have recently attained higher levels of education than males. Only 40 percent of individuals live in settlements larger than 5000, as Slovenia has many small settlements, with the majority residing in rural areas. Financial literacy is considered to be low according to internationally established criteria (UMAR 2023). Therefore, improving financial and other types of literacy, especially among adults, is among the priorities of the country (UMAR 2023).

Thus, recognizing the importance of tax knowledge and tax fairness on compliance, based on the presented literature and strategic documents of the EU and OECD, the first question that arises is whether tax knowledge perception depends on gender and settlement size. Secondly, do the dimensions of tax fairness perception differ based on gender and settlement size? And thirdly, what is the relationship between tax knowledge perception and tax fairness perception?

The aim of this study is to assess the level of tax knowledge perception and tax fairness perception among Slovene taxpayers, examining differences based on gender and settlement size. By examining Slovenian taxpayers, new insights into factors, such as tax knowledge and fairness perception within a specific region can be gained. The findings may offer valuable information for Slovenian policymakers to tailor tax educational policies as well as for other countries with similar social, political, and economic situations. As the empirical evidence in this study is limited to tax knowledge perceptions and tax fairness perceptions, it is expected that the results of this study will contribute to the literature on tax compliance behavior (tax compliance factors). This study generates additional evidence for the limited literature available on these aspects in Slovenia, especially by analyzing differences based on gender and settlement size. Further, the study proposes some educational initiatives based on the results to enhance existing taxpayer knowledge and awareness.

The findings of this study indicate disparities in perceived tax knowledge between male and female taxpayers. Furthermore, this research demonstrates that the size of one's settlement does not notably affect the level of tax knowledge among Slovene taxpayers. The statistically significant relationship between tax knowledge and tax fairness perception was relatively weak in both directions, contingent on the particular dimension of fairness being considered. However, in order to better understand the relationship between gender and tax knowledge and settlement size and tax knowledge while controlling for relevant factors such as education, income, and marital status, a more comprehensive multivariate analysis based on data from an improved questionnaire and a stratified random sample should be conducted in future studies.

2. Literature Review and Theoretical Background

Becker (1968) and Allingham and Sandmo (1972) represent the first attempts to develop a framework for tax compliance behaviour. Their Economic Approach (Rational Choice Theory) involves taxpayers engaging in both tax evasion and tax avoidance. Taxpayers commonly undertake a cost-benefit analysis, assessing potential penalties and the tax loss they might face if their evasion is detected (Güzel et al. 2019). The Moral Sentiments The Planned Behaviour Theory, a concept within social psychology, explains individuals behavior through the examination of behavioral intentions influenced by attitudes toward three key components: the behavior itself, subjective norms, and perceived behavioral control (Sundari et al. 2022; Taing and Chang 2020). The Behavioural Approach, emphasizes that the behavior of taxpayers in complying with taxes is shaped by non-economic factors and not just by economic ones. The non-economic factors of tax compliance include trust, tax morality, perception of justice/fairness, beliefs, norms (personal and social), deterrence, and educational awareness.

This study investigated two non-economic factors of tax compliance, tax knowledge perception, and tax fairness perception. The educational level of taxpayers significantly influences their understanding of taxes, particularly with respect to tax laws and regulations. Tax knowledge helps taxpayers navigate declaration procedures effectively, accurately determine tax liabilities (Nguyen 2022). A prevailing agreement in tax compliance research highlights the important role of a fair tax system in shaping taxpayers' compliance behavior (Taing and Chang 2020; Nguyen 2022; Inasius 2019a). Therefore, education on taxation has a positive impact on tax knowledge (Kumi and Kwasi 2023; Gunaasih 2022), leading to a positive influence on the perceptions of tax fairness, which in turn significantly contributes to enhanced tax compliance, Mukhlis et al. (2015).

2.1. Tax Knowledge

In the tax compliance literature, the term "tax knowledge" lacks a singular, universally accepted definition and is used in various contexts. Tax knowledge encompasses a broad spectrum of fiscal awareness, including general financial knowledge, awareness of tax evasion possibilities, overall educational background, and familiarity with tax laws (Devos 2016). According to Wong and Lo (2015), tax knowledge pertains to an individual's assessment of their capability to adhere to tax regulations, including both technical expertise in taxation and a broader understanding of the tax system and compliance requirements. Tax knowledge is a fundamental component of a voluntary tax compliance system (Kasippilai 2000). Non-compliance with tax regulations may arise due to the taxpayer's insufficient knowledge and skills to adhere to them (OECD 2019b). Udin (2015) considered tax knowledge as one of the crucial factors in determining taxpayers' tax obligation correctly. Loo (2006) emphasized that in a self-assessment system, taxation knowledge stands out as the most influential factor in shaping taxpayer compliance behavior.

There are several types of knowledge, including implicit knowledge, explicit knowledge, empirical knowledge, and rationalism knowledge (Damajanti 2015). Saad (2014) determined two dimensions of tax knowledge: knowledge acquired through formal education and knowledge focused on potential tax evasion opportunities, while Bornman and Ramutumbu (2019) identify three categories of tax knowledge: general knowledge, procedural knowledge, and legal knowledge. There is limited research (Saad 2010; Mohamad et al. 2013) measuring next to general knowledge and also specific tax knowledge (legal and technical knowledge).

General tax knowledge for the individual means to understand the overall fiscal strategies of the government, i.e., to understand why taxes should be paid, to understand one's personal financial situation, and to understand the influence of taxation on personal financial situation (Bornman and Ramutumbu 2019). Saad (2010) and Mohamad et al.'s (2013) idea is that general tax knowledge relates to a perceived idea of the tax system and its purpose.

Legal knowledge highlights individuals' knowledge of regulatory aspects, including their obligations and responsibilities, rights, and consequences in the form of penalties for non-compliance (Saad 2010; Mohamad et al. 2013). Bornman and Ramutumbu (2019) suggested that legal knowledge can be divided into a conceptual understanding of tax legislation, which includes a high-level awareness of legislative terminology and the capacity to differentiate between various taxation concepts. Additionally, they proposed a technical understanding of tax legislation, which involves the capability to apply legal tax knowledge to one's specific situation and ensure precise compliance with tax obligations (Bornman and Ramutumbu 2019). Taxpayers are feeling tax incompetent because of the complexity of the tax laws and because of that, they lose interest in the tax system (McKerchar 2001). The situation becomes notably demanding because tax laws are usually subject to frequent changes and are often too complex for the average person to understand, which is particularly true for many small business owners (Bornman and Ramutumbu 2019).

Technical knowledge pertains to individuals' capability to fill out and submit their tax return form (Saad 2010; Mohamad et al. 2013). In some research, it is also defined as procedural knowledge, which refers to understanding the process and timing for submitting a tax return. According to Oladipupo and Obazee (2016), procedural knowledge encompasses several key elements. These include understanding the rationale behind the current structure and administration of the tax system, familiarity with tax requirements, particularly in relation to registration and filing obligations, and awareness of diverse compliance measures (Oladipupo and Obazee 2016). Additionally, procedural knowledge involves a certain degree of consciousness and attentiveness regarding procedures and protocols associated with tax return filing, comprehension of the processes and obligations involved in maintaining tax compliance, and the practice of timely, accurate, and comprehensive record-keeping for the completion and submission of tax returns and relevant documents (Oladipupo and Obazee 2016). Bornman and Ramutumbu (2019) proposed that procedural tax knowledge can be delineated into two key components: interacting with tax authorities and maintaining essential records for tax-related purposes.

In the existing literature, most studies examined the relationship between tax knowledge and tax compliance. The results of these studies are mixed, from the confirmation of existing correlation between tax knowledge and tax compliance, where taxpayers' decisions regarding tax compliance are largely influenced by their tax knowledge (Hofmann et al. 2008; Azmi et al. 2016; Maqsudi et al. 2021; Remali and Jalil 2021; Remali et al. 2018), to non-existing correlation (Nicoleta 2011; Ghani et al. 2020). According to Hofmann et al. (2008), tax knowledge is a fundamental factor that affects tax compliance. In the context of individual taxpayers' attitudes, having a solid understanding of tax laws is crucial, and there is a notable positive correlation between tax knowledge and the level of tax compliance (Azmi et al. 2016). Maqsudi et al. (2021) also found that taxpayer knowledge directly and positively influences taxpayer compliance. Contrary to that, Nicoleta (2011) found that tax knowledge is negatively linked to tax compliance behavior and revealed that taxpayers with a higher level of tax knowledge were more capable of identifying discrepancies in the tax system and regulations, which, in turn, led to increased instances of tax non-compliance. Ghani et al. (2020) indicated that tax knowledge does not significantly impact tax compliance among self-employed individuals. According to Palil et al. (2013), individuals with sufficient tax knowledge can mitigate unintentional noncompliance. In other words, this implies that tax knowledge can enhance the degree of tax compliance. Remali and Jalil (2021) claimed that tax education can help undergraduate students enhance their tax compliance by positively influencing their perceptions of the tax system and ethical attitudes. Additionally, some authors have suggested that education is linked to knowledge and, in this way, search for connections with tax compliance (Putri and Venusita 2019; Natasha and Yustina 2020). However, they mostly did not find any significant partial influence, as general education is not always associated with an understanding of the tax system and specific tax knowledge. One of the goals of this study was to test the relationship between tax knowledge and two socio-demographic factors (gender and settlement size). As the first main hypothesis, which was further tested with two subhypotheses, we defined the following:

H1: *The level of tax knowledge differs significantly by gender and settlement size among taxpayers in Slovenia*.

Stotsky (1996) and Gunnarsson et al. (2017) demonstrated that gender differences exist even in taxation (OECD 2022). Tax policies significantly influence the economic participation and overall well-being of both females and males. These policies play a crucial role in shaping gender outcomes by impacting disposable consumption, incomes, and wealth. Therefore, tax policies are instrumental in influencing the overall well-being of individuals across genders OECD (2022). Socioeconomic inequality between males and females derives from legal cultures and economic structures (Torgler and Schneider 2004). The division of labor plays a central role in shaping fundamental objectives and norms in society, introducing a gendered dimension to the distributive and allocative effects of tax laws and policies. Males traditionally earn more and are wealthier than females; they accumulate more wealth in capital income, property rights, and financial investments and are therefore more oriented toward entrepreneurship (OECD 2022). Females are clustered in lower-income groups and have higher poverty rates than males. Paid work favors males rather than females. While males' labor is more valued publicly in the market, females tend to be more reproductive inside the private domain of the home (Gunnarsson et al. 2017).

Implicit and explicit gender bias exists in most tax systems around the world, and eliminating bias may increase equality within tax systems (Grown et al. 2022). Females and males can be deliberately treated differently due to favorable tax law provisions, regulations, and procedures (explicit gender bias) or because the tax system and taxes affect their well-being differently (implicit bias). The inefficiencies of any tax system must be continually tested. Even if females and males are taxed under the same tax law, the structure of the tax system can have different impacts on females versus males (Grown et al. 2022). Gender differences drive various mechanisms, shaping the gender perception of the tax system differently between males and females. Coelho et al. (2022) identified differences in labor supply, progressivity on pay gaps, and lower effective capital income taxation on the personal income tax burden gap as gender bias in taxation. It is evident that gender differences exist (OECD 2022; Stotsky 1996; Gunnarsson et al. 2017) due to interaction with economic or societal differences between males and females.

Several researchers have examined gender as a demographic variable (Lohse and Qari 2014; Amponsah and Adu 2017; D'Attoma et al. 2017), demonstrating that males are less compliant than females. Kastlunger et al. (2010) pointed out that gender needs to be examined with caution as it affects socialization and education. Natasha and Yustina (2020) and Formanova et al. (2021) could not find a gender effect on the level of tax knowledge or literacy, which does not align with Fallan's (1999) conclusion that reportedly identified a higher level of tax literacy among males. A sizable gender gap in financial knowledge was identified by Yao et al. (2023). Although gender-sensitive tax laws are essential, they cannot attain gender equality. However, Fallan's (1999) study unveiled a non-significant result that gender does not possess predictive power in this context.

When explaining the reasons for the gender gap in tax knowledge, we can follow the findings of Yao et al. (2023), who identified some key factors for explaining a possible gender gap in financial knowledge. These mechanisms can be assumed to also apply to the gap in tax knowledge.

Gender differences depend on the complex interactions between specific family contexts and the socialization of gender roles, i.e., the family financial socialization process. In this process, norms, values, standards, attitudes, knowledge, and behaviors are acquired, contributing to the well-being of the individual and financial viability (Yao et al. 2023; Danes 1994). The socialization processes positively correlate with individuals' subjective self-evaluated knowledge and objective knowledge (Zhu 2018; Deenanath et al. 2019).

Previous research (LeBaron and Kelley 2020) on traditional gender roles depicts males as the breadwinners, financially responsible, and females as the caregivers, highlighting differences in parenting. Male children tend to receive more experiences in information about financial matters compared to female children (Yao et al. 2023).

Another particularly important source identified for acquiring financial knowledge is formal (informal) financial education. Prior research has found positive causal effects (Kaiser et al. 2021) of education programs on knowledge and financial behaviors, favoring females. Even after taking formal courses (Danes and Haberman 2007; Danes and Brewton 2014), females gained more knowledge. Yao et al.'s (2023) investigation confirmed that, in comparison to family socialization, financial experiences beyond the family, such as education, play significantly more substantial roles in influencing the gender gap in financial knowledge among males and females. Eriksen and Fallan (1996) found that females and males learn tax knowledge differently; there are unique learning patterns, as reported by Fallan (1999). Coelho et al. (2022) observed that gender differences are driven by various mechanisms, including income disparities, occupational disparities, family responsibilities, tax knowledge and financial literacy, legal and regulatory factors, risk aversion, enforcement and penalties, social and cultural norms, and access to resources. As Formanova et al. (2021) could not find a gender effect on the level of tax literacy, which does not align with Fallan's (1999) conclusion that reportedly identified a higher level of tax literacy among males, the mix result needs additional testing country-specific.

We believe that (tax) cultural, social norms, and (tax) values, as well as society expectation regarding responsibility, may influence the level of type and engagement in acquiring tax knowledge by gender differently. Other potential reasons for variations in tax knowledge by gender could derive from historical gender roles, due to unequal access to education—educational disparities, unequal access to financial resources and opportunities for financial decision-making, and occupational segregation. The scope of this research is limited to the subjective perception of tax knowledge based on self-evaluated knowledge, focusing on general knowledge, legal knowledge, and technical knowledge. If our study confirms gender differences in tax knowledge, further detailed research should be conducted, testing, for example, effective knowledge and the possible mechanisms driving gender differences. Building on the previous literature, the current study seeks to examine the following subhypothesis:

H1a: *The level of tax knowledge differs significantly between male and female taxpayers in Slovenia.*

When examining the differences by settlement type between rural and urban areas, there seems to have been a shift over time, with a smaller percentage of tax non-compliance observed in rural areas and an increase in non-compliance rates in small or medium-sized towns (Williams 2020). Although there were no significant differences between urban and rural residents in their likelihood of engaging in tax non-compliance in 2007 and 2013, by 2019, those living in large urban areas were significantly less likely to be non-compliant compared to those in rural areas or villages (Williams 2020). Therefore, Williams (2020) argues that at the European level, taxpayers in villages and rural areas are more likely to be non-compliant. Altering the tolerance for tax non-compliance can be achieved through educational efforts and awareness-raising campaigns, e.g., higher tax knowledge. There are few other studies measuring the impact of a taxpayer's settlement size (rural or urban area) on their compliance, with some empirical evidence supporting the influence of the area variable for businesses on tax compliance (Dissanayake and Premaratna 2020; Williams 2020).

There could be several reasons why differences might be expected based on settlement size. Significant disparities in rural areas, both in OECD and non-OECD countries, exist primarily in terms of mobility, the accessibility of public transport, the adoption of new information, and communication technologies, as well as the availability of sufficient and high-quality resources for education and training (OECD 2006, 2019a). Wood (2023) identifies the following reasons for differences in knowledge between urban and rural areas. First, the availability of resources, such as well-equipped educational institutions, favors urban areas, making it challenging for rural areas, which often lack these resources. Consequently, access to specific and high-quality education in taxation, as well as highly qualified educators, is difficult (Wood 2023). Due to the distance and limited access to formal educational institutions in rural areas, access to specific knowledge is restricted, and local knowledge needs to be disseminated through others, such as online communication channels, for which the infrastructure is not always adapted (Wood 2023). Among the most significant factors in knowledge dissemination are communication networks, which are more crucial for spreading specific tax knowledge in rural areas as well as transport and access to services (Pateman 2011). Due to the distance and limited access to formal educational institutions in rural areas, access to specific knowledge is restricted, and local knowledge needs to be disseminated through others, such as online communication channels, for which the infrastructure is not always adapted. Access to technology, facilitating online resources and tools for learning about tax matters, is not equal. There are more economic activities in urban areas than in rural areas. Urban areas have more robust government services, including tax-related education and assistance, compared to urban areas. Second, socio-economic factors, especially income levels, are higher in urban areas, and this significantly influences educational, that is, knowledge differences (Wood 2023). Rural individuals are found to have lower financial (i.e., tax) literacy levels than their urban individuals, and a possible explanation could be found in several socio-economic and demographic variables, such as age, income level, marital status, and employment status (Mckenzie 2022).

This study examines the existence of the differences between rural and urban taxpayers in tax knowledge perception but does not investigate the mechanisms and reasons behind them, which could be the subject of future research. The subhypothesis states the following:

H1b: *The level of tax knowledge differs significantly between rural taxpayers and urban taxpayers in Slovenia.*

2.2. Tax Fairness

Social psychologists discovered that tax compliance is affected by the taxpayers' perceptions of fairness and unfairness (Tyler 1997). Psychological elements, including attitudes, norms, and the perceived fairness of the tax system, hold equal significance as economic factors in enhancing taxpayer compliance (Kirchler 2007). In general, research examining the impact of fairness consistently reveals that "taxpayers are less inclined to adhere to a tax system they perceive as unjust, inequitable, and therefore lacking legitimacy" (Wenzel 2002). Kirchler et al. (2008) proposed in a slippery-slope framework that taxpayer compliance relies on a combination of economic and non-economic factors. Taxpayers adhere to tax compliance either out of fear of the tax authorities or due to a sense of obligation. The dimension of fear pertains to the perceived authority's power and the enforced compliance, including economic factors like audit rates and penalties. The sense of obligation, on the other hand, is associated with trust in the tax authorities and voluntary compliance, including non-economic factors such as norms, attitudes, and the perceived fairness of the tax system. The literature on tax morale has revealed that, in addition to deterrence mechanisms (Kirchler 2007; Alm 2019), the social and institutional context in which individuals engage with one another can have a substantial impact on their tax morale (Bergolo et al. 2020).

According to Kassa (2021), tax fairness is defined as the equity in tax collection procedures, principles, and execution, and when the tax collection process lacks fairness, it can lead to unethical practices. Tax fairness is a topic of debate, contention, and controversy since all taxpayers do not pay taxes using the same tax rates (Abate 2019). Fairness is linked to the perception of a harmonious balance between taxes paid and the benefits of public goods received. Despite the extensive discussion about individual motivations for tax compliance, the political economy literature still provides limited consideration to the impact of individual attitudes regarding fairness and wealth redistribution on tax morale (Castañeda 2023).

Previous research indicates the importance of fairness in taxation (Gobena and Van Dijke 2017; Niesiobędzka and Kołodziej 2020). Fairness could be observed from many different aspects, and therefore, there are many understandings of this concept (Sikayu et al. 2022). When taxpayers believe that the existing tax processes and procedures are unjust toward them, they might be hesitant to collaborate with tax audit officials (Kirchler et al. 2008). Individuals who are more sensitive to fairness are less inclined to view tax payment as a civic duty and more inclined to rationalize tax evasion (Castañeda 2023). Tax evasion is more likely to happen among taxpayers who perceive the tax system as unfair, leading them to exhibit non-compliance with their tax obligations (Sing and Bidin 2020). Tax fairness is a non-economic determinant of tax evasion and represents a significant factor influencing taxpayer behavior (Alm et al. 2017).

Ullah et al. (2018) find that most of the survey participants (individual taxpayers in Pakistan) believe that transparency and fairness within the system would directly contribute to an increase in tax revenue. Chan et al. (2000) discovered that when taxpayers believe that the government does not allocate tax revenue fairly, it leads to a perception of tax unfairness. Saad (2010) found that taxpayers considered the current income tax system fair, but there was no proof that this perception significantly affected their compliance behavior. Additionally, Saad (2010) found that fairness perceptions were influenced by tax knowledge and tax complexity, while Mohamad et al. (2013) indicated a significant difference in tax knowledge and fairness perception between accounting and non-accounting students.

There are various classifications of the dimensions and sub-dimensions of fairness in the literature and ways defined by the authors (Gerbing 1988; Azmi and Perumal 2008; Farrar et al. 2020). Based on previous research (Hartner et al. 2008; Van Dijke and Verboon 2010; Wenzel 2002; Farrar et al. 2020, 2022), Saad (2010) suggested ten dimensions of fairness, but in her study, seven dimensions were identified to be important in assessing the fairness of the income tax system: general fairness, exchange fairness, vertical fairness, horizontal fairness, personal fairness, retributive fairness, and administrative fairness. General fairness assesses individuals' opinions regarding the overall fairness of the (income) tax system (Saad 2010). Exchange fairness focuses on the fairness in the relationship between the benefits received from public goods and services provided by the government and the tax burden placed on taxpayers (Bayram et al. 2017). Personal fairness pertains to an individual's self-interest, whereas administrative fairness encompasses both the content of tax law (policy fairness) and the procedures followed by the tax authority (procedural fairness) (Saad 2010). Vertical equity is a judgment regarding the appropriate tax burden for taxpayers with varying abilities to pay while horizontal equity is a judgment that taxpayers with equal ability to pay should be subjected to the same taxation (Susilawati 2022). In other words, horizontal fairness pertains to the equitable distribution of benefits and costs among individuals within the same group, while vertical fairness concerns the allocation of benefits and costs among individuals who are not of equal standing (Bayram et al. 2017). In the context of tax behavior, some have authors categorized fairness as distributive, procedural, and retributive justice (Comunale et al. 2019). Among the principles of justice, distributive justice and procedural justice are given the most attention (Druckman 2020). Distributive justice concerns the fairness of the decision's outcome, while procedural justice pertains to the fairness of the decision-making process (Druckman and Wagner 2016). Distributive justice refers to the equity of outcomes in resource allocation or distribution and boasts the longest history of research in social psychology (Wenzel 2003). The primary four principles of distributive justice include equality, proportionality, compensation, and need (Druckman and Wagner 2016). Another categorization of distributive fairness can be horizontal fairness, vertical fairness, or fairness in exchanges with the government (Bayram et al. 2017).

Wenzel (2003) observed distributive, procedural, and redistributive justice in tax research on the societal, group, and individual levels. The individual level of analysis of distributive justice in tax research includes analysis of personal tax burdens, personal benefits, and personal options related to tax evasion compared to others, other times, or relative income. Procedural justice encompasses the consideration of the process (Druckman 2020) and includes analysis of holding regard for everyone's dignity and maintaining consistency compared to others, expression, authority, process and decision control, information and explanation, effectiveness, and balancing service quality against expenses incurred by the individual (Wenzel 2003). It offers a way to assess individuals' perceptions regarding the legitimacy of an authority and their compliance with the rules and decisions established by that authority (Hoong Voon et al. 2023). Redistributive justice includes an analysis of the appropriateness of a penalty for individuals (penalties) and inflexibility or lack of consideration in the audit process for individual cases (audits) (Wenzel 2003).

Incorporating gender considerations is important across all tiers of research, policy development, and advocacy in the realm of tax fairness/justice; overlooking this dimension implies forfeiting the chance to achieve an equitable tax system (Christain Aid 2014). Even if explicit and implicit gender biases do not exist in a tax system, implementing a gender-based tax system may face challenges in achieving high compliance, as it can still be perceived as unfair by taxpayers. Therefore, when designing tax systems and tax policies and considering the gender gaps (Nerudova et al. 2019), these should not be overlooked. The reason why tax fairness perception differs might be also found in the non-uniform distribution of tax preferences in society, which varies depending on the urbanization rate (Andersson 2017). This study limited the research to all dimensions of fairness defined by Saad (2010, 2012), who confirmed positive perceptions of personal, vertical, and administrative fairness. However, for exchange, horizontal, and retributive fairness perceptions, the results were mixed. Fairness perception by dimensions can differ among different groups, as Mohamad et al. (2013) revealed in their research on accounting and non-accounting students. Measuring perceptions on all dimensions of fairness by gender and settlement size was identified as a literature gap. Therefore, as the second main hypothesis, which was further tested with two subhypotheses, we defined the following:

H2: *The level of tax fairness differs significantly by gender and settlement size among taxpayers in Slovenia.*

In addition to the gender arguments already stated under subhypothesis one, why expect gender differences in tax knowledge, we believe that the same mechanisms apply to tax fairness. Gender differences in the perception of tax fairness are anticipated because females often earn lower incomes, enter and exit the labor market at different life stages, and contribute significantly to unpaid labor and caregiving responsibilities at home, in family businesses, and within the community (Nerudova et al. 2019; Hundsdoerfer and Eva 2020). These variations also arise from the prevailing gender roles in society (Christain Aid 2014). Altering female and male awareness with improved tax knowledge raises perceptions of the fairness of the tax system (Fallan 1999). Research has confirmed gender disparities in perceptions of fairness concerning distributive and procedural justice (Hundsdoerfer and Eva 2020) and in redistributive fairness (Nerudova et al. 2019). Male participants are particularly responsive to procedural justice violations in their fairness perceptions, while female participants tend to adjust their fairness perceptions based on the outcomes of the tax allocation procedure (Hundsdoerfer and Eva 2020). To test whether gender differences exist in different dimensions of tax fairness, the subhypothesis was as follows:

H2a: *The level of tax fairness differs significantly between male and female taxpayers in Slovenia.*

Disparities between urban and rural areas can impact individuals' perspectives on taxes (Mohammed and Tangl 2024). The literature explains that these disparities may arise from actual differences in taxation between urban and rural areas in terms of paying different types of taxes and receiving tax exemptions and allowances that some are entitled to while others are not (Beck et al. 2016), affecting both vertical and horizontal fairness. We expect that the tax fairness perception between urban and rural areas will be different due to differences in economic, social, and cultural conditions, as well as the varying needs and expectations of individuals in both types of areas. Access to services and infrastructure, as well as access to tax education and specific tax knowledge, can influence the perception of tax fairness in these different environments. Therefore, to examine the dimensions of tax fairness perception based on settlement size, the following subhypothesis was formulated:

H2b: *The level of tax fairness differs significantly between rural and urban taxpayers in Slovenia.*

The perception of the fairness of the tax system can be improved by raising tax knowledge (Fallan 1999). These findings are inconsistent with Chucks and Azaka's (2023) conclusion, which states that the level of tax knowledge does not influence individuals' perception of tax fairness. Contrary to this, Saad (2010) confirmed a positively oriented relationship between tax knowledge and fairness dimensions and concluded that, in general, tax knowledge had varying effects on fairness perceptions, except for horizontal fairness (Saad 2010, 2014). Specifically, technical knowledge was found to significantly influence vertical fairness, retributive fairness, and personal fairness, while legal knowledge was only significant in shaping taxpayers' perceptions of retributive fairness (Saad 2010). The results in the literature are mixed. Based on these findings, we further tested the third hypothesis:

H3: *Tax knowledge positively influences the dimensions of fairness perception of Slovene taxpayers.*

3. Materials and Methods

In the conducted survey, the respondents were Slovene taxpayers who provided answers to a long range of questions related to the tax topic. For most respondents, the tax topic tends to be a sensitive topic. Therefore, in order to select respondents and further recruit them, the snowball sampling approach was used (a non-probability sampling technique).

Snowball sampling is a non-probability sampling technique used in social sciences to select respondents from populations that may be marginalized, hidden, or hard to identify with traditional sampling methods. The snowball sampling starts with a small group of respondents who provide information about other possible respondents. These respondents are then asked to participate in the survey and to recommend other potential respondents with specific characteristics. The process continues until there are no more recommendations or the planned sample size is reached.

Snowball sampling can be employed when studying attitudes toward sensitive topics like tax payments or opinions about the tax system. However, it is crucial to emphasize that snowball sampling could introduce bias into the survey results. Specifically, respondents may recommend others who share similar characteristics and opinions with the existing respondents, leading to a non-representative sample. Therefore, the results obtained through snowball sampling should be interpreted and observed carefully, with the main focus on the characteristics of the observed respondents.

In the survey, which was carried out from March to May 2023, 390 respondents who completed the questionnaire participated. The survey included in-depth and detailed questions related to the taxpayers' attitude toward the tax system in Slovenia.

Table 1 shows a list of the selected variables from the questionnaire, the key variables for conducting the analysis. Overall, 30 items were adopted from previous studies. Items measuring tax knowledge (GK1, LK1, LK2, LK3, TK1, TK2, and TK3) from Mohamad et al. (2013) and Saad (2010), items measuring tax fairness (GF1, GF2, GF3, GF4, GF5, HF1, EF1, VF2, and RF1) from Mohamad et al. (2013), and items measuring personal (PF1–PF9) and administrative fairness (AF1, AF2) from Braithwaite et al. (2001) were included, while 12 items (marked as "overall") are introduced by calculating the averages of subdimension variables for the purpose of further analyzing the results.

Table 1. List of observed questions and variables.

Code	Dimension	Question/Statement
TAXK	Tax knowledge perceptions	Overall
GK	General knowledge	Overall
GK1	General knowledge	The tax system may not be perfect, but it works well enough for most citizens.
LK	Legal knowledge	Overall
LK1	Legal knowledge	If I detect not reporting my exact income, I believe that the tax authority is tolerant toward my offence and most probably it will escape without any punishment.
LK2	Legal knowledge	Working for cash in hand payment without paying tax is a trivial offence.
LK3	Legal knowledge	Taxpayers cannot object to or make appeals against the tax authority's assessments.
TK	Technical knowledge	Overall
TK1	Technical knowledge	I have little idea about the deductions that I can claim as a taxpayer in the computations of my tax liability.
TK2	Technical knowledge	To my knowledge, I can deduct all personal expenses in calculating my tax liability.
TK3	Technical knowledge	Do you think it is acceptable to overstate tax deductions on one's tax returns?
FAIRP	Fairness perceptions	Overall
GF	General fairness	Overall
GF1	General fairness	I believe everyone pays their fair share of income tax under the current income tax system.
GF2	General fairness	I think the government spend too much tax revenue on unnecessary welfare assistance.
GF3	General fairness	Given the scope of social rights, taxes are not too high.
GF4	General fairness	Tax evasion is ethical if the tax system is unfair.
GF5	General fairness	Generally, I feel that income tax is a fair tax.
EF	Exchange fairness	Overall
EF1	Exchange fairness	By paying the right amount of income tax, I believe that other people, especially the poor will get the benefit.
HF	Horizontal fairness	Overall
HF1	Horizontal fairness	It is fair for individuals with similar amounts of income to pay similar amounts of income tax.
VF	Vertical fairness	Overall
VF1	Vertical fairness	Higher-income earners should pay more taxes than lower-income earners.
VF2	Vertical fairness	It is fair that high-income earners are subject to tax at progressively higher tax rates than middle-income tax.
RF	Retributive fairness	Overall
RF1	Retributive fairness	It is fair that individuals who deliberately evade their taxes should be penalized with the same amount of penalty regardless of the amount of tax evaded.
PF	Personal fairness	Overall
PF1	Personal fairness	I believe that I pay my fair share of the burden under the current income tax system.
PF2	Personal fairness	Do you believe that waiters pay a fair share of taxes under the current income tax system?
PF3	Personal fairness	Do you believe that farmers pay a fair share of taxes under the current income tax system?
PF4	Personal fairness	Do you believe that workers in a manufacturing company pay a fair share of taxes under the current income tax system?

Table 1. *Cont.*

Code	Dimension	Question/Statement
PF5	Personal fairness	Do you believe that surgeons and medical doctors pay a fair share of taxes under the current income tax system?
PF6	Personal fairness	Do you believe that board members of large national corporations pay a fair share of taxes under the current income tax system?
PF7	Personal fairness	Do you believe that judges pay a fair share of taxes under the current income tax system?
PF8	Personal fairness	Do you believe that entrepreneurs pay a fair share of taxes under the current income tax system?
PF9	Personal fairness	Do you believe that teachers pay a fair share of taxes under the current income tax system?
PF10	Personal fairness	Do you believe that construction workers pay a fair share of taxes under the current income tax system?
PF11	Personal fairness	Do you believe that public servants pay a fair share of taxes under the current income tax system?
AF	Administrative fairness	Overall
AF1	Administrative fairness	The tax authority respects honest taxpayers.
AF2	Administrative fairness	The tax authority is trustworthy by you in administering the tax system fairly.

While the survey questions were based on previous research studies, additional steps were taken to validate the survey questionnaire. Initially, the content of the survey questionnaire was validated, ensuring that all relevant aspects of the observed topic were appropriately measured and covered. Furthermore, some questions were slightly modified to enhance their clarity. Pilot testing was carried out with a small sample of respondents, and suggestions for improving the questionnaire were duly considered. Additionally, the data collection process was closely monitored to promptly address any unexpected issues that may have arisen.

Those 30 observed variables, listed in Table 1, belong to the 5-point Likert scale type of question, with the answer range from 1 (strong disagreement) to 5 (strong agreement). The variables were grouped according to their main dimensions, tax knowledge, and fairness perceptions. Inside those dimensions, variables were grouped further according to their following subdimensions. There are three tax knowledge subdimensions introduced: general knowledge, legal knowledge, and technical knowledge. The definitions and understanding of those items are provided by Saad (2010), and Mohamad et al. (2013). In the dimension of fairness perception, seven subdimensions were defined as follows: general fairness, exchange fairness, horizontal fairness, vertical fairness, retributive fairness, personal fairness, and administrative fairness. The definitions and understanding of those items are provided by Saad (2010) and Braithwaite et al. (2001) are presented in Appendix A. An additional 12 variables were introduced by calculating the averages of subdimension variables. Values from the variable legal knowledge (LK) were calculated as averages of variables LK1, LK2, and LK3 for each respondent separately. The tax knowledge (TAXK) variable was calculated as an average of variables GK, LK, and TK, which present the three subdimensions under the tax knowledge dimension. Similarly, the variable fairness perceptions (FAIRP) was estimated by considering seven fairness perceptions subdimensions: GF, EF, HF, VF, RF, PF, and AF. The analysis of the data was conducted using Microsoft Excel, R 4.3.0, and RStudio 2023.06.1+524. The data editing was conducted using Microsoft Excel, whereas the statistical analyses were performed in RStudio.

The analysis was conducted as follows: In the first step, the structure of the respondents according to their main demographic characteristics was observed. That was first performed on the overall level, and after that, it was according to the respondents' gender and the respondents' settlement type in which they live. The separate view of respondents according to their gender (H1a) and settlement type (H1b) is important. Research hypothesis H1a states that the level of tax knowledge differs significantly between females and males and H1b between rural taxpayers and urban taxpayers, respectively. To inspect whether those differences are statistically significant or not, the Kruskal–Wallis test was applied. The Kruskall–Wallis test (Kruskal–Wallis rank sum test) is a rank-based non-parametric test in which at the null hypothesis it is assumed that there are no statistically significant differences between two or more groups, whereas at the alternative hypothesis it is assumed that there is at least one group statistically different from the others. The test statistic is equal to the following:

$$H = (N-1)\frac{\sum_{i=1}^{g} n_i (\overline{r}_{i.} - \overline{r})^2}{\sum_{i=1}^{g}\sum_{j=1}^{n_i}\left(r_{ij} - \overline{r}\right)^2} \quad (1)$$

where N is the total number of observations in all groups, g is the number of groups, n_i is the observations' number in the i-th group, r_{ij} is the rank of the j-th observation from the i-th group, $\overline{r}_{i.}$ is the average rank of all observations in the i-th group, and $\overline{r}$ is the average rank of all N observations (Kruskal and Allen 1952; Dunn 1964). The Kruskal–Wallis test is appropriate since the observed data are assumed not to follow a normal distribution, a consequence of using the Likert scale with only five answer options. Additionally, two independent groups were observed (males vs. females and respondents from rural vs. urban settlements). The preliminary analysis indicates similar distributions in each group in terms of the shape and spread. However, a significant Kruskal–Wallis test will not indicate a difference in medians but the presence of a statistically significant difference between the groups, ensuring comparability for different variables. Finally, the large total sample size ensures that each group sample has more than 20 observations (Zar 2010). The Kruskal–Wallis test will be applied to inspect research hypothesis H2 (the level of tax fairness differs significantly between females and males (H2a), and between rural taxpayers and urban taxpayers respectively (H2b) as well. Finally, to investigate research hypothesis H3, tax knowledge positively influences the dimensions of fairness perception of Slovene taxpayers, the Kendall's coefficient of rank is used to determine the association between the tax knowledge with seven fairness perception dimensions. The Kendall's coefficient of rank is suitable for use when observing the association between ordinal variables measured on the Likert scale. To make appropriate adjustments for ties, Kendall's Tau-b statistic is used in the analysis (Agresti 2010):

$$\tau_b = \frac{n_c - n_d}{\sqrt{(n_0 - n_1)\cdot(n_0 - n_2)}} \quad (2)$$

where n_c is the number of concordant pairs, n_d is the number of discordant pairs, $n_0 = n\cdot(n-1)/2$, $n_1 = \sum_i t_i\cdot(t_i - 1)/2$, t_i is the number of tied values in the i-th group of ties for the first variable, $n_2 = \sum_j u_j\cdot\left(u_j - 1\right)/2$, and u_j is the number of tied values in the j-th group of ties for the second variable. Kendall's Tau-b statistic ranges from -1 to 1, where -1 indicates a perfect negative association, while a value of 1 indicates a perfect positive association. If Kendall's Tau-b statistic equals 1, this would imply that there is no association between the two observed variables. It has been demonstrated that Kendall's Tau-b statistic is robust against outliers. Additionally, Kendall's Tau-b statistic is often employed in cases where the observed variables are not normally distributed.

4. Results

4.1. Demographic Structure of Respondents

In Table 2, the structure of all 390 respondents, according to their main demographic characteristics, is given. The share of respondents was calculated by taking the ratio of the number of respondents in a certain category to the total number of respondents (n = 390) and multiplying the result by 100.

Table 2. Structure of respondents; n = 390 respondents.

Variable	Items	Share of Respondents, %
Gender	Female	52%
	Male	48%
Education	No education	0%
	Primary school	4%
	Vocational, secondary education	42%
	Higher secondary education	19%
	Tertiary education or university degree	29%
	Master's or doctoral degree in science	6%
Gross income	Less than EUR 500	2%
	From EUR 501 to EUR 1000	11%
	From EUR 1001 to EUR 2000	50%
	More than EUR 2001	17%
	I do not have one	1%
	I prefer not to answer	19%
Religion	Christianity	73%
	Islam	3%
	Hinduism	0%
	Buddhism	0%
	I am not religious	11%
	Other	3%
	I prefer not to answer	11%
Marital status	Single	18%
	Married	41%
	Divorced	4%
	Domestic partnership/cohabiting	37%
Type of settlement	Rural settlement	60%
	Urban settlement	40%

In the survey, 52% females and 48% males participated. Most respondents have a vocational secondary education (42%), and most respondents have a gross income in the range from EUR 1001 to 2000 (50%). The vast majority of respondents have stated that they are Christians (73%). Where a marital status is observed, 41% of respondents are married, whereas 37% of the respondents are in domestic partnership or cohabiting. According to the settlement type in which they live, 60% of respondents are from a rural settlement, whereas 40% of respondents are from an urban settlement. In this research, rural settlements are considered to have 3000 or fewer inhabitants. On the other hand, rural settlements are those with more than 3000 inhabitants. The structure of the respondents' demographic characteristics according to gender is provided in Table 3.

The share of female respondents was calculated by taking the ratio of the number of female respondents in a certain category to the total number of female respondents (n = 203) and multiplying the result by 100. Similarly, the share of male respondents was calculated by taking the ratio of the number of male respondents in a certain category to the total number of male respondents (n = 187) and multiplying the result by 100. This approach allows for the comparison of distributions across different variables (education, gross income, religion, marital status, and type of settlement) between female and male respondents. The demographic characteristics of female and of male respondents are quite similar. However, it can be concluded that considerable differences are present if the education and the marital status of respondents are observed. There are more females with tertiary education or university degree than males (37% vs. 20%). On the other side, there are fewer females with vocational, secondary education than males (35% vs. 49%). There are also more married females than males (47% vs. 34%), but there are fewer single females than males (11% vs. 26%).

Table 3. Structure of respondents according to gender: females = 203 respondents; males = 187 respondents.

Variable	Items	Share of Female Respondents, %	Share of Male Respondents, %
Education	No education	0%	1%
	Primary school	4%	3%
	Vocational, secondary education	35%	49%
	Higher secondary education	17%	22%
	Tertiary education or university degree	37%	20%
	Master's or doctoral degree in science	7%	6%
Gross income	Less than EUR 500	1%	2%
	From EUR 501 to EUR 1000	13%	8%
	From EUR 1001 to EUR 2000	49%	52%
	More than EUR 2001	16%	19%
	I do not have one	1%	1%
	I prefer not to answer	20%	19%
Religion	Christianity	74%	71%
	Islam	3%	4%
	Hinduism	0%	0%
	Buddhism	0%	1%
	I am not religious	10%	11%
	Other	1%	4%
	I prefer not to answer	12%	9%
Marital status	Single	11%	26%
	Married	47%	34%
	Divorced	3%	5%
	Domestic partnership/cohabiting	39%	35%
Type of settlement	Rural settlement	59%	61%
	Urban settlement	41%	39%

The structure of the respondents' demographic characteristics according to the settlement type in which they live is given in Table 4.

The share of rural respondents was calculated by taking the ratio of the number of respondents living in rural settlements in a certain category to the total number of respondents living in rural settlements (n = 233) and multiplying the result by 100. Similarly, the share of urban respondents was calculated by taking the ratio of the number of respondents living in urban settlements in a certain category to the total number of respondents living in urban settlements (n = 157) and multiplying the result by 100. This approach allows for the comparison of distributions across different variables (gender, education, gross income, religion, and marital status) between respondents living in rural settlements and respondents living in urban settlements. The main differences between respondents who live in a rural or in urban settlement appear in variables such as education and religion. There are more respondents with vocational, secondary education from rural settlements than from urban settlements (47% vs. 34%), but there are fewer respondents from rural settlements with a tertiary education or university degree than from urban settlements (25% vs. 35%). There are more Christians in rural settlements than in urban settlements (78% vs. 66%). Respondents from urban settlements tend to be less religious than respondents from rural settlements (15% vs. 7%).

It has to be emphasized that the focus of the paper is to observe the differences between respondents based on gender (female vs. male) and type of settlement (rural vs. urban) in the areas of tax knowledge and fairness perception. Therefore, to better understand the structure of respondents according to these two main variables of interest, the distributions of respondents for different demographic variables are shown in Tables 3 and 4. However, other demographic variables (education, gross income, religion, and marital status) will not be further analyzed as they are not the main focus of the paper's research.

Table 4. Structure of respondents according to settlement type: rural settlement = 233 respondents; urban settlement = 157 respondents.

Variable	Items	Share of Rural Respondents, %	Share of Urban Respondents, %
Gender	Female	51%	54%
	Male	49%	46%
Education	No education	0%	0%
	Primary school	4%	3%
	Vocational, secondary education	47%	34%
	Higher secondary education	18%	22%
	Tertiary education or university degree	25%	35%
	Master's or doctoral degree in science	6%	7%
Gross income	Less than EUR 500	0%	3%
	From EUR 501 to EUR 1000	12%	9%
	From EUR 1001 to EUR 2000	49%	52%
	More than EUR 2001	18%	16%
	I don't have one	1%	1%
	I prefer not to answer	20%	19%
Religion	Christianity	78%	66%
	Islam	1%	7%
	Hinduism	0%	0%
	Buddhism	0%	1%
	I am not religious	7%	15%
	Other	3%	2%
	I prefer not to answer	11%	10%
Marital status	Single	17%	20%
	Married	41%	40%
	Divorced	5%	2%
	Domestic partnership/cohabiting	36%	38%

4.2. Tax Knowledge Differences by Gender and Settlement Size

In this chapter, tax knowledge level differences between females and males and between respondents from rural and urban settlements are investigated. Table 5 shows the average levels of tax knowledge variables for females, males, respondents from a rural settlement, and respondents from an urban settlement. The average levels were calculated as the means of all respondents belonging to specific groups (females, males, respondents from rural settlements, and respondents from urban settlements) for each tax knowledge variable separately. All tax knowledge variables are rated on a scale from one to five, where one indicates strong disagreement with the statement related to the tax knowledge variables, and five indicates strong agreement with the statement. The midpoint, value 3, in this context, signifies that a respondent neither disagrees nor agrees with the statement in the tax knowledge variable. Therefore, all calculated averages presented in Table 5 should be interpreted in the context of specific groups of respondents tending to agree or disagree with certain tax knowledge variables.

The highest average tax knowledge level for females is achieved at variable GK1 (3.33), whereas males have the highest average at variable TK1 (3.42). On the other hand, the lowest average tax knowledge level for both females (2.31) and males (2.58) was achieved at variable TK3. Respondents from a rural settlement have the highest average at variable GK1 (3.37) and the lowest average at variable TK3 (2.27). Respondents from an urban settlement have the highest average at variable TK1 (3.42) and the lowest average at variable LK3 (2.52). In Figure 1, box plots of variable tax knowledge (TAXK) according to gender are shown (Figure 1).

Table 5. Average level of tax knowledge variables according to gender and settlement type; n = 390 respondents.

Code	Gender		Settlement Type	
	Female	Male	Rural Settlement	Urban Settlement
TAXK	2.72	2.90	2.76	2.87
GK	3.33	3.33	3.37	3.27
GK1	3.33	3.33	3.37	3.27
LK	2.52	2.73	2.59	2.66
LK1	2.49	2.70	2.48	2.75
LK2	2.60	2.89	2.76	2.72
LK3	2.46	2.59	2.53	2.52
TK	2.71	2.93	2.72	2.94
TK1	3.28	3.42	3.30	3.42
TK2	2.53	2.78	2.60	2.73
TK3	2.31	2.58	2.27	2.68

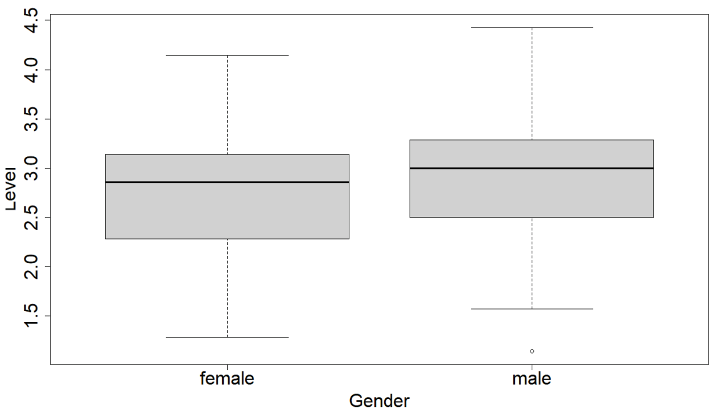

Figure 1. Box plots of variable tax knowledge (TAXK) according to gender.

A box plot consists of a "box" that is delimited by the values of the first and third quartiles. Inside this box or between the first and third quartiles, the median value can be found. In addition to the quartiles, a box plot provides information about the minimum and maximum values. However, the presented box plots will also provide information about potential outliers. Data values that may be considered potential outliers are shown as circles in the box plots.

If those box plots are compared, it could be concluded that females have lower values of TAXK levels than males. Namely, all five key elements of a box plot—minimum, first quartile, median, third quartile, and maximum—are lower for females than for males for the observed variable. Similarly, in Figure 2 box plots of variable tax knowledge (TAXK) according to settlement type are provided.

It seems that the variability level of variable TAXK is larger at respondents from a rural settlement than at respondents from an urban settlement. This conclusion can be drawn by observing the data range (the difference between the maximum and the minimum) and the interquartile range (the difference between the third and the first quartile). On the other hand, the median values are at the same level for respondents who live in rural settlements and respondents who live in urban settlements (median = 2.86). It should be emphasized that the box plot analysis was presented only for the main variable under study, which is the variable TAXK, whereas the box plots for other tax knowledge dimensions are not shown.

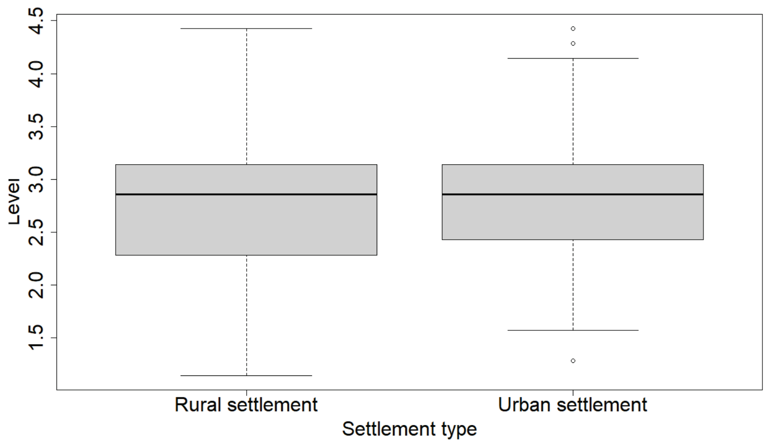

Figure 2. Box plots of variable tax knowledge (TAXK) according to settlement type.

Kruskal–Wallis rank sum test results, in which tax knowledge variables according to gender and settlement type are compared, are given in Table 6.

Table 6. Kruskal–Wallis rank sum test results, tax knowledge variables according to gender and settlement type; degrees of freedom = 1; n = 390 respondents.

Code	Gender		Settlement Type	
	Kruskal–Wallis Chi-Squared	p-Value	Kruskal–Wallis Chi-Squared	p-Value
TAXK	6.36	0.0116 *	1.59	0.2067
GK	0.01	0.9383	2.35	0.1252
GK1	0.01	0.9383	2.35	0.1252
LK	4.62	0.0316 *	0.72	0.3967
LK1	2.88	0.0898	4.12	0.0425 *
LK2	5.46	0.0195 *	0.16	0.6868
LK3	1.06	0.3032	0.00	0.9451
TK	5.19	0.0227 *	5.73	0.0167 *
TK1	1.22	0.2695	1.17	0.2801
TK2	3.56	0.0591	1.00	0.3172
TK3	4.35	0.0369 *	11.91	0.0006 *

* Note: p-values lower than 0.05 level are denoted with *.

In Table 6, the test statistics of the conducted Kruskal–Wallis rank sum tests and their corresponding p-values are provided separately. If the p-value is lower than 0.05, it can be concluded that there is a statistically significant difference in the tax knowledge level for a certain tax knowledge variable between females and males when observed according to gender, or between respondents living in urban and rural settlements when observed according to settlement type variables.

According to the results, statistically significant differences, at the significance level of 0.05, between females and males regarding tax knowledge level appeared to be at variables TAXK (p-value = 0.0116), LK (p-value = 0.0316), LK2 (p-value = 0.0195), TK (p-value = 0.0227), and TK3 (p-value = 0.0369). So, the research subhypothesis H1a, that the level of tax knowledge differs significantly between females and males, can be accepted. However, the research subhypothesis H1b, that the level of tax knowledge differs significantly between rural taxpayers and urban taxpayers, cannot be accepted. Namely, there are statistically significant differences, at the significance level of 0.05, between respondents from a rural settlement and from an urban settlement at LK1 (p-value = 0.0425), TK (p-value = 0.0167), and TK3 (p-value = 0.0006) but not at variable TAXK (p-value = 0.2067).

4.3. Fairness Perception Differences by Gender and Settlement Size

Fairness perception levels have been separately observed for gender and settlement type. The average values throughout fairness perception variables are given in Table 7. The average levels were calculated as the means of all respondents belonging to specific groups (females, males, respondents from rural settlements, and respondents from urban settlements) for each fairness perception variable separately. Similar to the tax knowledge variables, the fairness perception variables are also rated on a scale from one to five with the same meaning of the values. Therefore, one indicates strong disagreement with the statement related to the fairness perception variables, the midpoint (value three) signifies that a respondent neither disagrees nor agrees with the statement, and five indicates strong agreement with the fairness perception statement. Therefore, all calculated averages provided in Table 7 should be interpreted as the levels of disagreement or agreement of specific groups of respondents with the fairness perception variables.

Table 7. Average level of fairness perception variables according to gender and settlement type; $n = 390$ respondents.

Code	Gender		Settlement Type	
	Female	Male	Rural Settlement	Urban Settlement
FAIRP	3.21	3.23	3.20	3.25
GF	2.93	3.03	2.96	3.01
GF1	2.75	2.88	2.75	2.91
GF2	3.58	3.64	3.65	3.55
GF3	2.71	2.89	2.77	2.84
GF4	2.42	2.64	2.47	2.60
GF5	3.20	3.12	3.15	3.17
EF	3.22	3.44	3.25	3.44
EF1	3.22	3.44	3.25	3.44
HF	3.91	3.79	3.85	3.85
HF1	3.91	3.79	3.85	3.85
VF	3.89	3.91	3.96	3.82
VF1	3.95	3.95	4.01	3.85
VF2	3.84	3.87	3.90	3.78
RF	2.79	2.72	2.56	3.06
RF1	2.79	2.72	2.56	3.06
PF	3.20	3.17	3.17	3.21
PF1	3.90	3.81	3.87	3.84
PF2	3.19	3.38	3.27	3.29
PF3	3.11	3.09	3.08	3.14
PF4	3.44	3.38	3.44	3.37
PF5	2.99	3.02	3.00	3.01
PF6	2.69	2.63	2.57	2.80
PF7	2.95	2.88	2.86	3.01
PF8	2.97	3.06	2.98	3.06
PF9	3.41	3.28	3.32	3.39
PF10	3.17	3.20	3.20	3.15
PF11	3.35	3.17	3.28	3.25
AF	3.13	3.24	3.20	3.16
AF1	3.26	3.48	3.40	3.30
AF2	3.01	3.00	2.99	3.03

Both females and males have achieved the highest average value at variable VF1 with the same value of 3.95. The lowest average values for females and males have also been achieved at the same variables GF4 (female = 2.42; male = 2.64) and PF6 (female = 2.69; male = 2.63). If respondents are compared by the type of settlement in which they live it can be noticed that there are a lot of similarities present here as well. So, respondents from a rural settlement and respondents from an urban settlement have achieved the highest average value at variable VF1 (rural settlement = 4.01; urban settlement = 3.85). The lowest average values from both categories, respondents from a rural settlement and respondents from an urban settlement, were recorded at variable GF4 (rural settlement = 2.47; urban settlement = 2.60).

The data distributions of variable FAIRP according to respondents' gender are shown in Figure 3.

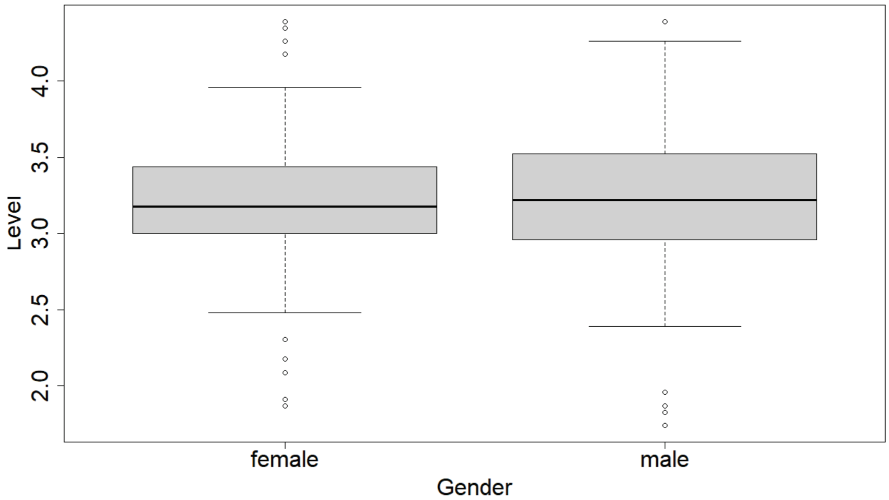

Figure 3. Box plots of variable fairness perceptions (FAIRP) according to gender.

According to the box plots given in Figure 3, it can be concluded that males could have a slightly higher variability level of the fairness perceptions (FAIRP) variable distribution than females. This conclusion can be drawn from the fact that males have a lower minimum (without outliers) and a higher maximum (without outliers) in variable FAIRP than females. Additionally, males have a lower first quartile but a higher third quartile in variable FAIRP compared to female respondents. However, the average levels seem to be quite the same between males and females at the variable FAIRP.

The data distributions of variable FAIRP according to the settlement type in which respondents live are presented by box plots in Figure 4.

Figure 4. Box plots of variable Fairness perceptions (FAIRP) according to settlement type.

The box plots suggest that respondents from a rural settlement and respondents from an urban settlement have quite similar distributions of variable FAIRP. For example, the first quartile for respondents who live in rural settlements is 2.96, whereas for respondents who live in urban settlements, it is 3.00. Similarly, the median for respondents who live in rural settlements is 3.17, whereas for respondents who live in urban settlements, it is 3.22. Again, the box plots are presented only for the main variable under study, FAIRP, whereas the box plots for other fairness perception dimensions are not shown.

In Table 8 Kruskal–Wallis rank sum test results are provided, in which fairness perception variables according to gender and settlement type are compared.

Table 8. Kruskal–Wallis rank sum test results, fairness perception variables according to gender and settlement type; degrees of freedom = 1; n = 390 respondents.

Code	Gender		Settlement Type	
	Kruskal–Wallis Chi-Squared	p-Value	Kruskal–Wallis Chi-Squared	p-Value
FAIRP	0.12	0.7263	1.17	0.2786
GF	2.80	0.0944	1.13	0.2874
GF1	1.26	0.2608	2.01	0.1562
GF2	0.36	0.5501	0.59	0.4432
GF3	2.78	0.0957	0.70	0.4023
GF4	2.78	0.0952	1.51	0.2191
GF5	0.65	0.4184	0.25	0.6138
EF	3.67	0.0553	2.58	0.1083
EF1	3.67	0.0553	2.58	0.1083
HF	0.56	0.4548	<0.01	0.9904
HF1	0.56	0.4548	<0.01	0.9904
VF	0.30	0.5829	0.95	0.3287
VF1	0.11	0.7429	1.32	0.2514
VF2	0.74	0.3882	0.32	0.5731
RF	0.33	0.5684	12.57	0.0004 *
RF1	0.33	0.5684	12.57	0.0004 *
PF	0.09	0.7661	0.42	0.5150
PF1	1.19	0.2763	0.30	0.5827
PF2	3.83	0.0503	0.18	0.6744
PF3	0.06	0.8035	0.35	0.5554
PF4	0.22	0.6359	0.18	0.6721
PF5	0.06	0.8023	0.23	0.6316
PF6	0.48	0.4862	3.84	0.0500 *
PF7	0.31	0.5784	1.45	0.2288
PF8	0.38	0.5393	0.26	0.6101
PF9	0.69	0.4056	0.43	0.5131
PF10	0.02	0.8791	0.01	0.9434
PF11	1.57	0.2102	0.11	0.7439
AF	2.41	0.1206	0.27	0.6060
AF1	4.94	0.0263 *	0.47	0.4914
AF2	0.02	0.8870	0.08	0.7810
AF2	0.02	0.8870	0.08	0.7810

* Note: p-values lower than 0.05 level are denoted with *.

In Table 8, the test statistics of the conducted Kruskal–Wallis rank sum tests and their corresponding p-values are provided separately. If the p-value is lower than 0.05, it can be concluded that there is a statistically significant difference in fairness perception levels for a certain fairness perception variable between females and males when observed according to gender or between respondents living in urban and rural settlements when observed according to settlement type variables. The results from Table 7, Figure 3, and Figure 4 already indicated what could be the Kruskal–Wallis rank sum test results. According to results from Table 8, at the significance level of 0.05, there is a statistically significant difference between females and males only at variable AF1 (p-value = 0.0263). Similarly, statistically significant differences, at the significance level of 0.05, between respondents from a rural settlement and from an urban settlement are present only at variables RF1

(p-value = 0.0004) (consequently at variable RF as well) and PF6 (p-value = 0.0500). Therefore, the research subhypothesis (H2a, H2b) that the level of tax fairness differs significantly between females and males and between rural taxpayers and urban taxpayers, respectively, can be rejected.

4.4. Tax Knowledge Correlation with Fairness Perception Dimensions

The correlation between overall tax knowledge (variable TAXK) and fairness perception dimensions (variables GF, EF, HF, VF, RF, PF, and AF) was measured by applying the Kendall's coefficient of rank. The correlation results are given in Table 9. Along with Kendall's Tau-b statistic, the related p-value is provided as well. If the p-value is lower than 0.05, it can be concluded that there is a statistically significant association between the variable TAXK and the observed fairness perception dimension. If the association is statistically significant, the strength of the association can be commented upon.

Table 9. Tax knowledge correlation with fairness perception dimensions; Kendall's coefficient of rank correlation τ_b; n = 390 respondents.

Fairness Perception Dimensions	Kendall's τ_b	p-Value
GF	0.2936	<0.0001
EF	0.1083	0.0054
HF	−0.1262	0.0014
VF	−0.1805	<0.0001
RF	0.2922	<0.0001
PF	0.0901	0.0116
AF	0.1219	0.0013

According to the results from Table 9, all observed correlations are statistically significant at significance level 0.05. However, tax knowledge is mostly weakly associated with fairness perception dimensions. The highest association levels are present at the GF and RF fairness perception dimensions. In those two cases, it could be concluded that tax knowledge is medium and positively associated with GF (Kendall's τ_b = 0.2936) and RF (Kendall's τ_b = 0.2922), respectively. The results have shown that tax knowledge is negatively associated with HF (Kendall's τ_b = −0.1262) and with VF (Kendall's τ_b = −0.1805). Therefore, the third research hypothesis, H3, that tax knowledge positively influences the dimensions of fairness perception of Slovene taxpayers, can be partially accepted.

5. Discussion

For the purpose of selecting respondents, the snowball sampling approach was used. This method is appropriate when investigating sensitive topics, such as personal finances and tax behaviors, due to privacy concerns and a reluctance to disclose certain sensitive information. However, snowball sampling could lead to bias in the results due to a non-representative sample. Therefore, the drawn conclusions should be limited only to the observed sample.

The findings regarding taxpayers' tax knowledge indicate that taxpayers perceive themselves as having an average level of general tax knowledge. When comparing the results of tax knowledge perception levels between male and female taxpayers in Slovenia, it was revealed that females have a lower overall tax knowledge level than males (TAXK). Among the dimensions of tax knowledge perceptions, females tend to believe more than males that the taxation obligation in the existing income tax system is fair and equitable. The highest score in male perception was achieved for the statement about their lack of technical knowledge regarding deductions from their tax liability. On the other hand, both females and males had the lowest average tax knowledge level when it came to the technical knowledge of whether it is acceptable to overstate tax deductions on one's tax returns. It should be emphasized that our research measured the perception of tax knowledge, not the reasons influencing perception, and not differences in actual tax knowledge between females and males. Statistically, females in Slovenia achieve higher levels of formal education than males (SURS 2023). Nevertheless, their perception is that their tax knowledge is lower than that of males. The explanation for such results could be attributed to various underlying mechanisms, including historical, sociological, psychological, economic, institutional, or others. According to Yao et al. (2023) and their family financial socialization process theory, as well as the conclusions of Zhu (2018) and Deenanath et al. (2019), individuals' subjective self-evaluated knowledge correlates with socialization processes. These factors undoubtedly influence the educational self-image of females in Slovenia. Further research is needed to examine this more precisely. If we compare our results to those from Saad's (2010) study, our taxpayers exhibit notably much lower levels of perceived general, legal, and technical tax knowledge, irrespective of gender. Still, as the differences in overall tax knowledge in our research were significant, the research subhypothesis H1a, that the level of tax knowledge differs significantly between females and males, was accepted. These results are similar to Fallan's (1999) conclusion that males and females may possess varying levels of tax knowledge, but these differences were not substantial in his research; therefore, he sees that gender lacks predictive influence. This result does not align with the findings of Natasha and Yustina's (2020) study, in which no gender differences in tax knowledge and tax compliance were identified. They concluded that socialization could be conducted uniformly regardless of gender, as males and females absorb tax knowledge from the same media in the same amount (Natasha and Yustina 2020).

The results of the research subhypothesis H1b indicate that the variability in the level of overall tax knowledge perception is higher among taxpayers from rural settlements compared to taxpayers from urban areas. Taxpayers in rural areas perceive the existing income tax system as sufficient for most citizens, even though it may not be perfect. However, urban taxpayers scored the highest on the statement about having low knowledge of tax deductions (technical knowledge). On the other hand, rural taxpayers tend to disapprove of the acceptability of overstating tax deductions on their tax returns (technical knowledge), while urban taxpayers have slightly better legal knowledge concerning appeals against tax authority assessments compared to those in rural areas. However, the research subhypothesis H1b, which suggests that the level of tax knowledge significantly differs between rural and urban taxpayers, was not accepted. There are no statistically significant differences in overall tax knowledge (TAXK), although there are statistically significant differences in LK1, TK, and TK3. Our finding shows that taxpayers' tax knowledge perception is independent of their living area (urban and rural). Potential reasons behind these results might stem from the fact that the Slovenian tax system (tax administration) is well-organized, has good information support, and taxpayers are informed about crucial tax matters, such as meeting tax obligations (tax return deadlines), primarily through public media (TV, radio), and online.

Further, our results also show that both females and males have achieved the highest average value in the variable of vertical fairness, indicating that higher-income earners should pay more taxes than lower-income earners. Both females and males mostly disagree with the idea that tax evasion is justified as ethical, even if the tax system is not fair. When measuring their perceived attitude toward personal fairness, they both perceive a specific group of taxpayers, namely board members, as not paying their fair share of taxes under the current income tax system. According to the results, males may have a slightly higher level of variability in the distribution of the fairness perceptions (FAIRP) variable compared to females. However, the average levels of the FAIRP variable appear to be quite similar between males and females. When comparing taxpayers based on the type of settlement they live in, it becomes evident that there are numerous similarities. Both taxpayers from rural settlements and those from urban settlements have achieved the highest average value in the variable of vertical fairness, which suggests that higher-income earners should pay more taxes than lower-income earners. However, both categories recorded the lowest average values in the variable of general fairness. This implies that tax evasion is considered ethical if the tax system is perceived as unfair. Taxpayers from rural and urban settlements exhibit quite similar distributions in the FAIRP variable. The subhypotheses H2a and H2b, which hypothesized significant differences in tax fairness levels between females and males, as well as between rural and urban taxpayers, were rejected. Statistically significant differences were found only between respondents from rural and urban settlements in variables RF1 (and consequently RF) and PF6, but not in the overall variable of fair perception (FAIRP). Our results are not in line with Hundsdoerfer and Eva's (2020) findings, where gender disparities in perceptions of fairness concerning distributive and procedural justice were confirmed. Male participants are particularly responsive to procedural justice violations in their fairness perceptions, while female participants tend to adjust their fairness perceptions based on the outcomes of the tax allocation procedure (Hundsdoerfer and Eva 2020).

The third hypothesis (H3) predicts a positive influence of tax knowledge on the perception of tax fairness dimensions. The results show that all observed correlations between tax knowledge (TAXK) and fairness dimensions were statistically significant, but weak. General fairness and redistributive fairness exhibited the most moderate associations among all dimensions with tax knowledge. Still, further analysis, using Kendall's test, confirmed statistically significant correlations between tax knowledge and various tax fairness dimensions, including general, exchange, redistributive, personal, and administrative fairness. However, the correlations were negative for horizontal and vertical fairness, also known as distributive fairness. Horizontal fairness pertains to providing equitable tax treatment to taxpayers in similar economic circumstances, while vertical fairness evaluates taxpayers' ability to pay and their preference for the tax rate structure (progressive or not). The negative relationship suggests that higher tax knowledge does not necessarily lead to a higher perception of distributive fairness within the existing income tax system. Therefore, the third research hypothesis, H3, was partially accepted. One explanation for this finding is mostly like that of Saad (2010), who suggests that taxpayers may believe that they should not be taxed equally solely based on income without considering their financial responsibilities or social welfare. Our findings align with previous studies (Saad 2010; Fallan 1999; White 1990) that assert tax knowledge increases taxpayers' perceptions of tax fairness. However, the findings do not fully align with Eriksen and Fallan (1996), whose conclusions suggest that the perception of fairness increases with tax knowledge, and with the more knowledgeable taxpayers viewing the tax system more favorably. We defined tax knowledge and tax fairness as multidimensional, but the Eriksen and Fallan (1996) study did not distinguish between these dimensions. According to our study, higher tax knowledge does not appear to support taxpayers in perceiving greater distributive fairness.

Policymakers should consider addressing this problem. Based on our results, we propose specific policy recommendations in the field of educational initiatives, which should be tailored and gender-specific at all formal educational levels as well as informal educational levels. For this purpose, tailored communication strategies and approaches should be employed. The OECD (2021) report presents 149 educational initiatives in 59 developed and developing countries, providing cross-country comparisons as a tool to assist policymakers in this regard. In the past, Slovenia has already implemented some effective communication tools to raise awareness about individuals' tax obligations and payment deadlines, utilizing public communication channels such as TV shows, radio, and modern e-administration tools. However, there is a deficiency in educating individuals, providing in-depth tuition, and building new knowledge and skills in this regard. Tools similar to the TaxEdu portal at the European level could be developed in Slovenia as well, utilizing short videos but in the Slovene language.

More detailed reasons for such results and (non)differences between different groups of respondents should be investigated in future research, with a focus solely on this narrow topic. Nevertheless, based on Eriksen and Fallan's (1996) conclusion, it remains essential to provide more tax knowledge to larger segments of society to improve the perception of tax fairness and enhance tax compliance.

6. Conclusions

The aim of this study was to determine the level of tax knowledge and tax fairness perception of the tax system among Slovene taxpayers, with a focus on gender and settlement size differences. Additionally, the study aimed to investigate the correlations between tax knowledge and tax fairness dimensions.

This article presents evidence indicating that tax knowledge differs between male and female taxpayers. This gap should be addressed through the development of appropriate educational programs in tax education. These programs should promote voluntary compliance and enhance taxpayers' understanding of the tax system, particularly when disseminating information to both male and female taxpayers using different strategies. It also demonstrates that settlement size is not a relevant factor influencing tax knowledge among Slovene taxpayers. However, when examining tax fairness, the results lead to different conclusions. Tax fairness consists of various dimensions, and our research revealed no differences based on gender and settlement size. When the correlation between tax knowledge and tax fairness perception was measured, the results showed statistically significant but weak correlations in both directions, depending on the fairness dimension.

To overcome this limitation in further studies, a probability sampling approach should be employed. One approach would be to use a stratified random sampling approach based on the most important characteristics of the population, such as income level, age, gender, etc. However, in that case, much higher non-response rates should be expected, along with significantly higher survey costs.

In this paper, the conducted analyses were based on the Kruskal–Wallis rank sum test and Kendall's coefficient of rank Tau-b. The choice of the statistical approach was determined by the type of observed variables, which were defined in the questionnaire as questions given on the Likert scale with only five answer options. Additionally, the choice of the statistical analysis was guided by the research aims and hypotheses. Therefore, the range of possible appropriate statistical methods was very narrow but straightforward. For future research, it is recommended to redefine survey questions so that they are quantitative variables. In that case, a wider range of different statistical analyses could be employed.

The practical application of this study's findings suggests that policymakers should also consider taxpayers' perceptions of distributive fairness and tax knowledge when developing communication strategies and educational programs. These strategies should be designed to enhance the distributive fairness dimension, benefiting taxpayers. According to our results, they should be applied and presented differently by gender, as a statistically significant relationship was found. Further testing in other countries using our measurement instrument would be necessary to determine whether these gender differences exist. A subject for further debate and research may also be whether this approach is economically meaningful or not. If taxpayers perceive tax knowledge gender-dependent, authorities and educators should adapt their approaches by using different communication strategies to enhance tax compliance through improved tax knowledge. The tax knowledge dimensions are vital components in shaping compliance behavior. Understanding the influence of specific factors places policymakers in a stronger position to affect the compliance behavior of taxpayers and devise more precise strategies for improving various facets of tax knowledge. Since we have only partially confirmed the correlation between tax knowledge and tax fairness, future research could explore other economic and psychological factors and their relationship with tax knowledge and tax fairness. In tax practice, there can be a distinction between perception and actual tax knowledge, so future research could measure the actual knowledge of taxpayers, which would require the development of a new measurement instrument. Also, other tax-related variables, such as tax liability, should be included in further studies. This study aimed to evaluate tax knowledge levels and perceptions of tax fairness among Slovenian taxpayers, with a particular emphasis on gender and settlement size disparities. To achieve this, the questionnaire and sampling methods were tailored to yield preliminary findings and insights. Demographic factors such as education, income, and marital status were predominantly employed to profile the sample and respondents.

Future research endeavors should involve refining the questionnaire and employing a stratified random sampling approach to more accurately examine the interplay between gender, tax knowledge, and other demographic variables. Additionally, applying advanced multivariate approaches such as an ordered probit or ordered logit model would enhance the understanding and depiction of these relationships.

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Appendix A. Variable Definition

Code	
TAXK	Tax knowledge perceptions
GK	Relates to an idea of the tax system/structure and its purpose.
LK	Emphasises taxpayers' knowledge on the regulation aspects of the income tax system, responsibility, rights and the penalty for non-compliance.
TK	Concerns with taxpayers' ability to fill their tax return.
FAIRP	Fairness Perceptions
GF	Measures general taxpayers' judgments about fairness of the income system.
EF	Expresses a reciprocal exchange between taxpayers and the government.
HF	Considers equitable tax treatment for taxpayers with comparable economic positions.
VF	Assumes the ability to pay and preference for tax progressive rate structure.
RF	Addresses the fairness of imposed punishments and penalties.
PF	Involves the self-interest of the taxpayers.
AF	Pertains to the fairness of the content of the tax law.

References

Abate, Abera Aynekulu. 2019. Factors affecting presumptive tax collection in Ethiopia: Evidence from category "c" taxpayers in bahir dar city. *Journal of Tax Administration* 5: 74–96. [CrossRef]

Agresti, Alan. 2010. *Analysis of Ordinal Categorical Data*, 2nd ed. New York: John Wiley & Sons.

Ali, Azwadi, and Norsiah Ahmad. 2014. Trust and Tax Compliance among Malaysian Working Youth. *International Journal of Public Administration* 37: 389–96. [CrossRef]

Allingham, Michael G., and Agnar Sandmo. 1972. Income tax evasion: A theoretical analysis. *Journal of Public Economics* 1: 323–38. [CrossRef]

Alm, James. 2019. What motivates tax compliance? *Journal of Economic Surveys* 33: 353–88. [CrossRef]

Alm, James, Kim M. Bloomquist, and Michael McKee. 2017. When you know your neighbour pays taxes: Information, peer effects and tax compliance. *Fiscal Studies* 38: 587–613. [CrossRef]

Amin, Shahnaz Noorul, Putri Zaqqeya Amin Buhari, Abu Sofian Yaacob, and Zuberi Iddy. 2022. Exploring the Influence of Tax Knowledge in Increasing Tax Compliance by Introducing Tax Education at Tertiary Level Institutions. *Open Journal of Accounting* 11: 57–70. [CrossRef]

Amponsah, Stephen, and Kofi Osei Adu. 2017. Socio-demographics of tax stamp compliance in upper Denkyira east municipal and upper Denkyira west district in Ghana. *International Journal of Law and Management* 59: 1315–30. [CrossRef]

Andersson, Per F. 2017. Democracy, Urbanization, and Tax Revenue. *Studies in Comparative International Development* 53: 111–50. [CrossRef]

Azmi, Anna Azriati Che, Suria Zainuddin, Mohd Zulkhairi Mustapha, and Yusni Naw. 2016. The mediating effect of tax fairness on the relationship between knowledge, complexity and voluntary tax compliance. *Asian Journal of Accounting Perspectives* 9: 1–12. [CrossRef]

Azmi, Anna Che, and Kamala A. Perumal. 2008. Tax Fairness Dimensions in an Asian Context: The Malaysian Perspective. *International Review of Business* 4: 11–19.

Bayram, Nuran, Mine Aydemir, Zuhal Yıldırım, and Reyhan Leba Tansöker. 2017. Confirmatory Factor Analysis on Tax Compliance Intentions, General Fairness, Procedural Fairness and Social Norms. *Business and Economics Research Journal* 8: 749–58. [CrossRef]

Beck, Marisa, Rivers Nicholas, and Yonezawa Hidemichi. 2016. A rural myth? Sources and implications of the perceived unfairness of carbon taxes in rural communities. *Ecological Economics* 124: 124–34. [CrossRef]

Becker, Gary S. 1968. Crime and punishment: An economic approach. *Journal of Political Economy* 76: 169–217. [CrossRef]

Bergolo, Marcelo L., Leites Martin, Truglia Ricardo Perez, and Strehl Matias. 2020. *What Makes a Tax Evader?* NBER Working Paper no. w28235. Cambridge: National Bureau of Economic Research, pp. 1–52.

Bornman, Marina, and Pusheletso Ramutumbu. 2019. A conceptual framework of tax knowledge. *Meditari Accountancy Research* 27: 823–39. [CrossRef]

Braithwaite, Valerie, Reinhart Monika, Mearns Malcolm, and Graham Rachelle. 2001. *The Community Hopes, Fears and Actions Survey, Goals and Measures*. Centre for Tax System Integrity Working Paper 3. Canberra: The Australian National University.

Carley, Kathleen M., Dawn C. Robertson, Michael K. Martin, Ju-Sung Lee, Jesse L. St. Charles, and Brian R. Hirshman. 2010. Predicting Intentional and Inadvertent Noncompliance, Recent Research on Tax Administration and Compliance. Selected Papers Given at the 2010 IRS Research Conference. Available online: http://www.casos.cs.cmu.edu/publications/papers/CMU%20IRS%20Research%20Conference_v7.pdf (accessed on 3 November 2023).

Castañeda, Néstor. 2023. Fairness and Tax Morale in Developing Countries. *Studies in Comparative International Development* 31: 1–25. [CrossRef]

Chan, Chan W., Troutman Coleen S., and O'Bryan David. 2000. An expanded model of taxpayer compliance: Empirical evidence from the United States and Hong Kong. *Journal of International Accounting, Auditing and Taxation* 9: 83–103. [CrossRef]

Christain Aid. 2014. Taxing Man and Woman—Why Gender Is Crucial for a Fair Tax System. Available online: https://www.oecd.org/dac/gender-development/44896295.pdf (accessed on 20 October 2023).

Chucks, Akan David, and Lilian Azaka. 2023. The perception of tax fairness and tax knowledge of taxpayers in response to the Finance Act of 2019–2023. *International Journal of Science Academic Research* 4: 6368–74.

Coelho, Maria, Davis Aieshwarya, Klemm Alexander, and Buitron Carolina Osorio. 2022. *Gendered Taxes: The Interaction of Tax Policy with Gender Equality*. IMF Working Paper No WP/22/26. Washington, DC: International Monetary Fund.

Comunale, Christie L., Charles A. Barragato, and Denise Buhrau. 2019. Framing tax audit risks: The role of temporal framing and perceived fairness. *Advances in Accounting Behavioral Research* 22: 1–9. [CrossRef]

Craig, Ashley C., and Joel Slemrod. 2022. *Tax Knowledge and Tax Manipulation: A Unifying Model*. Working Paper 30151. Cambridge: National Bureau of Economic Research.

Damajanti, Anita. 2015. Pengaruh Pengetahuan Terhadap Kepatuhan Wajib Pajak Perorangan Di Kota Semarang. *Jurnal Dinamika Sosial Budaya* 17: 12–28. [CrossRef]

Danes, Sharon M. 1994. Parental Perceptions of Children's Financial Socialization. *Financial Counseling and Planning* 5: 23.

Danes, Sharon M., and Heather Haberman. 2007. Teen Financial Knowledge, Self-Efficacy, and Behavior: A Gendered View. *Journal of Financial Counseling and Plannin* 18: 13.

Danes, Sharon M., and Katherine Brewton. 2014. The Role of Learning Context in High School Students' Financial Knowledge and Behavior Acquisition. *Journal of Family and Economic Issues* 35: 81–94. [CrossRef]

D'Attoma, John, Volintiru Clara, and Steinmo Sven. 2017. Willing to share? Tax compliance and gender in Europe and America. *Research and Politics* 4: 1–10. [CrossRef]

Dayioğlu Erul, Rana. 2020. Socio-Economic Variables and Tax Compliance In The Scope Of Fiscal Sociology: A Research On The European Union And OECD. *The Journal of Social Science* 4: 1–7. [CrossRef]

Deenanath, Veronica, Sharon M. Danes, and Jang Joyoung. 2019. Purposive and Unintentional Family Financial Socialization, Subjective Financial Knowledge, and Financial Behavior of High School Students. *Journal of Financial Counseling and Planning* 30: 83–96. [CrossRef]

Devos, Ken. 2016. A comparative study of compliant and non-compliant individual taxpayers in Australia. *Journal of Business and Policy Research* 2: 180–96.

Dissanayake, Nadee, and Sandaram P. Premaratna. 2020. Influence of Business Location on Tax Compliance: An Application of the Slippery-Slope Framework. Proceeding of the Open University Research Sessions (OURS 2019): 1–7. Available online: https://www.researchgate.net/publication/350035070_INFLUENCE_OF_BUSINESS_LOCATION_ON_TAX_COMPLIANCE_AN_APPLICATION_OF_THE_SLIPPERY-SLOPE_FRAMEWORK (accessed on 20 October 2023).

Druckman, Daniel. 2020. Looking back and looking forward in negotiation and conflict research. *International Negotiation* 25: 130–50. [CrossRef]

Druckman, Daniel, and Lynn M. Wagner. 2016. Justice and negotiation. *Annual Review of Psychology* 67: 387–413. [CrossRef] [PubMed]

Dunn, Olive Jean. 1964. Multiple comparisons using rank sums. *Technometrics* 6: 241–52. [CrossRef]

Edgley, Carla, and Kevin Holland. 2021. "Unknown unknowns" and the tax knowledge gap: Power and the materiality of discretionary tax disclosures. *Critical Perspectives on Accounting* 81: 102227. [CrossRef]

Eriksen, Knut, and Lars Fallan. 1996. Tax knowledge and attitudes towards taxation; A report on a quasiexperiment. *Journal of Economic Psychology* 17: 387–402. [CrossRef]

European Commission. 2019. *Estimating International Tax Evasion by Individuals*. Taxation Papers Taxation and Customs Union Working Paper No 76-2019. Brussels: European Commission.

Fallan, Lars. 1999. Gender, Exposure to Tax Knowledge and Attitudes towards Taxation: An Experimental Approach. *Journal of Business Ethics* 18: 173–84. [CrossRef]

Farrar, Jonathan, Dawn W. Massey, Errol Osecki, and Linda Thorne. 2020. Tax Fairness: Conceptual Foundations and Empirical Measurement. *Journal of Business Ethics* 162: 487–503. [CrossRef]

Farrar, Jonathan, Steven E. Kaplan, and Linda Thorne. 2022. The Effect of Interactional Fairness and Detection on Taxpayers' Compliance Intentions. *Journal of Business Ethics* 154: 167–80. [CrossRef]

Fauziati, Penerbit, Arie Frinola Minovia, Resti Yulistia Muslim, and Rasidah Nasrah. 2016. The Impact of Tax Knowledge on Tax Compliance Case Study in Kota Padang. *Indonesia Journal of Advanced Research in Business and Management Studies* 2: 22–30.

Formanova, Lucie, Michal Mádr, Břetislav Andrlík, and Veronika Hrabalová. 2021. Factors influencing the level of tax literacy of students of bachelor study programmes in economics at Faculties of Economics. *Law and Economics Review* 12: 308–23. [CrossRef]

Gerbing, Monica Diane. 1988. An Empirical Study of Taxpayer Perceptions of Fairness. Ph.D. dissertation, University of Texas at Austin, Ann Arbor, MI, USA.

Ghani, Hazman Hadi Abdul, Nadiah Abd Hamid, Soliha Sanusi, and Roszilah Shamsuddin. 2020. The Effect of Tax Knowledge, Compliance Costs, Complexity and Morale Towards Tax Compliance Among Self-Employed in Malaysia. *Global Business and Management Research: An International Journal* 12: 18–32.

Gilligan, George, and Grant Richardson. 2005. Perceptions of Tax Fairness and Tax Compliance in Australia and Hong Kong: A Preliminary Study. *Journal of Financial Crime* 12: 331–43. [CrossRef]

Gobena, Lemessa Bayissa, and Marius Van Dijke. 2017. Fear and caring: Procedural justice, trust, and collective identification as antecedents of voluntary tax compliance. *Journal of Economic Psychology* 62: 1–16. [CrossRef]

Grown, Caren, Ozer Ceren, and Bronchi Chiara. 2022. Gender Differences in Taxation: Why Do They Matter? Available online: https://blogs.worldbank.org/developmenttalk/gender-differences-taxation-why-do-they-matter (accessed on 10 October 2023).

Gunaasih, Sang Ayu Putu Piastini. 2022. Investigation of taxation knowledge, services, and sanctions of the head of village government financial affairs of Gunung Kidul regency in Indonesia. In *Environmental, Social, and Governance Perspectives on Economic Development in Asia*. Bingley: Emerald Publishing Limited, pp. 157–67. [CrossRef]

Gunnarsson, Åsa, Schratzenstaller Margit, and Spangenberg Ulrike. 2017. Gender Equality and Taxation in the European Union. Available online: http://www.europarl.europa.eu/supporting-analyses (accessed on 7 October 2023).

Güzel, Sonnur Aktas, Gökhan Özer, and Murat Özcan. 2019. The effect of the variables of tax justice perception and trust in government on tax compliance: The case of Turkey. *Journal of Behavioral and Experimental Economics* 78: 80–86. [CrossRef]

Hartner, Martina, Rechberger Silvia, Kirchler Erich, and Schabmann Alfred. 2008. Procedural fairness and tax compliance. *Economic Analysis & Policy* 38: 137–52. [CrossRef]

Hofmann, Eva, Hoelzl Erik, and Kirchler Erich. 2008. Preconditions of Voluntary Tax Compliance: Knowledge and Evaluation of Taxation, Norms, Fairness, and Motivation to Cooperate. *Zeitschrift für Psychologie* 216: 209–17. [CrossRef]

Hoong Voon, Yuen, Che Azmi Anna, and Jayasingam Sharmila. 2023. The effects of concession timing, perceived fairness and aggressiveness on tax negotiation offers. *Pacific Accounting Review* 35: 1–18. [CrossRef]

Hundsdoerfer, Jochen, and Matthaei Eva. 2020. *Gender Discriminatory Taxes, Fairness Perception, and Labor Supply*. Discussion Paper, No. 2020/6. Berlin: Freie Universität Berlin, School of Business & Economics. [CrossRef]

Inasius, Fany. 2019a. Factors influencing SME tax compliance: Evidence from Indonesia. *International Journal of Public Administration* 42: 367–79. [CrossRef]

Inasius, Fany. 2019b. Voluntary and enforced tax compliance: Evidence from small and medium- sized enterprises in Indonesia. *Advances in Taxation* 26: 99–111. [CrossRef]

Jimenez, Peggy, and Govind S. Iyer. 2016. Tax compliance in a social setting: The influence of social norms, trust in government, and perceived fairness on taxpayer compliance. *Advances in Accounting, incorporating Advances in International Accounting* 34: 17–26. [CrossRef]

Juliobenedrick, Bryan, Draven Davidson, and Ilham Condro Prabowo. 2023. The Relationships between Social Media Narcissism, Tax Knowledge, and Trust in Government on Tax Compliance. Paper presented at E3S Web of Conferences—The 5th International Conference of Biospheric Harmony Advanced Research (ICOBAR 2023), Jakarta, Indonesia, June 27; Les Ulis: EDP Sciences, vol. 426, p. 02143.

Kaiser, Tim, Annamaria Lusardi, Lukas Menkhoff, and Carly Urban. 2021. Financial education affects financial knowledge and downstream behaviors. *Journal of Financial Economics* 145: 255–72. [CrossRef]

Kasippilai, Jeyapallan. 2000. Taxpayer knowledge index as a clue for non-compliance. *Journal on Pakistan's Taxation Laws* 81: 45–91.

Kassa, Erstu Tarko. 2021. Factors influencing taxpayers to engage in tax evasion: Evidence fromWoldia City administration micro, small, and large enterprise taxpayers. *Journal of Innovation and Entrepreneurship* 10: 8. [CrossRef]

Kastlunger, Barbara, Dressler Stefan G., Kirchler Erich, Mittone Luigi, and Voracek Martin. 2010. Sex differences in tax compliance: Differentiating between demographic sex, gender-role orientation, and prenatal masculinization (2D: 4D). *Journal of Economic Psychology* 31: 542–52. [CrossRef]

Kirchler, Erich. 2007. *The Economic Psychology of Tax Behavior*. New York: Cambridge University Press.

Kirchler, Erich, Hoelzl Erik, and Wahl Ingrid. 2008. Enforced versus Voluntary Tax Compliance: The Slippery Slope Framework. *Journal of Economic Psychology* 29: 210–25. [CrossRef]

Kruskal, William H., and Wallis W. Allen. 1952. Use of ranks in one-criterion variance analysis. *Journal of the American Statistical Association* 47: 583–621. [CrossRef]

Kumi, Richmond, and Bannor Richard Kwasi. 2023. Job performance, knowledge and perceived power of tax officers on tax morale amongst agrochemical traders in Ghana. *Arab Gulf Journal of Scientific Research* 41: 260–82. [CrossRef]

LeBaron, Ashley B., and Heather H. Kelley. 2020. Financial Socialization: A Decade in Review. *Journal of Family and Economic Issues* 42: 195–206. [CrossRef] [PubMed]

Lewis, Alan. 1982. The social psychology of taxation. *The British Psychological Society* 21: 151–58. [CrossRef]

Lohse, Tim, and Salmai Qari. 2014. Gender differences in deception behavior: The role of the counterpart. *Applied Economics Letters* 21: 702–5. [CrossRef]

Loo, Ern Chen. 2006. The Influence of the Introduction on Self-Assessment on Compliance Behaviour of Individual Taxpayers in Malaysia. Ph.D. thesis, University of Sydney, Sydney, Australia.

Maqsudi, Achmad, Tri Ratnawati, and Slamet Riyadi. 2021. Socialization, Service and Knowledge Matter with Taxpayer Compliance: An Empirical Study in Indonesia. *Journal of Asian Finance, Economics and Business* 8: 89–95.

Mckenzie, Leanne Carvalho. 2022. U.S. Financial Literacy: Does Urban-Rural Residency Matter? Theses and Dissertations. Available online: https://scholarsjunction.msstate.edu/td/5601 (accessed on 15 November 2023).

McKerchar, Margaret. 2001. *The Study of Income Tax Complexity and Unintentional Non-Compliance: Research Method and Preliminary Findings (October 2001)*. Atax Discussion Paper No. 6. Camperdown: University of Sydney.

Mohamad, Marziana, Norsalihah Mohd Nor, Norshiela Bakar, and Winnie Lemi Anak Nanta. 2013. Accounting vs Non Accounting Majors: Perceptions on Tax Knowledge, Fairness and Perceived Behavioural Control. *International Journal of Asian Social Science* 3: 1887–96.

Mohammed, Hunad, and Anita Tangl. 2024. Taxation Perspectives: Analyzing the Factors behind Viewing Taxes as Punishment—A Comprehensive Study of Taxes as Service or Strain. *Journal of Risk and Financial Management* 5: 5. [CrossRef]

Moore, Mick. 2019. *Intelligent Government: How Research Can Help Increase Tax Compliance*. ATAP Working Paper, No. 9. Brighton: International Centre for Tax and Development. Available online: https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/14501/ATAP9.pdf?sequence=42&isAllowed=y (accessed on 10 October 2023).

Mukhlis, Imam, Sugeng Hadi Utomo, and Yuli Soesetyo. 2013. Increasing Tax Compliance Through Strengtheing Capacity of Education Sector for Export Oriented SMEs Handicarft Field in East Java Indonesia. *European Scientific Journal* 10: 170–84.

Mukhlis, Imam, Sugeng Hadi Utomo, and Yuli Soesetyo. 2015. The role of taxation education on taxation knowledge and its effect on tax fairness as well as tax compliance on handicraft SMEs sectors in Indonesia. *International Journal of Financial Research* 6: 161–69. [CrossRef]

Natasha, Irina, and Andi Ina Yustina. 2020. Causal Relations Between Knowledge, Norms, and Tax: A Study of Gender Differences on Taxpayers. *Ekuilibrium: Journal Ilmiah Bidang Ilmu Ekonomi* 15: 14–26. [CrossRef]

Nerudova, Danuse, Janova Jitka, Hampel David, Dobranschi Marian, and Rozmahel Petr. 2019. *Sustainability of the Taxation Systems in the Eu: A Proposal of an Evaluation Model*. Brussels: European Commission.

Nguyen, Thu Hien. 2022. The Impact of Non-economic Factors on Voluntary Tax Compliance Behaviou: A Case Studa of Smal and Medium Enterprises in Vetnam. *Economies* 20: 179. [CrossRef]

Nicoleta, Barbuta-Misu. 2011. A review of factors for tax compliance. *Economics and Applied Informatics Journal* 1: 69–76.

Niesiobędzka, Malgorzata, and Sabina Kołodziej. 2020. The fair process effect in taxation: The roles of procedural fairness, outcome favorability and outcome fairness in the acceptance of tax authority decisions. *Current Psychology* 39: 246–53. [CrossRef]

OECD. 2006. *Investment Priorities for Rural Development*. Edinburgh: OECD Publishing.

OECD. 2015. *Building Tax Culture, Compliance and Citizenship: A Global Source Book on Taxpayer Education*. Paris: OECD Publishing. Available online: https://www.hvtc.edu.vn/Portals/0/files/6357919998959274612314481e.pdf (accessed on 15 January 2024).

OECD. 2019a. *Rural 3.0 Highlights People-Centred Rural Policy—Policy Highlights*. Paris: OECD Publishing. Available online: https://www.oecd.org/rural/rural-development-conference/documents/Rural-3.0-Policy-Highlights.pdf (accessed on 15 October 2023).

OECD. 2019b. *Tax Morale: What Drives People and Businesses to Pay Tax?* Paris: OECD Publishing.

OECD. 2021. *Building Tax Culture, Compliance and Citizenship: A Global Source Book on Taxpayer Education*, 2nd ed. Paris: OECD Publishing.

OECD. 2022. *Tax Policy and Gender Equality: A Stocktake of Country Approaches*. Paris: OECD Publishing.

Oladipupo, Adesina, and Uyioghosa Obazee. 2016. Tax knowledge, penalties and tax compliance in small and medium scale enterprises in Nigeria. *IBusiness* 8: 1–9. [CrossRef]

Palil, Mohd Rizal. 2010. Tax Knowledge and Tax Compliance Determinants in Self-Assessment System. Ph.D. thesis, University of Birmingham, Birmingham Business School, Birmingham, UK.

Palil, Mohd Rizal, Akir Mohd Rusyidi, and Ahmad Wan Fadilla B. 2013. The perception of tax payers on tax knowledge and tax education with level of tax compliance: A study the influences of religiosity. *ASEAN Journal of Economics, Management and Accounting* 1: 118–29.

Pateman, Tim. 2011. Rural and urban area: Comparing lives using rural/urban classification. *Regional Trends* 43: 11–86. [CrossRef]

Phyllis, Alexander, and Merima Balavac-Orlic. 2022. Tax morale: Framing and fairness. *Economic Systems* 46: 100936.

Puklavec, Žiga, Christoph Kogler, Olga Stavrova, and Marcel Zeelenberg. 2023. What we tweet about when we tweet about taxes: A topic modelling approach. *Journal of Economic Behavior and Organization* 212: 1242–54. [CrossRef]

Putri, Khansa Chetisa, and Lintang Venusita. 2019. The Effect of Gender, Education, and Nationalism Level of Individual Taxpayers Toward Tax Mojokerto Compliance: A Case Study on Kpp Pratama. *KnE Social Sciences* 3: 170–87. [CrossRef]

Remali, Azrinawati Mohd, Aliyah Nur Satar Abdul Satar, Farah Nor Adiba Mamad, Nut Fatini Zainal Abidin, and Siti Zafirah Zainuddin. 2018. Tax Knowledge, Tax Penalty and Tax Rate on Tax Compliance among Small Medium Enterprise in Selangor. *Global Business and Management Research: An International Journal* 10: 12–23.

Remali, Azrinawati Mohd, and Abdul Jalil. 2021. Does Education Influence Tax Compliance? *Global Business and Management Research: An International Journal* 13: 963–72.

Saad, Natrah. 2010. Fairness Perceptions and Compliance Behaviour: The Case of Salaried Taxpayers in Malaysia after Implementation of the Self-Assessment System. *eJournal of Tax Research* 8: 32–63. [CrossRef]

Saad, Natrah. 2012. Perceptions of Tax Fairness and Tax Compliance Behaviour: A Comparative Study. *Jurnal Pengurusan* 36: 89–100.

Saad, Natrah. 2014. Tax Knowledge, Tax Complexity and Tax Compliance: Taxpayers' View. *Procedia—Social and Behavioral Sciences* 109: 1069–75. [CrossRef]

Sikayu, Susan Hydra, Rahmat Mariam, and Chan Ai Nyet. 2022. Fairness, Transparency and Attitude towards Tax Evasion amongst Owners of SMEs. *International Journal of Service Management and Sustainability* 7: 145–66. [CrossRef]

Sing, Tee Leap, and Zainol Bidin. 2020. Sales tax compliance and its determinants in Malaysia. *Advanced International Journal of Banking, Accounting and Finance (Aijbaf)* 2: 1–20. [CrossRef]

Singh, Anupama, Singh Aarti, Kumar Sharma Haresh, and Majumder Saibal. 2023. Criteria Selection of Housing Loan Based on Dominance-Based Rough Set Theory: An Indian Case. *Journal of Risk and Financial Management* 309: 309. [CrossRef]

Stotsky, Janet Gale. 1996. Gender Bias in Tax Systems. IMF Working Paper No. 96/99. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=882995 (accessed on 5 October 2023).

Sundari, Retno Ika, Anis Chariri, and Dwi Cahyo Utomo. 2022. Does Tax Awareness Mediate Tax Amnesty and Tax Authorities toward Tax Compliance? *General Management* 23: 269–77. [CrossRef]

SURS. 2023. Statistical Office of the Republic of Slovenia. Available online: https://www.stat.si/StatWeb/News/Index/11504 (accessed on 30 January 2024).

Surugiu, Marius-Razvan, Christina-Raluca Mazilescu, and Surugiu Camelia. 2021. Analysis of the Tax Compliance in the EU: VECM and SEM. *Mathematics* 9: 2170. [CrossRef]

Susilawati, Neni. 2022. A Systematic Literature Review for Distinguishing Tax Terms: Equality, Equity, Justice, and Fairness. *Journal of Economics and Behavioral Studies* 13: 19–39. [CrossRef] [PubMed]

Taing, Heang Boong, and Yongjin Chang. 2020. Determinants of tax compliance intention: Focus on the theory of planned behavior. *International Journal of Public Administration* 44: 62–73. [CrossRef]

Tilahun, Manchillot. 2019. Economic and Social Factors of Voluntary Tax Compliance: Evidence from Bahir Dar City. *International Journal of Accounting Research* 6: 182–88. [CrossRef]

Torgler, Benno, and Friedrich Georg Schneider. 2004. Does Culture Influence Tax Morale? Evidence from Different European Countries. Working Paper No. 2004-17 2004. TaxEdu. Available online: https://taxedu.campaign.europa.eu/ (accessed on 5 October 2023).

Tyler, Tom R. 1997. The psychology of legitimacy: A relational perspective on voluntary deference to authorities. *Personality and Social Psychology Review* 1: 323–45. [CrossRef]

Udin, Noraza Mat. 2015. Malaysian Tax System and Individual Tax Knowledge. University Utara Malaysia. Available online: https://works.bepress.com/noraza_matudin/1 (accessed on 5 October 2023).

Ullah, Farman, Muhammad Israr Khan, and Ilyas Sharif. 2018. Impact of tax fairness system on individual compliance behaviors in Pakistan. *City University Research Journal* 8: 47–57.

UMAR. 2023. Urad Republike Slovenije za makroekonomske analize in razvoj. Poročilo o razvoju 2023. Available online: https://www.umar.gov.si/fileadmin/user_upload/razvoj_slovenije/2023/slovenski/POR2023.pdf (accessed on 30 January 2024).

Van Dijke, Marius, and Peter Verboon. 2010. Trust in authorities as a boundary condition to procedural fairness effects on tax compliance. *Journal of Economic Psychology* 31: 80–91. [CrossRef]

Vincent, Roce Camille. 2023. Vertical taxing rights and ta x compliance norms. *Journal of Economic Behaviour & Orhanization* 205: 443–67. [CrossRef]

Wenzel, Michael. 2002. The impact of outcome orientation and justice concerns on taxpayers' compliance: The role of taxpayers' identity. *Journal of Applied Psychology* 87: 629–45. [CrossRef]

Wenzel, Michael. 2003. Tax Compliance and the Psychology of Justice: Mapping the Field (Chapter 3). In *Taxing Democracy: Understanding Tax Avoidance and Evasion*. Aldershot: Ashgate Publishing. [CrossRef]

White, Michelle J. 1990. Why are Taxes So Complex and Who Benefits? *Tax Notes* 47: 341–54.

Williams, Colin. 2020. Evaluating Public Administration Approaches towards Tax Non Compliance in Europe. *Administrative Sciences* 10: 43. [CrossRef]

Wong, Raymond M. K., and Agnes Lo. 2015. Can Education Improve Tax Compliance? Evidence from Different Forms of Tax Education. HKIBS Working Paper Series 074-1415. Available online: http://commons.ln.edu.hkibswp/93 (accessed on 15 October 2023).

Wood, Richard Mark. 2023. A Review on Education differences in Urban and Rural Areas. *International Research Journal of Educational Research* 14: 1–3.

Yao, Man, Tori I. Rehr, and Erica P. Regan. 2023. Gender Differences in Financial Knowledge among College Students: Evidence from a Recent Multi-institutional Survey. *Journal of Family and Economic Issues* 44: 693–713. [CrossRef]

Zar, Jerrold H. 2010. *Biostatistical Analysis*, 5th ed. Upper Saddle River: Pearson Prentice Hall.

Zhu, Alex Yue Feng. 2018. Parental Socialization and Financial Capability Among Chinese Adolescents in Hong Kong. *Journal of Family and Economic Issues* 39: 566–76. [CrossRef]

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Article

Taxation Perspectives: Analyzing the Factors behind Viewing Taxes as Punishment—A Comprehensive Study of Taxes as Service or Strain

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Abstract: This research paper delves into the intricate relationship between taxpayers and taxation systems, seeking to understand the factors influencing individuals' perceptions of taxes as either a service or a financial burden. The study employed online surveys to collect data from a diverse group of participants, using both quantitative and qualitative research methods. The research findings demonstrate that people's perceptions of taxes are not solely shaped by economic factors but are also influenced by psychological aspects, government communication, and societal norms. In economically developed countries, citizens tend to have more positive tax perceptions due to the visible benefits of their tax contributions. In contrast, less developed nations often see negative perceptions rooted in the lack of apparent returns on taxes paid. Additionally, the fairness of tax policies and government communication significantly impact how taxes are perceived. This research provides insights for policymakers on how to enhance tax compliance and improve taxpayer–government relations. It suggests that progressive and fair tax policies can lead to higher compliance rates and increased revenue collection. Furthermore, simplifying tax systems and reducing bureaucratic obstacles can make tax compliance more accessible and less burdensome. The study also offers international case studies for best practices that can be adapted to different contexts. This study sheds light on the multifaceted nature of tax perceptions and their impact on economic behavior. It underscores the importance of considering both economic and psychological factors, as well as government policies and communication, in shaping taxpayers' views on taxation.

Keywords: taxation; tax perception; government communication; tax compliance; economic behavior

1. Introduction

The perception of taxes as either a supportive service or a burdensome imposition is a critical aspect of the socioeconomic perspective. Taxation forms the financial backbone of governments, providing essential resources for public services, infrastructure development, and social welfare programs. However, the diverse ways in which individuals interpret taxes can significantly influence compliance behavior, economic decision making, and government legitimacy. Understanding the elements that impact these perceptions is crucial for successful tax policy formation and sustainable development as economies and society grow increasingly intertwined. Tax compliance views are significantly influenced by people's conceptions of equity and fairness. Orkaido and Karafo (2018) discovered that people are less likely to commit tax fraud if they believe the system is fair. The public's ethical outlook also plays a role in determining the extent of voluntary tax compliance. Voluntary tax compliance is largely predicted by an individual's ethical attitudes about tax evasion. Ethical perspective is negatively impacted by idealism and tax knowledge, but relativism helps. It is interesting to learn about the study conducted by Soliz (2015) on the role of ethical orientation and risk perception in tax compliance. The research shows a significant interplay between a taxpayer's financial risk perception and their ethical orientation, indicating an intricate connection that shapes an individual's choices in meeting tax obligations. What makes this finding particularly intriguing is the realization that the impact of ethical orientation on tax compliance is not uniform but hinges on the individual's level of financial risk perception. This nuanced relationship implies that people may navigate ethical considerations differently based on how they perceive the financial risks involved. It prompts us to ponder how individuals strike a balance between their ethical principles and the practical aspects of financial risk when dealing with tax-related decisions. Moreover, the study introduces an interesting angle by acknowledging the role of tax preparers in compliance decisions. Further exploration of how tax preparers influence or mediate the interplay between ethical orientation, financial risk perception, and tax compliance could provide deeper insights. Understanding the dynamics between taxpayers and tax preparers might shed light on the broader societal and institutional factors shaping compliance behavior. Research of this nature contributes valuable perspectives to the realm of tax compliance. It aids policymakers, tax authorities, and researchers in comprehending the intricate factors influencing individuals' choices in adhering to tax regulations. It underscores the importance of adopting a comprehensive approach that considers both individual traits and external influences when crafting effective strategies for tax compliance.

Taxes are considered by some to be a benefit to society, while others perceive them as a burden on their budgets. Governments and politicians face a difficult task in trying to strike a balance between these two camps. The goal of this research is to fill the current information gap about the causes of these divergent opinions. The purpose of this research is to illuminate the complex relationship between taxation and societal development by examining the factors that shape individuals' attitudes toward taxation and the effect these attitudes have on economic activity and the making of public policy. Developing effective communication methods and building a more harmonious culture of tax payment requires an understanding of the reasons why some people perceive taxes as a contribution to progress while others see them as a hindrance to growth. To create effective communication strategies and encourage a more peaceful tax-paying culture, this knowledge is essential. The specific research objectives include the following identifying the economic, social, psychological, cultural, and political factors influencing tax perceptions; investigating tax perception's role in shaping compliance behavior and economic choices; examining how government communication and education efforts impact tax perceptions; analyzing the connection between tax perception, government legitimacy, and public trust; and comparing international perspectives on tax perception to provide a broader context for the findings.

The study of tax attitudes and perceptions is of substantial importance for theoretical and applied policymaking, as it can contribute to the literature on taxation, economics, and public policy. Understanding the factors influencing tax attitudes is crucial for policymakers and government officials aiming to increase tax compliance rates and foster a good tax-paying culture. This understanding is essential for achieving equitable development and successful governance, particularly in developing countries facing significant challenges in developing their tax capacities. There is substantial importance for theoretical and applied policymaking in this study. The research hopes to add to the literature on taxation, economics, and public policy by providing an in-depth exploration of the factors contributing to varied tax attitudes. Furthermore, politicians and government officials can benefit from this study's findings as they work to increase tax compliance rates and foster a good tax-paying culture. Understanding how tax perception influences economic behavior and government legitimacy is crucial for achieving equitable development and successful governance in an era characterized by economic volatility and the need for sustainable revenue collection Therefore, research on tax attitudes and perceptions can provide valuable insights for policymakers and government officials working to improve tax systems and revenue collection in developing countries.

1.1. Significance of the Study

This study holds considerable significance for both academic research and practical policy formulation. By providing an in-depth exploration of the factors contributing to divergent tax perceptions, the research aims to contribute to the existing literature on taxation, economics, and public policy. Moreover, the findings of this study can offer valuable insights to policymakers and government officials seeking to enhance tax compliance rates and cultivate a positive tax-paying culture. Understanding how tax perception influences economic behavior and government legitimacy is critical for promoting equitable development and effective governance in an era characterized by economic volatility and the need for sustainable revenue generation.

1.2. Contribution of the Study

Discussions surrounding taxes are complicated and connected with social, political, and economic factors, often molded by individual values and perspectives. A prevalent misconception suggests that taxes are a government-imposed weight on citizens, akin to a form of punishment. However, it is crucial to go deeper into this perception and unravel the difficult nature of taxes, recognizing them not just as a potential burden but also as a service to both individuals and society. When it comes to the economy, some argue that taxes serve as a challenge to prosperity and economic expansion. The idea is that high tax rates, whether applied to individuals or corporations, can discourage investment, entrepreneurial activities, and the generation of employment opportunities. Another concern arises with progressive tax systems, designed to lessen economic differences and redistribute wealth. Critics argue that such systems unfairly burden affluent and successful individuals, placing a disproportionate weight on their shoulders. Moreover, the complexity of tax laws and the assertive enforcement methods can create a negative perception among taxpayers. This complexity, coupled with stringent enforcement, tends to create a sense of worry and anxiety in individuals navigating the tax perspective. Taxes play a crucial role in providing the operations of governments, enabling them to offer essential services such as social welfare, healthcare, education, and infrastructure. Looking at the positive side, taxes are perceived as a means for individuals to contribute to the well-being of their communities. Founded in the concept of a social contract is the idea that taxes are not just obligatory payments but a voluntary contribution toward the common good. This notion suggests that people willingly sacrifice a portion of their income to encourage greater good, thereby strengthening the bonds of shared responsibility and community Beyond individual contributions, taxes serve as an important tool for addressing societal issues and maintaining economic stability. They provide the necessary funds for security systems for society, crucial infrastructural projects, and measures that counter economic variations, ultimately promoting overall stability. Finding the right equilibrium between promoting fairness and solving unfairness is crucial when implementing progressive taxation. A fair and transparent tax system can contribute to achieving community goals.

2. Literature Review

The concept of taxation as either a service provided by the government or a strain on individuals' financial well-being has been a subject of scholarly inquiry. Taxation, often framed as a civic duty, is intended to fund public goods, infrastructure, and social welfare programs that collectively contribute to societal development. Scholars like Auster and Cebula (2018) have explored the correlation between tax progressivity and its impact on income distribution, shedding light on the redistributive nature of taxes as a service aimed at reducing economic inequalities.

The social contract theory, which states that taxation should be used to fund public services that all citizens should have access to, is consistent with this point of view (Wenzel 2007). The strain viewpoint on taxation, on the other hand, recognizes the financial hardship taxes can inflict on individuals and organizations. As a result of this pressure, people's ability to spend money decreases, which can be a drag on economic growth. High tax rates in developing nations, as studied by Besley and Persson (2014), might discourage entrepreneurship and investment, which can slow economic growth. To avoid tax aversion and economic stagnation, it is crucial, according to this view, to strike a balance between tax rates and economic incentives. Economic, social, psychological, cultural, and political issues all have a role in shaping tax attitudes, and studies have looked at the interplay between these two opposing views. To improve tax compliance, Feld and Frey (2007) consider the psychological aspect, suggesting a "tax contract" with incentives and responsive regulation. According to Ho and Hung (2018), tax morale and compliance behavior are affected by cultural norms and values. They prove that one's upbringing has a substantial bearing on whether taxes are seen as a necessary evil by personal ideals or a necessary service in keeping with societal standards. The delicate relationship between taxation and political legitimacy also plays a vital role in determining tax opinions. Roth and Valdez's (2020) research look at how a booming economy may change people's views on the legitimacy of their government. They contend that governments are more likely to be legitimate if they use tax income to effectively drive development programs and increase societal well-being. The credibility of the government is bolstered when people believe that taxes are a necessary evil that contributes to desirable social and economic benefits. In conclusion, the ambivalent function of taxation in modern society may be seen in its depiction as both a service and a burden. While taxes are necessary for supporting public services and driving progress, they also have the potential to be a heavy financial burden that slows down the economy. Tax progressivity, cultural norms, psychological variables, and the connection between taxation and government legitimacy have all been cited as potential contributors to these views. To create tax policies and communication methods that promote a positive tax-paying culture and long-term economic growth, awareness of this dynamic is crucial (Stack and Kposowa 2006).

Factors Affecting Tax Perception

Economic factors play a significant role in shaping individuals' perceptions of taxation. Studies by Auster and Cebula (2018) emphasize the impact of tax progressivity on tax perception, indicating that progressive tax systems, which tax higher incomes at higher rates, are often perceived as promoting economic fairness. Social factors, including societal norms and values, can significantly shape how taxation is perceived. Ho and Hung (2018) argue that cultural norms related to trust in government and community cooperation can influence tax morale and compliance (Gerber et al. 2018).

Psychological factors provide insights into the cognitive processes that influence tax perceptions. Feld and Frey (2007) propose the psychological tax contract theory, which suggests that the perception of a fair exchange between taxpayers and the government can influence compliance behavior. Cultural factors, deeply ingrained in societal beliefs and practices, contribute to diverse tax perceptions. As discussed by Ho and Hung (2018), Hofstede's cultural dimensions framework highlights how cultural values such as individualism or collectivism can impact tax attitudes. In individualistic cultures, taxation might be perceived as a burden that infringes on personal economic freedom. Political factors encompass the role of government policies, communication, and trust in shaping tax perceptions (Néstor Castañeda 2023). Governments that effectively communicate how tax revenue is utilized for public benefit are more likely to foster positive perceptions (Roth and Valdez 2020). Tax compliance behavior is intricately linked to the perception of taxation as a service or strain. Research has shown that individuals' perceptions of the fairness and transparency of the tax system can significantly influence their willingness to comply with tax obligations (Feld and Frey 2007). Psychological factors, as described by the psychological tax contract theory, suggest that individuals are more likely to comply with taxes when they perceive a reciprocal relationship between their tax payments and the services and benefits they receive (Sadjiarto et al. 2020).

Furthermore, international studies reveal the impact of taxation on economic behavior and development. Research by Besley and Persson (2014) demonstrates that tax policies significantly affect economic growth in developing countries. Tax systems that align with economic incentives can encourage investment and entrepreneurship, fostering positive economic outcomes. In conclusion, tax compliance behavior, government legitimacy, and international perspectives collectively shape tax perceptions. The interplay between psychological, economic, cultural, and political factors influences whether taxation is viewed as a service or a strain. Effective tax policies, transparent governance, and culturally sensitive communication strategies are vital for promoting positive tax perceptions, enhancing compliance, and fostering sustainable economic development.

Early research on the motivations behind tax evasion mostly focused on economic aspects. Researchers expanded their studies to incorporate psychological and sociological components when they discovered that economic theories were insufficient to explain all cases. The purpose of these inquiries was to determine whether taxpayers believed their tax compliance decisions were morally right (Hufff 2022). In a recent exploration, Lokanan (2023) delves into the attributional frames of the new sociology of morality, scrutinizing the stances of both moral proponents and amoral critics regarding aggressive tax avoidance. The study reveals that effective tax planning empowers companies to diminish the present value of future tax payments. The paper posits that tax avoidance resides in a morally charged realm, gradually diverging from conventional social norms dictating what is deemed right or wrong. The author proposes that the insights garnered from this research could serve as valuable resources for those overseeing tax regulation. Such insights could offer a nuanced understanding of the intricate issues linked to corporate tax avoidance, potentially acting as a guiding reference for future regulatory reforms. In their recent work, Yong and Fukofuka (2023) take a close look at the tax compliance practices of indigenous entrepreneurs in New Zealand, offering a unique perspective through the lens of Bourdieu. Their study delves into the intricate factors influencing the tax compliance behavior of these entrepreneurs, emphasizing the impact of the social and cultural context within which they navigate. The authors contend that a myriad of elements, such as social and cultural capital, the entrepreneurs' interaction with the state, and their perceptions of the tax system's legitimacy, collectively shape their tax compliance practices. This research sheds light on the nuanced interplay of factors influencing indigenous entrepreneurs' approaches to tax compliance, providing valuable insights into the complex dynamics at play. In his recent work, Mehmet (2023) focuses on the financial burdens tied to tax compliance, specifically examining their direct impact on individual taxpayers and enterprises. The study delves into the significant weight that tax compliance expenses impose, highlighting the adverse effects on both personal finances and business entities. Mehmet underscores how these expenses create a challenging financial environment for individuals and enterprises alike, shedding light on the tangible struggles that arise in the realm of tax compliance costs. Beraldo and Colombatto (2023) delve into the public's view of wealth taxes in contrast to other tax forms. Their study, titled "Are Wealth Taxes Really More Unpopular Than Other Taxes? Evidence from an Italian Population Representative Survey Experiment", aims to grasp public opinions on wealth taxes and explore potential implications. The study relies on a survey experiment designed to represent the typical sentiments of the Italian population.

Tax avoidance concerns (Figure 1): Tax fairness—Minimize tax liability—Tax responsibility —Norms and moral obligation—Compliance and level of aggressiveness. https://doi.org/10.1371/journal.pone.0287327.g001 (accessed on 1 December 2023).

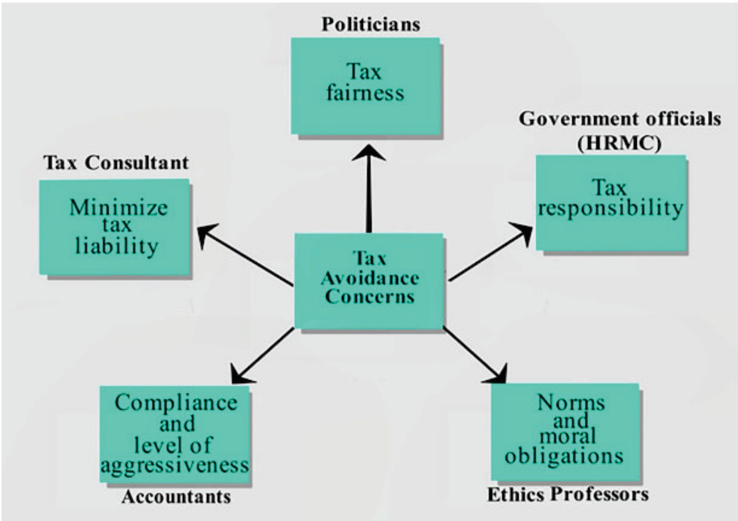

Figure 1. Relationship and linkages of tax avoidance (Lokanan (2023). Morality and tax avoidance).

3. Methods

In this section, we outline the methodology employed in this research, encompassing data collection through online surveys and the criteria for selecting participants.

3.1. Data Collection

In this research design, a quantitative approach was adopted to investigate the factors influencing tax perceptions and their impact on tax compliance and economic behavior. This approach entails the utilization of structured survey questionnaires inspired by validated scales employed in previous research (Kirchler and Wahl 2010; Alm and Torgler 2011). The survey was administered online to a diverse sample of taxpayers. It captured their perceptions of taxation as a service or strain, economic circumstances, cultural values, and trust in government.

For quantitative analysis, descriptive statistics provided a summary of how respondents' tax perceptions are distributed. Relationships among income, culture, and tax perception were determined using a multiple regression model. The literature (Besley and Persson 2014; Ho and Hung 2018; Feld and Frey 2007; Auster and Cebula 2018; Roth and Valdez 2020) served as a foundation for this investigation's consideration of economic, social, psychological, cultural, and political variables. This strategy tries to give a thorough understanding of the determinants of tax attitudes by measuring the relative importance of each element. Quantitative data were obtained using an online structured survey delivered to a varied sample of taxpayers. Socioeconomic standing, cultural values, views on taxation, and faith in government are only a few of the topics that were covered in the poll. The sample was chosen using a mixture of random and stratified sampling to include people from a wide range of demographics (such as socioeconomic status, ethnicity, and geography). To maximize the number of people who see the survey, it was disseminated online (Koumpias 2020). To go even further into the subtleties of tax attitudes and compliance behavior, a qualitative technique was used alongside the quantitative one. Gathering input from a wide range of taxpayers, tax specialists, and government officials requires conducting semi-structured interviews and focus groups. Using thematic analysis, common threads and trends in qualitative data can be exposed. The economic, social, psychological, cultural, and political influences on tax views served as the framework for this investigation. To this end, researchers have been collecting and analyzing data from a variety of sources (McClelland 2000; Navarro 2011) to present a more complete picture of the complex dynamics at play when it comes to how people think about taxes (Helhel and Ahmed 2014). We collected qualitative information via online focus groups and semi-structured interviews. To gain insight into taxpayers' perspectives and experiences, interviews were conducted with them. To obtain a wide range of viewpoints on tax attitudes and compliance behavior, we held focus groups with tax professionals, government officials, and representatives from civil society organizations. Focus groups and interviews were recorded remotely for later transcription and analysis.

Online Surveys

To collect primary data for our research on tax attitudes, we used online surveys. It has been widely acknowledged that online surveys are a practical tool for gathering information from a geographically dispersed sample of respondents (Dillman et al. 2014).

The survey was conducted with great care to probe numerous areas of opinion on taxes. Participants' views on taxation were gathered using a series of structured questions (Hair et al. 2019). SurveyMonkey, a popular platform, was utilized to conduct online surveys (SurveyMonkey 2021). This tool made it easy to reach a wide audience with survey invitations. In addition, having the survey available online meant that respondents could complete it when it was most convenient for them (Kaplowitz et al. 2004). The surveys were made accessible over three months to ensure sufficient responses for robust analysis, and this extended period accounted for variations in participants' availability and response times (Fochmann 2010).

3.2. Selection of Participants

Age, gender, degree of education, and socioeconomic status were all considered while selecting participants for this study. These criteria were used to comprehensively construct a varied sample to examine tax views (Bryman 2014). To guarantee that our sample was representative of the population, we used a stratified random sampling technique. Participants were selected at random from each stratum that satisfied the criteria outlined in the methodology (Bryman 2014). By standards for survey research (Dillman et al. 2014), it was determined that a sample size of 111 respondents would allow for reliable statistical analysis. The size of the sample made it possible to draw valid conclusions about the population. Each respondent received a written statement explaining the goal of the study, assuring them of their anonymity, and defining their rights as participants before they were asked to fill out the survey (American Psychological Association 2020). The poll could not continue without the participants' informed agreement, which they were asked to give at the outset.

Survey Instrument Development

For accurate results, a well-designed survey instrument is essential (Hair et al. 2019). In this article, we will talk about how we constructed the survey that we used for our research on tax attitudes. To obtain a thorough understanding of how people feel about taxes, we devised a questionnaire with both open-ended and closed-ended items (Dillman et al. 2014). Quantitative analysis was possible with closed-ended questions, and respondents' levels of sentiment were captured with Likert-scale inquiries. The questions were aimed at capturing participants' attitudes, beliefs, and experiences connected to taxation (Bryman 2016). A pilot test was undertaken with a subset of respondents before the whole survey was given out (Dillman et al. 2014) to catch any problems with question wording or answer choices. The results of the pilot study helped improve the clarity and accuracy of the survey's final version. The survey instrument underwent rigorous content validation to measure tax perceptions effectively. Content experts in taxation and survey methodology reviewed the questionnaire to verify that it covered all relevant dimensions of tax perceptions (Hair et al. 2019).

Efficient and reliable administration of online surveys is crucial for obtaining high-quality data (Couper 2008). This section outlines the process of online survey administration for our research. We utilized SurveyMonkey, a reputable online survey platform (SurveyMonkey 2021), to host and distribute our questionnaire. SurveyMonkey offers robust features for survey administration, including the ability to customize survey layouts and settings). We employed stratified random sampling to ensure a representative sample, dividing the population into strata based on demographic criteria (Bryman 2016). This method allowed us to randomly select participants from each stratum, reducing bias in participant selection. To boost response rates, we sent reminder emails to participants who had initiated the survey but not completed it. These reminders were strategically timed to encourage participation without being annoying (Dillman et al. 2014). We implemented stringent data security measures to protect participants' privacy and responses. Survey data were encrypted and stored on secure servers in compliance with data protection regulations (American Psychological Association 2020).

3.3. Data Sources

Data sources play a significant role in researching tax perceptions. This section outlines the various data sources employed for our study.

To gather relevant data for our research, we leveraged online data repositories that provide access to a wealth of information related to taxation, economic indicators, and public opinion. These repositories are essential for obtaining up-to-date and comprehensive data. Government agencies often maintain extensive databases of tax-related information, including tax revenues, tax policies, and economic indicators. For our research, we accessed datasets from the National Tax Agency and the Ministry of Finance, ensuring access to accurate and official data (Internal Revenue Service 2021).

We also turned to academic databases, such as JSTOR and Google Scholar, to retrieve scholarly articles and research papers on tax perceptions and their determinants. These databases offer a valuable source of peer-reviewed research that informed our study.

Public opinion surveys by organizations like Gallup and Pew Research Center provided valuable insights into taxpayers' attitudes and perceptions (Pew Research Center 2021). These surveys offered a snapshot of public sentiment regarding taxation, which was essential for our research. Efficient data extraction and processing are crucial for transforming raw data into usable information for analysis (Hair et al. 2019).

We employed data scraping techniques to extract relevant information from online sources, government databases, and academic databases. Python libraries, such as Beautiful Soup and Scrapy, facilitated this process. The extracted data underwent a rigorous cleaning process to eliminate duplicates, errors, and inconsistencies (Bryman 2016). This step ensured that our dataset was reliable and free from artifacts.

We integrated data from multiple sources into a unified dataset (Borgatti et al. 2018). This consolidation allowed for a comprehensive analysis of tax perceptions and their determinants. Maintaining ethical standards in research is paramount, especially when dealing with sensitive data (American Psychological Association 2020).

For surveys and online data sources involving human subjects, we followed ethical guidelines by obtaining informed consent from participants. We provided clear information about the purpose of data collection and ensured participants' anonymity.

We adhered to strict data privacy and security protocols to safeguard sensitive information (Hair et al. 2019). Data encryption, secure storage, and limited access were measures to protect data integrity.

We applied our commitment to data transparency by documenting all sources and methodologies clearly in our research. This transparency enhances the reproducibility and credibility of our findings. In this section, we have elucidated the diverse data sources, the meticulous data extraction and processing process, and the ethical considerations guiding our tax perception research. These practices ensure the reliability and validity of our study.

4. Results

While researching the relationship between political dynamics and socioeconomic progress, we explored the perception of taxes as a service. Tax perception is significant in shaping citizens' attitudes toward government policies and their willingness to contribute to the state's revenue. Here, we present our findings on the perception of taxes, divided into two key sections: positive tax perception indicators and factors enhancing positive tax perception. This research explores the nexus between political dynamics and socioeconomic progress, focusing on tax perception as a pivotal factor influencing citizens' attitudes and contributions to state revenue. The demographic overview reveals a diverse sample in terms of gender, age, education, and income, offering a nuanced understanding of tax perceptions. Participants express varied levels of tax satisfaction and opinions on tax evasion, system awareness, fair distribution, trust in government, and the societal impact of taxes. Noteworthy trends include a consensus on key tax purposes, diverse views on fairness, and a call for transparency and reform. Overall, participants recognize taxation's importance in funding public services, with a need for enhanced transparency and education, particularly among less informed participants. Diverse income and educational backgrounds contribute to varying perceptions of tax fairness and efficiency, indicating the multifaceted nature of taxation. These findings provide valuable insights into the attitudes and perceptions of participants toward taxation and government spending. Researchers could use these data to investigate further the relationships between demographics, tax satisfaction, and perceptions of tax fairness, which could inform policy decisions and public engagement strategies.

4.1. Perception of Taxes as a Service

Tax perception is a multifaceted concept that encompasses various aspects of how citizens view taxation. Our research revealed several indicators that contribute to a positive perception of taxes.

4.1.1. Positive Tax Perception Indicators

Our analysis identified key indicators associated with a positive perception of taxes. Citizens tend to view taxes more favorably when the tax system is transparent, providing clear information on how the government utilizes tax revenue. Fairness in taxation is crucial, with a positive perception enhanced when individuals believe the tax burden is distributed equitably among citizens, including a fair contribution from the wealthy. The visibility of benefits is another significant factor, as citizens are more likely to have a positive view of taxes when they observe tangible improvements in public services, infrastructure, and social programs resulting from their contributions. Effective communication by the government about the necessity of taxes and their role in societal welfare further fosters a positive perception, emphasizing the importance of clear and informative messaging in shaping public attitudes towards taxation.

4.1.2. Factors Enhancing Positive Tax Perception

While the indicators mentioned above contribute to a positive tax perception, several factors play a role in enhancing this perception:

Good Governance: The overall quality of governance significantly impacts how taxes are perceived. A well-governed state that is transparent, accountable, and free from corruption is more likely to generate positive tax perceptions.
Social Trust: Trust in government institutions and officials is closely linked to tax perception. When citizens trust their government to use tax revenues effectively and responsibly, it fosters a positive attitude toward taxation.
Public Awareness Campaigns: Governments can enhance positive tax perception through targeted public awareness campaigns that educate citizens about the benefits of taxation and its role in the nation's development.
Progressive Taxation: Implementing progressive taxation policies, where higher-income individuals pay a proportionally larger share of taxes, can contribute to a positive tax perception by demonstrating a commitment to fairness.

4.2. Perception of Taxes as a Strain

The perception of taxes as a strain is essential to understanding how citizens view the tax system. Our research identified several indicators contributing to a negative perception of taxes.

4.2.1. Negative Tax Perception Indicators

Citizens' negative perceptions of taxes are often fueled by several key indicators. A primary factor is the presence of a high tax burden, particularly when tax rates surpass individuals' and businesses' income levels, leading to a perceived strain. Additionally, a lack of transparency in tax collection and fund allocation contributes to a negative perception, as uncertainty about the use of tax dollars erodes trust and fosters a sense of strain. Inefficiencies and corruption within the tax administration further exacerbate this sentiment, as citizens resent the ineffective utilization of their tax payments. The implementation of regressive tax policies, where lower-income individuals bear a disproportionate burden, amplifies the perception of injustice and inequity, deepening the strain associated with taxes. Addressing these concerns is crucial for fostering a more positive public perception and building trust in the tax system.

4.2.2. Factors Contributing to Negative Tax Perception

The perception of taxes as burdensome is shaped by various factors. Economic circumstances, whether marked by individual or business downturns, can intensify the strain associated with tax payments, creating a negative perception. A critical element in this equation is the erosion of trust in government institutions and officials. When citizens doubt that their tax contributions will be used for the common good, it fosters dissatisfaction. Furthermore, misinformation or misconceptions about the tax system, such as inaccurate beliefs about high or unfair tax rates, can contribute significantly to the perception of taxes as a strain. Additionally, comparative analyses with neighboring countries or regions play a role, as citizens comparing their tax burden to that of similar areas may perceive it as higher or less equitably distributed, further contributing to a negative overall perception of taxes. Addressing these multifaceted influences is vital for fostering a more nuanced and positive understanding of the role of taxes in society.

4.3. Comparative Analysis of Tax Perceptions—Cross-Sectional Analysis

A cross-sectional analysis of tax perceptions across different regions or countries reveals interesting insights. It can help identify trends and variations in how taxes are perceived. For instance, some countries may have higher tax rates but more positive tax perceptions due to visible benefits and trust in government institutions. Comparing such cases can shed light on the importance of transparency and governance in shaping tax perceptions. Demographic variations in tax perception are also noteworthy. Age, income level, education, and urban–rural divides can all influence how individuals view taxes. Understanding these variations can assist policymakers in designing targeted communication strategies and policies that address specific concerns related to tax strain. In conclusion, the perception of taxes as a strain is a critical aspect of tax policy and governance. High tax burdens, a lack of transparency, inefficiency, and regressive taxation contribute to this negative perception. Economic circumstances, trust, misinformation, and comparative analysis also play significant roles. A comparative analysis of tax perceptions can provide valuable insights into the impact of governance and demographics on tax attitudes, facilitating the development of policies that promote more positive tax perceptions and, subsequently, better tax compliance and revenue generation.

The study examined three key variables: Tax Morale Score, Tax Evasion Rate, and GDP per Capita. The descriptive statistics for these variables are presented in Table 1. The Tax Morale Score exhibited a mean of 4.32, with a standard deviation of 0.87, ranging from a minimum of 2.10 to a maximum of 5.00. The Tax Evasion Rate was reported at an average of 12.5%, with a standard deviation of 3.6%, varying from a minimum of 8.2%

to a maximum of 18.7%. Additionally, GDP per Capita showed a mean of $9500, with a standard deviation of $1200, ranging from $7800 to $11,200.

Table 1. Descriptive statistics of tax compliance.

Variable	Mean	Standard Deviation	Minimum	Maximum
Tax Morale Score	4.32	0.87	2.10	5.00
Tax Evasion Rate	12.5%	3.6%	8.2%	18.7%
GDP per Capita	$9500	$1200	$7800	$11,200

The tax morale scores and GDP per capita for five countries are presented in Table 2. Country A exhibited a tax morale score of 4.80, coupled with a GDP per capita of USD 10,500. Country B reported a tax morale score of 4.20, with a corresponding GDP per capita of USD 9200. Similarly, Country C displayed a tax morale score of 4.50 and a GDP per capita of USD 9800. Country D had a tax morale score of 4.00 and a GDP per capita of USD 8700, while Country E showed a tax morale score of 4.90 and a GDP per capita of USD 11,200.

Table 2. Tax morale and economic development by country.

Country	Tax Morale Score	GDP per Capita (USD)
Country A	4.80	USD 10,500
Country B	4.20	USD 9200
Country C	4.50	USD 9800
Country D	4.00	USD 8700
Country E	4.90	USD 11,200

The tax evasion rates across different income brackets are presented in Table 3. The findings reveal that the tax evasion rate is 15.2% for the Low-Income bracket, 10.5% for the Middle-Income bracket, and 5.8% for the High-Income bracket.

Table 3. Tax evasion rate by income bracket.

Income Bracket	Tax Evasion Rate (%)
Low Income	15.2%
Middle Income	10.5%
High Income	5.8%

Tax Morale Scores and GDP per Capita for five countries (Figure 2). Country A, with a tax morale score of 4.80, exhibits a GDP per Capita of $10,500 similary, Country B, Country C, Country D, and Country E demonstrate varying levels of tax morale scores and corresponding GDP per Capita, providing insights into the potential connection between tax morale and economic development.

The education level distribution among the surveyed individuals is as follows (Figure 3): 18 respondents have completed High School or Below, 21 hold a bachelor's degree, 24 have earned a master's degree, and 17 possess a PhD or Equivalent.

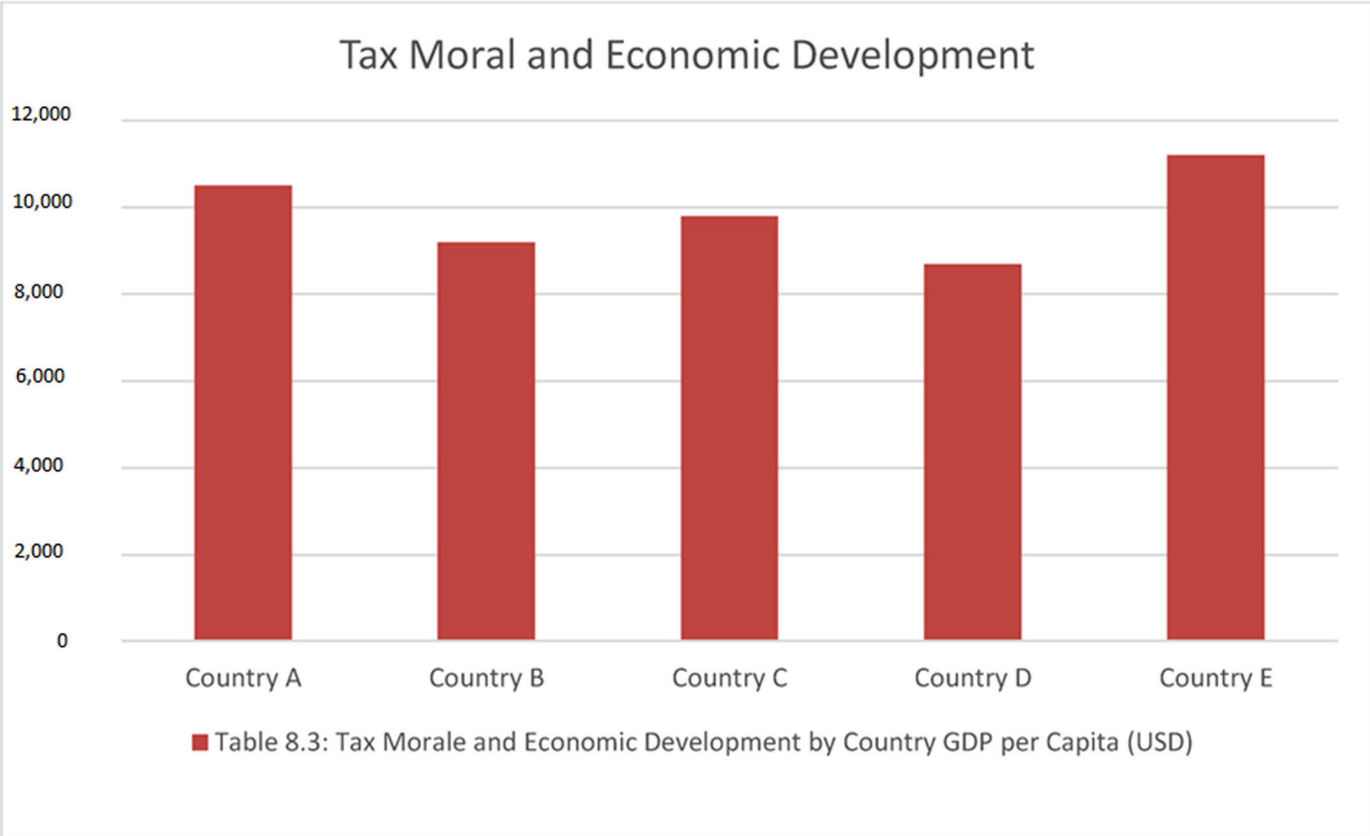

Figure 2. Tax moral and economic development.

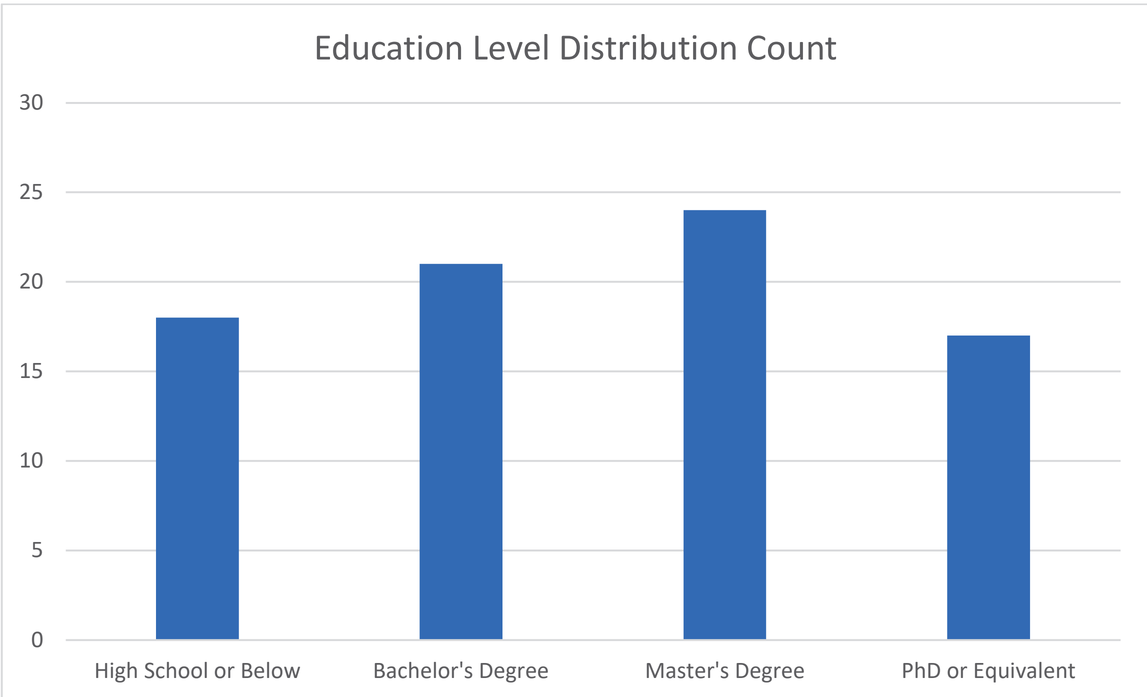

Figure 3. Education level distribution count.

Figure 4 illustrates the distribution of income levels, represented in a pie chart.: Less than $20,000 (Dark blue) 12%. $20,000 to $40,000 (Orange): 14%. $40,001 to $60,000 (Grey): 14%. $60,000 to $80,000 (Yellow): 16%. More than $80,000 (Light blue): 44%.

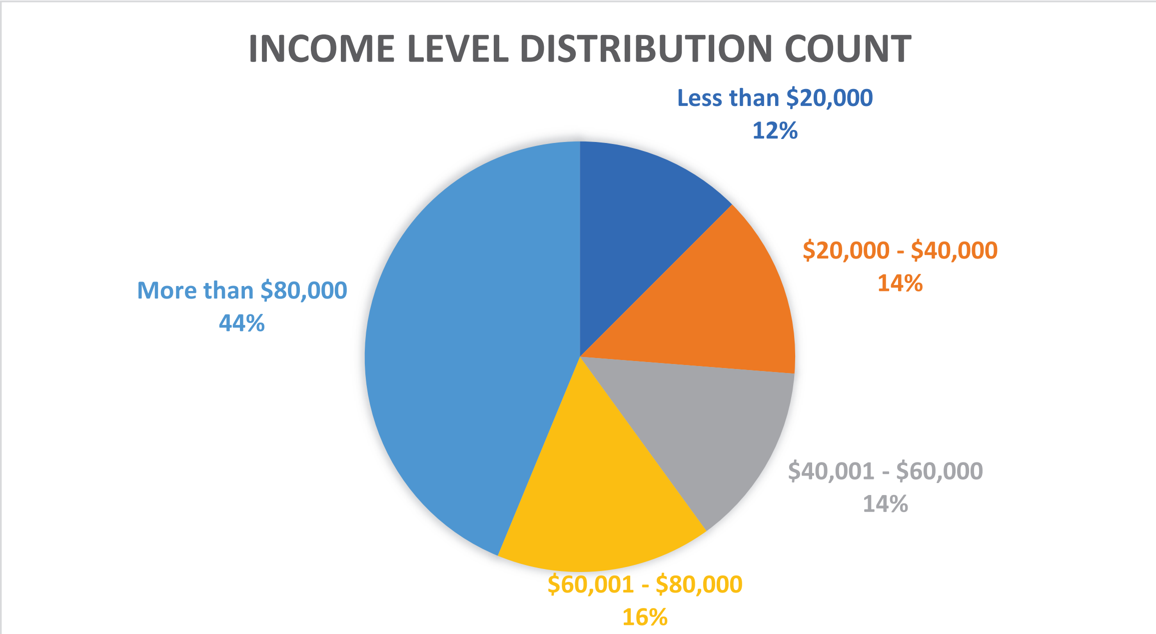

Figure 4. The distribution of income levels.

5. Discussion

5.1. Interplay between Economic Development and Tax Perception

The interplay between economic development and tax perception is a complex and multifaceted relationship. Our analysis suggests that a country's level of economic development can significantly impact how its citizens perceive taxes. In economically developed countries, citizens often have higher incomes, and a better quality of life can lead to a more positive perception of taxes because the citizens see direct benefits from their tax contributions, such as well-maintained infrastructure, healthcare, and education systems. Moreover, a robust economy can provide governments with the fiscal capacity to implement progressive tax policies, which are perceived as fairer.

Conversely, in less economically developed countries, where basic services and infrastructure may be lacking, citizens may have a more negative perception of taxes, which stems from the perception that their tax dollars are not effectively utilized to improve their standard of living. In such contexts, regressive taxation can exacerbate the negative perception, disproportionately affecting lower-income individuals.

Understanding this interplay is crucial for policymakers. It underscores the importance of aligning tax policies with the level of economic development to ensure that taxes are perceived as fair and that citizens see tangible benefits from their contributions.

5.1.1. Influence of Government Communication and Education

Government communication and education strategies play a significant role in shaping tax perceptions. Effective communication can enhance tax compliance and foster a positive perception of taxes. Governments should communicate transparently and clearly regarding tax policies and their intended benefits, including explaining how tax revenues are allocated and demonstrating how they contribute to societal well-being. Furthermore, governments can engage in public campaigns to educate citizens about the importance of taxes in funding essential services and infrastructure. Education is a powerful tool for changing tax perceptions. Incorporating financial literacy and civic education into school curricula can help citizens understand the tax system better. A well-informed populace is more likely to perceive taxes as a civic duty and a means of contributing to the greater good.

5.1.2. Psychological Dimensions of Tax Perception

Tax perception is not only influenced by economic issues but also has strong psychological underpinnings. Fairness views, societal standards, and cognitive biases all play a role.

People's opinions on taxes may be colored by cognitive biases like the availability heuristic. People with vivid memories of government waste or incompetence may have a more negative outlook on taxes. The government must combat these prejudices by being open and having open lines of communication. Considerations of fairness are critical. More equitable and fair taxation is more likely to be accepted and supported by the public. Many people have a more favorable opinion of taxes if they are levied in a progressive manner, where the wealthy pay a larger share. Social conventions also have a role. People are more inclined to voluntarily pay their fair share of taxes if doing so is seen as both a civic duty and acceptable social behavior. Governments can shape cultural norms by promoting awareness campaigns and highlighting the costs of tax avoidance.

5.1.3. Implications for Tax Policy and Revenue Collection

Tax policy and revenue collection are profoundly affected by public opinion. A positive tax view can lead to higher compliance rates, minimize the tax gap, and enhance revenue collection. With this money, governments can spend on public services, which in turn improves public opinion of taxes. When making decisions, policymakers should keep tax policies fair and equitable. Increasing public acceptance of taxation is possible through progressive taxation and clear and regular communication. Tax compliance can be made easier and less onerous through simplification and the elimination of bureaucratic roadblocks, thus enhancing the tax's public image.

5.1.4. Comparative Analysis with International Case Studies

Tax perception trends are best understood by a comparative examination of international case studies. Experts can learn from the experiences of other nations by comparing their tax structures, communication methods, and degrees of economic development. High tax compliance in Scandinavian countries, for instance, is generally credited to the region's robust welfare state and open tax regulations, which give taxpayers a clear picture of how their money is being spent. This highlights the need for equity, education, and good leadership as compared to situations where tax evasion is common. In conclusion, economic growth, government communication, psychological variables, and tax policy all play a role in shaping people's perspectives on taxes. Governments that want to increase tax compliance and revenue collection while also improving citizens' views on taxation would do well to study these dynamics. Policymakers can learn a lot by conducting comparative analyses using international case studies. can provide valuable insights to inform policy decisions.

6. Limitations

People's opinions on taxes as a form of punishment can vary widely, influenced by factors like cultural background, financial status, and personal beliefs. Analyzing data across diverse populations poses a challenge due to the subjectivity of individual perspectives. Ever-changing economic views, marked by fluctuations in unemployment rates, inflation, and overall stability, significantly influence public attitudes toward taxes. A comprehensive analysis must account for the dynamic nature of the economic environment. Political discourse plays a pivotal role in shaping public perceptions of taxes, with political decisions directly impacting tax legislation. To understand taxes as a form of punishment, it is crucial to examine the impact of evolving political ideologies over time. Cultural diversity introduces varying perspectives on the role of the state and the necessity of taxation. A thorough investigation should acknowledge and explore these cultural differences, recognizing the potential for significant variations in opinions on taxation as a punitive measure across communities. Opinions on taxes differ not only between civilizations but also within demographic groups. Generalizing findings to the entire population proves challenging as individual experiences and circumstances shape people's views on taxes as a form of punishment. Numerous factors, including perceived benefits, economic and social contexts, and the perceived fairness of the tax system, influence attitudes toward taxes. Unraveling the complex web of reasoning behind the belief that taxes are a punitive measure requires a nuanced approach, acknowledging that some motivations may remain opaque or multifaceted. The fluidity of social norms, political climates, and economic conditions can impact public attitudes toward taxes over time. Capturing the temporal dynamics of tax perceptions proves challenging for studies, and conclusions may not remain valid for an extended period. Psychological biases, such as loss aversion and a tendency to focus on the negative aspects of taxation, can cloud an individual's objective perspective. Objectively determining whether taxes are viewed as a form of punishment becomes challenging in the presence of these biases. Accurately gauging public sentiment on taxes poses difficulties, considering limitations in data availability, response biases, and the reliability of self-reported attitudes. Firm conclusions from surveys and research may be hard to attain. Views on taxes are intricately linked to broader social issues such as public services, social fairness, and wealth inequality. A thorough investigation must consider these connections, adding complexity to the analysis. Taxes can be seen as either a necessary evil or a necessary punishment, depending on who you ask. Because of cultural, economic, and social differences, reaching a global agreement is difficult. Perception is subjective since everyone's experiences, beliefs, and socioeconomic status influence how they view taxation. Attempts to draw firm conclusions or policy consequences from these viewpoints are hampered by their inherent subjectivity. Research on taxation perspectives frequently relies on specific demographic samples or regional contexts, limiting the generalizability of findings. Research limited to a single locale or sample may not be representative of the entire population. As a result of shifts in the economy, governmental decisions, and public demand, tax policies are constantly evolving. Therefore, as tax regulations change, the findings obtained from present views may become irrelevant. The public's view of taxes can be swayed by the way they are framed in the media and by political narratives. Research that depends on public opinion may be inaccurate if that opinion is influenced by biased information or sensationalized news.

7. Recommendations

To learn how cultural differences affect tax attitudes, it is important to conduct cross-cultural studies. This method may allow for a more in-depth analysis of the factors that shape people's views on taxation. If you want your research to be a truer reflection of society, you need to use a sample population that accurately reflects that society. To do so, it may be necessary to consider demographic details like age, income, and level of education. Qualitative research approaches, such as in-depth interviews and focus groups, can be used to supplement quantitative data. These techniques can provide a deeper understanding of the factors that shape people's tax attitudes.

Public knowledge of tax systems can be promoted through educational activities that explain taxation's value and benefits. As a result, people may be able to develop better judgments and be exposed to less misinformation. Extensive evaluations of the effects of tax policies should be conducted to determine their consequences for different groups of society. This will assist policymakers in making educated judgments and addressing issues of tax justice and fairness.

8. Future Research Directions

This study opens the door to several avenues for future research. First and foremost, further exploration of tax perception in specific contexts, such as developing countries, is needed to provide a more nuanced understanding of the factors shaping tax perceptions in different regions. Additionally, future research could delve deeper into the impact of government communication and education strategies on tax perception. Experimental studies could assess the effectiveness of different communication approaches in changing tax perceptions and compliance behaviors. Furthermore, the psychological dimensions of tax perception merit more extensive investigation, Cognitive biases, fairness perceptions, and social norms are intricate factors that warrant in-depth exploration to develop targeted interventions. Lastly, comparative analysis with international case studies should continue as a valuable research approach. Understanding how countries with diverse tax systems and socioeconomic contexts manage tax perception can offer valuable insights for global tax policy recommendations. This research has illuminated the complexities of tax perception and its implications for tax policy and revenue collection. While it has provided valuable insights, there is much more to explore in this dynamic field, with the potential to shape more effective and equitable tax systems worldwide.

9. Conclusions

In conclusion, this research paper provides a comprehensive examination of the complex relationship between taxpayers and taxation systems.

Economic circumstances, erosion of trust, misinformation, and comparative analyses with other regions also contribute to the perception of taxes as a strain.

The research provides a comprehensive demographic overview, revealing diverse perspectives across gender, age, education, and income groups. The consensus on key tax purposes, the diverse views on fairness, and the call for transparency and reform emphasize the complicated nature of taxation. Importantly, participants recognize the significance of taxation in funding public services but highlight the need for enhanced transparency and education, particularly among less informed individuals.

Furthermore, the comparative analysis of tax perceptions across different regions and demographic groups offers valuable insights. It highlights the importance of governance transparency and demographic variations in shaping tax attitudes. Policymakers can leverage this information to design targeted communication strategies and policies that address specific concerns related to tax strain, ultimately promoting more positive tax perceptions, better compliance, and increased revenue generation. To put it briefly, this research contributes valuable insights into the complex dynamics of tax perception, offering a foundation for further investigations into the relationships between demographics, tax satisfaction, and perceptions of tax fairness. These insights have practical implications for policymakers seeking to inform tax policies, enhance public engagement strategies, and ultimately foster a more positive and informed citizenry.

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References

Alm, James, and Benno Torgler. 2011. Cultural differences and tax morale in the United States and Europe. *Journal of Economic Psychology* 32: 229–41.

American Psychological Association. 2020. Ethical principles of psychologists and code of conduct. *American Psychologist* 72: 900–10.

Auster, R. D., and R. J. Cebula. 2018. Recent evidence on determinants of state personal income tax progressivity. *Applied Economics* 50: 3999–4007.

Beraldo, Sergio, and Enrico Colombatto. 2023. *Do People Really Dislike Wealth Taxes More than Other Types of Taxes? Evidence from a Survey-Experiment Representative of the Italian Population*. No. 671. Napoli: Centre for Studies in Economics and Finance (CSEF), University of Naples. Available online: https://www.csef.it/WP/wp671.pdf (accessed on 12 October 2023).

Besley, Timothy, and Torsten Persson. 2014. Why do developing countries tax so little? *Journal of Economic Perspectives* 28: 99–120. [CrossRef]

Borgatti, Stephen P., Martin G. Everett, and Jeffrey C. Johnson. 2018. *Analyzing Social Networks*, 2nd ed. Thousand Oaks: Sage. Available online: https://uk.sagepub.com/en-gb/eur/analyzing-social-networks/book255068 (accessed on 12 October 2023).

Bryman, Alan. 2014. *Business Research Methods*. s.l.:s.n. Oxford: Oxford University Press, pp. 20–25.

Bryman, Alan. 2016. *Social Research Methods*. Oxford: Oxford University Press.

Castañeda, Néstor. 2023. Fairness and Tax Morale in Developing Countries. *Studies in Comparative International Development* 1–25. [CrossRef]

Couper, P. Couper. 2008. *Designing Effective Web Surveys*. Cambridge: Cambridge University Press.

Dillman, Don A., Jolene D. Smyth, and Leah Melani Christian. 2014. *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. Hoboken: John Wiley & Sons. Available online: https://psycnet.apa.org/record/2014-34233-000 (accessed on 12 October 2023).

Feld, Lars P., and Bruno S. Frey. 2007. Tax compliance as the result of a psychological tax contract: The role of incentives and responsive regulation. *Law & Policy* 29: 102–20.

Fochmann, Martin. 2010. Tax Perception—An Empirical Survey. *Arqus Discussion Paper No. 99*. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1707443 (accessed on 12 October 2023).

Gerber, Claudia, Li Liu, Victor Mylonas, and Alexander Klemm. 2018. Income Tax Progressivity: Trends and Implications. *IMF Working Paper*. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3314577 (accessed on 12 October 2023).

Hair, Joseph F., William C. Black, Barry J. Babin, and Rolph E. Anderson. 2019. Multivariate Data Analysis (8. Baskı). *Eight Edition, Cengage: Learning EMEA*. Available online: https://books.google.iq/books/about/Multivariate_Data_Analysis.html?id=0R9ZswEACAAJ&redir_esc=y (accessed on 12 October 2023).

Helhel, Yeşim, and Yazeed Ahmed. 2014. Factors Affecting Tax Attitudes and Tax Compliance. *European Journal of Business and Management* 6: 48–58.

Ho, L. C., and S. W. Hung. 2018. Cultural effects on tax morale and tax compliance behavior. *International Journal of Accounting & Information Management* 26: 580–94.

Hufff, Grace M. 2022. How do People Justify not Paying their Taxes? A Study on Moral Disengagement and Tax Evasion. Available online: https://digitalcommons.georgefox.edu/dbadmin/54/ (accessed on 12 October 2023).

Kaplowitz, Michael D., Timothy D. Hadlock, and Ralph Levine. 2004. A comparison of web and mail survey response rates. *Public Opinion Quarterly* 68: 94–101. [CrossRef]

Kirchler, Erich, and Ingrid Wahl. 2010. Tax compliance inventory TAX-I: Designing an inventory for surveys of tax compliance. *Journal of Economic Psychology* 31: 331–46. [CrossRef] [PubMed]

Koumpias, Antonios M. 2020. Trust in Government Institutions and Tax. *Andrew Young School*. Available online: https://scholarworks.gsu.edu/icepp/135/ (accessed on 12 October 2023).

Lokanan, Mark. 2023. The morality and tax avoidance: A sentiment and position taking analysis. *PLoS ONE* 18: e0287327. [CrossRef] [PubMed]

McClelland, G. H. 2000. Increasing the generalizability of your research. *Behavior Research Methods, Instruments, & Computers* 32: 396–402.

Mehmet, Nar. 2023. Costs Stemming from Tax Systems: Tax Compliance Costs. *The Journal of Asian Finance, Economics and Business (JAFEB)* 10: 267–80.

Navarro, A. 2011. What we know and do not know about the effects of taxes on work. *Journal of Economic Literature* 49: 123–25.

Orkaido, Kanbiro, and Addisu Karafo. 2018. The Impact of Communication Strategies and Access to Finance on the Success of Small-scale Enterprises in Tabor Sub-city, Hawassa. *Research Journal of Finance and Accounting* 9.

Roth, S., and J. Valdez. 2020. Economic growth and government legitimacy: An empirical analysis. *Social Indicators Research* 150: 1001–21.

Sadjiarto, Arja, Agatha Nathania Susanto, Evania Yuniar, and Melissa Gunawan Hartanto. 2020. Factors Affecting Perception of Tax Evasion among Chindo. In *Advances in Economics, Business and Management Research*. Amsterdam: Atlantis Press. [CrossRef]

Soliz, Ashley Beckett. 2015. Tax Compliance: Ethical Orientation, Risk Perception and the Role of the Tax Preparer. Available online: https://egrove.olemiss.edu/etd/350/ (accessed on 12 October 2023).

Stack, Steven, and Augustine Kposowa. 2006. The Effect of Religiosity on Tax Fraud Acceptability: A Cross-National Analysis. *Scientific Study of Religion* 45: 325–351. [CrossRef]

Wenzel, Michael. 2007. The Multiplicity of Taxpayer Identities and Their Implications for Tax Ethics. *Tax Law & Policy* 29: 31–50.

Yong, Sue, and Peni Fukofuka. 2023. Accounting, tax compliance and New Zealand indigenous entrepreneurs: A Bourdieusian perspective. *Accounting, Auditing & Accountability Journal* 36: 1350–78. [CrossRef]

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