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Navigating the emerging Digital Technology: A strategical rethinking of corporate tax avoidance

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for daring to dream, for embracing every challenge,
for cultivating resilience and tenacity,
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Knowledge needs someone who dares to dream big!

ABSTRACT

This PhD dissertation investigates the role of digital technology in tax research across different stakeholder levels, including corporate taxpayers and tax authorities. First, it provides evidence about (i) the effects of digital technology on corporate tax avoidance. In addition, it sheds light on the role of crypto in accounting, tax accounting, and tax policy by analysing: (i) the risk disclosures of corporate crypto holders; (ii) the effects of corporate crypto holding of ICT industry on unrecognised tax losses; and (iii) the policy-making process underlying the fiscal treatment of crypto.

The study employs multiple methodologies. First, an Integrative Literature Review combined with an Ecosystem approach is used to conduct a critical review of the literature on the impact of digital technology on corporate tax avoidance. Second, the risk disclosures of corporate crypto holders are analysed using the qualitative approach of thematic analysis. Third, to investigate the corporate crypto holding on unrecognised tax losses, the study applies (i) linear probability model, (ii) probit regression analysis, and (iii) complementary log-log regression. Finally, to analyse the policy-making process, questionnaires were administered to accountants and tax experts in digital field, drawing on Kingdon's (1984) multiple streams framework.

The findings, respectively throughout the four chapters, demonstrate that (i) digital technology plays a multifaceted role in the tax system and facilitates a shift in corporate business models toward more intangible forms of economic activity; (ii) the risk disclosures of corporate crypto holders vary according to their different business lines and covers both the mandatory and voluntary risk disclosure; (iii) the crypto exposure is significant and positively associated with the probability to disclose the unrecognised tax losses; and (iv) how the readiness of policy and political environment is pivotal for the adoption of effective policies surrounding the crypto.

This PhD thesis contributes to the emerging literature on digital technology and crypto across multiple fields of study, demonstrating how these developments are reshaping tax accounting towards a paradigm of "digital tax accounting." Moreover, it highlights the dominant role of crypto and shows how their intangibility and associated risks challenge

existing accounting and tax regulatory frameworks. It is a call for accounting and tax regulators who are finding the right recognition of crypto and the related transactions.

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List of Abbreviations

CARF: Crypto-Asset Reporting Framework

CRS: Common Reporting Standard

ESMA: European Security Market Authority

ILR: Integrative Literature Review

DST: Digital Service Tax

IASB: International Accounting Standard Board

MiCA: Market in Crypto-Assets

XBRL: Extensible Business Reporting Language

Background and general motivations

The term digital technology encompasses multiple domains of study and includes tools which intersect both accounting and tax policy, such as permanent establishment, the Common Reporting Standard, e-commerce, blockchain technology, digital finance, eXtensible Business Reporting Language (XBRL), digital transformation, crypto, and digital service taxes (DST). Within this complex landscape, technology serves as a channel that shapes interactions between corporate taxation and the regulatory perspective of tax authorities (Belahouaoui & Attak, 2024). The intangibility stemming from the use of digital instruments at the basis of transactions weakened the power of control of tax authorities and opened the doors for tax avoidance.

Among these challenges, the emergence of crypto has had notable corporate-level consequences, particularly for the accounting regulators (Anderson et al., 2025; Huang et al., 2023; Klopper and Brink, 2023; Luo and Yu, 2024), in tax planning and for the complexity of tax codes (Chawla & Mahipal, 2023; Mazur, 2022).

On a pure accounting level, crypto are characterised by heightened volatility and uncertainty (Klopper and Brink, 2023; Huang et al., 2023; Luo and Yu, 2024). International Accounting Standard Board (IASB), in 2019, started regulating the crypto recognition, mandating that crypto should be recognised under IAS No. 2, *Inventories*, if held for sale; otherwise under IAS No. 38, *Intangible Assets*. However, the adaptation of existing accounting principles is not fully tailored to the unique characteristics of crypto (Jackson and Luu, 2023; Klopper & Brink, 2023), leading to inconsistencies in financial reporting across firms under the same standards (Luo & Yu, 2024). These crypto transactions draw the attention of investors at different levels, both individuals and corporations who started investing or mining them. Luo & Yu (2024), in analysing the financial statements of these firms, noted that these adapted accounting principles to the crypto recognition is dependent on the different crypto business lines, identified in crypto mining, crypto trading, crypto as a mean of payment. In the absence of clear accounting standards, firms have tended to assess and report crypto based on their own prior experience and professional judgment (Anderson et al., 2025). In line with prior research, risk disclosure offers relevant and decision-useful information, enhancing investors' assessments (Tan et al., 2017; Kravet and Muslu, 2013; Jin et al., 2024),

informing evaluations of corporate performance (Ibrahim and Aboud, 2024), and influencing corporate innovation outcomes (Au and Tan, 2025). Alongside, recent studies on the development of corporate disclosure highlighted the relevance of digital risks, such as cybersecurity, among the risks listed by firms in their risk disclosure (Gao et al., 2020) and uncovered by the existent accounting regulation. Therefore, the inherent riskiness of crypto may affect the future investor's choices, calling accounting regulators to provide an up-to date framework of risk disclosures for the crypto-oriented cybersecurity risks.

On a tax accounting level, the uncertainty of crypto investments and volatility of their prices (Klopper and Brink, 2023) produced both profits and losses, and both at an individual and corporate level (Yousef et al., 2024) with relevant consequences in terms of augmented tax avoidance (Cui et al., 2024). In presence of uncertainty, firms voluntarily disclose more information about deferred taxes, in particular, about unrecognised deferred tax losses (Flagmeier and Müller, 2024). The presence of uncertainty reduces the predictability about the future taxable income (Flagmeier and Müller, 2024) and increase the likelihood to report unrecognised tax positions (Flagmeier and Müller, 2024; IASB, 2001). We assume that ICT firms, due to their digital business, are more prone to invest in crypto. Hence, the digital nature of crypto transactions makes more complex the already intricated and unexplored tax management of ICT firms. Consequently, this crypto-based volatility might worsen the already existent uncertainty of ICT industry augmenting the probability of unrecognised tax losses disclosure.

On a tax policy level, the intangibility of crypto created challenges which were not grasped by tax code (Wang, 2025). There is an accounting-tax misalignment about the recognition of crypto. Under the Crypto Asset Reporting Framework, there are some crypto recognised as financial instruments. Regulation (EU) 2023/1114 (MiCA Regulation) defines two different clusters of crypto: crypto fulfilling the requirements of financial instruments, as defined by European Security Market Authority (ESMA) and crypto excluded from being a financial instrument. Additionally, this MiCA Regulation integrates the automatic exchange of information under the Directive 2011/16/EU which aims at preventing, among others, the tax avoidance behaviours. On the other hand, the accounting regulators do not allow crypto to be recognised as a financial asset (IASB, 2019). As reported in the review of Hanlon &

Heitzman (2010), the book-tax difference is one of the primary sources of tax avoidance. The mismatch is explained by the different scopes pursued by financial statement and tax principles; the former aimed to inform the accounting stakeholders, while tax principles pursuing the collection of tax revenues (Graham et al., 2012; Whitaker, 2005). When the gap between accounting principles and tax principles reduces, the tax avoidance reduces as well (Tang et al., 2025). In the context of crypto, the divergence between the accounting and tax rules might increase the levels of tax avoidance. There is evidence about the positive relationship between crypto holding and tax avoidance (Cui et al., 2024). To date, there is not a well-established tax framework of crypto classification. Therefore, given (i) the importance of mismatch between the accounting and tax principles for tax avoidance and (ii) the relevance of regulation for tax avoidance (i.e. MiCA), we study the tax policy making process behind crypto.

Contributions

This PhD thesis provides several contributions across different levels of scholarship and for various stakeholders within the accounting and tax systems. First, it introduces a novel approach to taxation and accounting fields by incorporating the digital studies. Second, it progressively sheds light on the niche topic of crypto by analysing their asset-specific risks, initially at the corporate accounting level and subsequently by linking accounting practices to taxation. In doing so, this PhD thesis (i) reveals a new risk profile for crypto, emphasising the relevance of cybersecurity for corporate strategies, and (ii) lays the groundwork for future research on the heterogeneous tax treatment of deferred tax positions within the ICT industry when crypto-related uncertainty is introduced. Third, the thesis offers a critical perspective on crypto tax policy and provides a broad overview of the political choices underlying their tax treatment. Overall, it enriches the emerging debate on crypto and, more broadly, on digital technologies: highlighting the limitations of current tax regulation, the diminishing ability of tax authorities to monitor digital transactions, and the reduced capacity of investors to forecast corporate operations in contexts of heightened uncertainty and risk.

PhD thesis' structure

This PhD thesis follows an article-based format and comprises four distinct chapters. The first chapter explores the role of digital technologies and their impact on tax avoidance, considering both the perspectives of corporate taxpayers and tax authorities. The second chapter, adopting a thematic analysis, demonstrates the new risk disclosure of corporate crypto holders and the different corporate disclosure across different crypto business lines. The third paper presents an empirical analysis of crypto adoption and its influence on unrecognised tax losses. The fourth chapter investigates the policy making process of crypto at a corporate level. Finally, the main conclusions of this PhD thesis are synthesised in the end, after the analysis and the discussion carried out in each chapter.

Chapter 1

Digital technology in a tax Eco-system: An Integrative Literature Review[i]

1.1 Introduction

Digital technologies are transforming all realms of knowledge, including disciplines such as accounting (Rabbani, 2024), economics (Salman et al., 2025) and law (Engstrom, 2021). Accounting scholars are increasingly exploring how digital tools redefine contemporary practices (Quinn & Murphy, 2025), while also disrupting research methodologies and techniques (Leoni & Sangster, 2025). This evolution is affecting the multifaceted streams of accounting research in various ways, and corporate tax accounting is no exception, with digital technology reshaping tax data collection as well as the granularity and timing of tax reporting (Deloitte Global, 2024).

The purpose of this paper is to review the growing literature investigating the role of digital technology in tax avoidance, which is a key topic in tax accounting research and is also informed by tax law and economics studies. Aiming to provide a comprehensive framework of current academic research, we analyse the two main sides of a tax transaction: the corporate side (taxpayer) and the tax authority side (tax collector). We focus on how digital technology influences the propensity of corporate taxpayers to engage in tax avoidance, as well as the countervailing evolution of tax law provisions adopting digital technologies to deter it. Digital technology affects tax policies and the economic reality both endogenously and exogenously.

To the best of our knowledge, this is the first review attempting to combine various contexts, stakeholder perspectives, and technological tools of the corporate tax avoidance process.

[i] This chapter is based on the following published article.
Ricci, Maria Francesca and Mafrolla, Elisabetta. "Digital Technology and Corporate Tax Avoidance: An Integrative Literature Review". *Accounting, Economics, and Law: A Convivium*. https://doi.org/10.1515/ael-2025-0031

Previous studies in tax research have analysed the effects of digital technology on corporate tax avoidance in terms of tax policies (Chen & Lei, 2025; Klein et al., 2022; Pandey et al., 2023; Su, 2025), either from a tax accounting perspective, focusing on corporate taxpayers (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021; Chen & Meng, 2023; Chen et al., 2024; Tiantian et al., 2023; Zhang & She, 2024; Zhou et al., 2022), or from the viewpoint of tax collectors and tax law enforcers (Chen & He, 2025; Feng et al., 2024; Fu et al., 2025; Klein et al., 2022; Pandey et al., 2023; Pandey et al., 2024; Su, 2025; Zhou, 2024). These research streams offer interesting insights, although they silo knowledge on the two sides of a single business reality, where taxpayers and tax collectors interact (Demin, 2018), and technology serves as an instrument for their interaction (Belahouaoui & Attak, 2024). This review reflects the overarching approach of studying academic knowledge at the intersection where tax accounting and tax law reciprocally inform each other (Brooks, 2000).

Using an integrative literature review (ILR) methodology (Whittemore & Knafl, 2005), combined with an ecosystem approach (Bassey et al., 2022; Canares et al., 2016), we highlight the emergence of a new stream of academic knowledge on 'digital tax research', defined as tax studies focusing on the reactions of businesses and governments to the growth of digital technologies. This stream encompasses new business strategies aimed at pursuing tax avoidance and new tax policies designed to deter corporate tax avoidance strategies, while simultaneously promoting corporate digital growth. By grouping papers and matching them with the underlying objectives of the analysis (Whittemore & Knafl, 2005), ILR is capable of identifying critical points in the literature at the intersection of different fields of study (Snyder, 2019). Tax avoidance, as the set of lawful corporate tax strategies aimed at reducing tax burden (Hanlon & Heitzman, 2010), concerns the immorality rather than illegality of corporate tax behaviours (Mayer & Gendron, 2024).

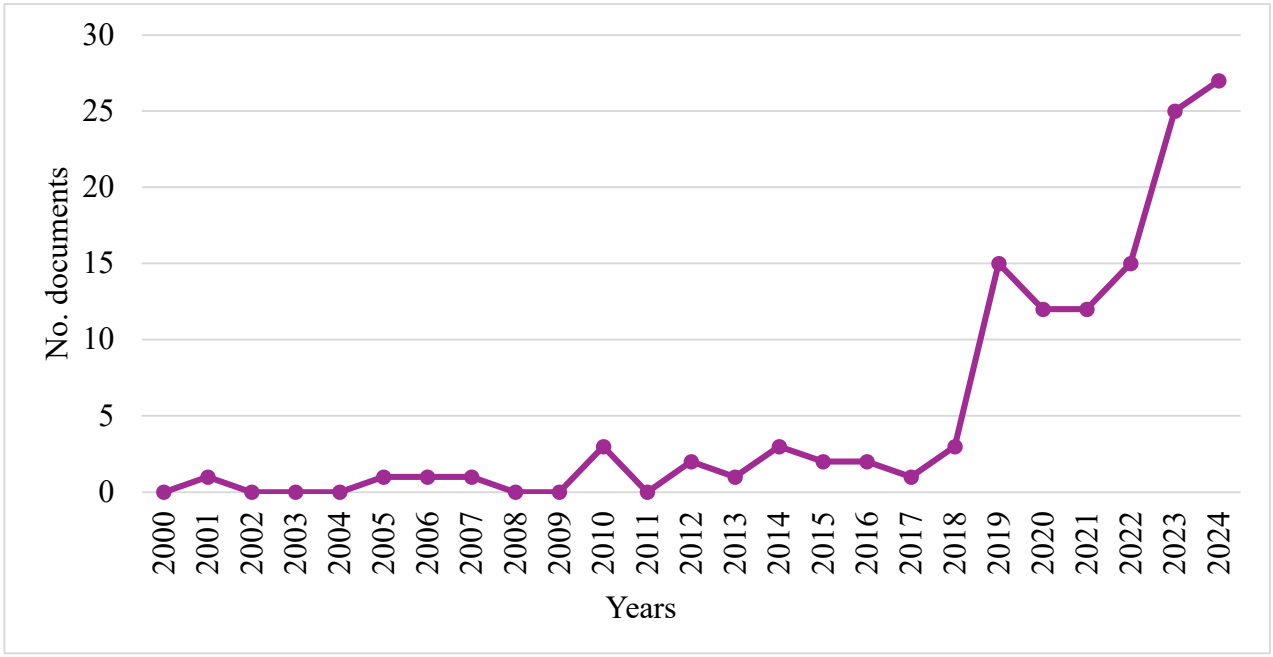
Therefore, with a focus on tax avoidance, this review disentangles the roles of contexts, stakeholders, and tools of digital technology in tax research, supporting a more in-depth analysis of digital technology in a tax ecosystem and extending ILR through the ecosystem approach.

The analysis shows the multifaceted role of digital technology in tax avoidance research. Tax policies are designed both to combat corporate tax avoidance behaviours (Chen & Lei, 2025; Geringer, 2021; Su, 2025) and to promote corporate digital growth (Chen & He, 2025; Feng et al., 2024; Fu et al., 2025; Su, 2025). Conversely, digital tools can enhance tax transparency and reduce tax avoidance (Azenzoul et al., 2025; Chen & Meng, 2023; Chen et al., 2021; Chen et al., 2024; Tiantian et al., 2023; Xie & Huang, 2023; Zhang & She, 2024; Zhou et al., 2022), but can also be exploited by corporate taxpayers to avoid taxation (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021; Chen & Meng, 2023; Zhou et al., 2022).

1.2 The digital technology in tax research: state of the art

Recent research on digital technologies has increasingly influenced various academic disciplines, including accounting (Abu Afifa et al., 2024; Rabbani, 2024; Quinn & Murphy, 2025) and, more specifically, tax accounting (e.g., Chen et al., 2021). As illustrated in Graph 1, the number of publications in this area has risen sharply over the past few years—a trend expected to continue in the near future (Barnay et al., 2018).

Graph 1. The growing per year trend of published documents at the intersection between Digital Technology and Tax Accounting Research



Notes: Graph 1 shows the per-year incremental growing trend of the frequency of documents sorted on Scopus database using the query: "digital AND tax* AND avoid*" from 2000 to 2024 (updated September 21st, 2025).*

Within this emerging field, corporate tax avoidance stands out as the central theme explored in connection with digital technology. According to a widely accepted definition, tax avoidance encompasses lawful tax planning strategies aimed at minimizing a firm's tax liabilities (Hanlon & Heitzman, 2010). Consistent with prior research in tax accounting, this study excludes practices that fall outside the boundaries of legality—such as tax evasion, fraud, money laundering, or other illicit forms of non-compliance (Hanlon & Heitzman, 2010).

Digital technology refers to the strategic deployment of diverse digital tools capable of transforming all dimensions of corporate activity, including value chain processes, accounting systems, and organizational workflows (e.g., Westerman et al., 2021). Since its emergence, digitalization has profoundly reshaped both governmental and corporate contexts, affecting areas such as corporate taxation (Klein et al., 2022; Pandey et al., 2023; Pandey et al., 2024; Spinosa and Chand, 2018; Ye and Li, 2024), value chain management (e.g., through e-commerce) (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021), and digital accounting infrastructures (e.g., XBRL) (Chen et al., 2021; Kobbi-Fakhfakh and

Athie, 2023). More broadly, technologies such as artificial intelligence, blockchain, advanced data management systems, and digital infrastructures have further accelerated this transformation (Chen & Meng, 2023; Chen et al., 2024; Tiantian et al., 2023; Zhang & She, 2024; Zhou et al., 2022).

These developments raise critical issues concerning corporate tax avoidance (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021; Chen & Meng, 2023; Chen et al., 2021; Chen et al., 2024; Klein et al., 2022; Tiantian et al., 2023; Zhou et al., 2022) and pose significant challenges for policymakers seeking to regulate an increasingly digitalized tax environment (Geringer, 2021). The growing reliance on digital tools has widened the tax gap, prompting renewed efforts to develop legal frameworks capable of addressing digital-era business models (Devereux & Vella, 2018), which, in turn, create fertile ground for tax avoidance practices.

The expanding involvement of digital technology in business transactions thus taxation underscores the need for a comprehensive synthesis of existing evidence, moving beyond fragmented and discipline-specific perspectives (Raitasuo, 2024). Accordingly, in this Chapter 1, Integrative Literature Review (ILR) is combined with an Ecosystem approach to map the ways in which digital technologies influence both corporate taxpayers and tax authorities, highlighting interdependencies, emerging dynamics, and avenues for future inquiry in this rapidly evolving domain.

1.3 The application of ILR and the Ecosystem approach in Tax Accounting Research

To capture the breadth of digital technology, we examine the tax literature concerning the adoption of digital tools across the various layers of the tax ecosystem. In doing so, it combines two complementary methodologies: the Integrative Literature Review (ILR) (Lubbe et al., 2020; Torraco, 2005, 2016; Whittemore & Knafl, 2005) and the Ecosystem approach (Bassey et al., 2022; Canares, 2016), with a specific focus on corporate tax avoidance.

The ILR method originated in Nursing Studies as a systematic means of assessing and synthesizing existing research (Ganong, 1987). Although first introduced in the 1980s, it was formally codified by Whittemore and Knafl (2005), who proposed a structured sequence of stages to ensure methodological rigor in literature reviews. Since then, the ILR has been applied across diverse disciplines such as Management and Accounting (Burke & Hutchins, 2007) and Marketing (Stoeckl & Luedicke, 2015). ILR provides a comprehensive and integrative view of interrelated phenomena (Kutcher & LeBaron, 2022; Whittemore & Knafl, 2005), bridging emerging research streams with more established fields (Snyder, 2019). Its flexibility allows for the inclusion of both quantitative and qualitative studies (Kutcher & LeBaron, 2022; Whittemore & Knafl, 2005). The key value of ILR lies in its ability to embed new theoretical frameworks within existing knowledge bases (Snyder, 2019), which justifies its use as the main methodological foundation of this study.

1.4 Digital technology and tax avoidance: ILR and the ecosystem approach

1.4.1 Stage (i): Problem identification and review questions

This stage defines the purpose and guiding questions of the review (Lubbe et al., 2020; Whittemore & Knafl, 2005), which steer the entire ILR process (Bloome et al., 2000). Given the objective of this study, to analyse the literature on digital technology and corporate tax avoidance from both the taxpayer and tax authority perspectives, an Ecosystem approach (Berkman Centre, 2005) is integrated into Stage (i). This approach facilitates the examination of the interplay among "policies, strategies, processes, information, technologies, applications and stakeholders that together constitute a technology environment for a country, government, or enterprise" (Berkman Centre, 2005, p. 3).

Within this framework, the tax ecosystem encompasses four interrelated elements (Canares et al., 2016; Bassey et al., 2022):

a. Context – the mix of tax-related accounting strategies, legislation, and policies shaping the economic environment;

b. Technology – the deployment of digital tools applied to tax-related processes;

c. Stakeholders – the main actors (taxpayers and tax collectors) whose behaviours and interactions shape the ecosystem; and

d. Demonstrated results – the observable outcomes in terms of responsiveness, effectiveness, and efficiency in mitigating tax avoidance.

In order to map the existing body of research on digital technology within the field of taxation, specifically with regard to corporate tax avoidance, we examine publications indexed in Scopus database.

Accordingly, and in line with the objectives of this study, we formulate the following Review Questions (RQs):

RQ1*: What are the effects of digital technology on corporate tax avoidance?*

RQ2: *What are the effects of digital technology on tax policies intended to curb corporate tax avoidance?*

RQ3. *What are the effects of corporate tax avoidance (and consequent tax policies) on digital technology?*

1.5 Stage (ii): Literature search and sampling

We conducted a non-systematic literature review. However, to ensure rigour and transparency (Heli et al., 2015), the search process was structured in three main steps, classified as *Stages (ii.a)*, *(ii.b)*, and *(ii.c)*, reflecting the iterative process formalised for the ILR (Whittemore & Knafl, 2005). This literature analysis is a targeted or focused review (Heli et al., 2015) and is largely based on a knowledgeable selection of current, high-quality articles directly aligned with the topic of interest, to expand the discussion and provide context and substance (Hardies et al., 2015) to the multifaceted role of digital technology in tax avoidance research.

To select the papers, given the emerging relevance of the topic (as depicted in *Graph 1*), we adopt a pearl growing strategy aimed at identifying primary, secondary, and tertiary 'pearls' of the articles for review (Mangat & Sharma, 2023). This pearl growing strategy was

operationalised through a direct search of available online databases (Mangat & Sharma, 2023), backward reference scanning, as introduced by Snyder (2019) for ILR, and forward additional search (Mangat & Sharma, 2023), thereby embedding the iterative comparison of papers that underpins the ILR (Whittemore & Knafl, 2005).

Therefore, in *Stage (ii.a)*, fulfilling the scope defined by RQ1, RQ2, and RQ3 in *Stage (i)*, we conducted the primary search using the Scopus database. We demarcated the field of analysis (Torraco, 2016), restricting the search in Scopus to the scientific macro-areas of 'Accounting, Business and Management', 'Social Sciences', and 'Economics, Econometrics and Finance', thereby limiting the risk of collecting ambiguous documents (Hardies et al., 2022; Torraco, 2005). Other macro-areas were not excluded from the research. As a result of this search strategy, studies from various disciplines, including fiscal studies, law, and sociology, were included alongside purely accounting and management studies (Hardies et al., 2022). This also implies that the results of the primary search strategy may include documents that fall at the boundaries between these and other disciplines. For example, while this research does not explicitly exclude the 'Computer Science' macro-area, only computer science studies that also contribute to accounting, business and management, social sciences, or economics, econometrics, and finance are retained. Using the words *digital**, *tax**, and *avoid**[ii] in titles, abstracts, and keywords, and limiting the search to papers published in English (Reineholm et al., 2023) over the period 2000–2026 (Hardies et al., 2022), this search stage resulted in a total of 209 documents.[iii] We then manually screened their abstracts to identify studies aligned with the aims of this research as primary pearls (Mangat & Sharma, 2023). Documents considered out of focus (183) and the review articles (3) were excluded,[iv] resulting in a set of 23 documents for review.

In *Stage (ii.b)*, to identify secondary pearls (Mangat & Sharma, 2023), we adopted a backward reference scanning strategy (Mangat & Sharma, 2023; Snyder, 2019). Specifically,

[ii] The following search string was used (last accessed 31 December 2025): [*(TITLE-ABS-KEY (digital*) AND TITLE-ABS-KEY (tax*) AND TITLE-ABS-KEY (avoid*)) AND PUBYEAR > 1999 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON")) AND (LIMIT-TO (LANGUAGE , "English"))*].
[iii] The full list of 209 articles is unreported for brevity, but is available from the authors upon request.
[iv] Pertinent review articles, although excluded, were used for reference scanning in *Stage (ii.b)*.

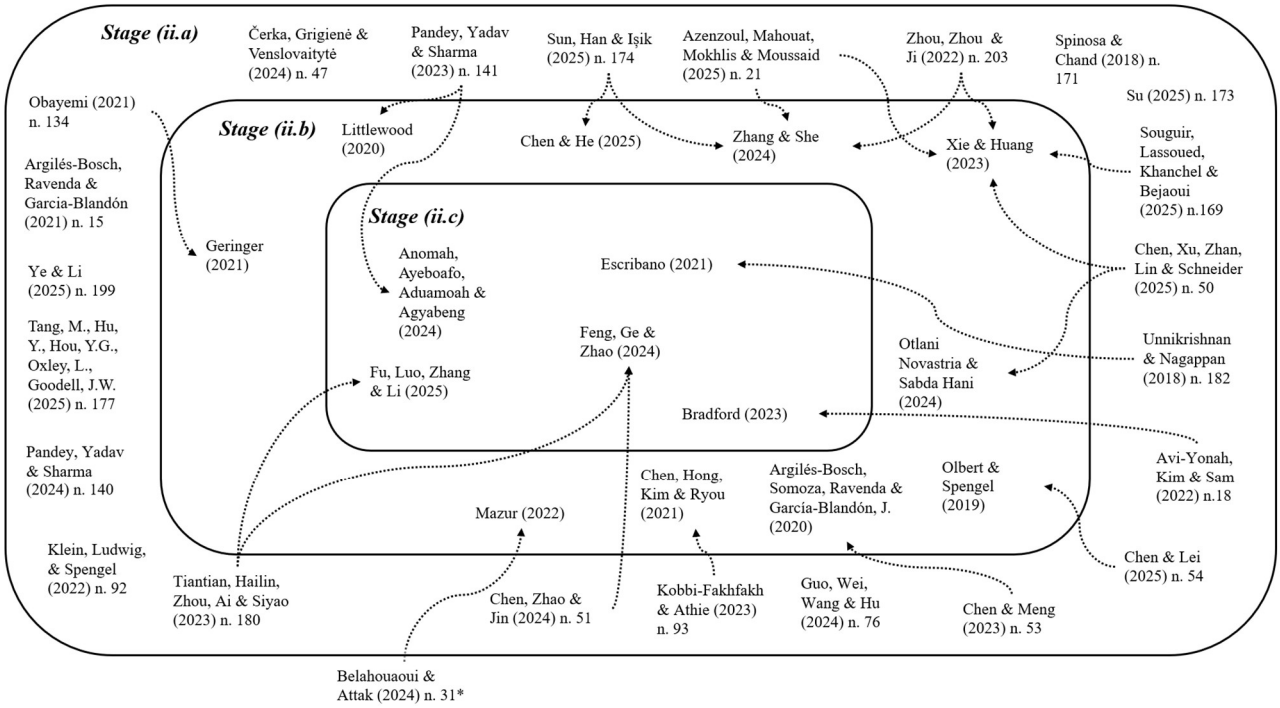
examining the reference lists of the papers selected in *Stage (ii.a)*, through which we obtained 11 additional papers.

Finally, in *Stage (ii.c)*, we employed a forward additional search by screening articles that cited the papers included in *Stage (ii.a)* using the 'Cited by' tools available in the Scopus database (Mangat & Sharma, 2023). Additionally, we searched for further articles using the 'Similar articles' function in Scopus (Mangat & Sharma, 2023), through which we identified five additional relevant documents.

For the manual screening activities described in *Stages (ii.a)*, *(ii.b)*, and *(ii.c)*, our primary focus was on digital technology and tax avoidance in studies on accounting, economics, and law. For example, this research did not focus on purely tax law studies, as legal research follows a fundamentally different methodological orientation, being largely normative and interpretive of 'black-letter law' (McConville & Chui, 2017), rather focusing on corporate empirical investigation and theory-driven approaches characteristic of accounting, business, and management research (Hanlon & Heitzman, 2010; Shackelford and Shevlin, 2001). Including purely legal studies would have compromised the conceptual coherence of our integrative literature review. A similar rationale was applied to all border disciplines, essentially searching for documents that make transdisciplinary contributions.

To reduce the risk of selection bias in the search strategy, which is typical of a non-systematic review (Hardies et al., 2015), the three stages were conducted independently by the co-authors. The results were then compared and discussed (Whittemore & Knafl, 2005), and adjustments were made to reach agreement on the final list of 38 articles, displayed in Figure 1, which also synthesises the search stages.

Figure 1. Literature search and sampling



Notes: Figure 1 illustrates the papers selected in *Stages* (*ii.a*), (*ii.b*), and (*ii.c*). Arrows indicate the relationships (*ii.a* →*ii.b*; *ii.a*→*ii.c*; *ii.b* →*ii.c*) . The numbers indicated for each document in the *Stage (ii.a)* square refer to their position in the original (unreported) list of 209 documents, resulting from the Scopus search of the string reported in *Footnote ii*, displayed in alphabetical order by first author's surname. Articles marked with an asterisk were identified outside the *Stage (ii)* methodology. Asterisks inside the grey square correspond to references of documents identified during *Stage (ii.c)*.

The small number of papers collected in *Stage (ii)* compared with the original list (38 out of 209) is justified by the broad scope of digital technology: most references cover topics beyond tax research, whereas tax avoidance is an important but niche topic. *Table 1* reports, for each included document, the authors' surnames (*Column (b)*), year of publication (*Column (c)*), journal (*Column (d)*), a synthesis of the research aim (*Column (e)*), and the RQs addressed by each paper, as declared in this ILR (*Column (f)*). *Extra-Table 1* (unreported for brevity but available online) provides an expanded version of *Table 1*, including article titles and abstracts.

Table 1. Summary of Literature search and sampling of Stage (ii)

Article no.	Author	Year of publication	Journal	Title	Aim	RQs target
*1***	Anomah, Ayeboafo, Aduamoah & Agyabeng	2024	*Scientific African*	Blockchain technology integration in tax policy: Navigating challenges and unlocking opportunities for improving the taxation of Ghana's digital economy	The implementation of blockchain technology within tax policy to tax online enterprises	RQ2
*2**	Argilés-Bosch, Somoza, Ravenda & García-Blandón, J.	2020	*Journal of International Accounting, Auditing and Taxation*	An empirical examination of the influence of e-commerce on tax avoidance in Europe	E-commerce for corporate tax avoidance	RQ1
3	Argilés-Bosch, Ravenda & Garcia-Blandón,	2021	*Critical Perspectives on Accounting*	E-commerce and labour tax avoidance	E-commerce for labour tax avoidance	RQ1
4	Avi-Yonah, R., Ran, Kim & Sam.	2022	*Harvard International Law Journal*	A New Framework for Digital Taxation	The issues of digital taxation and DST	RQ2
5	Azenzoul, Mahouat, Mokhlis & Moussaid	2025	*Journal of Risk and Financial Management*	Digital Transformation and Corporate Tax Avoidance: Evidence from Moroccan Listed Firms	The effects of digital transformation on corporate tax avoidance	RQ1
*6***	Bradford	2023	*Oxford Academic*	Digital Empires: The Global Battle to Regulate Technology	The digital challenges of current tax regulation	RQ2
7	Čerka, Grigienė & Venslovaitytė	2024	*Review of European and Comparative Law*	Tax Challenges Arising from Digitalization: Evaluating the Taxation Models Proposed by the European Commission and the OECD	The modern tax law for the digital economy	RQ2
*8**	Chen & He	2025	*Pacific-Basin Finance Journal*	Does digital tax enforcement drive corporate digitalization? Evidence from the Golden Tax Project III in China: A pre-registered report	Golden Tax project and the corporate digital growth	RQ3
*9**	Chen, Hong, Kim & Ryou	2021	*Journal of Accounting and Public Policy*	Information processing costs and corporate tax avoidance: Evidence from the SEC's XBRL mandate	The effect of XBRL adoption on corporate tax avoidance	RQ1

10	Chen & Lei	2025	*Journal of International Financial Markets, Institutions & Money*	Tax avoidance opportunity for multinational enterprises: effects of digitalized tax administration in China	The effects of digital tax administration (Golden Tax Project) on corporate tax avoidance	RQ2
11	Chen & Meng	2023	*International Journal of Managerial Finance*	Is corporate digital transformation a tax haven?	How corporate digital transformation affects corporate tax avoidance	RQ1
12	Chen, Xu, Zhan, Lin & Schneider	2025	*Journal of Technological Forecasting and Social Change*	Like adding oil to the fire or pouring water on it? The effect of the digital economy on corporate tax avoidance: Evidence from China	Theeffect of digital economy on corporate tax avoidance	RQ1
13	Chen, Zhao & Jin	2024	*Pacific-Basin Finance Journal*	Corporate digital transformation and tax avoidance: evidence from China	The effect of digital transformation on tax avoidance	RQ1
*14***	Escribano	2021	*Intertax*	Day 1 of the Spanish Digital Services Tax: And Now What? A Wave of Tax Policy, Legal Interpretation and Compliance Challenges	The critical aspects of legal uncertainty of Digital Service Tax	RQ2
*15***	Feng, Ge & Zhao	2024	*Journal of Asian Economics*	Tax incentives and corporate digital transformation: Evidence from China's accelerated depreciation policy	The effects of accelerated depreciation tax policy on the levels of corporate digital transformation	RQ3
*16***	Fu, Luo, Zhang, & Li	2025	*International Review of Economics and Finance*	Tax incentives, marketization level, and corporate digital transformation	The effects of tax incentives on corporate digital transformation	RQ3
*17**	Geringer	2021	*South African Journal of Accounting Research*	National digital taxes–Lessons from Europe	The main issues of tax law under digital taxes	RQ2
18	Guo, Wei, Wang & Hu	2024	*Research in International Business and Finance*	Corporate governance effects of digital finance: Evidence from corporate tax avoidance in China	The effect of digital finance on corporate tax avoidance	RQ1
19	Klein, Ludwig & Spengel	2022	*National Tax Journal*	Taxing the digital economy: Investor reaction to the European Commission's digital tax proposals	How digital service tax affects tax avoidant (digital) enterprises through reaction of investors	RQ1 & RQ2

20	Kobbi-Fakhfakh & Athie	2023	*Asia Pacific Journal of Information Systems*	Digitalization of financial reporting through XBRL and corporate tax avoidance: Evidence from Indonesia	Mandatory XBRL adoption for curbing corporate tax avoidance	RQ1
*21**	Littlewood	2020	*New Zealand Law Review*	Taxing highly digitalised firms: the OECD and New Zealand's proposed Digital Services Tax	The critical aspects of New Zealand DST and the concept of permanent establishment	RQ2
*22**	Mazur	2022	*Penn State Law Review*	Can blockchain revolutionize tax administration?	The benefits on the tax administration from the implementation of blockchain technology	RQ2
23	Obayemi	2021	*Intertax*	Taxing the income of digital non-resident companies under the 'Significant Economic Presence' (SEP) rules in Nigeria	The shift of permanent establishment under digital economy	RQ2
*24**	Olbert & Spengel	2019	*ZEW Discussion Papers,*	Taxation in the digital economy: Recent policy developments and the question of value creation	The critical analysis of DST	RQ2
*25**	Otlani Novastria & Sabda Hani	2024	*Educational Administration: Theory and Practice*	The impact of e-commerce on tax avoidance in Indonesia: Empirical study on companies registered on Indonesia Stock Exchange	The effects of e-commerce on tax avoidance	RQ1
26	Pandey, Yadav & Sharma	2023	*Journal of Advances in Management Research*	Drivers of tax avoidance by MNEs in the developing countries under the digital economy: a modified-TISM approach	How digital economy may affect corporate tax avoidance	RQ1
27	Pandey, Yadav & Sharma	2024	*Journal of Asia Business Studies*	Investigating the international corporate tax revenue efficiency under the digital economy: multiple case study of MNEs operating in India	How digital economy helps to avoid taxes through permanent establishment	RQ2
28	Souguir, Lassoued,	2025	*Journal of Risk and Financial Management*	Behind the Screens: Digital	The effects of digital transformation on	RQ1

	Khanchel & Bejaoui			Transformation and Tax Policy	corporate tax avoidance	
29	Spinosa & Chand	2018	*Intertax*	A long-term solution for taxing digitalized business Models: should the permanent establishment definition be modified to resolve the issue or should the focus be on a shared taxing rights mechanism?	The new legal configuration of digital establishment	RQ2
30	Su	2025	*Baltic Journal of Economics*	Tax administration digitization and corporate tax avoidance: a quasi-natural experiment based on the Golden Tax III project in China	The effects of Golden Tax Project on corporate tax avoidance	RQ1 & RQ2
31	Sun, Han & Işik	2025	*International Review of Economics and Finance*	Can digital transformation be a "powerful tool" to curb corporate tax avoidance? Mechanism analysis and policy implications based on Chinese data	The effects of digital transformation on corporate tax avoidance	RQ1
32	Tang, Hu, Hou, Oxley & Goodell	2025	*International Review of Financial Analysis*	Fintech development, corporate tax avoidance and firm value	The effects of fintech on corporate tax avoidance	RQ1
33	Tiantian, Hailin, Zhou, Ai & Siyao	2023	*Finance Research Letters*	Does corporate digital transformation affect the level of corporate tax avoidance? Empirical evidence from Chinese listed tourism companies	Digital transformation for tax avoidance	RQ1
34	Unnikrishnan & Nagappan	2018	*Intertax*	Virtual Permanent Establishments: Indian Law and Practice	The implementation of digital technology into permanent establishment tax policy	RQ2
*35**	Xie & Huang	2023	*Discrete Dynamics in Nature and Society*	The impact of digital transformation on corporate tax avoidance: Evidence from China	The role of digital transformation for tax avoidance	RQ1
36	Ye & Li	2024	*Economic Letters*	Digital regulation and multinational tax avoidance: evidence from	The role of digital platforms for Common Reporting	RQ1 & RQ2

				Common Reporting Standard	Standard and the consequences for tax avoidance	
*37**	Zhang & She	2024	*PLoS ONE*	Digital transformation and corporate tax avoidance: An analysis based on multiple perspectives and mechanisms	Digital transformation for tax avoidance	RQ1
38	Zhou, Zhou & Ji	2022	*Technological Forecasting & Social Change*	Can digital transformation alleviate corporate tax stickiness: The mediation effect of tax avoidance	The link between digital transformation for tax stickiness and the effects on tax avoidance	RQ1

Notes: This table summarises papers gathered throughout Stage (ii), Literature search and sampling, according to the scope of Stage (i) (Whittemore & Knafl, 2005). Articles marked with a single asterisk in the first column were collected in Stage (ii.b), while those marked with two asterisks were collected in Stage (ii.c). All other articles resulted from Stage (ii.a).

1.6 Stage (iii) and Stage (iv): Data evaluation and data synthesis disentangling the relationship between digital technology and corporate tax avoidance

Data synthesis in *Stage (iv)* aims to depict the main results found in the literature concerning the effects of digital technology on: *(i)* corporate tax avoidance (RQ1); *(ii)* tax policies intended to curb tax avoidance (RQ2); and *(iii)* reverse causality (i.e., corporate tax avoidance, and consequent tax collector's policies, on digital technology) (RQ3).

In Table 2, we tabulate how the sampled documents have been evaluated by integrating *Stage (iii) Data evaluation*, within *Stage (iv) Data synthesis*. To conduct the *Stage (iii) Data evaluation* papers are clustered by themes (Lubbe et al., 2020) in *Column (c)* and by empirical approach (qualitative and/or quantitative) in *Column (d)* (Kutcher & LeBaron, 2022). Furthermore, given the different empirical approaches employed, we screened the documents by reporting: the research design adopted (e.g., interviews, regression analysis, or normative approaches) in *Column (e)*; the indicators adopted to measure both tax avoidance and digital technology (when applicable) in *Column (f)*, and the geographical setting of the research in *Column (g)*. To offer a more in-depth analysis of the reviewed

documents, the analysis proceeds with *Stage (iv), Data synthesis*, also reported in Table 2: the theories espoused (if any) by each reviewed study in *Column (h)*, and the key findings are synthesised in *Column (i)*, each contributing to one of the three RQs addressed in this review, also reported in *Column (c)*. Finally, future research directions described in each document (if any) are briefly reported in *Column (j)* of *Table 2*.

Table 2. Summary of papers in *Stage (iii) Data Evaluation* and *Stage (iv) Data Synthesis*

				Stage (iii) Data evaluation				***Stage (iv) Data synthesis***		
	Authors *(a)*	Digital technology *(b)*	Theme (RQs) *(c)*	Empirical approach *(d)*	Research design *(e)*	Indicators *(f)*	Country test *(g)*	Theory *(h)*	Findings (RQs) *(i)*	Future Research Directions (j)
1	Anomah, Ayeboafo, Aduamoah & Agyabeng (2024)	Blockchain	The integration of blockchain technology in tax policy (RQ2)	Qualitative and quantitative	Unstructured and Semi-structured interviews	-	Ghana	Legitimacy theory	1. Blockchain technology may improve the level of real time reporting of tax data (RQ2). 2. The results rely on the application of legitimacy theory, in turn, considering (i) the institutional pressure; (ii) institutional conformity; (iii) the legitimacy theory; (iv) technological interoperability.	1. Lack of generalisability of results to other tax framework. 2. Future research investigations should englobe the role of institutions as a set of informal and formal norms and the role of external stakeholders perceptions to the blockchain technology
2	Argilés-Bosch, Somoza, Ravenda & García-Blandón (2020)	E-commerce	E-commerce for corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: Effective Tax Rate (ETR) and abnormal ETR; E-commerce: dummy variable for traditional and e-commerce firms	Europe	-	1. E-commerce positively affect the level of corporate tax avoidance with respect to traditional firms (RQ1) 2. Tax avoidance gap between	1. The presence of dummy hampers the direct effect of e-commerce on tax avoidance 2. B2B commerce was not included in the sample

									traditional and e-commerce firms has reduced over time.	3. Few data are not available 4. Future studies should focus also over B2B enterprises 5. More information about foreign sales
3	Argilés-Bosch, Ravenda & Garcia-Blandón,(2021)	E-commerce	E-commerce for labour tax avoidance (RQ1)	Quantitative	Propensity score matched sample	Labor tax avoidance: ratio of social security contribution (SSC) to sales and wages E-commerce: dummy variable	France	-	1. E-commerce positively affects labour tax avoidance (RQ1)	1. Social wealth 2. E-commerce regulation 3. Sales via internet 4. SSC 5. Non-standard forms of employment (NSE) contract 6. Type of wages for SSC
4	Avi-Yonah, R., Ran, Kim & Sam. (2022)	Digital Service Tax	The criticism of digital taxation and Digital Services Tax (RQ2)	Qualitative	Normative approach	-	-	-	1. The discriminatory role of DST (RQ2) 2. The emerging digital policies are not covered by traditional taxation (RQ2)	2. Foster the future tax principles towards digital taxation in respect of the traditional tax principles
5	Azenzoul, Mahouat, Mokhlis & Moussaid (2025)	Digital transformation	The effects of digital transformation on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: book-tax difference Digital transformation: keywords in the	Morocco		1. The implementation of digital transformation reduces the levels of corporate tax avoidance (RQ1)	1. Tax authorities should implement more advanced digital technologies; 2.

						annual report of firms				Measuring digital transformation with keywords is not reliable because of management discretion 3. Future studies should focus on the qualitative approach as well as corporate structure and internal control
6	Bradford (2023)	Digital Services Tax	The digital challenges of current tax regulation (RQ2)	Qualitative	Normative approach	-	-	-	1. It discusses the digital challenges of emerging digital taxation under a normative perspective (RQ2) 2. The paper underlines the discriminatory effect of DST (RQ2)	-
7	Čerka, Grigienė & Venslovaitytė (2024)	Digital permanent establishment & Digital Services Tax	The implementation of digital technology into digital permanent establishment and the DST	Qualitative	Normative approach	-	-	-	1. The digital economy shifted the traditional permanent establishment towards the concept of digital presence (RQ2)	-

			(RQ2)						2. The digital technology pushed the introduction of DST in order to regulate the digital presence (RQ2).	
8	Chen & He (2025)	Digital transformation	The effects of Golden Tax Project on corporate digital growth (RQ3)	Quantitative	Difference-in-Difference	Digital transformation: textual analysis of digital keywords in the annual report; Digital tax policy: dummy variable for the adoption of Golden Tax Project	China		1. The adoption of Golden Tax Project increased the levels of corporate digital growth (RQ3)	-
9	Chen, Hong, Kim & Ryou (2021)	eXtensible Business Reporting Language (XBRL)	The effect of eXtensible Business Reporting Language (XBRL) on corporate tax avoidance (small businesses) (RQ1)	Quantitative	Difference-in-difference analysis	XBRL: 1 if firms adopted XBRL o otherwise; Tax avoidance: Book-tax difference (BTD), Desai-Dharmapala residual book-tax differences (DD_BTD), ETR differential, BTD factor (extracted from the three measures)	United States	-	1. The adoption of XBRL has negatively affected the levels of tax avoidance (RQ1) 2. The effect is less strong when firms were under the supervision of Internal Revenue Service before the adoption of XBRL (RQ1)	1. Policy implications regards the actual possibility to be subjected to the XBRL adoption
10	Chen & Lei (2025)	Digital Transformation	The effects of Golden Tax	Quantitative	Regression analysis	Tax avoidance: difference	China		1. the implementation	1. Future studies should extend

			Project on tax avoidance (RQ2)			between nominal and effective tax rate; book-tax difference; effective tax rate Digital transformation: implementation of Golden Tax Project in China (dummy variable)			of Gloden Tax Project reduced the levels of corporate tax avoidance (RQ2). 2. The effects are more pronounced in multinational enterprises and state-owned enterprises (RQ2).	the sample to other countries; 2. They should focus on other corporate internal process such as corporate governance, decision making and strategic planning
11	Chen & Meng (2023)	Digital Transformation	How corporate digital transformation affect corporate tax avoidance (RQ1)	Quantitative	Heckman two-stage and cross-section models	Tax avoidance: ETR; Digital Transformation: Frequency of "digital transformation" in annual reports	China	-	1. Corporate digital transformation as a tool for tax avoidance (RQ1); 2. Corporate digital transformation as enabler for tax avoidance when tax authorities strengthen their tax effort (RQ1).	1. Research is limited to the Chinese context; different countries and different industries; 2. The future works on digital transformation should focus on the process instead of the result
12	Chen, Xu, Zhan, Lin & Schneider (2025)	Digital Permanent Establishment	The effect of digital economy on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Digital economy: internet access, the use of digital device, human resources with digital skills, digital industry	China	-	1. The digital economy reduced the levels of corporate tax avoidance (RQ1) 2. the effects are more pronounced in non-state-owned	1. Implementation of digital tools in tax administration; 2. Adoption of different digital instruments based on the

						and digital transactions Tax avoidance: book-tax difference			enterprises, regions with higher financial development and advanced tax enforcement (RQ1)	different types of enterprises
13	Chen, Zhao & Jin, (2024)	Digital Transformation	The effect of corporate digital transformation on tax avoidance (RQ1)	Quantitative	Regression analysis	Digital Transformation: Frequency of digital keywords in annual reports Tax avoidance: book-tax difference	China	-	1. Corporate digital transformation negatively affects the level of tax avoidance (RQ1)	1. Corporate investments in digital transformation 2. Chinese-listed companies 3. Expand sample size 4. Compare different countries
14	Escribano (2021)	Digital Service Tax	The critical aspects of legal uncertainty of Digital Service Tax (RQ2)	Qualitative	Normative approach	-	Spain	-	1. Issues in determining the taxable amount subjected to the DST (RQ2) 2. Issues for the traceability of digital service transactions	1. Implementation of digital platforms aimed at matching the DST information of tax authority with taxpayers DST information declared in their tax return. 2. Better system used to locate the users and

										their operations.
15	Feng, Ge & Zhao (2024)	Digital Transformation	The effects of accelerated depreciation tax incentive on corporate digital transformation (RQ3)	Quantitative	Difference-in-difference	Digital transformation: text analysis by counting the digital keywords on total keywords in annual reports. Tax incentive: dummy variable in pre and post implementation of Difference-in-difference	China	-	1. There is a positive relationship between the accelerated depreciation tax policy on the level of corporate digital transformation (RQ3)	The analysis should not be generalized because there are regions with different tax incentives and different levels of digital transformation of enterprises.
16	Fu, Luo, Zhang, & Li (2025)	Digital Transformation	The effects of tax incentives on corporate digital transformation (RQ3)	Quantitative	Regression analysis	Tax incentives: ratio between tax refunds and total tax refunds plus taxes paid. Digital transformation: text analysis on keywords related to digitalization	China	-	1. There is a positive relationship between tax incentives and corporate digital transformation in larger firms (RQ3) 2. The relationship is weaker in presence of financial constraints (RQ3)	1. Tax policymakers should differentiate the tax incentives considering the corporate size. 2. The importance of financial support for firms investing in digital transformation.

17	Geringer (2021)	Digital Service Tax	The issues of tax law and the novel digital taxes (RQ2)	Qualitative	Normative approach	DST, digital advertisement tax (DAT), permanent establishment	Austria, France, UK, Spain	-	1. The enactment of DST is jeopardized. The levels of transactions which DST is levied is not clear, in some cases extended in other cases strict (RQ2).	
18	Guo, Wei, Wang & Hu (2024)	Digital Finance	The effect of digital finance on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: tax avoidance and cash effective tax rate (statutory rate-ETR); digital finance: Digital Finance Inclusion Index (DEFI)	China	-	1. Digital finance has decreased the levels of corporate tax avoidance (RQ1) 2. Digital finance has improved transparency	1. Investigate digital finance's impact on tax avoidance. 2. Examine complementary effects of governance mechanisms.
19	Klein, Ludwig & Spengel (2022)	Digital Service Tax	How digital service tax affect tax avoidants enterprises through reaction of investors (RQ1 & RQ2)	Quantitative	Event study	Tax avoidance: Short-run and long-run ETR	-	-	1. The effects of digital service tax proposal on corporate investors reaction (RQ2) 2. The effect is more pronounced in tax avoidant firms (RQ1)	1. Digital service tax as a threat for future corporate profitability and economic growth and innovation
20	Kobbi-Fakhfakh & Athie (2023)	eXtensible Business Reporting Language (XBRL)	The compulsory adoption of XBRL reduces corporate tax avoidance (RQ1)	Quantitative	Regression analysis	XBRL: dummy variable based on the years of XBRL enactment (1 if it was enacted; 0	Indonesia	-	1. The compulsory adoption of XBRL reduces the level of	1. Incentive for XBRL adoption 2. Indonesian context 3. The level of technology

						otherwise) Tax avoidance: ETR and current ETR			corporate tax avoidance (RQ1)	adoption and tax system 4. Other significant variables could be hidden
21	Littlewood (2020)	Digital Service Tax & Permanent Establishment	The critical aspects of New Zealand DST and the concept of permanent establishment (RQ2)	Qualitative	Normative approach	-	New Zealand	-	1. The tax regulation is old fashioned and needs an up-to-date model capable to tax the corporate digital businesses (RQ2)	-
22	Mazur (2022)	Blockchain	The benefits on the tax administration from the implementation of blockchain technology (RQ2)	Qualitative	Normative literature review	-	-	-	1. The use of blockchain may foster the transparency of transactions 2. The use of blockchain may reduce the tax gap (RQ2)	The critical role of policymaker in implementing the blockchain within tax administration.

23	Obayemi (2021)	Digital Permanent Establishment	The shift of permanent establishment under digital economy (RQ2)	Qualitative	Normative approach	-	Nigeria	-	1. There is a shift of permanent establishment from the physical presence towards the digital presence (RQ2)	-
24	Olbert & Spengel (2019)	Digital Services Tax	The critical analysis of Digital Services Tax (RQ2)	Qualitative	Review	-	-	-	The use of DST increased taxpayer's uncertainty and the risk of double taxation (RQ2)	The paper calls for a new tax model of digital business
25	Otlani Novastria & Sabda Hani (2024)	E-commerce	The effects of e-commerce on tax avoidance (RQ1)	Quantitative	Regression analysis	E-commerce: dummy variable Tax avoidance: effective tax rate	Indonesia	-	There is a positive effect of e-commerce on tax avoidance (RQ1)	1. the evidence is limited to Indonesia 2. Use of other measurement methods
26	Pandey, Yadav & Sharma (2023)	Digital Permanent Establishment	How digital economy may affect corporate tax avoidance (RQ1)	Qualitative	M-TISM (total interpretive structural model)	- Analysis of complex problems using the analysis of interaction among the elements composing the structure	-	-	2. ICT and tax avoidance practices through tax arbitrage opportunities (RQ1).	1. Digital economy under digital service tax; 2. ICTs, intellectual property, professional enablers, international organizations, tax arbitrage.
27	Pandey, Yadav & Sharma (2024)	Digital Permanent Establishment	The effect of digital economy of developing countries to avoid taxes through digital	Qualitative	Case study	Analysis of digital Multinational enterprises (MNEs) (e.g. Google; Ebay;	-		1. The strategical adoption of affiliates helps to overcoming the threshold of permanent	1. Confidentiality of financial data 2. Country-by-country reporting as

			permanent establishment (RQ2)			Yahoo) under Indian Tax jurisdiction			establishment and save more taxes (as a way to be more tax avoidant) (RQ2)	information of public domain
28	Souguir, Lassoued, Khanchel & Bejaoui (2025)	Digital transformation	The effects of digital transformation on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Digital transformation: frequency of digital terms in annual reports Tax avoidance: Effective Tax Rate (ETR) and three year Effective Tax Rate (long-term ETR)	Middle East and North Africa	-	1. There is a negative relationship between the digital transformation and corporate tax avoidance (RQ1). 2. The effects are more pronounced in the conventional banks than the Islamic banks	1. Tax authorities should monitor the tax transparency of banks which are not adopting the digital transformation 2. Future studies should focus on the non-financial industry and considering the governance mechanisms.
29	Spinosa & Chand (2018)	Digital Service Tax	The new digital presence and intangibility of digital platforms (RQ2)	Qualitative	Normative approach	-	-		1. The intangibility of digital platforms is challenging the concept of permanent establishment (RQ2)	1. Amend OECD guidelines for digital taxation. 2. Establish digital permanent establishment for remote businesses.
30	Su (2025)	Digital Transformation	The effects of Golden Tax Project on tax avoidance (RQ1 & RQ2)	Quantitative	Difference-in-difference	Tax avoidance: book tax difference Golden Tax Project (digital	China	-	1. Golden Tax Project (RQ2) reduced the levels of tax avoidance (RQ1)	1. Governments should focus on the levels of digital transformation for tax

						transformation): dummy variable			2. The effects are more prominent in private firms and firms with lower financial development (RQ1 & RQ2)	management 2. Governments should enact reforms addressed to digital growth 3 the investigation is limited to Chinese context
31	Sun, Han & Işik (2025)	Digital transformation	The effects of digital transformation on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: Difference between taxes paid and taxes refund Digital transformation: textual analysis of corporate annual reports using the digital related words	China	-	Digital transformation reduces corporate tax avoidance (RQ1)	1. The role of government is crucial for the corporate digital growth 2. Blockchain technology funds are determinant for the digital transformation 3. There is an important research stream about the relationship between digital transformation, tax compliance and sustainability development 4. Governments should promote digital transformation

										through some tax incentives 5. Data cannot be generalised because focused only on the Chinese context
32	Tang, Hu, Hou, Oxley & Goodell (2025)	Digital Finance	The effects of fintech on corporate tax avoidance (RQ1)	Quantitative	Regression analysis	Fintech development: the natural logarithm of the provincial aggregated Peking University Digital Financial Inclusion Index of China (PKU-DFIIC). Tax avoidance: as GAAP effective tax rate and cash effective tax rate	-	-	1. The use of fintech increased corporate tax avoidance (RQ1) and augmented the firm value 2. The effects of fintech are significant for the reduction of cash flow uncertainty 3. This effect does not augment corporate tax risk	1. Lack of generalizability. 2. Future studies should conduct an analysis across the different markets and countries.
33	Tiantian, Hailin, Zhou, Ai & Siyao (2023)	Digital Transformation	The role of digital transformation for corporate tax avoidance (RQ1)		Regression analysis	Digital transformation: frequency of digital terms in annual reports Tax avoidance: BTD	-		1. Digital transformation inhibits corporate tax avoidance (RQ1) 2. Digital transformation reduces financial constraints and improve information transparency	1. Digital transformation and the access to corporate information. 2. Tolo contrasting corporate opportunistic behaviour.

34	Unnikrishnan & Nagappan (2018)	Digital Permanent Establishment	The implementation of digital technology into permanent establishment tax policy (RQ2)	Qualitative	-	-	India	-	1. The implementation of digital technology into permanent establishment's tax policy produced more uncertainty in the tax law (RQ2)	-
35	Xie & Huang (2023)	Digital Transformation	The role of digital transformation for tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: BTD; Digital transformation: times of "digital transformation" in annual reports; internal control: internal environment; risk assessment; control activities; information and communication; internal supervision; tax administration: (local revenues)/GDP	China	Agency theory	1. Digital transformation decreases the level of tax avoidance (RQ1) through the internal control quality 2. This effect is more prominent in firms with inwards government subsidies (RQ1)	1. Limited to China 2. No generalisability 3. Government should focus on digital transformation 4. The beneficial effects on internal control should push firms to incorporate digital transformation in their strategies like decision making process.
36	Ye & Li (2024)	Common Reporting Standards	The role of digital platforms for common Reporting Standards and	Qualitative	Normative approach	-	China	-	1. Digital platforms helped to accomplish to Common Reporting Standard regulation (RQ2)	1. More governmental investments in digital infrastructures and automatic

			the effects on tax avoidance (RQ1 & RQ2)						2. The use of digital platforms has helped to accomplish to Common Reporting Standard (RQ2) 3. Digital platforms have improved tax transparency and reduced tax avoidance (RQ1)	exchange system.
37	Zhang & She (2024)	Digital Transformation	The effect of corporate digital transformation on tax avoidance (RQ1)	Quantitative	Regression analysis	Tax avoidance: BTD Digital transformation: amount of investments on digital transformation intangibles assets	China	Signal theory; Asymmetric information theory; TOE	1. Digital transformation inhibits corporate tax avoidance (RQ1) 2. The effect is more pronounced when financial constraints and business risk are higher (RQ1) 3. The effect is weaker underdeveloped regions (RQ1)	1. Government for digital transformation, laws and regions; 2. Corporations: AI, big data and digital transformation; 3. The sample is limited to China; 4. More measures of tax avoidance.
38	Zhou, Zhou & Ji (2022)	Digital Transformation	The effects of digital transformation on tax avoidance (RQ1)	Quantitative	Regression analysis	Tax stickiness: tax changes and changes in earnings' performance Digital Transformation: Frequency of	China	-	1. Corporate digital transformation increases the levels of tax avoidance (RQ1) and reduces the	1. Chinese listed companies; 2. Comparative analysis in different contexts; 3. Corporate tax stickiness

			digital keywords in annual reports (i.e., artificial intelligence, blockchain technology, data management, digital infrastructures)	levels of tax stickiness 2. The effect over tax avoidance is stronger when there is a grater internal control system and a lower tax enforcement (RQ1)	among different taxes; 4. Future studies should focus on digital transformation for corporate tax management; 5. Government should incentivise digital transformation with some tax benefits.

While *Table 2* reports the screening activity of the ILR, consisting in *Stage (iii)* (*Data evaluation*) and *Stage (iv)* (*Data synthesis)*, *Table 3* offers a reinterpretation of the information reported in *Table 2* through the lens of the ecosystem approach, critically disentangling the context (*Column (a)*), technology (*Column (b)*), stakeholders (*Column (c)*), and demonstrated results (*Column (d)*) highlighted by the documents under review, and matching these tax ecosystem elements to the RQs investigated by this literature review, as reported in *Column (e)* of *Table 3*.

Table 3. The application of Ecosystem approach to ILR in *Stage (iv) Data Synthesis*

(a) Context	***(b) Technology***	***(c) Stakeholders***	***(d) Demonstrated results***	***(e) Stage (i) matching***
Tax Law	Digital permanent establishment	Tax authorities	1. From permanent establishment to digital establishment in the context of digital economy (Avi-Yonah et al., 2022; Čerka et al., 2024; Pandey et al., 2023; Pandey et al., 2024; Spinosa & Chand, 2018; Unnikrishnan and Nagappan, 2018). 2. The tools of digital economy reduced the levels of corporate tax avoidance (Chen et al., 2025).	RQ2 RQ1
Tax Law	Digital Service Tax (DST)	Tax authorities Corporate taxpayers	1. Discriminatory effects of DST (tax authority perspective) (Avi-Yonah et al., 2022; Escribano, 2021; Geringer, 2021; Olbert and Spengel, 2019). 2. Issues between the amount of estimated revenues and real revenues for the taxable income subjected to the DST (Escribano, 2021). 3. A negative reaction to DST from the investors of tax avoidant firms was documented (Klein et al., 2022).	RQ2 RQ1 & RQ2
-Tax Law -Tax Accounting	Common Reporting Standard	Tax authorities Corporate taxpayers	1. Digital systems enhanced the information exchange thus the effectiveness of Common Reporting Standard rules (tax authority perspective) (Ye and Li, 2024). 2. Embedding digital systems into the Common Reporting Standard rules reduced corporate tax avoidance (corporate taxpayers' perspective) (Ye and Li, 2024).	RQ1 & RQ2

Economics of the business transaction	E-commerce	Corporate taxpayers	1. E-commerce positively affected corporate tax avoidance (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021; Otlani Novastria and Sabda Hani, 2024) with more prominent effects in multinational enterprises and firms with more intangible assets (Otlani Novastria and Sabda Hani, 2024). 2. E-commerce generated different forms of tax avoidance: income tax avoidance (Argilés-Bosch et al., 2020) and labour tax avoidance (Argilés-Bosch et al., 2021).	RQ1
Tax Accounting	Extensible Business Reporting Language (XBRL)	Corporate taxpayers	1. XBRL enhanced corporate tax transparency (Kobbi-Fakhfakh & Athie, 2023) and reduced corporate tax avoidance (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023).	RQ1
Economics of the business transaction	Digital transformation	Tax authorities Corporate taxpayers	1. Digital transformation fragmentarily affected corporate tax avoidance. There is evidence about the adoption of digital transformation and a reduction of tax avoidance (Azenzoul et al., 2025; Chen et al., 2024; Souguir et al., 2025; Sun et al., 2025; Tiantian et al., 2023; Xie & Huang, 2023; Zhang & She, 2024) and other papers demonstrating the increased levels of corporate tax avoidance (Chen & Meng, 2023; Zhou et al., 2022). In those cases where it had positive effects on corporate tax avoidance, digital transformation contributed to enhance the corporate tax transparency (Chen et al., 2024; Tiantian et al., 2023). 2. Expanding the analysis to the tax policies, the latter have a beneficial effect on corporate digital transformation (Chen and He, 2025; Fu et al., 2025; Zhou, 2024), in larger firms and in firms with lower financial constraints (Fu et al., 2025; Zhou, 2024). In particular, the relationship strongly holds in cases of tax incentives consisting in accelerated depreciation (Feng et al., 2024). Alongside, the implementation of specific digital	RQ1 RQ1, RQ2 & RQ3

			tax policies (like Golden Tax Project in China) reduced the levels of corporate tax avoidance in multinational firms and state-owned enterprises (Chen and Lei, 2025; Su, 2025).	
Economics of the business transaction	Digital finance	Corporate taxpayers	1. Contrasting results about the effects of digital finance on the corporate tax avoidance. Financial information, digitally exchanged, led to increased levels of corporate tax transparency and reduced corporate tax avoidance (Guo et al., 2024). 2. On the other side, digital finance positively affected the levels of tax avoidance (Tang et al., 2025).	RQ1
-Tax law -Tax accounting -Economics of the business transaction	Cryptocurrencies	Tax authorities	1. The crypto market needs a proper regulation in order to better control the transactions (Chawla and Mahipal, 2023). 2. Governments applied a different tax treatment worldwide (Chawla and Mahipal, 2023). 3. Mostly, crypto profits are taxed with a capital gain tax, like in United States (Chawla and Mahipal, 2023).	RQ2
-Tax accounting -Tax law -Economics of the business transaction	Blockchain	Tax authorities	1. The integration of blockchain technology improves the tax reporting with the real time tax data acquisition (Anomah et al., 2024). The involvement of blockchain technology depends on the main behaviours of tax policymakers and on the acceptability of these changes from taxpayers.	RQ2

In the following subparagraphs, we report the relevance of *Digital technologies* across the ILR, as displayed in *Column (b)* of *Table 2*, and then sort them by *Technology* according to the elements of the ecosystem approach presented in *Column* (*b*) of *Table 3*. For each *Technology*, we first focus on the *Context* and subsequently discuss *Stakeholder* perspectives.

Digital Permanent Establishment

The concept of permanent establishment traditionally refers to the physical location, outside the firm's country of fiscal residence, where business activities are conducted (Spinosa &

Chand, 2018). The rapid expansion and dynamism of digital technology,[v] however, have challenged this longstanding tax principle (Obayemi, 2021; Pandey et al., 2024). Digital multinational enterprises that leverage the absence of permanent establishment in the countries in which they operate tend to avoid more taxes (Obayemi, 2021), benefitting from lower tax rates (Čerka et al., 2024). Digital technology enables firms to operate across borders without a physical presence, blurring the geographical boundaries that underlie the permanent establishment concept (Avi-Yonah et al., 2022; Čerka et al., 2024; Spinosa & Chand, 2018; Unnikrishnan & Nagappan, 2018) and creating more flexible transaction models (Geringer, 2021; Spinosa & Chand, 2018).

The concept of digital permanent establishment has been introduced or proposed for implementation in tax law worldwide. However, its application has at times been inconsistent, leading to ambiguities and uncertainty in tax law (Unnikrishnan & Nagappan, 2018). Pandey et al. (2024) expanded this concept to the digital economy and argued that digital business models constitute a corporate workaround used to reduce tax burdens. The same conclusions are upheld by Obayemi (2021), who considered the Nigerian context and how the government extended the taxation of the digital economy to include digital transactions such as digital advertising platforms. However, more recent studies on the digital economy document negative effects on corporate tax avoidance, especially among state-owned enterprises and in regions characterised by higher levels of financial development and more advanced tax enforcement (Chen et al., 2025).

In this evolving regulatory and socioeconomic environment, scholars argue that profits from digital transactions should be taxable even when firms do not meet traditional physical presence criteria (Čerka et al., 2024; Littlewood, 2020). For instance, a user-participation-based principle may be adopted, which considers a firm's active engagement in digital transactions rather than its physical establishment in the host country (Littlewood et al., 2020; Olbert & Spengel, 2019). Certain jurisdictions, such as Slovakia, as well as initiatives at the international level within the Base Erosion and Profit Shifting Project, have

[v] Digital technology, referred to as information and communication technology by Pandey et al. (2023), is defined as the ability of digital companies to escape from their 'physical presence for avoidance of tax payment' (901).

introduced the concept of digital permanent establishment, enacting rules to regulate firms' digital presence and ensure the taxation of cross-border digital activities (Geringer, 2021; Obayemi, 2021). Despite these developments, the effectiveness of such regulatory measures in fully capturing digital revenues remains open to question.

Digital Services Tax

Digital technology has created a scenario in which goods and services sold online are often left untaxed. In response, the OECD proposed the Pillar One initiative, followed by the European Union and other governments worldwide (e.g., New Zealand), which introduced the Digital Service Tax (DST) to address the under-taxation of large digital businesses such as Google or Facebook (Littlewood et al., 2020). DSTs specifically aim to capture the value created by the intangibility of digital services, such as user data, digital platforms, algorithms, and online interfaces. DSTs are designed to levy taxes on the gross revenues generated by digital services (Avi-Yonah et al., 2022; Geringer, 2021; Klein et al., 2022), rather than on profits (Klein et al., 2022). Large digital firms fall within their scope because they exploit the intangibility of digital markets, maintaining a presence in multiple countries without falling under local tax jurisdictions (Littlewood, 2020).

The scope and design of DSTs vary, reflecting different national strategies to tax intangibility-driven digital activities (Enache, 2025). Revenue thresholds represent the key discriminant, as DSTs apply differently depending on firm size (Geringer, 2021; Olbert & Spengel, 2019). Their unclear definition has increased taxpayer uncertainty, creating fertile ground for double taxation (Olbert & Spengel, 2019). At the EU level, DSTs have been heterogeneously enacted due to their transposition into national tax codes (Geringer, 2021), resulting in fragmented outcomes.[vi] For example, Austria extended its pre-existing digital advertisement tax beyond the EU DST scope; France taxed online advertisements and marketplaces but excluded user data exchanges; and Spain focused on revenues from digital

[vi] EU digital tax policy aligns with the OECD's Pillar One initiative, which seeks to reform international taxation by reallocating part of global profits to market jurisdictions where digital users are based. However, due to stalled negotiations and political resistance, notably from the United States, several countries – including almost half of EU member states – have implemented DSTs as interim measures. For a detailed and updated description of DST implementation in the EU, see Enache (2025) and https://taxfoundation.org/data/all/eu/digital-services-taxes-europe/

advertising, intermediation services, and user data (Escribano, 2021; Geringer, 2021). Within Europe, DST rates range from 1.5% in Poland to 7.5% in Turkey (Enache, 2025). Outside the EU, New Zealand enacted a DST at 3% on gross revenues from highly digitalised business models, including platforms, social media, content-sharing services, search engines, and user data (Littlewood et al., 2020).

Beyond institutional heterogeneity within the EU, DSTs have also produced significant consequences worldwide, involving notable economic distortions (Čerka et al., 2024; Olbert & Spengel, 2019). Avi-Yonah et al. (2022) emphasise that the French DST disproportionately affected United States technology companies, as it taxed firms without a physical presence in France while leaving domestic entities largely unaffected. From a geopolitical standpoint, this reliance on 'non-physical presence' as a criterion for taxation was perceived as discriminatory, intensifying trade tensions between the EU and the United States (Bradford, 2023; Enache, 2025).

Overall, these heterogeneous national implementations have blurred the boundaries of the EU DST, increasing legal uncertainty (Escribano, 2021; Geringer, 2021), while raising broader questions of fairness and reciprocity in international taxation regimes (Avi-Yonah et al., 2022).

Common Reporting Standard

The rise of digital technology has reshaped the effectiveness of existing international tax rules, most notably the Common Reporting Standard (CRS). Conceived by the OECD as a global instrument to combat tax evasion (OECD, 2017), the CRS establishes a framework for the automatic cross-jurisdictional exchange of financial information (Ye & Li, 2024). Under this regime, financial institutions must identify account holders, collect standardised data, and transmit the information to domestic tax authorities, which in turn share it with their foreign counterparts. The system heavily relies on digital infrastructures to ensure secure processing, interoperability, and cross-border communication (OECD, 2017). Recent evidence suggests that this digital exchange has enhanced the timeliness and reliability of the CRS, thereby reducing opportunities for corporate tax avoidance (Ye & Li, 2024). At the same time, the standard is embedded in a broader institutional landscape in which data

protection, technical compatibility, and international cooperation remain ongoing challenges.

E-Commerce

E-commerce encompasses both the sale of physical products through online platforms (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021; Spinosa & Chand, 2018) and the conduct of entire business activities via digital platforms, also known as pure e-commerce (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021). While income tax avoidance refers to strategies that reduce the corporate income tax burden, labour tax avoidance involves practices aimed at lowering social security contributions (Argilés-Bosch et al., 2021).

From a methodological standpoint, firms often rely on the broader definition of e-commerce, which can function as an effective instrument for tax avoidance because it frequently operates as an untraceable cross-border activity (Argilés-Bosch et al., 2020). Such transactions are commonly subject to at least two tax jurisdictions (Argilés-Bosch et al., 2020), providing firms with flexibility to exploit mismatches and select the most favourable tax jurisdiction (Argilés-Bosch et al., 2020). The difficulty that tax authorities face in detecting and monitoring these activities reinforces this dynamic. Empirical evidence confirms that firms engaging in e-commerce exhibit high levels of both income tax avoidance (Argilés-Bosch et al., 2020; Otlani Novastria & Sabda Hani, 2024) and labour tax avoidance (Argilés-Bosch et al., 2021). For income tax avoidance, this effect is more pronounced among multinational enterprises and firms with more intangible assets (Otlani Novastria & Sabda Hani, 2024).

Extensible Business Reporting Language

Emergent digital tools have increasingly permeated financial reporting processes. This subsection examines the novel digital accounting technology, the eXtensible Business Reporting Language (XBRL) (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023).

XBRL is widely adopted by firms to report corporate financial information in a standardised digital format. Its primary objectives are the efficient presentation, sharing, and streamlined processing of financial data (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023). The tool was

originally designed to enhance financial reporting comparability and transparency, benefitting both investors and regulators. Although not originally designed for tax reporting, XBRL has important indirect effects on tax research and enforcement. Tax authorities rely on corporate financial reports as a complementary information source, particularly when assessing the credibility of reported taxable income, as these reports reduce information asymmetry between firms and tax collectors (Chen et al., 2021). This transparency can indirectly limit the scope for aggressive tax avoidance strategies that exploit reporting opacity.

Empirical studies confirm that the accessibility and usability of XBRL enhance tax transparency (Kobbi-Fakhfakh & Athie, 2023), contributing to reduced corporate tax avoidance (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023). However, these effects are notably weaker for firms already under direct scrutiny by tax authorities (Chen et al., 2021), suggesting that XBRL is most effective when tax administrations have limited supervisory capacity, as greater reporting transparency indirectly reduces opportunities for corporate tax avoidance (Balakrishnan et al., 2019).

Digital Transformation

Digital transformation is primarily driven by managerial choices and strategic intent (Zhang & She, 2024), reshaping corporate strategies and business models across organisations (Zhou et al., 2022). Its adoption significantly varies among firms. Most studies in tax research classify a firm as digitally transformative based on the degree of digital transformation declared in corporate annual reports (Azenzoul et al., 2025; Chen & He, 2025; Chen & Meng, 2023; Fu et al., 2025; Tiantian et al., 2023; Xie & Huang, 2023; Zhou et al., 2022; Zhou, 2024).

The analysis of the degree of digital transformation is often based on keywords in annual reports, such as artificial intelligence, blockchain technology, data management systems, digital infrastructures (Zhou et al., 2022), cloud computing, and the digital economy (Chen et al., 2024). Firms are also identified as digitally transformative when a portion of their intangible assets is allocated to digital transformation investments (Zhang & She, 2024). From the tax authorities' perspective, digital transformation has been implemented through

tax policies, particularly in China, where governments adopted specific tax provisions under the Golden Tax Project. In this context, the degree of digital transformation is measured based on tax policy exposure, considering whether firms operate in regions affected by these provisions (Chen & He, 2025; Chen & Lei, 2025; Su, 2025).

Within the tax ecosystem, digital transformation interacts with the broader tax context, comprising law, standards, and policies. Governments embed digital technology through specific tax policies (e.g., incentives) (Chen & He, 2025; Feng et al., 2024; Fu et al., 2025; Su, 2025; Zhou, 2024), which influence corporate digital growth (Chen & He, 2025; Feng et al., 2024; Fu et al., 2025; Zhou, 2024) and reduce corporate tax avoidance (Chen & Lei, 2025; Su, 2025). Such incentives positively influence the corporate digital transformation of larger firms, whereas firms facing financial constraints experience weaker effects (Fu et al., 2025; Zhou et al., 2024). Accelerated depreciation schemes may further reinforce this relationship (Feng et al., 2024). Similarly, the adoption of specific tax policies (e.g., the Golden Tax Project in China) has reduced corporate tax avoidance among multinational enterprises (Chen & Lei, 2025; Su, 2025), state-owned enterprises aligning with government objectives (Chen and Lei, 2025), and private firms or firms operating in regions with weaker financial development (Su, 2025).

The literature reports mixed evidence on corporate taxpayers. Some studies highlight that digital transformation amplifies corporate tax avoidance, especially when firms adopt weaker internal controls and lower levels of tax enforcement (Chen & Meng, 2023; Zhou et al., 2022). The enhanced complexity of corporate operations can make it more difficult for tax authorities to trace business transactions, further incentivising corporate tax avoidance (Chen & Meng, 2023). Conversely, digital transformation has also been shown to reduce corporate tax avoidance (Azenzoul et al., 2025; Chen & Meng, 2023; Chen et al., 2024; Souguir et al., 2025; Sun et al., 2025; Tiantian et al., 2023; Xie & Huang, 2023; Zhang & She, 2024; Zhou et al., 2022), including in the banking industry (Souguir et al., 2025), as technologies enhance transparency and governance (Chen et al., 2024; Tiantian et al., 2023). Evidence from the banking industry indicates that such effects differ depending on whether a bank adopts conventional or Islamic models (Souguir et al., 2025). Given the stronger ethical foundations of Islamic banks compared with conventional banks, digital

transformation implementation is more effective in conventional banks (Souguir et al., 2025).

Digital Finance

Digital finance refers to the application of digital technologies to financial services (Guo et al., 2024), enabling new mechanisms for corporate financing, payment systems, and financial intermediation beyond traditional banking structures (Tang et al., 2025). It encompasses a broad range of financial service applications, such as online and mobile banking services (Guo et al., 2024).

There is no unified measure for digital finance. Scholars have measured it as through the coverage and usage of digital financial services combined with the degree of digitisation (Guo et al., 2024), or by employing a dedicated digital finance index, primarily in the Chinese context (Tang et al., 2025). Text analysis of policies and reports has also been used to evaluate digital finance (Guo et al., 2024).

Findings are mixed. On the one hand, adopting digital financial instruments enhances corporate information transparency, thereby reducing corporate tax avoidance (Guo et al., 2024), particularly in more profitable firms, state-owned enterprises, and companies closely monitored by analysts (Guo et al., 2024). On the other hand, digital finance instruments have been shown to reduce corporate effective tax rates, thereby increasing corporate tax avoidance (Tang et al., 2025). This positive association has been linked to higher firm value and reduced cash flow uncertainty, without increasing overall corporate risk (Tang et al., 2025).

It is important to note that this literature focuses on regulated digital finance in China. In contrast, other forms of digital finance, such as cryptocurrencies, have been widely associated with facilitating illicit transactions and cross-border tax evasion. Thus, while evidence in the context of China highlights transparency-enhancing effects under regulated conditions, the broader global landscape of digital finance remains ambivalent and unevenly regulated.

Cryptocurrencies

Cryptocurrencies, also known as crypto, represent a heterogeneous class of digital assets held by individuals and businesses (Chawla & Mahipal, 2023). They are a decentralised form of virtual currency based on cryptographic and blockchain technology (Anomah et al., 2024; Chawla & Mahipal, 2023). Early cryptocurrencies, such as Bitcoin, were designed for peer-to-peer transactions without reliance on trusted intermediaries (Mazur, 2022). Contemporary crypto markets, however, exhibit a wide range of governance and infrastructural models (Chawla & Mahipal, 2023; Mazur, 2022).

Many crypto-related activities rely on centralised platforms, exchanges, custodial services, and intermediaries, reintroducing elements of central control and institutional responsibility often obscured by the appearance of decentralisation (Biondi, 2023). Cryptocurrencies, therefore, combine decentralised architectures with varying degrees of institutional mediation, contributing to high volatility (Chawla & Mahipal, 2023), governance uncertainty, and financial instability (Anomah et al., 2024; Chawla & Mahipal, 2023).

As a novel class of digital financial instruments, cryptocurrencies challenge existing tax systems and increase the complexity of tax codes (Mazur, 2022). Cryptocurrencies are primarily held as financial investments (Chawla & Mahipal, 2023), typically intended for eventual exchange into cash or cash equivalents (Biondi, 2023).[vii] However, their digital nature means traditional legal frameworks do not adequately support crypto regulation (Chawla & Mahipal, 2023). Therefore, governments require an appropriate legal classification that reflects their nature and usage (Chawla & Mahipal, 2023), as the chosen classification directly affects their taxation.

In accounting practice, based on their nature, cryptocurrencies are typically positioned between currency and property (Chawla & Mahipal, 2023; Huang et al., 2023). This

[vii] Cryptocurrencies may also function as a medium of exchange and are recognised as such in parts of the accounting, tax, and regulatory literature (e.g., EU Parliament and Council, 2023; Luo & Yu, 2024). However, tax and accounting frameworks typically address cryptocurrencies primarily as investment or trading assets rather than as means of payment. Accordingly, most studies included in this review limit their analysis to cryptocurrencies held as financial investments.

ambiguity has led to differing tax treatments across jurisdictions. For example, in India, crypto profits are taxed at a flat rate of 30%, similar to the US capital gains tax on crypto. The Indian government also defines crypto as a 'virtual digital asset' without distinguishing between different types of digital assets (Chawla & Mahipal, 2023).

Blockchains

Blockchain technology is an emerging information system that enables the exchange of digital assets without requiring a central institution (Allen & Potdar, 2022; Anomah et al., 2024). It is based on digital blocks containing all transaction-related information (Allen & Potdar, 2022). Owing to the security and encryption built into blockchain algorithms, this cryptographic mechanism can be leveraged to improve compliance monitoring among taxpayers (Allen & Potdar, 2022; Mazur, 2022), and to provide real-time access to tax data (Allen & Potdar, 2022; Anomah et al., 2024).

Blockchains are commonly classified as public or private (Mazur, 2022). Some also support smart contracts (Anomah et al., 2024), which enhance data traceability (Mazur, 2022). Private blockchains restrict participation to selected actors and rely on permissioned governance mechanisms (Mazur, 2022), which may strengthen organisational oversight and social control but reduce decentralisation and limit the number of validating nodes (Dhillon & Sivabalan, 2025), potentially affecting technical resilience against cyberattacks (Garanina et al., 2023; Mazur, 2022). By contrast, public blockchains are typically decentralised and rely on a large number of distributed nodes, enhancing technical security (Garanina et al., 2022), although network access is open to all users holding a private key (Mazur, 2022).

In recent years, the expansion of untraceable cross-border transactions has increased the incidence of unreported taxable income, thereby contributing to heightened levels of tax avoidance (Mazur, 2022). Moreover, the growing complexity of tax frameworks has made tax estimation increasingly resource-intensive (Mazur, 2022).

Recognising the potential of blockchain technology, Anomah et al. (2024) investigated how and to what extent its integration into tax policy could help tax authorities better track taxable online transactions. However, the degree of acceptance of blockchain technology

depends on stakeholders' perceptions of the appropriateness of both formal and informal institutional norms (Anomah et al., 2024).

The use of blockchain technology may reduce administrative burdens by promoting transparency in information sharing (Mazur, 2022). Users can share data using the same blockchain system without relying on multiple databases (Mazur, 2022). This ease of data sharing increases the transparency of tax information, reduces the tax gap, and increases interoperability among institutions (Anomah et al., 2024; Mazur, 2022). In Australia, where an 'office for digital transformation' already existed, the government proposed a blockchain framework to streamline complex tax mechanisms, particularly business-to-customer tax deductions (Allen & Potdar, 2022), with the primary goal of using blockchain codification to ensure the correct flow of transactions. It tracks transactions from inception and stores relevant tax data on the blockchain, allowing taxpayers to rely on automated tax return processes and claim deductions without submitting additional information (Allen & Potdar, 2022). Moreover, the use of private keys to access information enhances data privacy (Mazur, 2022).

Stakeholder Perspectives: Corporate Taxpayers versus Tax Collectors

This subsection examines whether and how the literature documents the adoption of digital technology in the tax ecosystem, focusing on two main and opposing stakeholders: corporate taxpayers and governmental tax collectors. Considering the relevant role of RQs from *Stage (i)* for the ILR (Whittemore & Knafl, 2005), we used the focus presented in *Column (c)* of *Table 3*, which identifies the main stakeholders of the ecosystem approach applied to tax research, to align the review results with the scope of ILR. In this subsection, the previously disentangled context and technology are intersected with stakeholders.

Digital Permanent Establishment

From the perspective of corporate taxpayers, the digital economy has been shifting tax models from traditional permanent establishment principles to digital presence rules, introducing both risks and uncertainties. Multinational corporations that once relied on the absence of a physical presence to minimise taxation now face unexpected liabilities under

new and fragmentary legal frameworks, such as 'user participation' or 'digital permanent establishment' (Geringer, 2021; Littlewood et al., 2020). Historically, these enterprises could adjust their location according to their tax planning strategies (De Simone & Olbert, 2025). Compliance burdens increase as firms must adapt reporting systems, align with divergent national approaches, and manage exposure to double taxation where rules overlap or conflict (Pandey et al., 2024; Spinosa & Chand, 2018). Simultaneously, the erosion of geographical barriers creates opportunities for digital firms to expand into new markets, although these opportunities are tempered by heightened scrutiny and regulatory intervention (Pandey et al., 2023). Digital permanent establishment may serve as a workaround for firms to pay less taxes, especially in developing countries (Obayemi, 2021; Pandey et al., 2024). As digital business models become more widespread, traditional tax models struggle to account for the digital aspects of firms (Littlewood, 2020; Olbert & Spengel, 2019).

From the standpoint of tax authorities, digital technology has opened new avenues for revenue collection but has also raised significant enforcement challenges, such as tax planning strategies hidden within intangible and technological business transactions. Authorities increasingly rely on user participation or digital permanent establishment rules to capture value generated within their jurisdictions (Avi-Yonah et al., 2022; Littlewood et al., 2020). These digitalised legal contexts enable tax revenue collection even in the absence of physical operations. However, their effectiveness depends on the ability to monitor digital flows, ensure accurate reporting, and coordinate cross-border tax enforcement, where regulatory fragmentation persists (Geringer, 2021). While digital technology provides tools to enhance oversight, it also introduces complexities regarding data management, user location, and international harmonisation that continue to test tax authorities' ability to govern a digital economy (Geringer, 2021; Spinosa & Chand, 2018).

Digital Services Tax

Digital Services Taxes (DSTs) have produced contrasting outcomes for corporate taxpayers and tax collectors.

To support tax authorities, governments introduced DSTs in response to structural limitations of current international tax frameworks that facilitate tax avoidance in the digital sector (Bradford, 2023). However, companies and investors (i.e., taxpayers) often perceive it negatively. DSTs can reduce investor sentiment toward tax-avoidant firms, and high-revenue corporations subject to DSTs may face declining profitability (Klein et al., 2022). Unlike income taxes on net profits, DSTs apply to gross revenues, which may discourage growth and digital investments (Klein et al., 2022). Accordingly, they resemble an excise or specific value-added tax (Geringer, 2021; Klein et al., 2022; Littlewood et al., 2020).

From the tax collector's perspective, DSTs have also raised significant challenges to tax control. The lack of a clear link between digital platforms and tax returns complicates transaction tracing (Escribano, 2021), and the absence of algorithms to locate users raises privacy concerns.

This asymmetry between taxpayers and tax collectors illustrates how DSTs operate at the intersection of corporate strategies to minimise taxation and institutional efforts to secure digital economy tax revenues. This intersection shows that in a digital tax ecosystem, while digital technologies create efficiencies and opportunities for tax authorities, they also intensify compliance costs and strategic risks for corporate taxpayers. The resulting asymmetry reflects an evolving tension between private strategies to minimise liabilities and institutional efforts to secure revenues in a digitalised global economy (Bradford, 2023; Littlewood et al., 2020; Spinosa & Chand, 2018).

In summary, DSTs have been promoted as a tool to capture revenue in the digital economy. However, given its perceived unfairness (Geringer, 2021; Klein et al., 2022; Littlewood et al., 2020), it has proven difficult to administer (Escribano, 2021).

Common Reporting Standard

Regarding reporting, the OECD's CRS and its reliance on digital tools create distinct experiences for corporate taxpayers and tax administrations.

For taxpayers, particularly multinational corporations, the CRS increases transparency by limiting opportunities to shift profits or conceal assets abroad (Ye & Li, 2024). For tax

authorities, it provides a powerful enforcement mechanism, enabling the tracking of cross-border financial flows with unprecedented detail (Ye & Li, 2024).

Digital infrastructures allow administrations to process vast amounts of financial data, supporting efforts to curb tax avoidance (Ye & Li, 2024). However, tax authorities face challenges in ensuring data accuracy, maintaining cybersecurity, and coordinating with foreign jurisdictions that may interpret CRS rules differently. Compliance burdens and data breach risks also arise, as reporting systems must align with multiple jurisdictions and manage heightened confidentiality and data security requirements (OECD, 2017).

The resulting asymmetry between administrative requirements and corporate concerns highlights the complex balance of interests in the digital tax ecosystem. The CRS, enabled by digital infrastructures, enhances the traceability of cross-border financial flows with unprecedented granularity while raising concerns about data accuracy, cybersecurity, and coordination across jurisdictions (Ye & Li, 2024).

E-Commerce

From a pure corporate perspective, e-commerce is pivotal in shifting traditional business transactions to digital formats. Identifying e-commerce firms, however, remains challenging. Using binary variables to classify firms as e-commerce entities is highly debatable (Argilés-Bosch et al., 2020; Otlani Novastria & Sabda Hani, 2024). No standardised industry classification comparable to the ICT or e-commerce sectors currently exists to guide empirical research. Moreover, distinctions across different types of e-commerce firms remain blurred. Depending on their position in the supply chain, firms may adopt digital business models only for specific e-commerce activities rather than the entire supply chain (Argilés-Bosch et al., 2020).

Extensible Business Reporting Language (XBRL)

Recent digital developments have also affected corporate accounting reporting. Firms increasingly report their financial information using XBRL, which enhances tax transparency (Kobbi-Fakhfakh & Athie, 2023). XBRL contributes in two ways: for corporations, it streamlines accounting processes and improves reporting efficiency; for tax

authorities, it facilitates access to corporate financial information, strengthening monitoring systems and supporting increased tax revenues (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023).

Digital Transformation

Debate continues regarding digital transformation and its implications for corporate tax avoidance and digital growth. Beyond the contrasting evidence previously discussed, both corporate organisations and tax authorities acknowledge digital transformation as a significant business-level factor influencing tax avoidance, albeit for different reasons (Azenzoul et al., 2025; Chen & He, 2025; Chen & Meng, 2023; Fu et al., 2025; Tiantian et al., 2023; Xie & Huang, 2023; Zhou et al., 2022; Zhou, 2024). Firms have invested in digital transformation to achieve greater tax savings (Chen & Meng, 2023; Zhou et al., 2022). Conversely, tax authorities have implemented tax policies designed to encourage investment in digital transformation, thus promoting digital transformation at the tax policy level (Chen & He, 2025; Feng et al., 2024; Fu et al., 2025; Su, 2025; Zhou, 2024).

Digital Finance

Evidence on digital finance and its effects on tax avoidance remains mixed (Guo et al., 2024; Tang et al., 2025). Comparability of these results is limited due to heterogeneous measurement methods, and most studies are confined to China, restricting the generalisability of the findings. To date, there is no documented evidence of tax policies specifically designed to address the emerging role of digital finance from the perspective of tax authorities.

Cryptocurrencies

From the corporate taxpayer's perspective, digital technologies expand market opportunities while introducing risks of heightened scrutiny and compliance obligations. Cryptocurrencies enable new forms of exchange and investment but challenge existing tax and accounting frameworks by blurring the distinction between currency and property (Chawla & Mahipal, 2023; Mazur, 2022). For tax authorities and governmental institutions, the primary concerns stem from cryptocurrencies' inherent characteristics, including

extreme price volatility and market instability, which existing accounting and tax principles are not designed to adequately address (Huang et al., 2023). Regulation of cryptocurrencies, at any level, must contend with their digital intangibility (Huang et al., 2023). Despite considerable efforts by accounting and tax practitioners, cryptocurrencies remain challenging to regulate and effectively oversee.

Blockchains

Blockchain technology underpins cryptocurrency transactions. It enhances transparency and data traceability while requiring firms to adapt reporting systems and manage exposure to cross-border regulations (Allen & Potdar, 2022; Anomah et al., 2024). For tax collectors, these technologies provide both powerful enforcement mechanisms and new governance challenges. Blockchain, with its cryptographic security, offers opportunities to reduce administrative burdens and ensure real-time access to tax-relevant data (Anomah et al., 2024; Mazur, 2022). Nonetheless, the rapid rise of e-commerce has further intensified debates over the fairness of digital taxation (Avi-Yonah et al., 2022; Escribano, 2021).

5. Stage (v): Discussion and contributions

Based on the results collected throughout *Stage (iii)* and analysed in *Stage (iv)*, this section develops *Stage (v)*, reporting the evidence according to the RQs investigated while studying the impact of digital technology on the tax ecosystem, as described in Table 3, specifically focusing on: (i) corporate tax avoidance (RQ1); (ii) tax policies intended to curb tax avoidance (RQ2); and (iii) the reverse causality findings of tax avoidance pushing digital technologies growth (RQ3). For each RQ, we also indicate avenues for future research in tax accounting, tax law, and tax policy and economics.

Following the framework proposed by Whittemore and Knafl (2005), *Stage (i)*, *Problem identification and review questions*, guides the review process through to *Stage (v)*, *Discussion and conclusions*. In Table 4, we align each dimension of the ecosystem approach with the main objectives defined in *Stage (i)*. This mapping highlights several gaps in the tax accounting literature that remain insufficiently addressed. These gaps are presented below in relation to RQ1, RQ2, and RQ3.

Table 4. Ecosystem approach and ILR: Research gaps of *Stage (v)*

ECOSYSTEM APPROACH					ILR			ECOSYSTEM APPROACH + ILR	
a) Context	**b) Technology**	**c) Stakeholders**		**d) Demonstrated results**	**Scopes of review**			**Research gaps**	
		Corporate taxpayers	**Tax authorities**		**RQ1**	**RQ2**	**RQ3**		
Tax Law	Digital Permanent Establishment	X	X	From permanent to digital establishment	X			a)	What could be the effects over corporate environment?
			X				X	b)	What is the future of permanent establishment in terms of tax policies? How can tax authorities regulate the digital establishment?
					X		X	c)	How could governments enhance user participation within the digital establishment provisions?
Tax Law	Digital Service Tax	X		Negative reaction of investor of tax avoidant firms; jeopardized DST enactment worldwide.	X		X	a)	How a new system of DST taxation based on profits instead of digital revenues could affect the corporate growth/innovation?
			X			X		b)	How could tax authority improve the reliability of estimated values of digital operations?
			X			X		c)	What digital instrument could be adopted to match the real data of DST-subjected operations and tax return?

		X					X	d)	How do firms locate users and avoid privacy concerns?
			X			X	X	e)	As firms leverage the intangibility of digital markets, is there any relationship with the (under)regulation of the digital establishment?
		X	X			X	X	f)	Are governments thinking about a connection between the new digital establishment definition and the DST? How could they track it?
					(X)	(X)		g)	Is there any tax law bases for including DST under the value added tax or as adjunct standalone value added tax? What are the effects of neutrality of value added taxes for DST on consumers?
Tax Accounting	Common Reporting Standard	X		Effectiveness in the exchange of information	X			a)	What are the implications for enterprises in terms of compliance to these norms?
							X	b)	Is there difference in terms of exchange of information before the implementation of IT tools?
Tax Accounting	XBRL	X	X	Enhanced tax transparency and reduced tax avoidance		X		a)	Did tax authorities introduce XBRL to foster business-to-government information exchange?

						X		X	b) Can measure corporate tax avoidance throughout XBRL-compliance indicators?
			X				X	X	c) Could public subsidies for corporate XBRL implementation foster a better tax data collection from tax authorities?
Economics of business transactions	E-commerce	X		Augmented tax avoidance		X			a) Which is the difference between firms relying purely on e-commerce and those involving e-commerce only partially in the value chain?
			X				X		b) How can tax authorities regulate e-commerce?
		X	X					X	c) Is there any implication in terms of information exchange and tracking?
Economics of business transactions	Digital transformation	X	X	Contrasting results about both augmented and reduced tax avoidance. Tax incentives augmented the level of corporate digital transformation in larger firms.		X	X	X	a) Should digital transformation be attributed to a specific digital tool? Could the digital tools of change across firms (methodology)?
		X				X	X		b) Is "word-mining" from the annual reports a reliable proxy to estimate corporate digital transformativeness?
		X	X			X			c) How can accounting boards integrate a specific disclosure for firms in digital transformation (like specific intangible investments)?

				X	X	d)	How do tax authorities integrate digital transformation to reduce tax avoidance (different tax policies across different countries)?
	X			X		e)	What is the impact of digital transformation on corporate tax avoidance when the magnitude of tax incentives is higher/lower?
		X					
	X			X	X	f)	Do tax incentives change across countries? And which are the consequences in terms of corporate digital transformation?
		X					
	X					g)	Is there separation between the digital and traditional tax expense estimates in terms of accounting reporting?
		X					
	X			X	X	h)	What is the different impact of digital *versus* traditional tax incentives on corporate digital transformation?
	X				X	i)	Do governments introduce specific allowance measures to enable the access to financial resources?
	X				X	j)	Which is the effect on the digital transformation across firms with different attitude to digital investments and different risk levels?

Tax Law **Economics of business transactions (financing)**	Digital finance		X X	reduced corporate tax avoidance		X X		a)	What tax provisions could regulate the digital finance transactions?
								b)	Should tax authorities adopt a unified measure to proxy corporate digital finance?
Tax Accounting **Tax Law** **Economics of business transactions**	Cryptocurrencies	X		uncertainty of accounting, law and tax treatment	X	X		a)	Which are the consequences of unclear legal, accounting and tax crypto treatment for corporate tax avoidance?
			X		X	X		b)	Do we need specific accounting principles facilitating the measurement of crypto risk and volatility?
			X			X	X	c)	How can the governments regulate the anonymity of crypto transactions? Is there any implication for the digital establishment?
Tax Law **Tax Accounting** **Economics of business transactions**	Blockchain technology		X	high effectiveness in real time reporting and		X	X	a)	Is blockchain technology integration related to the digital skills of tax authority's employees?
			X			X		b)	How can we measure the level of blockchain technology of tax authorities?

	X		automatic tax procedures reducing the tax gap (Mazur, 2022).	X			c)	How can firms comply with blockchain integration? Is there space for tax avoidance?
		X			X	X	d)	Is the secure protocol of blockchain the solution for tax data store? What could be the consequences in terms of privacy protection?
	X	X		X	X	X	e)	How can tax authorities control the misuse of blockchain technology like fraudulent activities?

RQ1 – Corporate Tax Avoidance

Our review shows that digital technology reshapes traditional literature on corporate tax avoidance by weakening concepts such as permanent establishment, enabling new channels via e-commerce and digital finance, and creating opacity through cryptocurrencies. The intangibility of digital transactions challenges the permanent establishment rule (Avi-Yonah et al., 2022; Čerka et al., 2024; Pandey et al., 2024; Spinosa & Chand, 2018; Unnikrishnan & Nagappan, 2018), leaving loopholes that may reduce government tax revenues (Littlewood et al., 2020). Within these new digital models, some scholars demonstrate the pivotal role of the digital economy in reducing tax avoidance (Chen et al., 2025), although the ability to measure the digital economy remains underdeveloped in empirical research. Some countries, such as Slovakia, have attempted to regulate these issues by introducing the notion of 'digital establishment' (Geringer, 2021), though its scope remains contested. Other scholars propose the 'user participation principle' as a basis for taxation, which also remains underdeveloped (Littlewood et al., 2020).

E-commerce introduces further complexity, with implications for both income tax and labour-related contributions (Argilés-Bosch et al., 2020; Argilés-Bosch et al., 2021). The lack of a clear legal distinction between pure e-commerce firms and partially digitalised firms complicates classification and enforcement. Digital finance also generates contradictory findings: while Guo et al. (2024) link it to greater tax transparency, Tang et al. (2025) highlight its potential to augment tax avoidance. Similarly, cryptocurrencies remain a major enforcement challenge due to their anonymity, intangibility, and decentralised systems (Chawla & Mahipal, 2023; Mazur, 2022). At the same time, technologies such as XBRL can foster transparency in tax reporting (Chen et al., 2021; Kobbi-Fakhfakh & Athie, 2023), although adoption remains uneven across jurisdictions.

Evidence on digital transformation is mixed: some studies document increases in tax avoidance (Chen & Meng, 2023; Zhou et al., 2022), while others find reductions linked to enhanced transparency (Chen et al., 2024; Tiantian et al., 2023; Xie & Huang, 2023; Zhang & She, 2024). Digital transformation is a strategic tool both for enterprises – shifting business models from traditional to digital (Chen et al., 2024; Tiantian et al., 2023; Xie & Huang, 2023; Zhang & She, 2024) – and for tax authorities to (i) combat tax avoidance and

(ii) foster corporate digital growth (Chen & He, 2025; Chen & Lei, 2025). However, existing research focuses on digital transformation implementation at the top levels of firms, with no qualitative research investigating how firms practically approach becoming more digitally transformative (Azenzoul et al., 2025).

Contributions are required from scholars in tax law, tax accounting, and economics. Future research in accounting and economics should develop reliable, standardised measures for digital transformation, XBRL, and digital finance, as inconsistent proxies may explain much of the contradictory evidence. Law and accounting research should further clarify how digital establishments, e-commerce activities, and cryptocurrencies fit within existing international tax law frameworks and accounting standards. From a policy and economics perspective, studies should quantify the contribution of digital business models to tax gaps, such as labour-related avoidance and the erosion of social contributions.

RQ2 – Tax Policies to Curb Avoidance

Innovative policy provisions, such as the DST, the CRS, and blockchain technologies, attempt to address tax avoidance in the digital era. Each provision, however, raises challenges. DSTs have been criticised for their lack of fairness and growth-detrimental effects, as they tax gross revenues rather than net profits (Avi-Yonah et al., 2022; Geringer, 2021; Klein et al., 2022). The lack of a clear definition of 'digital services' complicates tracking cross-border transactions and may discriminate among firms by size (Geringer, 2021; Littlewood et al., 2020), creating economic distortions and undermining taxation fairness due to tax base differences (applying to gross revenues instead of profits) (Klein et al., 2022; Olbert & Spengel, 2019).

Research on the CRS demonstrates how digital platforms can improve the effectiveness of information exchange (Ye & Li, 2024), although comparative assessments of pre- and post-implementation outcomes remain limited. Blockchain is often described as promising for tax monitoring (Anomah et al., 2024; Mazur, 2022), though its implementation depends on tax authorities' digital readiness and raises concerns over privacy and fraud. Additionally, the implementation of digital transformation has been shown to reduce corporate tax

avoidance (Chen & Lei, 2025; Su, 2025). However, these results are limited to China, highlighting the need for further investigations in other countries to test their robustness.

Future research on tax law should refine the legal definitions underpinning DSTs and digital establishments, ensuring their consistency with international agreements. Tax accounting studies could assess compliance costs and the impact of CRS and blockchain adoption on corporate reporting. From a policy and economics perspective, studies should evaluate whether DSTs, the CRS, and blockchain adoption reduce tax avoidance in practice across industries and jurisdictions, and whether they produce unintended side effects such as distortions in innovation or investment.

RQ3 – Corporate tax avoidance, and the resulting tax authority policies, affecting digital technology

Digital technology not only facilitates avoidance but also produces unintended consequences. Recent evidence suggests that corporate tax avoidance practices – and the subsequent regulatory and enforcement responses by tax authorities – are increasingly driving digitalisation. In many cases, the need to detect and contain aggressive tax planning has accelerated the adoption of technologies such as blockchain, XBRL, and advanced data analytics (Guo et al., 2024; Kobbi-Fakhfakh & Athie, 2023; Ye & Li, 2024). Likewise, firms facing tighter compliance regimes or digital audits have been prompted to integrate digital tools to more efficiently manage tax risks and reporting obligations (Chen et al., 2024; Zhang & She, 2024). Following this trend, governments have promoted digital growth by enacting digital-oriented tax policies (Chen & He, 2025). This reverse causality, where tax avoidance behaviour stimulates technological innovation, emerges as an unintended but significant outcome of the literature, suggesting a new research avenue at the intersection of tax accounting, law, and economics.

Future studies should therefore move beyond analysing how digital tools affect tax avoidance to examine how tax avoidance pressures may shape digital transformation within corporate and institutional settings. Comparative, multi-country research could illuminate how differences in tax enforcement intensity or digital infrastructure influence the

coevolution of tax strategies and technologies. In accounting research, this implies operationalising tax technology adoption as a measurable variable linked to avoidance incentives; in law studies, assessing how regulatory frameworks adapt to – or even stimulate – technological development; and in economics and policy analyses, investigating how digitalisation induced by avoidance and enforcement dynamics reshapes compliance costs, competition, and innovation incentives.

In conclusion, our findings show that digitalisation disrupts the tax ecosystem by simultaneously facilitating avoidance and offering new mechanisms to counter it. RQ1 highlighted novel avoidance channels and methodological challenges in measuring digitalisation; RQ2 examined emerging but contested policy responses; and RQ3 revealed that both transparency gains and unintended loopholes drive digital technology adoption. The literature remains fragmented and largely country-specific, underscoring the need for coordinated, cross-disciplinary research in tax accounting, tax law, and tax policy and economics. Addressing these gaps is essential for a coherent understanding of how digital technologies reshape taxation in the 21st century.

1.8 Key findings

This chapter has revealed the multifaceted role of digital technology and its inverse causal relationship with corporate tax avoidance. Digital technology represents a new way of conducting business and affects tax avoidance. Specifically, digital technology can be understood as: (i) a tool enabling the digital shift of business operations (e.g., e-commerce and digital transformation); (ii) a new form of tax policy resulting from the incorporation of digital technology into tax systems (e.g., DST); and (iii) the outcome of specific tax incentives aimed at fostering corporate digital growth.

These different manifestations of digital technology affect corporate tax avoidance in distinct ways. Digital business operations contribute both to enhanced tax transparency and to greater business intangibility, thereby respectively reducing and increasing levels of tax avoidance. By contrast, the implementation of digital technology within tax policy is intended to counteract the more intangible forms of tax avoidance that have emerged in the

aftermath of digitalized business operations. Finally, digital technology also emerges as the result of traditional tax incentives, reflecting governments' willingness to promote corporate digital growth.

Chapter 2
Navigating the crypto transition: the risk disclosure. A manual for beginners[viii]

2.1 Introduction

Since the introduction of Bitcoin in 2009, the proliferation of crypto has generated significant implications. To date, accounting and tax authorities continue to face challenges in determining an appropriate classification and reporting framework for crypto. According to Coinbase, crypto fall within the broader category of digital assets, understood as digital representations of items created and maintained electronically[ix].

The objective of this study is to examine the risk disclosure practices of firms holding crypto, focusing on the accounting strategies adopted across distinct crypto-related business activities.

Following the diffusion of crypto, the European Financial Reporting Advisory Group (EFRAG) defined digital assets as "a digital representation of value or contractual rights created, transferred and stored on some types of distributed ledger technology" (EFRAG, 2020: 6). However, clear accounting guidance did not emerge until 2019, when the International Accounting Standard Board (IASB) released the paper *Holding of Crypto*, providing the first interpretative direction. Under this guidance, crypto are to be recognised under IAS 2 *Inventories* when held for sale, or otherwise under IAS 38 *Intangible Assets* (IASB, 2019). Crypto are widely characterised by high levels of risk and uncertainty (Klopper and Brink, 2023; Huang et al., 2023; Wang, 2025), which in turn affect measurement appropriateness (Klopper and Brink, 2023; Huang et al., 2023; Luo and Yu, 2024). Moreover, the accounting treatment varies according to the different crypto business models: firms may engage in crypto mining, crypto trading, or hold crypto for payment-

[viii] This chapter was submitted and accepted for discussion at the EAA Congress which will be held in Prague from the 27th to 29th May, 2026.
[ix] Coinbase. https://www.coinbase.com/it/learn/crypto-basics/what-are-digital-assets (last access on December 12th, 2025).

related purposes (Luo and Yu, 2024). There is evidence that more stringent accounting rules influence firms' recognition choices (Anderson et al., 2025). Although crypto share some economic characteristics with financial assets traded on markets, they are not classified as such under current IFRS standards (IASB, 2019).

In line with IASB recommendations, firms holding crypto must comply with IAS 1 *Presentation of Financial Statements* by providing supplementary disclosures relating to crypto holdings. Additionally, they are required to disclose valuation-related information in accordance with IAS 2 or IAS 38, and, where fair value measurement is applied, to comply with IFRS 13 *Fair Value Measurement*. Nevertheless, due to the volatility and uncertainty surrounding crypto markets, IFRS 13 frequently fails to adequately capture their underlying economic value (Klopper and Brink, 2023; Huang et al., 2023).

The rise of digital technologies has amplified the relevance of risk and uncertainty within corporate reporting (Gao et al., 2020). Firms generally communicate such risks within a designated risk disclosure section, which, under IFRS, often remains voluntary. No mandatory disclosure requirements currently exist regarding crypto transactions or cybersecurity matters. Prior literature demonstrates that risk disclosure provides valuable informational content for investors (Tan et al., 2017; Kravet and Muslu, 2013; Jin et al., 2024), supports corporate performance (Ibrahim and Aboud, 2024), and fosters corporate innovation (Au and Tan, 2025). The complexity and uncertainty of crypto markets generate considerable risk (Klopper and Brink, 2023; Huang et al., 2023). Firms facing greater uncertainty tend to issue more extensive risk disclosures, particularly when experiencing financial distress (Jin et al., 2024).

Furthermore, the linguistic features of risk disclosure have evolved, with firms, especially those in the ICT sector, increasingly emphasising cybersecurity risks (Gao et al., 2020). As noted by Gao et al. (2020:1), "disclosures have also become more difficult to read in general". Empirical findings by Alsadoun and Albaz (2025) suggest that enhanced cybersecurity disclosures may reduce stock return volatility. Despite the documented exposure to fraud (Kerr et al., 2023) and the substantial uncertainty associated with crypto holding (Klopper and Brink, 2023; Huang et al., 2023), no specific accounting framework currently governs the disclosure of asset-specific risks of crypto.

These considerations underscore the need for more comprehensive crypto accounting regulation, given the implications of crypto volatility for firms' future performance (Lou and Yu, 2024; Yousef, 2024) and the demonstrated relevance of risk disclosure for investors (Tan et al., 2017; Kravet and Muslu, 2013; Jin et al., 2024), corporate outcomes (Ibrahim and Aboud, 2024), and innovation (Au and Tan, 2025).

Since firms holding crypto (i) adapt their accounting policies according to their business models (Luo and Yu, 2024), (ii) are influenced by existing crypto-related accounting regulations (Anderson et al., 2025), and (iii) may be exposed to cybersecurity threats (Alsadoun and Albaz, 2025; Gao et al., 2020), this study investigates how these firms manage risk and uncertainty through their risk disclosure practices.

To analyse such disclosures, in this chapter Braun and Clarke's (2006; 2019) Reflexive Thematic Analysis is applied, examining how risk communication differs across crypto-related business lines and identifying risk areas not adequately addressed by the current accounting framework.

This study contributes to the literature by providing foundations for the development of new accounting principles tailored to the specific characteristics of crypto. Enhanced disclosure may improve stakeholders' understanding of the profound uncertainty surrounding crypto markets. The findings also enrich the debate on the appropriate accounting recognition and measurement of crypto-assets, while offering new evidence on the emerging relevance of cybersecurity-related disclosures among firms with crypto exposure. Finally, the study calls for regulators to introduce more detailed, business-line-specific disclosure requirements for crypto, emphasising the need to transition from traditional accounting approaches to reporting frameworks suited to a digital economic environment.

2.2 Literature background

2.2.1 Crypto accounting regulation

The IASB has established that crypto must be recognised in accordance with IAS No. 2 when they are held for sale, or otherwise under IAS 38 (IASB, 2019). In addition, IAS 1

Presentation of Financial Statements requires firms to disclose supplementary information that substantiates the values assigned to crypto reported in their financial statements (IASB, 2019). Building on the specific guidance for the accounting treatment of crypto, the IASB further clarified that such supplementary disclosures should follow the requirements of IAS 2, IAS 38, and IAS 10 *Events After the Reporting Period* (IASB, 2019). When fair value is applied, firms are also expected to comply with the disclosure provisions set out in IFRS 13 *Fair Value Measurement* (IASB, 2019). Moreover, given that crypto do not qualify as legal tender (Wang, 2025), IFRS standards do not classify them as financial assets, thereby excluding the applicability of IAS 32 *Financial Instruments: Presentation* (IASB, 2019).

Scholars have highlighted that the features of crypto diverge substantially from those of the traditional asset categories encompassed by IAS 2 (inventories) and IAS 38 (intangible assets) (Klopper and Brink, 2023). When the revaluation model under IAS 38 is applied, the significant volatility of crypto prices compromises the reliability of fair value estimates (Klopper and Brink, 2023). Furthermore, the absence of a legally recognised market undermines the ability of firms to identify an authoritative reference point for fair value measurement (Klopper and Brink, 2023). Prior evidence by Luo and Yu (2024) indicates that the recognition of corporate cryptocurrency exposure under IAS 2 and IAS 38 is contingent upon the firm's specific business activity, such as crypto mining, crypto trading, or the use of crypto as a medium of payment.

2.2.2 Accounting for the firm's risk: the disclosure

Knight (1921) was the first to conceptualise the distinction between *risk* and *uncertainty*. He defined risk as a condition in which the likelihood of outcomes is measurable and amenable to quantitative assessment, whereas uncertainty refers to situations in which such measurement is not possible (Knight, 1921).

A consolidated stream of research has demonstrated that risk disclosure provides relevant informational benefits to investors (Tan et al., 2017; Jin et al., 2024). Accounting scholars have examined its implications for firm value (Ibrahim & Aboud, 2024) and have identified it as a key determinant of investors' expectations regarding firms' future performance

(Alsadoun and Albaz, 2025; Ibrahim & Aboud, 2024; Jin et al., 2024; Kravet and Muslu, 2013; Tan et al., 2017). Prior literature also documents that risk disclosure influences stock market outcomes (Kravet and Muslu, 2013; Tan et al., 2017; Alsadoun and Albaz, 2025) and affects default risk (Jin et al., 2024).

Kravet and Muslu (2013) report a positive association between changes in risk disclosure and changes in stock return volatility. Tan et al. (2017) extend this line of inquiry by analysing stock price synchronicity, measured through the co-movement of firm-level and market-level returns, and show that firms providing more extensive risk disclosure exhibit lower synchronicity. Jin et al. (2024) further find that more detailed risk disclosure is linked to higher default risk. Consistent with these findings, Tan et al. (2017) observe that multinational firms, which operate in more uncertain environments, tend to disclose more risk-related information. Nonetheless, the voluntary nature of risk disclosure may weaken its credibility and informational value (Kravet and Muslu, 2013). When risk disclosure shifts from a voluntary to a mandatory requirement, it has been shown to hinder corporate innovation—an effect particularly pronounced in high-risk investment environments and in financially constrained firms (Au and Tan, 2025).

To date, most empirical studies have focused on firms operating under traditional business models (e.g., Tan et al., 2017). More recent contributions have examined firms adopting advanced digital technologies, which have increasingly begun to disclose information on cybersecurity risks (Alsadoun and Albaz, 2025; Gao et al., 2020). Cybersecurity disclosures relate to potential cyber-attacks and data breaches that organisations may encounter (Gao et al., 2020). In ICT-intensive firms, risk disclosure encompasses not only traditional operational risks but also cybersecurity-related threats (Alsadoun and Albaz, 2025). The growing prevalence of cybersecurity-related terminology in corporate communication is associated with reduced investment in intangible assets and with firms' prior exposure to cyber incidents (Gao et al., 2020). ICT firms, in particular, employ cybersecurity terms more frequently in their disclosures (Gao et al., 2020). Moreover, cybersecurity-related disclosures have been positively associated to firm value, contributing to a reduction in stock return volatility (Alsadoun and Albaz, 2025).

Research question

RQ: How do corporate crypto holders disclose information about their crypto-related risk across different crypto business lines?

2.3 Research design and empirical investigation

In the Stage (i), we aim to collect annual reports from Orbis by Moody's using the following Query (1) and Query (2).

Q: (i) active firms; (ii) firms IFRS adopters; (iii) listed enterprises; (iv) segment: "Corporate"; (v) Form: "Business"; (vi) keyword: "crypto"

(1)

Q: (i) active firms; (ii) firms IFRS adopters; (iii) listed enterprises; (iv) segment: "Corporate"; (v) Form: "Business"; (vi) keyword: "digital currenc"*

(2)

We manually gathered data from publicly available annual reports of firms holding crypto over 2021-2023 fiscal years. The search initially generated 55 observations for each fiscal year, of which 35 firms were ultimately identified and retained as corporate crypto holders over the period selected.

Table 5 provides an overview of the firms included in the final sample, selected on the basis of Query (1) and Query (2).

Table 5. Descriptive statistics of corporate crypto holders

Name	Fiscal year	Country	NACE Rev. 2 industry code	Crypto business line	Size			ROA			Net profits*		
					2021	2022	2023	2021	2022	2023	2021	2022	2023
ARGO BLOCKCHAIN PLC	2023	United Kingdom	6311	Crypto mining	12,74	11,55	11,14	0,15	-1,07	-0,26	36.491	-225.663	-31.346
BANXA HOLDINGS INC.	2023	Canada	6619	Crypto service provider	9,66	9,23	9,22	0,14	-0,63	-0,29	-3.687	-11.455	-5.711
BIGG DIGITAL ASSETS INC	2023	Canada	5829	Crypto trading	11,57	10,75	11,35	-0,05	-0,22	-0,13	-4.834	-30.431	-7.554
BLOCKMINT TECHNOLOGIES INC	2023	Canada	5829	Crypto mining	7,80	7,40	7,34	-0,20	-0,27	-0,06	-994	-791	-48
BLUESKY DIGITAL ASSETS CORP	2023	Canada	5829	Crypto trading	8,70	7,21	6,40	-0,54	-4,16	-3,06	-4.327	-5.099	-2.773
CRYPTOSTAR CORP	2023	Canada	6311	Crypto mining	10,39	9,83	9,35	-0,04	-0,45	-0,33	-3.058	-15.627	-5.080
CYPHER METAVERSE INC.	2023	Canada	6619	Crypto mining	8,01	7,30	6,53	-1,78	-0,36	-0,30	-9.123	-2.237	-1.066

FINTECH SELECT LTD.	2023	Canada	6419	Crypto service provider	6,73	5,81	5,94	-0,06	-2,01	0,47	-77	824	225
GRAPH BLOCKCHAIN INC.	2023	Canada	6619	Decentralised finance	8,98	9,04	7,03	-0,80	-0,45	-4,38	-10.328	-17.834	-5.632
HIVE BLOCKCHAIN TECHNOLOGIES LTD.	2023	Canada	6311	Crypto mining	12,92	12,10	12,56	0,15	-0,64	-0,15	71.725	-217.399	-47.364
LUXXFOLIO HOLDINGS INC.	2023	Canada	5829	Crypto mining	9,66	8,77	3,98	-0,05	-1,94	-8,41	-1.545	-16.328	-2.675
NEPTUNE DIGITAL ASSETS CORP.	2023	Canada	5829	Crypto mining	10,51	10,22	10,02	-0,04	-0,46	0,04	-397	-16.072	-3.485
NORTHERN DATA AG	2023	Germany	2620	Crypto trading	13,59	13,02	13,85	0,31	-0.56	-0.14	287.159	-265.775	-151.055
PHOENIX GROUP PLC	2023	United Emirates	6420	Crypto mining	12,96	12,28	13,53	0.09	0.63	-0.14	37.421	130.205	188.036
SOL STRATEGIES INC.	2023	Canada	6311	Crypto trading	9,96	9,79	9,38	-0.05	-0.06	-0.00	-796	268	-4.386
SPIRIT BLOCKCHAIN CAPITAL INC	2023	Canada	6311	Crypto service provider	7,93	6,23	6,66	-0.13	-0.73	-0.43	-6.992	-2.338	-1.343
WORLDLINE	2023	France	7490	Crypto service provider	16,81	16,90	16,89	-0.02	0.02	-0.04	-740.100	303.800	-958.400

The research design adopts the thematic analysis.

To analyse how firms disclose and manage crypto-related risks, we employed Reflexive Thematic Analysis. This methodological approach, originally developed within the field of psychology and first formalised as Thematic Analysis by Braun and Clarke (2006), was subsequently refined and expanded in their work, in 2019. Following the most recent articulation of the method (Braun and Clarke, 2019), this study adopts the Reflexive Thematic Analysis framework, which unfolds across six iterative phases:

a. *Data familiarisation*: an in-depth reading of the risk disclosure sections contained in the annual reports of the firms included in the sample;
b. *Generating codes*: identification and assignment of codes based on salient features emerging from the data;
c. *Generating themes*: aggregation of the codes into broader conceptual categories or themes;
d. *Reviewing themes*: assessment of the coherence and consistency of the relationships between codes and themes;
e. *Themes' definition*: formulation of clear definitions for each theme identified;
f. *Producing the report*: development of an analytical narrative describing the relationship between themes and codes and illustrating how the themes interact with one another.

Phase a) Data familiarisation

In Phase (a), the researchers engage in an initial examination of the dataset to identify preliminary patterns and establish a foundation for subsequent interpretation (Braun and Clarke, 2006; 2019; Ahmed et al., 2025). This phase supports both the breadth and depth of the analytical process, enabling a comprehensive understanding of the material (Braun and Clarke, 2006; 2019; Ahmed et al., 2025). A key objective of this stage is the identification of latent meanings embedded in the data, which is essential for informing the subsequent phases of coding and theme development (Braun and Clarke, 2006; 2019; Ahmed et al., 2025).

In our study, *Phase a)* involved a detailed reading of the risk disclosure sections contained in the annual reports of the corporate crypto holders. This initial immersion allowed us to familiarise ourselves with the content and nuances of the disclosures and provided an early basis for the code-theme associations developed in *Phase (b)* and *Phase (c)*. More specifically, this preliminary step was instrumental in outlining tentative codes and themes and in considering their potential interrelationships.

Phase b) Generating codes

Phase (b), *Generating Codes*, concentrates on identifying salient features within the dataset (Braun & Clarke, 2006; Ahmed et al., 2025) in order to detect meaningful patterns (Ahmed et al., 2025). This phase requires both a systematic organisation of the data and an interpretative effort aligned with the analytical objectives of the study (Braun & Clarke, 2006; Ahmed et al., 2025).

The purpose of this research is to analyse how firms disclose risks associated with their crypto holdings, noting that such risks are classified into various sub-categories, some of which fall within the scope of IFRS requirements. Insights gained during *Phase a)* indicated that crypto-related risks appear in two distinct forms: disclosures mandated under IFRS 7 and crypto-specific disclosures provided voluntarily. IFRS 7 *Financial Instruments: Disclosures* imposes mandatory reporting for certain risks, most notably credit risk, liquidity risk, and market risk (IASB, 2020). However, crypto are not recognised as financial assets under IFRS (IASB, 2019), they do not fall under the asset-specific disclosure requirements of IFRS No. 7.

For this reason, our first coding category differentiates between risks disclosed in accordance with IFRS No. 7 and those disclosed voluntarily by firms, which fall outside the standard's scope.

Additionally, corporate crypto holding involves various business activities, such as crypto mining, crypto trading, and the crypto as service providers (Anderson et al., 2025; Luo & Yu, 2024). Consequently, our second coding category captures these distinct crypto business lines. Consistent with Luo and Yu (2024), we excluded the use of crypto purely as a mean of

payment, as none of the firms in our sample hold crypto for this purpose; instead, their core operations are directly related to crypto-based activities.

Table 6 presents a summary of the coding structure developed in this phase.

Table 6. *Phase b) Generating codes*

Phase b) Generating codes	***Phase b) Generating codes* Code Tag (IFRS/non-IFRS)**		***Phase b) Generating codes* Code Tag (Crypto Business Line)**			
	IFRS	Non-IFRS	Crypto Mining	Crypto Trading	Crypto Provider	Service
Anti-Money Laundering	*			*	*	
Centralised Platforms Use	*	*	*		*	
Crypto Accounting Recognition	*		*			
Crypto Comminglin g	*		*	*	*	
Crypto Custody	*		*			
Crypto Disclosure	*		*			
Crypto Diversificati on	*		*			
Crypto Energy Consumptio n		*	*			
Crypto Exchanges Platforms	*				*	

Crypto Fair Value Volatility		*	*	*	
Crypto Halving		*	*		
Crypto Holding	*			*	
Crypto Loss		*	*	*	*
Crypto Market Monitoring	*		*		
Crypto Price Decline		*	*	*	
Crypto Price Fluctuations	*	*	*	*	*
Crypto Price Increase	*		*		
Crypto Theft		*	*	*	*
Crypto-Fiat Currency Conversion	*		*		
Decentralised Platforms Use	*	*	*		
Digital Technology Implementation		*	*		
Energy Regulation		*	*		
Hard fork and air drop risks		*	*	*	
Regulation Oversight		*	*		*

Security Policy		*	*	*	
Staking		*	*		
Technology Obsolescence		*	*		
Uncertainty of crypto price performance		*	*		
Unregulated Crypto Exchanges	*	*		*	*

Table 6 reports the coding of risk disclosures analysed.

2.4 Phase c) Generating themes

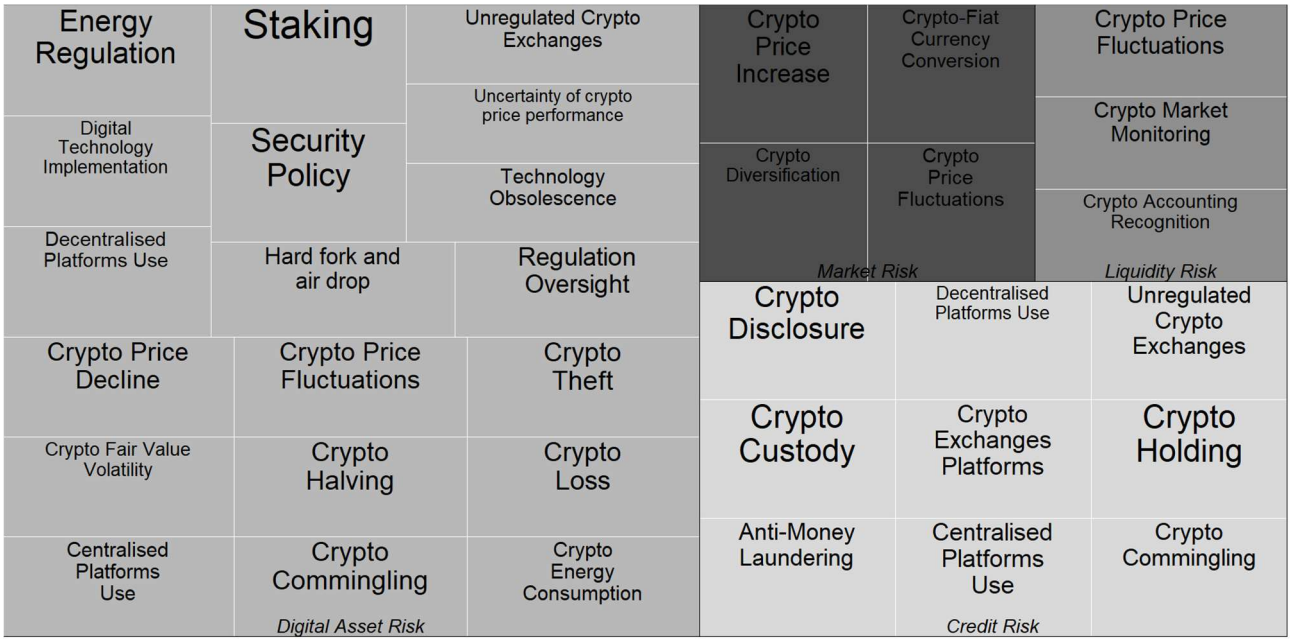
Phase c) aims at grouping the codes identified in *Phase b)* into unified patterns. This phase identifies the commonalities and differences between codes and examines how they interact with each other. According to Braun & Clarke (2006), the definition of themes is not merely a labelling exercise; it is a dynamic process of revision aimed at building a representative structure of interaction, which can also include sub-themes. Furthermore, when defining theme labels, they should not simply summarize the data but rather capture the underlying "diversity of meaning" related to a specific topic (Braun and Clarke, 2019: 11).

The hybrid coding used in *Phase b)* generates two clusters of themes: one derived from IFRS risks and the other from non-IFRS risks. Specifically, our analysis identifies themes reflecting the use of specific codes across different types of risks.

We grouped the themes according to the mandatory IFRS No. 7 risk disclosure of financial instruments, using *Market Risk*, *Liquidity Risk* and *Credit Risk*. For non-IFRS risk reporting, based on the structure and the meaning provided in each section of risk disclosure of sampled firms, we captured a general cluster containing crypto risks, labelled as *Digital Asset Risk*.

In Figure 1, we visually represent the themes and their association with the codes, as identified in *Phase b) Generating codes*.

Figure 2. Visual representation of *Phase c) Generating themes*-general overview



In Figure 2, we visualise the themes (in italics) and associated codes.

In Figure 1, the representation includes all the types of corporate crypto holders, without distinction by their crypto business line. Hence, after this general overview, we presented in Table 7 the path Code (*Phase b) Generating codes*)→Themes (*Phase c) Generating themes*)→Crypto Business Line.

Table 7. Code-Crypto Business Line-Theme matrix. *Phase c) Generating Themes*

Labels	***Phase b) Generating codes* Code Tag (IFRS/non-IFRS)**		***Phase b) Generating codes* Code Tag (Crypto Business Line)**			***Phase c) Generating themes***
	IFRS	Non-IFRS	Crypto Mining	Crypto Trading	Crypto Service Provider	
Anti-Money Laundering	*			*	*	***Credit Risk***
Centralised Platforms Use	*	*	*		*	***Credit Risk, Digital Asset Risk***
Crypto Accounting Recognition	*		*			***Liquidity Risk***
Crypto Commingling	*		*	*	*	***Credit Risk, Digital Asset Risk***
Crypto Custody	*		*			***Credit Risk***
Crypto Disclosure	*		*			***Credit Risk***
Crypto Diversification	*		*			***Market Risk***
Crypto Energy Consumption		*	*			***Digital Asset Risk***
Crypto Exchanges Platforms	*				*	***Credit Risk***
Crypto Fair Value Volatility		*	*	*		***Digital Asset Risk***
Crypto Halving		*	*			***Digital Asset Risk***
Crypto Holding	*			*		***Credit Risk***

Crypto Loss		*	*	*	*	***Digital Asset Risk***
Crypto Market Monitoring	*		*			***Liquidity Risk***
Crypto Price Decline		*	*	*		***Digital Asset Risk***
Crypto Price Fluctuations	*	*	*	*	*	***Market Risk, Liquidity Risk, Digital Asset Risk***
Crypto Price Increase	*		*			***Market Risk***
Crypto Theft		*	*	*	*	***Digital Asset Risk***
Crypto-Fiat Currency Conversion	*		*			***Market Risk***
Decentralised Platforms Use	*	*	*			***Credit Risk, Digital Asset Risk***
Digital Technology Implementation		*	*			***Digital Asset Risk***
Energy Regulation		*	*			***Digital Asset Risk***
Hard fork and air drop		*	*	*		***Digital Asset Risk***
Regulation Oversight		*	*		*	***Digital Asset Risk***
Security Policy		*	*	*		***Digital Asset Risk***
Staking		*	*			***Digital Asset Risk***
Technology Obsolescence		*	*			***Digital Asset Risk***

Uncertainty of crypto price performance		*	*			***Digital Asset Risk***	
Unregulated Crypto Exchanges	*	*		*	*	***Credit Risk, Digital Asset Risk***	

CREDIT RISK, MARKET RISK, and LIQUIDITY RISK are categorized as associated to the IFRS mandatory risk disclosure according to the IFRS No. 7; while non-IFRS risks (DIGITAL ASSET RISK) is associated to the voluntary corporate risk disclosure.

2.5 Phase d) Reviewing themes

Phase d) Reviewing themes completes the theme definition, by checking whether the association between codes and themes carried out in the previous phases is a fair representation of patterns (Braun and Clarke, 2006). According to Braun & Clarke (2021), a code captures only one feature of an observation, in this specific case a single firm, while themes represent the broader, multifaceted nuances of phenomena. In this research, in order to capture this dynamism, we checked the association between codes and themes using a matrix, by capturing the codes-themes association and mapping each code onto the corresponding crypto business line.

In Table 8, we report the *Phase d)*.

Table 8: Codes-themes dynamism. *Phase d) Reviewing themes*

Phase b) Generating codes	***Phase c) Generating Themes***			
	Credit Risk	***Digital Asset Risk***	***Liquidity Risk***	***Market Risk***
Anti-Money Laundering	*b, c			
Centralised Platform Use	*c	*a		
Crypto Accounting Recognition			*a	
Crypto Commingling	*a, b, c	*a		
Crypto Custody	*a			
Crypto Disclosure	*a			
Crypto Diversification				*a
Crypto Energy Consumption		*a		
Crypto Exchanges Platforms	*c			
Crypto Fair Value Volatility		*a, b		
Crypto Halving		*a		
Crypto Holding	*b			
Crypto Loss		*a, b, c		
Crypto Market Monitoring			*a	
Crypto Price Decline		*a, b		
Crypto Price Fluctuations		*a, b, c	*a	*a
Crypto Price Increase				*a
Crypto Theft		*a, b, c		
Crypto-Fiat Currency Conversion				*a

Decentralised Platform Use	*a	*a
Digital Technology Implementation		*a
Energy Regulation		*a
Hard Fork & Air Drop		*a, b
Regulation Oversight		*a
Security Policy		*a, b
Staking		*a
Technology Obsolescence		*a
Uncertainty Of Crypto Price Performance		*a
Unregulated Crypto Exchanges	*b, c	*b, c

[a] relates to crypto mining business line; [b] distinguishes crypto trading business line; [c] stands for crypto service provider business line. The codes in *italics* are associated to more than one theme.

2.6 Phase e) Themes' definition

Phase e) Themes' definition relates to the final assignment of labels to the themes, once the check about the themes-codes association is done.

We identified *Credit Risk*, *Digital Asset Risk, Liquidity Risk*, *Market Risk* as the themes for our analysis. *Credit Risk*, *Market Risk* and *Liquidity Risk* are associated to the IFRS risks, whereas *Digital Asset Risks* are attributed to the non-IFRS risks.

IFRS risks are the risks mandatorily provided by the IFRS No. 7; while the non-IFRS risks are the risks voluntarily reported by the companies.

IFRS risks

According to the IASB (2020) the IFRS No. 7, *Market Risk* is "[t]he risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices" (IASB, 2020: A316); *Liquidity Risk* is "[t]he risk that an entity will encounter difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial asset" (IASB, 2020: A316); *Credit Risk* is "[t]he risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation" (IASB, 2020: A316).

Non-IFRS risks

We identified *Digital Asset Risk* as the risk involving the specific technology adoption related to crypto. This theme is built upon the definition provided by each sampled firm and the *Phase b) Generating codes* because there is not a definition within the accounting regulation. Moreover, under IASB principles there is not a mandatory disclosure about the cybersecurity. Hence, based on these crypto holder firms, we defined this risk on different degrees such as the use of the digital platforms (centralised vs. decentralised); crypto commingling; fair value measurement for crypto recognition; crypto halving; the loss of access of crypto; the hard fork and air drop; regulation oversight; security policy to mitigate the specific crypto risks; staking activities.

2.7 Phase f) Report

In this phase there is the narrative related to the interpretation of each theme and how they interact with *(i)* the nature of risk disclosure, either mandatory (IFRS) or voluntary (non-IFRS), and *(ii)* the crypto business lines.

IFRS risk

Market Risk relates to (i) Crypto Diversification; (ii) Crypto Price Fluctuations; (iii) Crypto-Fiat Currency Conversion; and (ii) Crypto Price Increase, as elements of potential accounting loss. All are associated to crypto mining.

Under *Liquidity Risk*, corporate crypto holders associate (i) Crypto Accounting Recognition, (ii) Crypto Market Monitoring, and (iii) Crypto Price Fluctuations to the ability to meet future financial obligations. All these features are common to corporate crypto holders engaged in crypto mining activities.

Under *Credit Risk*, corporate crypto holders associate (i) Anti-money laundering; (ii) Centralised Platform Use; (iii) Crypto Commingling; (iv) Crypto Custody; (v) Crypto Disclosure; (Vi) Crypto Exchanges Platforms; (vii) Crypto Holding; (viii) Decentralised Platform Use; (ix) Unregulated Crypto Exchanges, as elements provoking a potential loss for the other party who fails to pay the financial obligation. The *Credit Risk* is distributed among all three different types of crypto business lines.

Non-IFRS risk

For *Digital Asset Risk*, firms consider (i) Energy Regulation; (ii) Regulation Changes; (iii) Technology Obsolescence as factors responsible for undermining the future of corporate crypto operations. All claims are reported by firms operating in crypto mining.

Additionally, (i) Crypto Accounting Recognition; (ii) Crypto Loss; (iii) Crypto Theft; (iv) Decentralised Platform Use; (v) Security Policy; (vi) Technology Obsolescence; (vii) Unregulated Crypto Exchanges are relevant as potential sources of data leaks. These issues apply across crypto miners, crypto traders, and crypto service providers.

Finally, (i) Crypto Fair Value Volatility; (ii) Crypto Halving; (iii) Crypto Price Fluctuations; (iv) Crypto Price Decline; (v) Digital Technology Implementation; (vi) Regulation Changes; (vii) Staking. Crypto fluctuations and the general volatility of crypto price are recognised as pivotal for future declines in corporate performance and operational changes among crypto mining and trading firms. Other features relate solely to crypto mining activity.

It is noteworthy that the Crypto Energy Consumption is perceived as a negative consequence for environmental sustainability, only among crypto holders involved in crypto mining.

Crypto business lines

Under the mandatory disclosure of crypto risk, *Market Risk* and *Liquidity Risk* are associated with crypto mining. Crypto miners attribute to the crypto activity the volatility of fair value and the cash flows of financial instruments (*Market Risk*) and the potential failure to meet financial obligation (*Liquidity Risk*). On the other hand, *Credit Risk* and *Digital Asset Risk* affect all the corporate crypto holders, with a prevalence of corporate crypto miners.

2.8 Discussion

This paper investigates the risk disclosure of corporate crypto holders, focusing on the different disclosure provided by crypto holders, either in line with IFRS, or out of IFRS provisions. We show a certain dynamism of crypto features (codes) across different risk disclosures (themes), and document how the codes-themes association varies across different crypto business lines, namely crypto mining, crypto trading, and crypto service provider.

Risks disclosed in line with IFRS provisions

Price Fluctuations, Decentralised Platforms, Crypto Diversification and Crypto-Fiat Conversion lead the *Market Risks* associated to crypto holdings, as driving market fluctuations determinant for the fair value and cash flows of financial instruments. Both financial press and previous academic research (Klopper and Brink, 2023; Huang et al.,

2023) highlight the inherent uncertainty associated with crypto markets, which is somewhat connected with the uncertainty of financial markets in general, working as an early warning system that markets are unwell (e.g., Martin, 2025). On the other side, in the same disclosure the term of crypto diversification is the literature is associated to the instrument used for the risk mitigation.

The use of decentralised platforms is pivotal for fair value and cash flow trend of financial instruments. Decentralised exchanges facilitate transactions, particularly those involving crypto, without the involvement of intermediaries or third parties (Mohan, 2022). In the absence of custodial services, decentralised exchanges rely on liquidity pools in which token holders deposit their assets (Mohan, 2022). These pools operate through smart contracts that underpin the functioning of the platform (Mohan, 2022; Schär, 2021). A key advantage of using a decentralised exchange is that investors retain direct control over their assets, eliminating the need to trust a third-party custodian (Mohan, 2022; Schär, 2021). However, the architecture of decentralised exchanges is complex and often entails high transaction fees (Mohan, 2022). Based on the results of our empirical analysis, risk mitigation in crypto-related transactions depends largely on the technological infrastructure supporting exchanges. The use of decentralised platforms reduces custodial failure risk arising from reliance on intermediaries (Mohan, 2022; Schär, 2021). Therefore, the fluctuations of fair value and cash flows might be associated to this risk of failure of technological architecture and the informatic structure on which traders should rely when using the centralised platforms. In other words, the use of decentralised exchanges might offset the targeted market risk due to reduced security issues as in centralised exchanges. Within our sample, only firms engaged in crypto mining expressed concerns regarding these specific market risks, which suggests that crypto traders and crypto service providers are partially unaware of this risk, thus providing lacunose risk disclosure.

Another point worth to be investigated is the accounting recognition of crypto-related liquidity risk. The corporate crypto miners associate fair value and price volatility of crypto to the future fulfilment of financial obligations. Specifically, within the revaluation model of IAS No. 38, the crypto price fluctuations undermine the reliability of accounting values

(Klopper and Brink, 2023) and create disparities among firms using the same accounting rules (Luo and Yu, 2024). Therefore, this research documents that the uncertainty from future liquidity risk is also due to the unstable accounting measurement. We add to previous research, strongly recommending the adoption of crypto-tailored accounting principles instead of adapting the existent accounting rules (Jackson and Luu, 2023; Klopper and Brink, 2023). Having a well-established accounting for crypto principles might reduce the liquidity risk of crypto holding firms.

As a novel in the accounting research, crypto commingling, associated to the *Credit Risk*, might potentially imply a financial loss for the counterpart as well as the type of crypto exchange platform where crypto transactions occur. Crypto commingling is defined as a crypto transaction recorded only by the exchange and not on the blockchain[x] with the possible consequence of risk about the occurrence of transaction[xi]. Additionally, the counterparty risk, and the consequent potential loss, might be offset with decentralised exchanges (Schär, 2021). In fact, the use of decentralised exchanges could perform, in one single time, the crypto transaction without the presence of a centralised platform (Schär, 2021). These types of risks are particularly concerning crypto miners, while crypto service providers claim the importance of anti-money laundering policies. The crypto service providers carry out a crypto transaction in the place of clients (Regulation (EU) 1114/2023), but the jeopardised regulation about the crypto "beast" (Knutter, 2022) opens the door to the illicit transactions (Benson et al., 2024). This regulation was enacted in 2024 with the Directive (EU) 2024/1640 where the centralised transactions, including the crypto-related should be controlled and monitored to limit the unlawful practices connected to the financial crime of money laundering related to crypto.

We uncovered the crypto disclosure under the mandatory IFRS No. 7, showing that, although the exclusion of crypto from the cluster of financial assets, the corporate crypto holders reported them in the mandatory section of risk disclosure. The association of these features to a mandatory risk disclosure opens the ways to different interpretations, in

[x] Banxa Holding Inc. Annual report 2023
[xi] Sol Strategies Inc. Annual report 2023

particular at the crossroad of legal and accounting regulation. IASB started recommending treatments for the crypto accounting only in 2019 when the legal provisions were still at an embryonal stage of development. Then, between 2022 and 2023, the European union and the Organisation for Economic Cooperation and Development (OECD) laid down the first rules about crypto and their classification. While the accounting standard setter excludes to treat crypto as financial assets, the Regulation (EU) 1114/2023 hypothesizes two different types of crypto: crypto deemed as financial instruments according to the European Securities Market Authority (ESMA) guidelines[xii] and crypto that do not qualify as financial instruments. This complex framework supports the emerging accounting orientation that the crypto market mechanisms need specific rules for their recognition (Jackson and Luu, 2023; Klopper and Brink, 2023).

Non-IFRS disclosure of risks

Voluntary risk disclosure on crypto uncertainty is dominated by the role of regulation and cybersecurity risks as well as energy consumption. Given that the crypto mining relies completely on the pure digital proceedings, the levels of technology play a crucial role for the future crypto operations, as claimed by corporate crypto holders. We document that technology obsolescence raises uncertainty, because it may limit the crypto business due to corporate competitiveness lags. The average life of informatic structure needed to perform a crypto mining activity is esteemed around 1.5 years (de Vries and Stoll, 2021). Hence, given the entirely reliance of crypto mining activity on the digital support, proper accounting recognition criteria should be provided by standard setters, in order to report properly the sudden obsolescence flipping the future crypto operations.

As a specific threat of cybersecurity (spread also in case of credit risk), the type of crypto exchange platforms, if centralised or decentralised, may affect the failure of transaction and data leaks. Centralised platforms are based on a trust relationship between the investors and the intermediaries which invest and offer services to the consumers. They suffer of potential

[xii] ESMA (2025). Guidelines On the conditions and criteria for the qualification of crypto-assets as financial instruments. https://www.esma.europa.eu/sites/default/files/2025-03/ESMA75453128700-1323_Guidelines_on_the_conditions_and_criteria_for_the_qualification_of_CAs_as_FIs.pdf

data leaks due to hacking activities with the consequent crypto losses as well as the little regulation to which they are subjected (Mohan, 2022; Schär, 2021). On the other side, the adoption of decentralised platform reduces the counterparty risk, by avoiding the crypto losses through the execution of a single transaction where the owner does not lose the crypto property (Mohan, 2022; Schär, 2021). According to the prior studies (Alsadoun and Albaz, 2025; Gao et al., 2020) the threat to the cybersecurity is becoming relevant especially for the digital firms and, in the specific cases of precedent cyberattacks, the firms disclose more information about digital security (Gao et al., 2020). Accordingly, in our analysis the technology obsolescence of infrastructure is an important factor for the cybersecurity risk. It is puzzling whether the use of extended cybersecurity disclosure depends on previous cyberattacks or on the inherent risk of crypto transactions. On a pure accounting level, the cybersecurity risk is associated with the crypto accounting recognition, highlighting how the accounting principles dominating the crypto recognition lack the digital component, in line with the emerging literature on the topic (Klopper and Brink, 2023; Huang et al., 2023).

The exaggerate use of energy for crypto mining activities with harmful effects on environment (de Vries and Stoll, 2021; Wendl et al., 2023) is known to spend a huge amount of energy in the process of crypto validation (OECD, 2022). The traditional internet protocol is not reliable for the physical presence of crypto miners because they can hide their physical location, by using the virtual private network for the mining activity (OECD, 2022). As a consequence, the computation and detection of environmental spillover is difficult (OECD, 2022), and also the use of renewable energy for the carbon footprint reduction is puzzling (Trespalacios and Dijk, 2021) and hard to trustfully control in emerging economies (OECD, 2022). In general, a too high energy consumption is associated to a specific algorithm of crypto called as Proof-of-Work, which provides the fee to the miners (OECD, 2022; Wendl et al., 2023; Trespalacios and Dijk, 2021), and forbidding crypto mining does not discard the problem, as happened in China in 2021 (OECD, 2022). The use of different algorithm such as Proof-of-Stake only partially reduces these negative effects on the environment (Wendl et al., 2023). To date, the use of digital artifact may mask the physical location and creates loopholes for the environmental regulation, which is in the end ineffective at containing

global environmental hurt (OECD, 2022). The policymakers can only empower the crypto miners with some guidelines or proposing new taxes for these polluting activities (Wendl et al., 2023), crypto miners moving to haven countries, with lower energy burden and weaker regulation (Wendl et al., 2023; OECD, 2022). Moreover, environmental regulatory instability enhances the uncertainties about the future of crypto business, as long as it is puzzling to estimate whether any fees would impact the business and whether these fees would gain any environmental achievement.

Crypto halving, defined as the process to control the supply in order to minimise the crypto inflation (Hive Blockchain Technology Ltd.), by affecting the macroeconomic choices about the digital crypto market, leads the future of corporate strategies and performance. As for the sustainability, the crypto regulation plays a pivotal role for the future of crypto companies. This regulatory framework is pivotal for the accounting recognition as well. There is evidence about the relevance of volatility of fair value. Accordingly, Klopper & Brink (2023) have already underlined the unreliable values and complexities in the application of fair value measurement for the crypto measurement. Notwithstanding the need for a regulatory framework, crypto, in particular Bitcoin, were born for discarding the third parties and work automatically and anonymously (Nakamoto, 2008). This is a double-edged sword, the crypto holders benefit from the anonymous transactions, whereas the unregulated transactions might lead to a higher uncertainty (Klopper and Brink, 2023; Huang et al., 2023), instability of corporate performance (Lou and Yu, 2024) and operations threats. This double perspective about regulation is perceived differently from crypto holders, depending on their activity. Regulation, in particular, is both associated to the unregulated crypto transactions and to the uncertainty about the regulatory framework of crypto, as two different and opposite aspects of crypto.

Furthermore, as peculiarities of crypto transactions, the hard fork and air drop represent both a risk and opportunity for the crypto holders. Based on the definition provided by the sampled firms, “a hard fork is a software upgrade that introduces a new rule to the network that is not compatible with the older software” while air drops “occur when the promoters of a new digital asset send amounts of the new digital asset to holders of another digital asset

that they will be able to claim a certain amount of the new digital asset for free" (Neptune Digital Asset, Annual Report 2021). Following these definitions the use of hard fork might provoke important cybersecurity consequences for crypto holders while air drops, concerning a sort of rewards for the crypto holders, represent a positive risk. According to the Ethereum Foundation, hard fork as an update of existing blockchain is needed after the occurrence of attacks (Ethereum Foundation, 2016). On the other side, literature, although at its infancy stage, attributes to the airdrops the marketing and decentralisation of control and property of crypto (Allen et al., 2023).

Another practice widely adopted among crypto holders is staking, whereby users lock a certain amount of cryptocurrency in a protocol to support network operations and, in return, receive rewards, typically in the form of additional tokens.

Crypto business lines

As discussed above, risk disclosure is more pronounced in crypto-holding firms engaged in mining activities, whereas significantly less information is provided by corporate crypto traders and crypto service providers. Crypto mining firms, in particular, depend entirely on the technological processes underpinning crypto creation. Consequently, they are concerned about fluctuations in the fair value and cash flows of financial instruments under market risk, as well as the liquidity risk associated with potential failures to meet financial obligations. In addition, they are highly exposed to regulations on energy consumption and the potential adverse environmental impacts of their activities (OECD, 2022), which raises concerns regarding the future sustainability of their crypto operations. Crypto service providers, on the other hand, are primarily concerned with compliance, as they are subject to anti-money-laundering regulations (Regulation (EU) 1114/2023) and are therefore only marginally exposed to the inherent riskiness of crypto transactions. Overall, crypto-mining activities, being the riskiest, generate a higher volume of disclosures. This is consistent with Tan et al. (2017), who demonstrate that firms facing greater uncertainty tend to disclose more information in their risk disclosure. Furthermore, in crypto holder firms are more concerned about the specific technological issues, disclosing technical information

regarding the hard fork and air drops as specific evolution of blockchain proceeding where the crypto transactions occur.

2.9 Discussion: Codes-themes dynamism across the crypto business lines

Another point worth analysing concerns the association between codes and themes, as well as the related dynamics. Focusing on shared codes, crypto price fluctuations appear in both crypto-mining firms and crypto-trading firms. However, only crypto-mining firms identify crypto price fluctuations as determinants of future fair value and cash flows (market risk), as well as future financial obligations (liquidity risk). By contrast, under the theme of *Digital Asset Risk*, crypto price fluctuations constitute an issue exclusively for corporate crypto traders, who disclose concerns about a potential deterioration in future operations and performance. Consequently, crypto price fluctuations may contribute to accounting misalignments, shifts in corporate performance, and changes in strategic orientation which impact differently on crypto mining and crypto trading. Due to the different objectives underpinning mining and trading activities, crypto price fluctuations are critical for the availability of financial resources in mining firms, whereas corporate crypto traders, given the inherently speculative nature of their business model, are primarily concerned with how losses arising from crypto uncertainty (Yousef, 2024; Bhatnagar et al., 2023; Klopper and Brink, 2023; Lou and Yu, 2024) may affect future operations and performance.

The use of decentralised platforms is particularly complex. It emerges as a concern solely for crypto miners and is associated with the potential risk of future financial loss (credit risk) and with voluntary disclosures on cybersecurity. As decentralised platforms are used to mitigate counterparty risk (Schär, 2021), typically present when relying on centralised exchange platforms, they may offset future financial losses related to credit risk. Accordingly, decentralised exchange platforms may function as a credit-risk mitigation tool; however, they are not subject to the same regulatory frameworks as centralised platforms (e.g., Regulation EU 2023/1114).

Regulation changes and technology obsolescence involve the sole crypto mining industry. Using an up-to-date technology is pivotal in crypto mining where the digital infrastructure is determinant for the success of crypto transactions and issuance of crypto. In line with Gao et al. (2020), the section devolved to the cybersecurity is remarkable in firms whose business relies predominantly on the digital infrastructure. Furthermore, pushing the crypto holding firms, especially crypto mining, to mandatorily disclose information regarding the crypto risks is useful for investors (Tan et al., 2017; Kravet and Muslu, 2013; Jin et al., 2024) and for a reduction of stock return volatility (Alsadoun and Albaz, 2025).

2.10 Key findings

This chapter sheds light on the variety of risks surrounding corporate crypto holdings. In particular, firms exposed to higher levels of crypto-related risk, such as crypto miners, disclose more extensive crypto-related information. By contrast, crypto traders and firms with lower levels of crypto involvement provide less detailed risk disclosures or are concerned about the regulatory framework (e.g., crypto asset service providers). Furthermore, two distinct clusters of risk disclosures emerge: those already regulated by existing accounting principles (e.g., risks related to financial instruments) and those that fall outside the scope of current accounting standards. These risk disclosures do not align with the prevailing accounting definition of crypto, which classifies them outside the boundaries of financial assets. Notably, the high energy consumption associated with crypto holdings, especially in crypto mining, represents a significant downside, with detrimental consequences for the external environment and sustainability processes. Finally, the chapter highlights the role of uncertainty surrounding crypto in shaping firms' expectations about future operations and performance. Perceptions of risk and uncertainty in the crypto market are key determinants of future corporate provisions, affecting both operating margins and financial activities.

Chapter 3

The crypto-based heterogeneity of Canadian ICT industry and unrecognised tax losses[xiii]

3.1 Introduction

Over the past few years, governments have faced increasing challenges in defining the appropriate tax treatment of crypto (hereafter, crypto), largely due to their hybrid nature as investment assets, means of exchange, and mining-related activities (IMF, 2023; Luo and Yu, 2024). The International Monetary Fund has expressed strong concerns regarding crypto markets, describing them as "a bubble that will sooner or later fully implode" (IMF, 2023: 26). At the same time, the Organisation for Economic Co-operation and Development (OECD) has recognized the significant fiscal implications associated with crypto-related profits and has initiated regulatory measures aimed at improving tax transparency. In particular, the approval of the Crypto-Asset Reporting Framework (CARF) in 2022 marked a key step toward the international exchange of information on crypto transactions. In the same year, the OECD issued a public consultation highlighting emerging risks to tax transparency (OECD, 2022). Earlier regulatory attention can be traced back to 2020, when the European Financial Reporting Advisory Group (EFRAG) published a discussion paper addressing the legal and accounting challenges posed by crypto assets. In that document, digital assets were defined as "a digital representation of value or contractual rights created, transferred and stored on some types of distributed ledger technology" (EFRAG, 2020: 6).

This study focuses on Canadian firms operating in the information and communication technology (ICT) sector, examining the effects of crypto exposure on the disclosure of unrecognised tax losses. Canada represents a particularly suitable institutional setting, as it is among the jurisdictions that have implemented comprehensive crypto tax regulations,

[xiii] This chapter is based on the paper entitled "Money for nothing? Crypto exposure and the disclosure on unrecognised tax losses in ICT industry" submitted to the *Journal of International Accounting, Auditing and Taxation*

requiring both individuals and corporations to maintain detailed records of crypto transactions (CRA, 2023). Additionally, this study focuses on the ICT industry because, due to its digital business, it is more prone to invest in crypto.

From an accounting perspective, formal guidance on crypto assets emerged only in 2019, when the IASB clarified that crypto should be accounted for either under IAS 2 or IAS 38. Nevertheless, due to pronounced market volatility, the resulting accounting values remain highly unreliable, especially when firms apply fair value measurement under the revaluation model of IAS 38 (Klopper and Brink, 2023).

Crypto exposure represents a major source of uncertainty (Bhatnagar et al., 2023; Yousef, 2024; Nguyen and Maine, 2023), with direct implications for firms' ability to reliably forecast future taxable income and, consequently, to recognise deferred tax assets related to unused tax losses (IASB, 2001; Flagmeier and Müller, 2024). According to IAS 12 *Income Taxes*, deferred tax assets may be recognised only when it is probable that sufficient future taxable profits will be available to offset unused tax losses or credits (IASB, 2001, §34). The standard further specifies that, in the presence of recent losses, recognition is permitted only if convincing evidence exists that future taxable profits will be generated or that sufficient taxable temporary differences are available (IASB, 2001, para. 35).

Prior literature on discretionary accounting highlights how managers strategically exercise judgment when recognising deferred tax assets under conditions of uncertainty (Flagmeier and Müller, 2024). Firms experiencing financial distress or volatile operating conditions tend to rely heavily on managerial expectations of future profitability when deciding whether to recognise deferred tax assets (Blaylock et al., 2017; Edwards et al., 2016). In addition, heightened uncertainty is associated with increased disclosure regarding deferred taxes, particularly tax loss carryforwards and valuation allowances that cannot be recognised on the balance sheet (Flagmeier and Müller, 2024). Empirical evidence also suggests that managers may postpone the recognition of tax assets for earnings management purposes (Frank and Rego, 2006; Hanlon and Heitzman, 2010; Herbohn, 2010). These findings underscore the inherent complexity of deferred tax accounting in uncertain environments,

a challenge that is further intensified by the volatility characterising crypto markets (Flagmeier and Müller, 2024; IASB, 2001).

Against this background, assessing the likelihood of generating future taxable income to utilise unused tax losses becomes particularly problematic for ICT firms, especially those with crypto exposure. As a result, corporate crypto holders face asset-specific risks and may prefer enhanced disclosure of unrecognised tax losses rather than recognition. Since uncertainty is a key determinant of disclosure practices related to unrecognised tax losses, especially in digitally intensive sectors (Canarella and Miller, 2018), this study concentrates on the ICT industry. ICT firms are not only inherently uncertain but also more likely to invest in crypto due to the nature of their business models. To the best of our knowledge, no prior research has examined unrecognised tax losses within the ICT sector, which already exhibits elevated uncertainty levels that may be further amplified by crypto exposure.

While the legal and accounting dimensions of crypto continue to evolve, tax accounting research has only recently begun to investigate the consequences of crypto adoption, primarily focusing on tax compliance (Cong et al., 2023) and tax avoidance (Cui et al., 2024). However, existing studies have not addressed the management of tax deferrals, particularly unrecognised tax positions. The extreme volatility of crypto assets undermines the reliability of estimates concerning future taxable profits and weakens the evidential basis required to support asset recovery beyond carrying amounts (Bakker et al., 2017).

To test our hypotheses, we employ, as a baseline, linear probability model, corroborated with additional robustness tests, using a sample of 193 Canadian firms, corresponding to 965 firm-year observations over the period 2020–2024.

This study represents, to the best of our knowledge, the first empirical investigation of how heterogeneity within the ICT sector, driven by crypto holdings, affects corporate unrecognised deferred tax losses. The ICT industry provides an ideal context for this analysis due to its digital orientation and higher propensity to crypto adoption.

This research is relevant for several reasons. First, accounting research on crypto remains at an early stage. Existing empirical evidence is limited to studies examining household tax

compliance (Cong et al., 2023) and corporate tax avoidance (Cui et al., 2024), with no attention paid to discretionary behaviour related to unrecognised tax positions. Second, crypto markets have generated substantial losses (Nguyen and Maine, 2023), which may significantly influence disclosure decisions regarding unrecognised tax losses. Third, both theoretical and empirical analyses of unrecognised tax losses in highly uncertain contexts, such as the ICT sector combined with crypto exposure, are still lacking.

3.2 Literature review

3.2.1 Tax accounting literature under uncertainty

Temporary differences can result in the recognition or non-recognition of deferred taxes, particularly with respect to unused tax losses. According to the IASB, deferred tax assets arising from such positions may be recognised only when "it is probable that future taxable profit will be available" to offset them (IASB, 2001, par. 34). A substantial body of literature examines the management of deferred tax assets, highlighting that disclosure related to these positions is largely voluntary. As a consequence, managers may strategically exercise discretion for various purposes (Frank and Rego, 2006), potentially affecting the reported value of deferred taxes (Badenhorst and Ferreira, 2016).

Prior studies show that voluntary disclosure of deferred tax positions varies significantly under conditions of uncertainty and when firms report losses (Flagmeier and Müller, 2024). Moreover, the value relevance of deferred tax assets during periods of economic distress is particularly pronounced in jurisdictions with specific tax treatments for unused tax losses (Badenhorst and Ferreira, 2016). When firms experience losses, their ability to reliably forecast future performance deteriorates, further complicating expectations regarding future taxable income (Mear et al., 2021; Flagmeier and Müller, 2024). In this respect, IFRS guidance explicitly states that "the existence of unused tax losses is strong evidence that future taxable profit may not be available" and therefore requires deferred tax assets to be recognised only when sufficient taxable temporary differences or other convincing evidence of future profitability exists (IASB, 2001, par. 35).

Loss-making firms are thus considered a critical factor undermining the interpretability and reliability of deferred tax disclosures (Mear et al., 2021). Under certain conditions, such as a history of losses combined with the absence of taxable income, the presence of unused tax losses signals a low likelihood of future taxable earnings (IAS 12, para. 35). Consistently, Dhaliwal et al. (2013) show that increases in valuation allowances are associated with a higher probability of future losses. Conversely, when valuation allowances do not increase despite negative tax expenses or positive taxable income, losses tend to be less persistent (Dhaliwal et al., 2013).

Although uncertainty related to losses generally incentivizes firms to provide more extensive disclosure on deferred taxes, particularly regarding tax loss carryforwards (Flagmeier and Müller, 2024), such disclosures often remain difficult for users to interpret (Mear et al., 2021). Even if forecasting future performance and tax positions of loss-making firms remains challenging, Dhaliwal et al. (2013) document that greater loss persistence is associated with higher accumulated valuation allowances. In situations of financial distress, deferred tax assets are value-relevant only when firms are able to carry forward unused tax losses; by contrast, when losses can be both carried forward and carried back, deferred tax assets do not appear to affect firm market value (Badenhorst and Ferreira, 2016).

Early research on the discretionary role of unrecognised tax assets dates back to the early 2000s, with the seminal study by Gordon and Joos (2004) on UK firms. These authors distinguish between unrecognised deferred tax assets and unrecognised deferred tax liabilities, investigating the determinants of unrecognised deferrals used for tax planning purposes and their predictive power for future firm performance. Their findings indicate that corporate losses are the primary determinant of unrecognised deferred tax assets, whereas leverage plays a more prominent role in explaining unrecognised deferred tax liabilities (Gordon and Joos, 2004). In particular, higher levels of losses are associated with greater amounts of unrecognised deferred tax assets, underscoring the strategic role of losses in the accumulation of unrecognised tax positions.

Subsequent studies have continued to explore unrecognised deferred tax assets. Consistent with the evidence provided by Frank and Rego (2006), later research documents a positive

association between earnings management and unrecognised tax losses, especially when reported earnings fall short of analysts' expectations (Herbohn, 2010).

3.2.2 Crypto fiscal classification and ICT firms

Within this context of pervasive uncertainty, crypto are commonly characterized as intangible assets, reflecting an expanded conception of personal property that extends beyond physical possession and traditional notions of tangibility (Huang et al., 2023; Çağlayan Aksoy, 2023). This approach foregrounds the intrinsic features, functions, and practical uses of digital assets (Avi-Yonah and Salaimi, 2022), yet it remains insufficient to fully encompass the complexity of crypto-related transactions (Powell and Hope, 2019). Crypto developed within a predominantly digital environment that evolved largely outside established legal frameworks (Sapovadia, 2024). As a result, they do not align with conventional classifications of physical property (Huang et al., 2023; Çağlayan Aksoy, 2023), a circumstance that has contributed to elevated levels of transactional anonymity and pronounced price volatility (Avi-Yonah and Salaimi, 2022; Shanan and Narotzki, 2024; Solodan, 2019). These features have, in turn, facilitated a range of illicit practices, notably money laundering (Goel and Mazhar, 2024) and data-related breaches (Sapovadia, 2024; Wronka, 2024). The rapid proliferation of crypto has also intensified speculative dynamics, leading public authorities across jurisdictions to seek more coordinated regulatory frameworks for crypto exchanges (Sapovadia, 2024).

Despite these efforts, the regulatory landscape for crypto remains highly fragmented from both legal and fiscal standpoints (Huang et al., 2023). Existing legal regimes, which serve as the foundation for tax policy design, have not yet reached a clear consensus on the legal characterization of crypto, thereby generating significant uncertainty with respect to their tax treatment (Avi-Yonah and Salaimi, 2022). At the international level, the taxation of crypto assets is further complicated by the differential treatment of crypto-to-crypto transactions as opposed to exchanges between crypto and fiat currencies (Avi-Yonah and Salaimi, 2022).

In general, capital gains taxation is grounded in the realization principle, under which assets are taxed only upon sale or exchange, irrespective of unrealized value fluctuations during the holding period (Shanan and Narotzki, 2024). Accordingly, prevailing crypto tax regimes allow investors to hold crypto assets without immediate tax consequences, postponing tax liabilities until realization. Such deferral mechanisms may exacerbate wealth inequality by favoring taxpayers with greater capacity to delay realization events (Shanan and Narotzki, 2024).

Lastly, due to their hybrid function as both investment vehicles and means of exchange (Baur et al., 2018; Solodan, 2019; Powell and Hope, 2019), crypto in Canada are subject to specific disclosure obligations enforced by the Canada Revenue Agency (CRA) (CRA, 2023). Under Canadian tax law, profits or losses derived from crypto trading activities may be treated either as business income (or losses) or as capital gains (or losses), depending on factors such as the nature, scale, and frequency of the transactions undertaken (CRA, 2023).

The literature examining the ICT sector identifies firm size, research and development (R&D) intensity, and leverage as central factors influencing corporate growth, albeit with heterogeneous effects (Canarella and Miller, 2018; Koutroumpis et al., 2020). Empirical studies consistently reveal a positive and statistically significant relationship between firm size and R&D spending, on the one hand, and growth outcomes, on the other (Canarella and Miller, 2018). Importantly, this association is not uniform across size classes: while larger ICT firms are more likely to grow, their growth rates tend to be lower than those observed among smaller firms (Canarella and Miller, 2018).

Irrespective of firm size, investment in R&D emerges as a key determinant of future performance for ICT firms (Koutroumpis et al., 2020). By contrast, a stronger reliance on external sources of finance is negatively correlated with growth, indicating that elevated leverage levels may limit ICT firms' capacity to capitalize on available expansion opportunities (Canarella and Miller, 2018).

3.3 Theoretical background

The increasing use of crypto (Baur et al., 2018; Powell & Hope, 2019; Avi-Yonah & Salaimi, 2022; Sapovadia, 2024) poses significant challenges for accounting standard setters and preparers (Jackson & Luu, 2023; Huang et al., 2023; Klopper & Brink, 2023) and for tax policy frameworks (Avi-Yonah & Salaimi, 2022). Existing accounting principles adopted for crypto recognition in financial reporting are not designed to capture the extreme volatility of crypto markets (Yousef, 2024; Bhatnagar et al., 2023; Klopper & Brink, 2023; Huang et al., 2023; Ramassa & Leoni, 2022). The use of fair value in crypto recognition further accentuates this volatility (Anderson et al., 2025) thus mirroring the uncertainty of crypto market (Guo et al., 2025). As a result, the substantial price fluctuations of crypto markets further amplify risk exposure, enhancing the cost of debt financing (Gao et al., 2025) and resulting in the possibility of both severe losses (Nguyen and Maine, 2023) and substantial gains (Bhatnagar et al., 2023; Yousef, 2024).

Alongside this, firms that hold crypto assets suffer uncertainty in financial reporting as they ought to adapt the accounting principles for recognizing crypto holdings in their financial reports (Guo et al., 2025) also depending on their business lines as crypto miner, crypto trader or holding crypto as a means of payment (Luo and Yu, 2024).

This uncertainty is the key for the recognition of deferred tax assets, specifically deferred tax losses. Following the IAS No. 12 "[a] deferred tax asset shall be recognised for the carryforward of unused tax losses and unused tax credits to the extent that it is probable that future taxable profit will be available against which the unused tax losses and unused tax credits can be utilised". (IASB, 2001: §34). Furthermore, with respect to the components of taxes, the principle establishes that the firm should provide additional information regarding "e) the amount (and expiry date, if any) of deductible temporary differences, unused tax losses, and unused tax credits for which no deferred tax asset is recognised in the statement of financial position" (IASB, 2001, §81). Prior research on corporate IFRS adopters indicates that under conditions of heightened uncertainty, firms are more likely to disclose information regarding the portion of unreported deferred tax positions specifically tax losses (Flagmeier and Müller, 2024).

In particular situations like financial distress, the relevance of deferred tax assets is significant only when the firm could carry forward its unused tax losses; otherwise (i.e., in case of carrying forward as well as carrying back), there is no significance for the market value of firm (Badenhorst and Ferreira, 2016). Conclusively, accountability is weakened and current disclosure requirements appear not fully equipped to discipline discretion in loss-making firms.

Within this context, the ICT industry represents a distinctive case, characterized by higher and more heterogenous levels of uncertainty compared to other sectors (Canarella and Miller, 2018). Many ICT firms hold crypto positions, and interdependencies and heterogeneous effects might be expected within the same ICT industry due to crypto holding (Umar et al., 2021). This is further reinforced by the sector's risk-taking profile, particularly with respect to R&D investments (Canarella and Miller, 2018; Koutroumpis et al., 2020), leverage (Alexeeva-Alexeev and Mazas-Perez-Oleaga, 2024), firm size, and age (Canarella and Miller, 2018; Koutroumpis et al., 2020). Empirical evidence indicates a positive association between R&D investment (Canarella and Miller, 2018; Koutroumpis et al., 2020) and firm size (Canarella and Miller, 2018) with corporate growth, whereas higher leverage might signal potential declines in future earnings (Canarella and Miller, 2018).

In recent years, crypto holders have experienced substantial losses (Nguyen and Maine, 2023) and pronounced instability (Bhatnagar et al., 2023; Yousef, 2024; Luo and Yu, 2024). To countervail the uncertainty about crypto market, firms might provide voluntary additional disclosure of details about the crypto exposure, which might likely enhance the quality of reporting and lower the cost of capital (Guo et al., 2025). Nevertheless, previous empirical research never verified the impact of such increase in crypto disclosure, as long as disclosure about crypto itself is voluntary almost worldwide, including the US (Guo et al., 2025).

Crypto exposure, due to its volatility (Klopper and Brink, 2023), may exacerbate this uncertainty (Yousef, 2024; Bhatnagar et al., 2023; Klopper & Brink, 2023; Huang et al., 2023; Ramassa & Leoni, 2022), particularly among ICT firms (Umar et al., 2021), with

relevant consequences in terms of increased disclosure of unrecognised tax losses (Flagmeier & Müller, 2024).

Due to the obligation for firms reporting crypto to disclose details about these items under the Canadian regulation (CRA, 2023), Canada remains an ideal background for empirically testing whether the crypto exposure and its inherent risk and volatility are indicators of disclosure about unrecognised tax losses. Based on the existent literature, the unrecognised tax losses are more probable to be disclosed when there is a high corporate uncertainty.

Therefore, building on the intrinsic risk profile of ICT firms (Alexeeva-Alexeev & Mazas-Perez-Oleaga, 2024) and the heightened uncertainty associated with crypto markets (Yousef, 2024; Bhatnagar et al., 2023; Klopper & Brink, 2023; Huang et al., 2023; Ramassa & Leoni, 2022), we conjecture that risk heterogeneity exists within the ICT sector and it depends on crypto exposure. Literature mostly studies the market side of crypto holdings, or its geopolitics, like crypto macroeconomics (Bouri, Gupta, & Vo, 2022 in Mercik), cyber risk (Aldasoro et al., 2022 in Mercik) and other systemic risks (Mercik et al., 2024), whilst the investigation of the impact of corporate crypto exposure on the tax disclosure is still at its infancy.

Accordingly, we formalise the following hypotheses:

Hypothesis 1. *Ceteris paribus,* the corporate crypto exposure positively affects the disclosure about unrecognised tax losses.

3.4 Empirical analysis

3.4.1 Research design

This paper goes deep into the analysis of the emergent corporate crypto holding activities, by investigating throughout Hypothesis (1) how the crypto holding increases the probability to disclose unrecognised tax losses. Furthermore, this effect is examined using two different measures of crypto: (i) crypto recognised under the current assets and (ii) crypto recognised under non-current assets.

3.4.2 Dependent variable

Our dependent variable is the *UTL* and refers to the unrecognised tax loss disclosure of a firm. Following the IAS No. 12, the disclosure about unrecognised tax losses is mandatory whenever firms cannot recognise the amount of deferred tax assets due to the uncertainty about the future realisation of taxable profits. Therefore, they report this information under the separate tax disclosure (IASB, 2001). The studies conducted by Dreher et al. (2024) and Flagmeier & Müller (2024) measure this tax reporting by adopting a dummy variable aimed at measure whether firms disclose unrecognised tax losses or not. Hence, we compute the *UTL* as a dummy variable equal to 1 if the firm reports the disclosure about unrecognised tax losses; 0 otherwise.

3.4.3 Test variables

Crypto investments are differently recognised, depending on the crypto business lines, identified in crypto mining, crypto trading, and crypto as a mean of payment (Luo and Yu, 2024). We compute the test variable *Crypto* using two different continuous variables. We measure it using both the amount of crypto recognised under current assets and crypto under non-current assets. Hence, we compute our *Crypto* as a ratio between the amount of crypto recognised under current assets (non-current assets) and total assets.

3.4.4 Control variables

Following previous accounting literature on unrecognised tax losses (Flagmeier & Müller, 2024) and those studies focusing on accounting determinants of crypto investments (Luo and Yu, 2024), we controlled for a series of phenomena using the following independent variables: *Cash; Loss; R&D; Size; Age; BIG4; M&A; OCF; ROA*.

Firms with higher risk and uncertainty hold more cash in order to face the eventuality of future losses. Therefore, we add *Cash* as a control variable, expecting that higher is the level of cash and more likely the firm will disclose information about unrecognised tax loss

disclosure. We measure *Cash* as a ratio between the amount of cash reported in the financial statement and total assets.

Based on prior research, when a firm realises losses its level of uncertainty increases (Flagmeier and Müller, 2024). Hence, we assume that in case of augmented uncertainty, as in the ICT industry, firms disclose more about the unrecognised tax losses (Flagmeier and Müller, 2024; Gordon and Joos, 2004). We measure *Losses* as a dummy variable equal to 1 if the firm has negative earnings before taxes in the current year; 0 otherwise (Gordon and Joos, 2004).

An established track of research finds that R&D investments positively impact corporate growth (Canarella and Miller, 2018; Koutroumpis et al., 2020). Accordingly, we expect that ICT firms with lower levels of R&D investments are more prone to disclose unrecognised tax losses, which is expected to be negatively correlated to corporate growth. In line with previous studies, we compute *R&D* as R&D expenses scaled by total assets.

Prior studies found that the bigger is the firm the more likely it will return to profitability (Joos and Plesko, 2005). Relying on the existent findings between the size and future profitability (Gordon and Joos, 2004), we predict a negative relationship between size and unrecognised tax losses disclosure. Therefore, we control for corporate dimensions measuring *Size* as the natural logarithm of total assets.

Dominant research on ICT firms demonstrated that corporate maturity positively affects the ICT future growth (Koutroumpis et al., 2020) hence with potential negative effect on the UTL. We compute *Age* as the natural logarithm of the difference between the current date of annual report and the date of establishment of the firm in years (Flagmeier and Wertherbach, 2025).

Big 4 tax auditors are documented to be more sceptical about the cumulation of valuation allowance compared to the non-big counterparts (Song and Yuan, 2025). Therefore, we expect that the firms audited by Big 4 may disclose less information about unrecognised tax losses. We measure *BIG4* as a dummy variable that equals to 1 if a firm is audited by a Big 4 auditor; 0 otherwise.

ICT firms are often involved in business restructuring and renovation throughout corporate merger and acquisition operations (M&A) Within M&A activities, the IT component is positively evaluated due to its high rate of success linked to the integration and flexibility of digital infrastructures (McKinsey & Company, 2011). M&A helps to diversify corporate risks (Garskaite-Milvydieneand Burksaitiene, 2016; Lobo and Gomes, 2022). Moreover, M&A announcements may determine negative effects on future corporate returns (Lobo and Gomes, 2022). Therefore, firms involved in M&A may disclose more information about unrecognised tax losses due to a loss-induced uncertainty (IASB, 2001; Flagmeier and Muller, 2024). We control for M&A including the dummy *M&A*, which equals 1 whether a firm published M&A announcements over the year; 0 otherwise.

We add other relevant variables as controls: *ROA* and *OCF*. We measure *ROA* as the ratio between the EBIT and the total assets. We compute *OCF* by scaling the operating cash flow margin with total assets.

APPENDIX A offers details on variables measurement.

3.5 Regression model

We used the linear probability model in the main analysis.

Equation (1) is used to test the impact of our test variable *Crypto* on *UTL*, as following reported.

$$UTL_{i,t} = \beta_0 + \beta_1 Crypto_{i,t} + \beta_{2-10} Controls_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

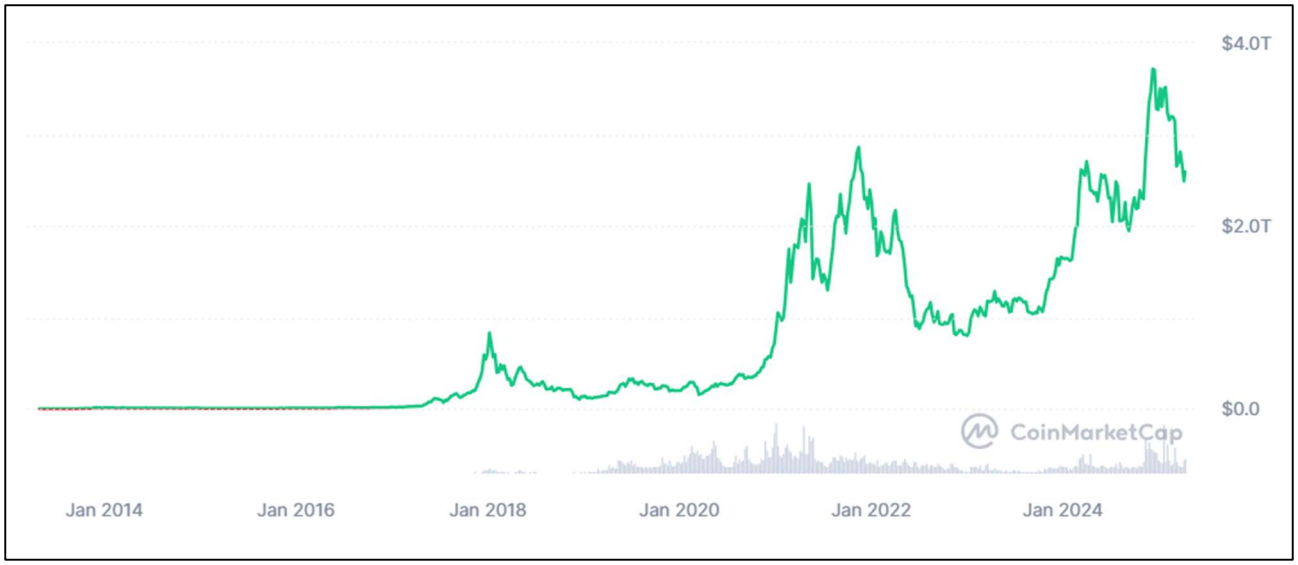
In Equation (1) *UTL* is the dependent variable and *Crypto* is the independent variable. *Controls* are our control variables such as *Cash; Loss; R&D; Size; Age; R&D; Leverage; Losses; BIG4; M&A; OCF; ROA,* α_i is firm fixed effects and δ_t is the year fixed effect. $\varepsilon_{i,t}$ is the error term.

3.6 Sample selection and description

Over years and since their spread, we have witnessed to a growing trend of crypto. As shown in Figure 2, a diffuse market adoption of crypto is backed to 2018, with exchanges becoming relevant in 2020 and experiencing a growing path, until a peak in 2022 and a subsequent peak in 2024.

Based on the data reported by CoinMarketCap[xiv], the total number of crypto on the market has rapidly grown over last years[xv].

Figure 3. The growing trend of crypto



The Figure 2 depicts an overview of crypto market capitalization (green line) and volume exchanged (grey bars), referred to the period January 2014-January 2024 (last accessed April 4 2025). The market capitalization of crypto is 2.59 trillion (U.S. dollars) and the correspondent volume of crypto exchanged is 103.4 billion (U.S. dollar).

Source: CoinMarketCap

[xiv] CoinMarketCap. Crypto Market Overview. https://coinmarketcap.com/charts/.

[xv] Based on the data available on CoinMarketCap, the total amount of crypto tracked at the end of 2019 (December 27th) is 18.502, against 5.6 million at the end of 2024 (December 27th, 2024). Source: CoinMarketCap. Cryptocurrencies Tracked by CoinMarketCap. https://coinmarketcap.com/charts/number-of-cryptocurrencies-tracked/

Canada is reportedly the second economy worldwide (after the United States) for crypto mining and investments in volume, first among IASB principles adopters. Moreover, it was the first country regulating the tax treatment of corporations holding crypto. Moreover, Canada is among those countries requesting to have track of crypto transactions to the investors. Therefore, these circumstances elect Canadian firms as a relevant observatory for crypto-economy (Rosales et al., 2024) and for the accounting and the taxation of crypto holders.

In 2019 IASB first issued accounting recommendations for crypto recognition in corporate financial reports of firms holding crypto. Therefore, we expect IFRS adopters to follow IASB recommendation since 2020, hence we settled the empirical analysis sampling firms' financial reporting from the financial year 2020.

3.6.1 Sample selection process

We gathered data using Orbis, by Moody's, and Sedar+. published by the Canadian Securities Administration[xvi]. We used Orbis to gather financial data on ICT firms and Sedar+ to get the annual reports which are used to hand-collect information about unrecognised tax loss disclosure and crypto exposure. Therefore, we used two different steps of search.

In the first step, we used Orbis to spot a representative sample of Canadian ICT firms according to the classification provided by Statistique Canada[xvii] which comprehends also additional data used to sponsor other research at intersection of multiple fields of studies[xviii]. For the sake of our analysis, we retrieved from Canadian webpage the following industry codes according to North American Industry Classification System (NAICS) Version 1.0: (i) 31-33i-ICT - Manufacturing ICT; 41i ICT - Wholesale trade; (iii) 51iICT - Information

[xvi] The databank Sedar+ is publicly provided at the webpage: https://www.securities-administrators.ca/national-systems/about-sedar/ (last accessed: December 20th 2025).
[xvii] Government of Canada. Variant of North American Industry Classification System (NAICS) 2022 Version 1.0 for Information and communication technology (ICT) sector. https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1384253&CVD=1370970&CPV=541514&CST=27012022&MLV=6&CLV=6
[xviii] Government of Canada. Statistical Methodology Research and Development Program Achievements, 2023/2024. https://www150.statcan.gc.ca/n1/pub/12-206-x/2025001/07-eng.htm

and cultural industries; 54iICT - Professional, scientific and technical services; 81i ICT - Other services (except public administration).

Starting from the list of firms selected from Orbis,[xix] we used Sedar+[xx] to gather detailed annual reports in order to collect data on: (i) crypto holdings; (ii) unrecognised tax losses, which are not provided in detail in the Orbis databank. On Sedar+, we manually searched the firms included in the Orbis list (n=371) and hand-collected information about crypto positions and unrecognised tax losses. Excluding firms not accessible in Sedar+ (172), we finally run the empirical analysis on a sample of 193 firms over the years from 2020 to 2024 (n=965 firm-year observations). financial reporting data, other than those hand collected such as crypto exposure and unrecognised tax loss disclosure, were collected from Orbis.

Table 1 resumes the data gathering process described in here.

3.6.2 Sample description

The empirical analysis involves a sample of 965 firm-year observations of 193 Canadian listed firms operating in the ICT sector over the years 2020-2024.

Table 1 provides the descriptive statistics for the variables used in the analyses. Consistently with the findings reported by papers on this topic (Gao et al., 2025) [xxi], about 10%[xxii]

[xix] The list of sampled firms is retrieved from Orbis using the following query: *(i) active firms; (ii) firms IFRS adopters; (iii) quoted enterprises; (iv) segment: "Corporate"; (v) Form: "Business"; (vi) industry: "58.2 OR 62.01 OR 62.02 OR 62.03 OR 62.09 OR 63.11 OR 63.12 OR 63.11"; (vii) geographic area: Canada.*

[xx] Sedar+ is a web-based database offering the electronic filings of firms participating to the Canadian capital market with a wide range of documents including the consolidated annual reports. The database follows a specific structure allowing to best perform the search. As far as this paper is concerned, among others, it displays three different sections for the ordinary search.. The ordinary section contains three different fields, namely "Document search"; "Filing type"; "Document type".
https://www.sedarplus.ca/

[xxi] Although this is a small amount of sampled firms, around 10% reported crypto both under current assets and non-current assets, it is proportionally higher than what is indicated in similar analyses by previous research. E.g., Chinese listed firms adopting blockchain technology are documented to count about 3.7% of the overall sample (Chen et al., 2025: 5). Moreover, *Crypto*^{a} and *Crypto*^{b} are much higher, counting the 10% of the sample against the 0.2% included in the existent studies on the sample topic (see Gao et al., 2025: 3).

[xxii] In our sample 7.1% firms recognised crypto under current assets and 3% of firms recognised crypto under non-current assets.

(untabulated) of the sampled firms recognized crypto in their financial reports. 78.5% of firms reported UTLs. According to the low presence of crypto in our sample, our independent variables (*mean(Crypto^a) = 0.018; mean(Crypto^b) = 0.0071)*, reflecting the crypto magnitude rather than crypto participation, present a rare event distribution.

Table 9. Descriptive statistics

Variable	N	Min	Q1	Median	Mean	Q3	Max
UTL	965	0.000	1.000	1.0000	0.784	1.000	1.000
Crypto^a	965	0.000	0.000	0.000	0.018	0.000	1.457
Crypto^b	965	0.000	0.000	0.000	0.007	0.000	0.954
Cash	965	0.000	0.057	0.175	0.268	0.391	1.000
Loss	965	0.000	0.000	1.000	0.658	1.000	1.000
R&D	965	-7.400	-0.049	0.000	-0.101	0.000	0.758
Size	965	1	1539	10542	1416384	97824	49223035
Age	965	0.00	9.00	19.00	20.91	29.00	80.00
BIG4	965	0	0	0	0.327	1	1
M&A	965	0	0	1	0.563	1	1
OCF	965	-127.593	-0.530	-0.067	-0.735	0.095	59.875
ROA	965	-108.187	-0.708	-0.131	-1.173	0.046	20.875

The Table 8 reports the descriptive statistics of the overall sample of 965 Canadian ICT firms from 2020 to 2024. *Crypto^a* refers to the amount of crypto recognised as current assets, *Crypto^b* refers to the amount of crypto recognised under non-current assets. Due to the presence of outliers, *Crypto^a* and *Crypto^b* were transformed using the log (1+x). We winsorized the OCF, R&D, ROA at 1st and 99th percentile and transformed *Age* using a natural logarithm.

3.6.2 Correlation matrix

Following we report the correlation matrix of sample under examination. Crypto variables, although included in the correlation matrix, are used alternatively in the next regression analyses.

Table 10. Correlation matrix

Variable	*UTL*	*Crypto*[a]	*Crypto*[b]	*Cash*	*Loss*	*R&D*	*Size*	*Age*	*BIG4*	*M&A*	*OCF*	*ROA*
UTL	1											
Crypto[a]	0.083	1										
Crypto[b]	-0.034	0.109	1									
Cash	0.164	-0.086	-0.059	1								
Loss	0.364	0.190	0.135	**0.589*****	1							
R&D	0.028	-0.018	-0.110	-0.425	-0.385	1						
Size	**-0.451***	-0.112	-0.145	**-0.761****	**-0.852*****	**0.449***	1					
Age	-0.119	-0.259	-0.199	-0.136	-0.349	-0.102	0.130	1				
BIG4	-0.296	-0.220	-0.063	-0.202	-0.292	-0.092	0.162	-0.035	1			
M&A	-0.065	-0.123	-0.209	0.104	0.009	-0.191	-0.060	-0.106	0.096	1		
OCF	-0.380	-0.114	-0.123	**-0.562****	**-0.686*****	0.417	**0.824*****	-0.021	0.046	-0.156	1	
ROA	-0.368	-0.132	-0.140	**-0.542***	**-0.681*****	**0.443***	**0.813*****	0.013	0.015	-0.167	**0.982*****	1

The Table 9 reports the results of correlation matrix. In bold the significant values. Variables are treated after transformations.

3.7 Results

Table 10 presents the results of the linear probability model (LPM), using for *Crypto* both the amount recognised as current asset (MODEL (A)) and that recognised under non-current assets (MODEL (B)), alternatively.

The results indicate notable differences in the effects of *Crypto* on *UTL* depending on whether they are recognised under current assets or non-current assets. In this section, we present the results using the linear probability model, as a baseline.

According to the provisions, *Crypto* positively affects the *UTL* only in MODEL (A), where it is computed using the amount of crypto recognised under current assets (Column (1), $p = 0.09$; Column (2), $p = 0.01$; Column (3), $p = 0.08$; Column (4), $p = 0.09$) and presented as $Crypto^{a}$. No significant effects are encountered for the *Crypto* as non-current asset.

Other controls confirm their effects on the *UTL*, both in MODEL (A) and MODEL (B). *Cash* negatively impacts the *UTL* (Column (1) and Column (5), *p-value*=0.01). *BIG4* negatively affects the UTL (Column (1), *p-value*=0.009; Column (5), *p-value*=0.007). However, their effect are weak and non-significant after introducing the fixed effects.

Contrary to some prior studies (Joos and Plesko, 2004), *Size* negatively affects the disclosure about unrecognised tax losses (Column (1) and Column (5), $p\text{-value} = 0.02$; Column (2) and Column (6), $p\text{-value} \leq 0.01$). R&D expenditures signal an increase in unrecognised tax loss disclosure (Column (1) and Column (5), $p < 0.01$; Column (2), $p\text{-value} = 0.01$ and Column (6), $p\text{-value} = 0.09$) contradicting the existent studies focused on the ICT firms (Canarella and Miller, 2018; Koutroumpis et al., 2020).

Interestingly, *Loss* does not appear so significant as documented in the extant research examining the unrecognised tax loss disclosure (Joos and Plesko, 2004).

Overall, the sample presents some issues, mainly related to the characteristics of dependent variable which is unbalanced with 78% of firms disclosing the unrecognised tax losses against the remaining without this disclosure.

In the fixed-effects specifications, coefficients are identified solely from within-firm and within-year variation. Because some regressors exhibit little within-firm variation, much of the cross-sectional information is absorbed by the fixed effects. As a result, several variables that were significant in models without fixed effects become statistically insignificant (*Cash* and *BIG4*). This loss of significance reflects the limited within-firm variation over time and accentuates the inter-firm heterogeneity.

Table 11. Baseline regression analysis

	MODEL (A)				***MODEL (B)***			
	UTL				***UTL***			
Variables	**(1) Coefficient (*p-value*)**	**(2) Coefficient (*p-value*)**	**(3) Coefficient (*p-value*)**	**(4) Coefficient (*p-value*)**	**(5) Coefficient (*p-value*)**	**(6) Coefficient (*p-value*)**	**(7) Coefficient (*p-value*)**	**(8) Coefficient (*p-value*)**
Intercept	1.015*** (0.000)	-	-	-	1.017 (0.000)	-	-	-
Crypto[a]	0.267* (0.098)	0.263** (0.010)	0.267* (0.082)	0.262* (0.094)	-	-	-	-
Crypto[b]	-	-	-	-	-0.044 (0.870)	-0.04713 (0.813)	-0.26656 (0.533)	-0.25863 (0.554)
Cash	-0.130** (0.016)	-0.132 (0.127)	-0.054 (0.226)	-0.059 (0.189)	-0.135* (0.013)	-0.13702 (0.115)	-0.06331 (0.161)	-0.06729 (0.134)
Loss	0.052 (0.101)	0.049 (0.338)	-0.020 (0.405)	-0.022 (0.359)	0.058* (0.068)	0.05472 (0.286)	-0.02115 (0.374)	-0.02214 (0.333)
R&D	0.246*** (0.000)	0.247** (0.011)	-0.037 (0.381)	-0.035 (0.410)	0.250*** (0.000)	0.25080** (0.009)	-0.02549 (0.525)	-0.02360 (0.554)
Size	-0.028*** (0.000)	-0.029** (0.002)	-0.007 (0.560)	-0.013 (0.306)	-0.028*** (0.000)	-0.02909** (0.002)	-0.00480 (0.687)	-0.01116 (0.390)
Age	0.024 (0.112)	0.023 (0.476)	0.016 (0.734)	-0.009 (0.899)	0.024 (0.113)	0.02323 (0.479)	0.01739 (0.708)	-0.00983 (0.887)
BIG4	-0.073** (0.009)	-0.073 (0.209)	0.085 (0.244)	0.079 (0.284)	-0.075** (0.007)	-0.07533 (0.198)	0.09273 (0.218)	0.08654 (0.254)
M&A	0.020 (0.451)	0.019 (0.556)	-0.013 (0.415)	-0.014 (0.403)	0.020 (0.448)	0.01897 (0.554)	-0.01342 (0.429)	-0.01347 (0.420)
OCF	0.001 (0.968)	0.002 (0.858)	0.006 (0.499)	0.007 (0.432)	0.001 (0.934)	0.00247 (0.813)	0.00641 (0.488)	0.00719 (0.428)
ROA	-0.004 (0.628)	-0.005 (0.516)	0.001 (0.739)	0.002 (0.644)	-0.004 (0.616)	-0.00470 (0.507)	0.00120 (0.777)	0.00181 (0.671)
N	965	965	965	965	965	965	965	965
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Adj. R^2	0.076	0.074	0.765	0.765	0.073	0.071	0.764	0.764
Within R^2	-	0.086	0.015	0.016	-	0.084	0.012	0.013

Table 10 presents the findings of the linear probability model of Equation (1). MODEL (A) contains the values of *Crypto* measured using the amount of crypto recognised as current assets; MODEL (B) contains the values of crypto recognised as non-current assets. Standard errors are clustered at the firm level.

p-value at 0 '***' 0.05 '**' 0.10 '*'

3.8 Robustness test

In this section, we report the robustness tests conducted to verify the baseline results. The Linear Probability Model (LPM) presents two main limitations: (i) fitted probabilities may fall outside the [0,1] range, and (ii) the model assumes that explanatory variables are constant or close to their mean values. In contrast, the probit model uses the cumulative distribution function, estimated through an integral and latent variables, and constrains predicted probabilities to the [0,1] interval overcoming the limitations of the LPM.

Therefore, we employ probit regression analysis to test H1. The results are presented in Table 11 and confirm the findings from the baseline regression reported in Table 10. Specifically, we observe (i) a positive effect of *Crypto*^{a} on *UTL* only in the Column (1) (*p-value*=0.01); however, intra-firm variability remains limited, and heterogeneity among ICT firms persists. Notably, applying both firm fixed effects and firm-year fixed effects jointly leads to a substantial reduction in the number of observations (from 965 to 155 firm-year observations), indicating that most of the sample variability is attributable to inter-firm differences rather than intra-firm variation.

In the raw probit results (before AME transformations, untabulated), *Crypto* under MODEL (A) is significant across all model specifications from Column (1) to Column (4) showing significance, respectively, at 10%; 10%; 5%; 5% level. The occasional lack of significance in probit regressions can be attributed to the rare occurrence of the independent variable across the sample. While such sparsity may produce unstable estimates in the LPM, the probit model accommodates skewed distributions more effectively, yielding interpretable marginal effects. Nevertheless, including firm or year fixed effects reduces the significance of *Crypto*, reflecting the limited within-firm variation.

Regarding other covariates, *R&D* and *Size* maintain a positive and statistically significant effect on *UTL*, confirming the baseline results. *Cash* and *BIG4* exhibit weak and mostly non-significant effects, consistent with the LPM.

Table 12. Probit regression analysis

	MODEL (A)				**MODEL (B)**			
	UTL				***UTL***			
Variables	**(1) AME (p-value)**	**(2) AME (p-value)**	**(3) AME (p-value)**	**(4) AME (p-value)**	**(5) AME (p-value)**	**(6) AME (p-value)**	**(7) AME (p-value)**	**(8) AME (p-value)**
Intercept	-	-	-	-	-	-	-	-
Crypto[a]	0.486* (0.087)	0.483 (0.135)	0.839 (0.233)	0.860 (0.271)	-	-	-	-
Crypto[b]	-	-	-	-	-0.04401 (0.870)	-0.056 (0.793)	-0.695 (0.406)	-0.589 (0.495)
Cash	-0.141** (0.010)	-0.142 (0.212)	-0.293 (0.454)	-0.295 (0.463)	-0.13549** (0.012)	-0.153 (0.189)	-0.357 (0.409)	-0.348 (0.440)
Loss	0.036 (0.262)	0.032 (0.483)	-0.050 (0.806)	-0.085 (0.671)	0.05806* (0.068)	0.040 (0.378)	-0.077 (0.676)	-0.101 (0.601)
R&D	0.242*** (0.000)	0.243** (0.026)	0.028 (0.826)	0.081 (0.634)	0.24982*** (0.000)	0.249** (0.025)	0.033 (0.796)	0.083 (0.640)
Size	-0.028*** (0.000)	-0.028* (0.084)	-0.065 (0.488)	-0.111 (0.401)	-0.0282*** (0.000)	-0.028* (0.085)	-0.051 (0.554)	-0.094 (0.457)
Age	0.022 (0.123)	0.022 (0.406)	0.060 (0.687)	-0.107 (0.753)	0.02364 (0.113)	0.022 (0.405)	0.087 (0.523)	-0.097 (0.777)
BIG4	-0.076** (0.008)	-0.077 (0.264)	0.231 (0.424)	0.196 (0.488)	-0.07452** (0.007)	-0.080 (0.249)	0.259 (0.412)	0.225 (0.474)
M&A	0.018 (0.483)	0.018 (0.580)	-0.082 (0.552)	-0.065 (0.631)	0.01968 (0.448)	0.018 (0.571)	-0.089 (0.543)	-0.070 (0.629)
OCF	-0.007 (0.710)	-0.006 (0.782)	0.006 (0.872)	0.017 (0.648)	0.00117 (0.934)	-0.006 (0.790)	0.016 (0.698)	0.025 (0.513)
ROA	-0.009 (0.410)	-0.010 (0.458)	0.021 (0.486)	0.018 (0.545)	-0.00412 (0.616)	-0.010 (0.461)	0.016 (0.586)	0.012 (0.650)
N	965	965	155	155	965	965	155	155
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Log-likelihood		-457.0	-86.5	-83.1		-459.0	-86.7	-83.6
Adj. Pseudo R^2		0.064	-0.208	-0.214		0.06	-0.21	-0.218

Table 12 presents the findings related to the H1 using Equation (1) after using the probit regression analysis. Standard errors are clustered at firm level.

p-value at 0 '***' 0.05 '**' 0.10 '*'

However, the use of probit regression does not correct for the unbalance and skewness of dependent variable. Therefore, we employed additional robustness test.

3.8.1 Additional robustness tests-complementary log-log

We make an additional robustness test to correct the unbalanced distribution of dependent variable. At this aim we apply complementary log-log (c-log-log) which addresses the unbalance of dependent variable and performs better than the probit and logit regressions because assumes an asymmetrical distribution rather than a normal trend. According to the extant research, complementary log-log was already used in the studies on crypto to mitigate the concerns of unbalanced and rare values as a dependent variable (Seetharam and Nyakurukwa, 2025). Additionally, it was adopted in other studies in accounting to adjust for the skewness and asymmetric distribution of binary events of dependent variable (Zeng and Ma, 2024).

C-loglog, after controlling for the skewness of dependent variable, showed interesting results on crypto exposure contrasting the probit model, as reported in the Table 5. *Crypto* is still significant on *UTL* for the values accounting for under current assets (i.e. *Crypto*^{a}), confirming the results of LPM. The asymmetric nature of the c-loglog link function makes it more sensitive to rare events in the independent variable, capturing the positive effect of *Crypto* on *UTL*. Therefore, in c-loglog the estimates are higher than in LPM.

For the controls, we confirm both the results in LPM and probit regression. *Cash*, although significant in the log-odds (untabulated) become non-significant after marginal transformations and application of fixed effects, signalling its weak effect on the *UTL*. According to the baseline results, *R&D* and *Size* significantly impact *UTL*, respectively, with a positive (Column (1), column (5), *p-value*≤0.01; Column (2), *p-value*=0.01, Column (6), *p-value*=0.008) and a negative sign (Column (1), Column (5), *p-value*≤0.01; Column (2), Column (6), *p-value*=0.02).

After running the c-loglog, we confirm the positive effect of crypto on the disclosure about unrecognised tax losses.

Table 13. C-loglog regression analysis

	MODEL (A)				***MODEL (B)***			
Variables	**(1) AME (*p-value*)**	**(2) AME (*p-value*)**	**(3) AME (*p-value*)**	**(4) AME (*p-value*)**	**(5) AME (*p-value*)**	**(6) AME (*p-value*)**	**(7) AME (*p-value*)**	**(8) AME (*p-value*)**
Intercept	-	-	-	-	-	-	-	-
Crypto[a]	0.4138* (*0.058*)	0.419* (0.077)	0.69* (0.072)	0.81154 (0.113)	-	-	-	-
Crypto[b]	-	-	-	-	-0.045 (0.859)	-0.0496 (0.8054)	-0.9893 (0.261)	-0.8342 (0.304)
Cash	-0.158** (*0.002*)	-0.161 (0.114)	-0.402 (0.287)	-0.30234 (0.387)	-0.169*** (0.00115)	-0.1703* (0.0987)	-0.4798 (0.225)	-0.3666 (0.331)
Loss	0.0349 (*0.264*)	0.03063 (0.496)	-0.074 (0.706)	-0.12133 (0.536)	0.0438 (0.162)	0.0395 (0.3817)	-0.1203 (0.479)	-0.1457 (0.425)
R&D	0.241*** (*<0.001*)	0.24276** (0.011)	0.01 (0.939)	0.05587 (0.714)	0.249*** (0.000)	0.2501** (0.0089)	0.0056 (0.963)	0.0492 (0.742)
Size	-0.0310*** (*<0.001*)	-0.0319** (0.029)	-0.075 (0.320)	-0.11811 (0.242)	-0.03055*** (0.000)	-0.032** (0.0295)	-0.0571 (0.408)	-0.0971 (0.315)
Age	0.0206 (*0.152*)	0.02131 (0.428)	0.082 (0.586)	-0.00676 (0.979)	0.02134 (0.139)	0.0218 (0.4220)	0.1168 (0.382)	0.0107 (0.964)
BIG4	-0.0829** (0.003)	-0.08396 (0.185)	0.20402 (0.421)	0.19013 (0.436)	-0.08648** (0.0022)	-0.0874 (0.1731)	0.2323 (0.417)	0.2134 (0.439)
OCF	-0.0021 (0.899)	-0.00081 (0.961)	0.00691 (0.845)	0.01757 (0.500)	-0.00207 (0.901)	-0.0008 (0.9607)	0.0189 (0.603)	0.0289 (0.278)
ROA	-0.0056 (0.567)	-0.00654 (0.537)	0.01802 (0.399)	0.01439 (0.546)	-0.00569 (0.562)	-0.0065 (0.5382)	0.0118 (0.568)	0.0077 (0.737)
M&A	0.0150 (0.548)	0.01428 (0.641)	-0.081 (0.470)	-0.069 (0.533)	0.01621 (0.519)	0.0154 (0.6196)	-0.0943 (0.423)	-0.0838 (0.500)
N	965	965	155	155	965	965	155	155
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Firm FE	No	No	Yes	Yes	No	No	Yes	Yes
Log-likelihood		-455.0	-85.7	-80.8		-457.2	-85.4	-80.9
Adj. Pseudo R^2		0.067	-0.20	-0.192		0.063	-0.197	-0.193

Table 13 shows the results using the c-loglog to test the effect of *Crypto* on the *UTL*. Standard errors are clustered at firm level.

p-value at 0 '***' 0.05 '**' 0.10 '*'

3.9 Discussion

The scope of this chapter is to examine how corporate crypto exposure affects the disclosure of unrecognized tax losses. Our findings suggest a positive effect of crypto on the disclosure of unrecognized tax losses. Interestingly, this relationship depends on the type of accounting recognition of crypto. In particular, crypto appears to significantly influence unrecognized tax loss disclosure only when classified as a current asset. Holding crypto as a current asset generally indicates that the firm is more likely to sell it within a year. In contrast, recognizing crypto as a non-current asset defers the selling decision to the long term and does not affect the disclosure of unrecognized tax losses for the current fiscal year. In other words, the key determinant for the probability of disclosure is crypto exposure recognized as a current asset rather than as a non-current asset.

The regression analysis also provides additional insights regarding R&D and firm size. For ICT firms, R&D expenses are positively associated with the disclosure of unrecognized tax losses. This contrasts with our initial expectation, based on the evidence conducted on ICT firms. The existent evidence in ICT firms documents a positive relationship with growth thus future expectations about firm's performance. Our results suggest that the more an ICT firm invests in R&D, the higher the probability of disclosing unrecognized tax losses, contrasting the existent studies on the R&D as a predictor of corporate growth (Canarella and Miller, 2018; Koutroumpis et al., 2020). This effect is justified by the R&D included in the study. Based on the existent literature and according to the proxies adopted in the ICT literature (Canarella and Miller, 2018; Koutroumpis et al., 2020), the use of R&D expenses rather than investment involves higher instability due to the uncertainty about future benefits related to these expenses (Kotari et al., 2002). Consistent with some prior research on tax accounting (Joos and Plesko, 2005), firm size growth appears to reduce unrecognized tax loss disclosure.

Overall, our findings are subject to limitations specific to the ICT industry. Our analysis revealed high heterogeneity among ICT firms and a lack of within-firm variation over time. Consequently, the results about the relationship lose significance when firm fixed effects are included.

3.10 Key findings

This chapter shows how the risk of crypto affects the probability to disclose unrecognised tax losses in ICT firms. According to our provisions, the riskiness of crypto holding is determinant on the disclosure on the unrecognised tax losses. The quantitative analysis about crypto conducted in this Chapter 3 documented also that this positive relationship is conditional on the type of accounting principles used to recognise crypto. Specifically, the effects on unrecognised tax losses disclosure are significant only in case of crypto recognition under the IAS No. 2. This principle reflects the corporate strategies of short-period as the accounting principle is adopted for those items which will be sold within the same fiscal year. Therefore, the probability of an unrecognised tax losses disclosure upward depends on the current year risk rather than the risks related to crypto held as intangibles (i.e., IAS No. 38).

Chapter 4

The policy making behind the crypto tax treatment[xxiii-xxiv]

4.1 Introduction

In 2009, an individual or collective operating under the pseudonym *Satoshi Nakamoto* introduced Bitcoin, a virtual currency grounded in a decentralized architecture whose functioning is outlined in the white paper *"Bitcoin: A Peer-to-Peer Electronic Cash System"* (Nakamoto, 2008). According to Coinbase, a centralized crypto exchange platform, Bitcoin falls within the broader category of digital assets, defined as "anything that is created and stored digitally, is identifiable and discoverable, and has or provides value".

This study adopts a broad definition of crypto as an overarching category of digital assets encompassing crypto, tokens, stablecoins, and utility tokens. In contrast, the term *crypto-asset(s)* is used in a narrower sense, referring specifically to the classification introduced by Regulation (EU) 2023/1114, commonly known as the Markets in Crypto-Assets (MiCA) Regulation.

As crypto adoption expanded, public authorities increasingly intervened to regulate crypto-related transactions (e.g., OECD, 2022b). However, the inherent digital and decentralized features of crypto significantly complicate both regulatory oversight and tax enforcement (Huang et al., 2023). Against this background, the present study investigates the views of Italian accountants and tax professionals, with the aim of understanding the political rationales underlying the fiscal treatment of crypto. Specifically, this Chapter concentrates

[xxiii] This chapter was entirely developed during the traineeship period at the Italian tax authority during which the PhD candidate has developed knowledge about the automatic exchange of information and the CARF.
[xxiv] This chapter is based on the paper entitled "Tax Me If You Can! Decrypting the accounting-tax misalignment of digital assets", submitted to the conference on Current Research in Taxation which will be held in Amsterdam on 29th and 30th June 2026

on the tax policy making of crypto as a reflection of book-tax difference of crypto classification.

From an accounting perspective, the International Accounting Standards Board (IASB) issued in 2019 an agenda decision entitled *Holdings of cryptocurrencies*, addressing the accounting recognition of crypto (IASB, 2019). Subsequently, the European Financial Reporting Advisory Group (EFRAG) defined digital assets as "a digital representation of value or contractual rights created, transferred and stored on some types of distributed ledger technology" (EFRAG, 2020: 6). The IASB (2019) clarified that crypto should be accounted for as inventories under IAS 2, otherwise as intangible assets under IAS 38. In the same document, the IASB (2019) explicitly excluded crypto from the category of financial assets.

Under a tax policy viewpoint, in 2022, the OECD introduced the Crypto-Asset Reporting Framework (CARF) to enhance tax transparency for crypto transactions within the Automatic Exchange of Information (AEOI) system (OECD, 2022b). CARF extends the Common Reporting Standard to transactions whose digital characteristics hinder their effective integration into existing tax frameworks (Avi-Yonah and Salaimi, 2022; Avi-Yonah, 2023). Following the OECD initiative, two major European measures were adopted: Regulation (EU) 2023/1114 (MiCA Regulation) and Council Directive (EU) 2023/2226, commonly referred to as DAC8. Collectively, these initiatives aim to (i) strengthen tax transparency in financial information exchanged under the AEOI and (ii) mitigate tax fraud, avoidance, and evasion associated with crypto activities.

According to the scope of this Chapter 4, we discuss the MiCA Regulation limitedly to the classification of *crypto assets* (financial instruments and non-financial instruments), being aware that this international tax provision is addressed to the automatic exchange of information and it delegates the tax treatment of *crypto assets* to each domestic tax framework.

Although MiCA Regulation partially solved the issues related to the crypto fiscal classification aiming to promote the tax transparency and automatic exchange of

information, the tax treatment of *crypto assets* misaligns with accounting recognition. Governments variously apply capital gain taxation or corporate income taxation, in the absence of a shared conceptual framework for crypto taxation and depending on the type of taxpayers (whether individual or corporate) (Powell and Hope, 2019; Huang et al., 2023; Cong et al., 2023; Solodan, 2019; Wronka, 2024; Sapovadia, 2024). The persistence of regulatory ambiguity is attributable both to the distinctive features of *crypto assets* (Huang et al., 2023; Klopper and Brink, 2023) and to their multiple economic uses (Avi-Yonah and Salaimi, 2022). Such legal incompleteness may facilitate regulatory breaches by both taxpayers and tax authorities (Demin, 2020), raising concerns related to privacy protection and aggressive tax strategies that stretch the limits of tax law.

In this context, the substantive classification of *crypto assets* becomes a crucial determinant of an effective tax environment, particularly in terms of curbing corporate tax avoidance and protecting public revenues. Prior literature documents the existence of accounting-tax discrepancies, commonly referred to as book-tax differences (Desai and Dharmapala, 2009; Hanlon and Heitzman, 2010). Put in a different way, the alignment between the accounting principles and tax principles, known also as book-tax conformity negatively affects earnings management and tax avoidance practices (Tang, 2015).

Mainly, this book-tax difference or ample book-tax conformity gap stems from the divergence in objectives between taxpayers and tax authorities (Graham et al., 2012; Whitaker, 2005). While taxpayers aim to minimize tax expenses, tax authorities pursue revenue maximization, rendering full alignment between the two unattainable (Whitaker, 2005). Within the crypto context, empirical evidence highlights heterogeneous accounting treatments (Anderson et al., 2025; Klopper and Brink, 2023; Lou and Yu, 2024) and a positive association between crypto holdings and tax avoidance intensity (Cui et al., 2024). Nevertheless, close interaction between tax authorities and taxpayers is essential for effective tax policy implementation (Wales and Wales, 2012).

Despite the legal definitions provided under MiCA and the AEOI framework, neither a coherent substantive classification of *crypto assets* nor a theoretically justified application of traditional tax principles, originally developed for tangible assets, has yet emerged. This

study therefore seeks to unpack the underlying reasons for this regulatory stance by examining crypto tax policymaking through the perspectives of accountants and tax specialists, with particular attention to the politically informed considerations underlying the uncertainty of the book-tax divergence.

Drawing theoretically on Kingdon's (1984) Multiple Streams Framework (MSF), we administered an open-ended questionnaire to collect insights of accountants and tax professionals about the drivers of crypto fiscal treatment.

This research contributes to the literature on crypto tax accounting in several respects. First, it advances a novel perspective on crypto tax treatment grounded in the practical experience of accountants and tax specialists as complementary perspective of crypto tax treatment. Second, it underscores the urgency for policymakers to develop a coherent and fit-for-purpose tax regime for crypto transactions. More broadly, the study highlights the critical role of political dynamics in tax policy adoption when disruptive technologies challenge established regulatory paradigms.

4.2 Methodological note and sources

Part of this framework adopted in this chapter originates from an internship carried out during the PhD programme, which involved the examination of the tax policy behind the *crypto assets*, with specific regard to MiCA Regulation and its interaction with existing mechanisms of automatic exchange of information, notably the Common Reporting Standard (CRS). The material and insights developed in that context have subsequently been critically re-elaborated and integrated into the present research, in order to ensure full coherence with the objectives and methodological approach of a data-driven tax accounting analysis.

From a methodological perspective, the internship did not constitute a source of empirical data as such but rather provided an informed vantage point on the tax regulatory design shaping the *crypto asset* ecosystem. Specifically, during the internship, the specific informative flow underlying the exchange of information under CRS framework was

analysed. In this sense, MiCA Regulation is treated as a regulatory source for the theoretical background of this chapter limitedly to the *crypto asset* classification regardless the scope of AEOI, in line with the scope of book-tax gap investigation. Alongside, CRS framework is considered as the starting point for the next implementation of Crypto Asset Reporting Framework[xxv], assessing the extent to which such information can be effectively channelled into tax transparency and administrative cooperation mechanisms. This regulatory interplay is central to understanding how accounting-tax mismatches emerge and persist.

Accordingly, the discussion developed in this chapter does not merely reconstruct the applicable legal framework, but situates the tax accounting analysis within the broader policy-making process at the intersection of accounting recognition and tax regulation of crypto.

4.3 A theoretical background

4.3.1 Crypto accounting regulation

The International Accounting Standards Board (IASB) established the foundational guidance for corporate disclosure of crypto holdings by clarifying the applicable accounting standards. Specifically, entities holding crypto are required to apply IAS 2 *Inventories* when such assets are "held for sale in the ordinary course of business"; in all other cases, IAS 38 *Intangible Assets* applies (IASB, 2019: para. 3). Although crypto may function as a medium of exchange, they lack legal tender status (Wang, 2025) and therefore fall outside the scope of IAS 32 *Financial Instruments: Presentation* (IASB, 2019: para. 5). In addition, pursuant to IAS 1 *Presentation of Financial Statements*, firms holding crypto are subject to enhanced disclosure requirements. When crypto is recognized under either IAS 2 or IAS 38, entities must provide supplementary information to ensure adequate transparency (IASB, 2019). Fair value considerations are addressed through IFRS 13 *Fair Value Measurement*, while

[xxv] Known also as CARF and issued by the Organisation for the Economic Cooperation and Development (OECD), it is the technical framework on which the exchange of crypto information among tax administrations is carried out.

material events affecting crypto holdings that occur after the reporting date must be disclosed in accordance with IAS 10 *Events after the Reporting Period*.

Crypto exhibit characteristics that distinguish them markedly from traditional asset classes. First, they are subject to pronounced price volatility and elevated uncertainty (Klopper and Brink, 2023; Luo and Yu, 2024). Such instability in market valuations may result in significant gains or losses for corporate holders (Bhatnagar et al., 2023; Nguyen and Maine, 2023; Yousef, 2024). Consequently, both positive and negative cash flows related to crypto holdings may be reflected in corporate cash flow statements (Luo and Yu, 2024). Valuation remains particularly challenging in the absence of active and liquid markets that could serve as reliable benchmarks for fair value estimation (Huang et al., 2023; Klopper and Brink, 2023).

Second, the accounting treatment of crypto is contingent upon their economic function within the reporting entity's business model (Luo and Yu, 2024). Firms may engage in crypto mining activities, operate primarily as crypto traders, or accept crypto as a mean of payment. These distinct uses give rise to differences in cash flow classification: crypto mining activities are generally associated with operating cash flows, whereas crypto trading activities are typically reported as investing cash flows (Luo and Yu, 2024).

The application of existing accounting standards to crypto raises several conceptual and practical challenges. The defining features of crypto do not align neatly with the characteristics of inventories under IAS 2, nor with those of intangible assets under IAS 38. In some instances, crypto resemble commodities held for trading purposes (Huang et al., 2023; Klopper and Brink, 2023; Luo and Yu, 2024). Conversely, when classified as intangible assets, difficulties emerge in applying the revaluation model. Although IFRS No. 13 defines fair value as the price that would be received to sell an asset in an orderly transaction between market participants, the existence of sufficiently reliable and observable reference markets for crypto remains uncertain (Huang et al., 2023).

In light of these complexities, an increasing body of literature and professional commentary advocates for the development of accounting standards specifically designed to address the

distinctive attributes of crypto, rather than relying on the adaptation of pre-existing frameworks (Jackson and Luu, 2023; Luo and Yu, 2024). Reflecting this shift, the US Financial Accounting Standards Board (FASB) issued Accounting Standards Update 2023-08, requiring entities that meet certain criteria to measure crypto at fair value (FASB, 2023). Consistently, professional services firms such as Deloitte (2023) have emphasized the significance of FASB's intervention in the accounting regulation of crypto, given their structural complexity and evolving economic role.

4.3.2 Crypto tax regulation

The regulation of *crypto assets* spans multiple domains, including legal classification, accounting treatment, and taxation. From an international tax perspective, recently adopted regulatory frameworks pursue two overarching objectives. First, they seek to enhance tax transparency through Automatic Exchange of Information (AEOI) mechanisms, notably the Crypto-Asset Reporting Framework (CARF), the Markets in Crypto-Assets Regulation (MiCA), and the Eighth Directive on Administrative Cooperation (DAC8). Second, these initiatives aim to support national tax systems in the accurate *crypto assets* classification for the taxation of income and capital gains arising from the related transactions. Within this architecture, AEOI-related provisions operate primarily at the supranational level, whereas the taxation of taxable income, deductible expenses, and realized losses associated with crypto activities remains largely within the remit of domestic tax legislation. Through these instruments, States are better positioned to identify, assess, and monitor the income tax liabilities of both individual and corporate taxpayers engaged in crypto-related operations (MiCA Regulation).

The CARF establishes a comprehensive framework for AEOI by specifying the categories of financial information to be exchanged in relation to crypto-asset transactions. In particular, it identifies: (i) the individuals and entities subject to reporting obligations; (ii) the scope of reportable crypto transactions; and (iii) the due diligence procedures required to identify reportable crypto-asset users. Building on the CARF, the MiCA Regulation provides

harmonized legal definitions of *crypto assets* and clarifies which types of transactions fall within, or outside, the scope of the AEOI regime. Additionally, it is addressed to collect financial information regarding the crypto transactions that occur in a centralised and partially decentralised platforms, excluding those totally decentralised (MiCA Regulation). Subsequently, DAC8 amended the existing EU Directive on Administrative Cooperation (Directive (EU) 2011/16) by incorporating the CARF standards and the MiCA framework into the European AEOI system.

From a legal standpoint, *crypto assets* are embedded within heterogeneous property regimes. Across jurisdictions, they are commonly classified as property, digital property, or other residual categories of assets that lack a precise legal definition (Wang, 2025). They are not recognized as legal tender and therefore cannot be equated with sovereign fiat currencies (Wang, 2025). As a result, the taxation of *crypto assets* presents significant challenges due to: (i) the inherent complexity of existing tax systems; (ii) asset-specific uncertainty stemming from crypto market volatility; and (iii) the prevalence of purely digital transactions, particularly those involving exchanges between different *crypto assets* rather than conversions into fiat currency (Avi-Yonah and Salaimi, 2022; Huang et al., 2023; Klopper and Brink, 2023; Wang, 2025).

At the same time, under MiCA, *crypto assets* that satisfy the criteria established by the European Securities and Markets Authority (ESMA[xxvi]) may qualify as financial instruments. In such cases, these *crypto assets* fall outside the scope of MiCA and are instead subject to the regulatory framework governing financial instruments. This dual classification further complicates the tax treatment of crypto-assets and contributes to regulatory fragmentation.

A notable misalignment persists between the tax configuration of *crypto assets* and their accounting interpretation. Both accounting and tax authorities have largely relied on adapting pre-existing principles, rather than developing new rules specifically tailored to the

[xxvi] ESMA (2024). Final report. Guidelines on the conditions and criteria for the qualification of crypto-assets as financial instruments. www.esma.europa.eu/sites/default/files/2024-12/ESMA75453128700-1323_Final_Report_Guidelines_on_the_conditions_and_criteria_for_the_qualification_of_CAs_as_FIs.pdf

digital, intangible, and decentralized nature of *crypto assets* (Jackson and Luu, 2023; Klopper and Brink, 2023; Wang, 2025). This reliance on legacy frameworks generates additional complexity, particularly given the disconnect between physical economic activities and digital markets. *Crypto assets* may remain within decentralized virtual environments, where monitoring and enforcement by tax authorities are limited (European Council, 2023), until they are either converted into fiat currency or intermediated through centralized service providers (MiCA; Wang, 2025). Moreover, even within digital ecosystems, crypto transactions can generate taxable gains that remain effectively untaxed.

The literature has advanced two main approaches to address these challenges. One approach advocates taxing *crypto assets* upon their interaction with the real economy, namely at the point of conversion into fiat currency. An alternative approach proposes treating *crypto assets* analogously to foreign currency for tax purposes (Avi-Yonah and Salaimi, 2022).

Reflecting the absence of international consensus, the tax treatment of *crypto assets* varies substantially across jurisdictions. In the United States, *crypto assets* are generally subject to capital gains taxation, thus equated with financial instruments (Huang et al., 2023; Cong et al., 2023; Powell and Hope, 2019; Sapovadia, 2024). In contrast, the United Kingdom typically subjects crypto related income to corporate income taxation (Solodan, 2019; Wronka, 2024). Under the Canadian Income Tax Act, crypto transactions may be taxed either as capital gains or as business income, depending on the nature of the activity (Canada Revenue Agency, 2023).

This fragmented international landscape highlights the difficulties which policymakers face in designing coherent and effective tax regimes for *crypto assets*. It also underscores the need for systematic and comparative analyses of national tax provisions to assess their effectiveness and to evaluate whether enhanced international coordination is required.

4.3.3 Book-tax difference and book-tax conformity

In their review of the tax literature, Hanlon and Heitzman (2010) argue that the fundamental misalignment between the objectives of firms and those of tax authorities

constitutes the primary source of divergence between financial accounting income and taxable income. Within this stream of research, two closely related corporate practices are commonly analysed: book-tax differences and book-tax conformity. Book–tax differences capture the discrepancy between pre-tax accounting income and taxable income (Desai and Dharmapala, 2009; Hanlon and Heitzman, 2010), whereas book-tax conformity reflects the degree of consistency between financial reporting standards and tax regulations (Tang, 2015).

Large book-tax differences are typically interpreted as indicators of lower earnings quality, as they are associated with earnings management behaviours (Desai and Dharmapala, 2009; Hanlon and Heitzman, 2010) and the use of tax shelters (Desai and Dharmapala, 2009). In contrast, higher levels of book-tax conformity tend to constrain managerial discretion, thereby limiting opportunistic reporting practices (Procházka and Molìn, 2016). Consequently, both the magnitude of book-tax differences and the extent of book-tax conformity are central to understanding firms' earnings management decisions and tax avoidance strategies (Desai and Dharmapala, 2009; Hanlon and Heitzman, 2010; Tang, 2015; Whitaker, 2005).

The coexistence of multiple stakeholders within the tax system, each characterized by distinct and often conflicting objectives, inhibits full harmonization between accounting standards and tax rules (Hanlon and Heitzman, 2010; Whitaker, 2005). As a result, a complete convergence between financial reporting and taxation is unlikely (Procházka and Molìn, 2016; Tang, 2015). More broadly, the separation between accounting income and taxable income reflects two different institutional rationales: financial accounting is designed to inform investors and other users of financial statements, while taxation is shaped by statutory requirements and public policy goals (Hanlon and Heitzman, 2010; Whitaker, 2005).

Empirical evidence provided by Tang (2015) indicates that stronger book-tax conformity curtails firms' capacity to engage in both earnings management and tax avoidance. However, Atwood et al. (2010) document that higher levels of book-tax conformity relates also to lower earnings quality and reduced earnings persistence.

4.4 Research design: Kingdon's Multiple Stream Framework

In this study, we ground the analysis on MSF that considers the flow of policy making. MSF was introduced by John Kingdon in 1984 in the book entitled *Agendas, Alternatives, and Public Policies,* and aftermath it has been applied by several researchers in their studies involving the policy making processes (e.g., see: Herweg et al., 2022). Kingdon (1984) identifies three streams for MSF:

a) *Problem stream*: An issue is recognized as needing government action.
b) Policy stream: A set of potential alternative solutions is settled to solve the problem.
c) Politics stream: One solution is adopted among different alternatives and under different degrees of influence.

In presence of a problem the "policy window" opens and the policy is ready to be adopted (Kingdon, 1984: 165). Usually, the problem identification is made by experts who propose solutions for the policy changes (Kingdon, 1984) which are more effective in case of involvement of tax administration and economists (Wales and Wales, 2012). The given problem opens the policy window which needs a *Policy stream*, made up of technical policy proposals, and *Politics stream*, engaging the policy makers for the policy approval (Kingdon, 1984).

The process of policy making is not a rational decision-making process (Herweg et al., 2022) and different types of stakeholders, at different levels of hierarchy, might be involved in the policy making, with limited time and resources (Herweg et al., 2022).

As result, in our investigation we consider:

i. *Problem stream*: the obstacles that the professionals and academics consider as determinant to open the policy window for crypto tax policy
ii. *Policy stream*: the set of possible alternatives given the existent crypto tax regulation
iii. *Politics stream*: the politics that hamper a proper classification and regulation for crypto tax treatment.

Problem stream

Kingdon (1984), in his work, highlights the relevance of problem for the policy window opening. A topic becomes relevant for the policy discussion when there are some issues coming up from different sources like indicators or people, pushing for a policy change (Kingdon, 1984). The policy window opening could be pushed from different experts in the field (Kingdon, 1984). Given the interdisciplinary nature of crypto, this approach invests also taxation (Boden et al., 2010).

Under a pure accounting perspective, three different crypto business lines are identified as dominant within corporate crypto holding: crypto mining, crypto trading, crypto as a mean of payment (Luo and Yu, 2024). With respect to crypto mining, where firms report their crypto profits and losses in the operating margin, instead of recognising them under financial margin, the fees from crypto mining represent the core business of these firms and are recognised under the operating margin (Lou and Yu, 2024). As a result of research in tax accounting, crypto holding positively impacted on the tax avoidance (Cui et al., 2024). In line with the main accounting guidelines of crypto, the crypto are excluded from the category of financial instruments and recognised under the IAS No. 2 otherwise under IAS No. 38 (IASB, 2019).

Comparing these results to the current crypto tax regulation, although the decentralised structure represents the bulk of crypto transactions such as crypto mining and the related operating activities (Luo and Yu,2024), MiCA Regulation provided a different classification of crypto, setting out two different categories: (i) crypto classified as financial instruments and (ii) crypto classified as non-financial instruments. There is evidence about the crypto holding and the augmented levels of tax avoidance (Cui et al., 2024) and reduced tax compliance (Cong et al., 2023). According to the existent literature, a high book-tax conformity decreases corporate tax avoidance (Tang, 2015). This misalignment is justified by the divergence in scope between the actors of the tax system (Graham et al., 2012; Whitaker, 2005).

Based on the above, there is a misalignment between the accounting and tax regulation for crypto items. According to the existent tax accounting literature, this misalignment might produce relevant consequences on the levels of tax avoidance (Hanlon and Heitzman, 2010; Tang, 2015) which is one of the opportunistic behaviours by corporate taxpayers that the MiCA Regulation is aiming to reduce. Therefore, the underlying element for the *policy window* opening that we consider as relevant is the crypto accounting-tax misalignment.

We embed the *Problem stream* into the questionnaire by considering which are the obstacles that the respondents consider for the tax regulation of crypto.

Policy stream

The alternative tax treatments for crypto define the feasible *Policy stream* (Kingdon, 1984). The wideness of policy community is made up of different categories of specialists such as researchers, analysts and professionals working in the specialised offices (Kingdon, 1984). Specialists of policy community are those professionals into a specific working group or area, who can bring about policy proposals that could solve the problem focused on the *Problem stream*.

After presenting the *Problem stream*, the available alternatives are mixed. We started from the available possible alternatives to the problem of crypto taxation.

With the questionnaire, we ask the respondents to provide the possible crypto tax treatment.

Politics stream

Based on MSF, the policy making process is influenced by various forces. Before taking any decision, there is a discussion and, depending on the type and intensity of the discussion, the policy makers will take the final decision (Kingdon, 1984). This phase is crucial because it balances the policy debate shifting towards the more influential people involved in this discussion (Kingdon, 1984). The solution to the problem is a mix of different influences from a pure policy and technical level to the dominant politics which, in that moment, may govern the debate (Kingdon, 1984) and are recognised as a political power (Marriott, 2010). When

a designated policy undergoes the MSF, some political parties may exert their disagreement because they are averse to change (Kingdon, 1984).

In this complex scenario, where the political choices are based on the available alternatives, the preparedness of tax professionals and their involvement in the policy making play a crucial role (Wales and Wales, 2012). In line with the Kingdon's framework (1984), Wales & Wales (2012) deem that the final decision is the result of knowledge and experience of people taking part in the policy-making process. In the specific area of taxation, the involvement of experts from different fields is fundamental for a more effective policies development given the interdisciplinarity of taxation, touching different fields of studies, such as accounting, public policy, law (Boden et al., 2010; Wales and Wales, 2012). Although the Minister has the highest role in the decision-making process for the tax policy approval, he or she delegates someone else given the complexity of tax norms (Wales and Wales, 2012). In fact, the effectiveness of tax policies depends also on the involvement of several stakeholders of tax system, including tax administration and economists (Wales and Wales, 2012).

Therefore, in the section of *Politics stream* we intend to test how and to what extent the respondents with different experience and background elect as relevant the politic framework for the final decision of crypto tax policy.

In APPENDIX 2, we report the administered questionnaire based on the stream of Table 14.

Table 14. *Policy Stream*. Global overview on crypto tax framework

INTERNATIONAL TAX FRAMEWORK (MiCA)	NATIONAL TAX FRAMEWORK (ITALY)	ACCOUNTING FRAMEWORK UNDER IAS/IFRS	THE TECHNOLOGICAL CONTEXT
1. Crypto are associated to financial instruments and non-financial instruments 2. Crypto included in the regulation are those employed as means of payment and involved in investment activities 3. Financial data deriving from crypto transactions exchanged relate to centralised crypto exchange and some partially decentralised, with exclusion of fully decentralised crypto transactions (e.g., crypto mining)	1. Corporate crypto tax treatment is based on the accounting values 2. The corporate crypto positions are assumed to be accounted for under financial instruments, inventories and intangibles	1. Crypto are recognised under IAS No. 2 otherwise under IAS No. 38.	1. The crypto transactions might occur on decentralised and centralised exchanges. Within decentralised crypto exchanges there are not third parties, while in centralised crypto exchanges there are intermediaries which make transactions in the place of their clients (Mohan, 2022; Schär, 2021).

4.5 Data collection

Within the MSF framework, we collected qualitative data using an open-ended questionnaire. This method was employed to operationalize the MSF framework and to link the findings to both the *Policy stream* and the *Politics stream*.

The design of the questionnaire is informed by the literature at the intersection of tax law, accounting, and fiscal studies. In line with MSF theory (Kingdon, 1984), we structured the analysis as follows:

i. *Problem stream*: the accounting-tax misalignment related to the classification of crypto.

ii. *Policy stream*: the range of potential alternatives derived from existing crypto tax regulations, as well as emerging insights from academic, accounting, and tax-accounting studies.
iii. *Politics stream*: the selection among the proposed alternatives for crypto tax treatment.

Data collection

Based on the data collected, there are both explored and unexplored areas relevant to the definition of crypto tax treatment. First, the scope of crypto holdings-such as trading activities-must be considered, together with the type of organization involved, whether a financial intermediary or an industrial company. Furthermore, it remains unclear whether crypto-asset service providers can be equated with traditional financial intermediaries. From an accounting perspective, the tax treatment of crypto assets is driven by crypto-to-fiat exchanges and, consequently, by the gains or losses arising from such exchanges. Moreover, the political influence is determinant for the adoption of ana appropriate tax policy framework of crypto. The jurisdictions more keen to the innovation and digital transformation are more prone to the adoption of crypto policies. On the other hand, more conservative institutions are less likely to address the digital disruption determined by crypto exposure.

4.6 Data interpretation

From the data collection, different areas of investigation emerged.

Scope of crypto holding

The interviewees referred to the scope of crypto holdings primarily in relation to trading activities. This type of activity has already been examined by Luo and Yu (2024), who analyse the financial statements of corporate crypto holders. Moreover, this activity is mainly associated with crypto holdings and reflects one of the dominant business lines identified in prior literature (Luo and Yu, 2024). Crypto trading is also the principal activity recognized

under the set of permitted crypto activities under MiCA Regulation. In Italy, the tax guidelines issued for crypto assets assume that they may be accounted for as: (i) inventory; (ii) intangible assets; or (iii) financial instruments, with the corresponding tax treatment. However, the IASB (2019) has excluded crypto assets from the definition of financial assets, reinforcing the existing mismatch between accounting and tax classifications (Jackson and Luu, 2023; Wang, 2025).

Type of organisation

There are different types of businesses, notably industrial companies and financial intermediaries. In the context of crypto transactions, financial intermediaries specializing in crypto custody are less directly involved in the execution of crypto transactions themselves. Crypto custody is recognized under the MiCA Regulation as an activity performed by centralized platforms—also referred to as crypto-asset service providers—which carry out activities, primarily related to trading, on behalf of their clients (Mohan, 2022). Under the MiCA Regulation, crypto transactions are recognized either as means of payment or as activities associated with trading.

However, the existing academic literature (Luo and Yu, 2024) on crypto assets identifies additional types of crypto-related activities, including crypto mining, which is not covered by the MiCA Regulation and, to date, is not associated with a specific accounting classification. Moreover, the degree of an entity's involvement in crypto-related activities is fundamental for determining the appropriate accounting recognition (Luo and Yu, 2024). In Italy, the current guidelines focus primarily on the accounting treatment of crypto assets themselves, rather than on their digital characteristics or the level of risk exposure and involvement of entities engaged in crypto activities, despite evidence that such features are central to valuation and reporting challenges (Klopper and Brink, 2023; Huang et al., 2023; Ricci and Mafrolla, 2026).

Type of exchange

An important aspect of crypto transactions concerns crypto-to-fiat exchanges. Under the MiCA Regulation and the Crypto-Asset Reporting Framework (CARF), financial data are

associated with both crypto-to-crypto and crypto-to-fiat exchanges. With respect to crypto-to-fiat exchanges, the Italian tax guidelines specify that such transactions are subject to taxation; however, they do not clarify the applicable tax treatment, reflecting the broad fragmentation of crypto taxation frameworks (Wang, 2025).

Traceability problems

The respondents report that the main problem is the traceability and accessibility of taxpayers' fiscal positions by tax authorities. They emphasise the lack of an effective regulatory oversight due to their decentralised and intangible nature of crypto-assets, which is consistent with prior literature on the challenges of monitoring crypto transactions (European Council, 2023; Wang, 2025). As a consequence, tax authorities cannot fully observe the financial positions of taxpayers, especially in cross-border contexts. Moreover, respondents underline the relevance of platforms where transactions are conducted, particularly in case of decentralised exchanges, whose architecture increases opacity and complexity (Mohan, 2022; Schär, 2021). On the other hand, they highlight the absence of appropriate instruments on the side of tax authorities to identify these taxpayers.

Solutions

The respondents highlight how stronger tax rules could enhance the crypto reporting, along with the international cooperation, specifically through clearer guidelines at the OECD level. The introduction of mandatory reporting related to crypto transactions is considered an important improvement, especially in terms of transparency, in line with the objectives of AEOI frameworks, such as CARF and DAC8. They propose more robust and appropriate tax rules that might better reflect the digital nature of crypto, echoing prior calls in the literature for tailored regulatory approaches (Jackson and Luu, 2023; Luo and Yu, 2024; Wang, 2025; Ricci and Mafrolla, 2026).

Political influence

Political stability is recognised as an important factor in the decision-making process underlying crypto tax regulation, because it provides the conditions for more stable policy

direction (Kingdon, 1984: Herweg et al., 2022). Moreover, the attention to digital development plays a relevant role. In jurisdictions less oriented towards digital innovation, policymakers are less likely to develop appropriate crypto tax regulation, thereby overlooking this policy-making process. Consequently, in more conservative jurisdictions, tax policies tend to be stricter, whereas in more flexible jurisdictions there is a more favourable approach to crypto adoption, and, consequently, less stringent tax rules. This finding aligns with the Multiple Streams Framework, according to which political dynamics significantly influence policy outcomes (Kingdon, 1984; Wales and Wales, 2012).

4.7 Key findings

Drawing on the MSF, the policy making process at the basis of fiscal treatment of crypto underlined several important tax implications: the scope of corporate crypto holding; type of organisation; type of exchange. The key reading of this chapter is the uncertainty and risk involvement of crypto holders. As a result, the scope pursued by each organisation shapes the crypto holding and its risk involvement. Furthermore, the perceptions about the political framework resulted as pivotal for the adoption of a proper crypto tax classification and correspondent regulation. The conservativeness of a tax jurisdiction is determinant for the crypto tax regulation.

OVERALL CONCLUSIONS AND RECOMMENDATIONS

We analysed the role of digital technology in Tax Research, by analysing different realms of Tax Research affecting tax avoidance. The general findings about digital technology on tax avoidance have highlighted the lack of an in-depth analysis about the corporate crypto holding. Subsequently, this PhD thesis investigated the corporate crypto holding employing an interdisciplinary approach, on accounting, tax accounting and tax policy levels.

The multidisciplinary approach of digital technology and Tax Research

The Chapter 1 critically analysed the existent research about the role of digital technology in tax accounting research, by considering digital technology and its effects on tax avoidance; tax policies addressed to curb tax avoidance; tax policies aimed at improving the corporate digital growth. We enriched the analysis by considering the perspectives of key stakeholders of tax system—namely, corporations and tax authorities. Utilizing the Integrative Literature Review (ILR) framework (Lubbe et al., 2020; Whittemore & Knafl, 2005) alongside the Ecosystem approach (Bassey et al., 2022; Canares, 2016), this study allows us to: (i) examine the tax ecosystem through the lenses of accounting, law, and economics; (ii) distinguish the different digital technologies affecting taxation; (iii) assess the impact of digital technologies on corporate tax avoidance and tax policy, including the reverse effect of tax avoidance driving digital adoption; and (iv) analyse the ecosystem from the viewpoints of corporate taxpayers and tax authorities.

Digital technology is significantly transforming the tax ecosystem, reshaping both corporate tax planning and governmental tax enforcement. However, the rapid evolution of technology has outpaced academic research and policy development, leaving critical gaps in understanding how digital tools influence tax behavior and regulation (Argilés-Bosch et al., 2020; Chen & Meng, 2023; Mazur, 2022).

Regarding the RQs addressed in the first chapter, first research question (RQ1) shows that digital technologies both facilitate tax avoidance and create mechanisms to limit it. Digital business models such as e-commerce, digital finance, and crypto provide innovative avenues for tax avoidance (Argilés-Bosch et al., 2020; Tang et al., 2025; Chawla & Mahipal, 2023),

whereas tools like XBRL and blockchain offer opportunities for a greater transparency (Kobbi-Fakhfakh & Athie, 2023; Anomah et al., 2024) and reduced corporate tax avoidance (Tiantian et al., 2023). Empirical results, however, are fragmented and occasionally contradictory, reflecting varying national contexts and different measurement approaches (Chen et al., 2024; Xie & Huang, 2023; Zhang & She, 2024).

In addressing the second research question (RQ2), the review highlights challenges for tax law and policy in adapting to digital business models. Traditional concepts such as permanent establishment are challenged by intangible, borderless transactions (Geringer, 2021; Littlewood et al., 2020), while new instruments like the DST raise unresolved concerns regarding fairness, definitional clarity, and enforceability (Avi-Yonah et al., 2022; Klein et al., 2022). Simultaneously, technology-driven mechanisms such as the Common Reporting Standard demonstrate the potential of digitalization to strengthen tax enforcement, though research on long-term effectiveness is limited (Ye and Li, 2024). Furthermore, the digital transformation offers a growing opportunity for both enterprises and governments. The digital transformation created new digital business model and, meanwhile, helps the tax authorities to pursue public interests by reducing tax avoidance (Su, 2025). Concerning the third research question (RQ3), the development of digital technologies acts as a bridge between corporate objectives and tax authority enforcement. For firms, these technologies facilitate strategic tax management, while for authorities, they improve monitoring capabilities yet also expose limitations in jurisdictional reach and international coordination (Mazur, 2022; Guo et al., 2024). Notably, very few studies simultaneously integrate these perspectives, despite their practical interdependence (Xie and Huang, 2023).

The main contribution of the first chapter is its structured, interdisciplinary assessment of how research on digital technology intersects with accounting, law, and economics in the context of tax avoidance. For tax accounting, digital technology is not merely a reporting innovation but also a driver of corporate strategies, complicating measurement of intangibles and disclosure practices (Chen et al., 2021; Chen & Meng, 2023). In tax law, it highlights the obsolescence of traditional categories and underscores the need for

frameworks addressing digital forms of avoidance alongside transparency of corporate transactions (Geringer, 2021; Littlewood et al., 2020). In tax policy and economics, it illustrates how uneven digital infrastructure across jurisdictions may exacerbate global tax inequalities (Avi-Yonah et al., 2022; Tiantian et al., 2023; Zhou, 2024).

Overall, the findings indicate that "digital tax research" is emerging as a distinct field at the intersection of accounting, law, and economics. Future research should adopt comparative, cross-jurisdictional, and multi-stakeholder approaches to fully capture the dynamics of the digital tax ecosystem, providing a stronger empirical basis for policymaking in the era of digitalization.

The riskiness of crypto and the accounting needs

The Chapter 2 shows that corporate crypto holders disclose information on crypto-related risks through both mandatory reporting requirements under IFRS 7 and voluntary disclosures. Moreover, the extent and nature of risk disclosure differ across crypto business models, namely mining, trading, and service providers. Our analysis reveals that, contrary to the accounting guidance issued by the IASB (2019), corporate crypto holders tend to associate crypto-related risks with those typically attributed to financial instruments. This interpretation appears consistent with the legal treatment introduced by Regulation (EU) 1114/2023, which places *crypto assets* within a regulatory framework closely aligned with financial instruments.

Beyond accounting recognition, sustainability regulation and environmental externalities are expected to play an increasingly important role in shaping the future of corporate crypto activities, particularly in the context of crypto mining, given its substantial energy consumption (OECD, 2022). In line with Gao et al. (2020), we observe a growing shift of risk disclosure towards digital-based corporate communication channels.

The empirical evidence further highlights substantial heterogeneity across crypto business lines. Crypto mining firms provide more detailed and sophisticated disclosures of crypto-related risks, reflecting their higher levels of operational and technological uncertainty (Tan et al., 2017). Across all crypto business models, cybersecurity emerges as a central concern

in corporate strategies underpinning crypto transactions. By contrast, crypto service providers exhibit a lower exposure to crypto-related risks, which is reflected in more limited disclosures primarily focused on compliance with anti-money laundering regulation.

This research contributes to the emerging literature on cybersecurity in the crypto environment (Alsadoun & Albaz, 2025; Gao et al., 2020) by explicitly linking cybersecurity risks to corporate operations and performance. The findings indicate that firms exposed to greater underlying uncertainty, particularly mining firms, tend to provide more extensive risk disclosures, consistent with the predictions of Tan et al. (2017). Future research may further investigate how exposure to cybersecurity risks affects firm performance. Overall, the study underscores the need for clearer classification and measurement criteria for crypto assets in financial reporting, capable of incorporating their digital nature into accounting assessments.

Several implications emerge at the interface between accounting standards and regulatory frameworks. First, a persistent disconnect can be observed between accounting guidance and legal regulation. While current accounting standards explicitly exclude crypto from the definition of financial instruments (IASB, 2019), recent regulatory initiatives classify certain categories of crypto within a financial instrument. This divergence highlights the need for greater alignment and interpretative guidance from accounting standard setters.

Second, mandatory risk disclosure requirements are primarily designed for financial instruments, yet crypto-related activities fall outside the scope of such assets under existing accounting standards (IASB, 2019). Our findings further indicate that firms' exposure to crypto-related risks varies substantially across business models. However, current accounting and disclosure standards do not distinguish among these models, despite evidence that firms subject to higher uncertainty tend to provide more extensive risk disclosures (Tan et al., 2017), as observed in the case of crypto mining firms. Consistent with the crypto accounting literature, these results reinforce the argument for the development of a dedicated accounting standard for crypto-assets, rather than the continued adaptation of traditional frameworks ill-suited to their specific features (Jackson & Luu, 2023; Klopper & Brink, 2023).

Third, sustainability considerations represent a crucial yet insufficiently addressed dimension of crypto-related activities, particularly with respect to energy intensity and environmental externalities. Robust and comparable metrics to measure the carbon footprint of crypto operations remain largely underdeveloped (OECD, 2022). Moreover, additional regulatory guidance is required for crypto-specific transactions, such as halving mechanisms and crypto commingling, which carry significant implications for credit risk and cybersecurity exposure. More broadly, the regulatory environment will play a decisive role in shaping the future of corporate crypto activities. This underscores the need for coordinated policy interventions aimed at mitigating crypto-related regulatory risks through clearly defined rules at both macroeconomic and procedural levels.

This second chapter shows the limitations regarding the sampled firms analysed. The majority of these firms are crypto miners and located in Canada. Further investigations are needed to expand the analysis and show a higher variation in terms of activities carried out, mainly considering more crypto trading and crypto asset service providers.

The tax accounting perspective: uncertainty of crypto market and the disclosure about unrecognised tax losses

The growing adoption of crypto has generated substantial challenges for both accounting standard setters and tax authorities, emphasising the need for regulatory frameworks capable of capturing the digitalised and highly volatile features of crypto assets in financial and tax reporting (Jackson & Luu, 2023; Baer et al., 2023). The hybrid nature of crypto, simultaneously functioning as an investment vehicle, a medium of exchange, and a speculative asset, has long contributed to regulatory uncertainty in both legal and fiscal domains (Baur et al., 2018). More recently, intensified speculative activity in crypto markets has attracted an increasing number of participants, including corporate investors (Luo & Yu, 2024).

The Chapter 3 contributes to the existing literature by showing that corporate maturity, loss status, and crypto exposure exert distinct and interacting effects on disclosure behaviour. The empirical evidence yields several important findings. First, corporate maturity plays a

more prominent role in explaining unrecognised tax loss disclosure among ICT crypto and non-crypto firms. Second, crypto exposure significantly increases the propensity to disclose unrecognised tax losses in older ICT firms. Third, loss status emerges as a relevant determinant only for ICT non-crypto firms. Overall, the results indicate that disclosure practices are driven by heterogeneous sources of uncertainty: loss-related uncertainty prevails in ICT non-crypto firms, whereas asset-specific uncertainty linked to crypto holdings is more salient in the whole ICT industry.

In this third chapter, the analysis was conducted in Canada and among firms belonging to the same industry (ICT). Further investigations may consider other industries, such as financial industries, and other countries where these firms are located other than Canada. Additionally, future research avenues might consider the difference between the IAS/IFRS firms and GAAP.

Tax policy: a preliminary analysis of crypto tax policy making

The Chapter 4 highlights the potential alternatives to the tax treatment of crypto tied to the book-tax misalignments. As emerged in the Chapter 4, the involvement of different actors such as accountants and tax specialists in the policy making process of crypto taxation might improve the tax policy through a more closeness of book to tax principles.

This study contributes to the growing literature on crypto regulation by examining the interplay between accounting, taxation, and policy-making through the lens of Kingdon's Multiple Streams Framework. The findings highlight a persistent misalignment between accounting standards and tax rules, which amplifies uncertainty and creates opportunities for inconsistent treatment of crypto transactions (Jackson and Luu, 2023; Wang, 2025). Empirical evidence from the interviews suggests that challenges related to traceability, classification, and regulatory fragmentation remain central obstacles to effective crypto taxation, particularly in cross-border contexts (Avi-Yonah and Salaimi, 2022; European Council, 2023).

Furthermore, the results emphasise the importance of political and institutional factors in shaping crypto tax policies, confirming that regulatory outcomes depend not only on

technical solutions but also on broader governance dynamics (Kingdon, 1984; Herweg et al., 2022). Overall, the study supports the need for more harmonised and crypto-specific regulatory frameworks, capable of addressing the unique digital and decentralised nature of crypto-assets while enhancing transparency and tax compliance.

Regulatory and managerial implications

This PhD thesis emphasizes the importance of an emerging stream of research in digital tax accounting. It sheds light on several areas of study related to taxation, including accounting, tax accounting, and tax regulation.

First, it highlights how digital technologies have increasingly permeated tax research and examines the extent to which digital tools, as intangible assets, moderate the effects of key tax policies aimed at curbing tax avoidance.

Second, the growing use of cryptocurrencies calls on accounting regulators to establish well-defined accounting principles to ensure appropriate disclosure of digital risks, particularly those related to cybersecurity, as well as differentiated risk disclosures across various crypto-related business models.

Third, the uncertainty associated with cryptocurrencies significantly increases the likelihood of unrecognized tax losses. Accordingly, tax regulation should account for crypto holdings as an additional source of risk that materially affects the recognition of such unrecognised tax losses. Drawing on the extant literature and established accounting principles, prior research shows that the disclosure of unrecognized tax losses negatively affects future corporate performance (IASB, 2001; Gordon and Joos, 2004). Consequently, governments should consider crypto-related risks as a key determinant of future corporate performance and design more targeted tax policies across industries, distinguishing between ICT and non-ICT sectors, as well as between crypto-intensive and non-crypto firms.

Finally, with regard to tax policymaking, political influence plays a crucial role in the regulation of cryptocurrencies. Governments should acknowledge the widespread expansion of crypto-related activities—including trading, mining, and service providers, and

account for the role of political dynamics in shaping tax policy frameworks for this evolving domain.

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APPENDIX

APPENDIX 1. Variables' description

MODEL	Variable items	Description	Database
	Dependent variable		
(A); (B)	*UTL*	Dummy variable equal to 1 if firms reported information regarding the tax losses; 0 otherwise. We considered the general information about tax losses regardless the separation between capital losses and non-capital losses provided by Canadian tax law (Suarez, 2012).	Hand-collected
	Test variables		
(A)	*Crypto*[a]	Continuous variable measured as a ratio between the amount of crypto recognised as current assets and total assets.	Hand-collected
(B)	*Crypto*[b]	Continuous variable measured as a ratio between the amount of crypto recognised as non-current assets and total assets.	Hand-collected
	Control variables		
(A); (B)	*Size*	Measured as the natural logarithm of total assets (Zimmerman, 1983).	Orbis [13077]
(A); (B)	*Age*	Difference between the current year and establishment date	Orbis
(A); (B)	*Losses*	Dummy variable equal to 1 if the firm has negative earnings before taxes in the current year; 0 otherwise.	Orbis [13034]
(A); (B)	*R&D*	Ratio between the R&D expenses and the total assets	Orbis [22020] & [13077]
(A); (B)	*BIG4*	Dummy variable equal to 1 whether a firm is audited by the Big4 auditors (i.e., KPMG, EY, PwC or Deloitte); 0 otherwise.	Orbis
(A); (B)	*M&A*	Dummy variable equal to 1 whether a firm began a merger and/or acquisition; 0 otherwise.	Orbis
(A); (B)	*ROA*	Ratio between earnings before interest and taxes (EBIT) and total assets	Orbis [13024] & [13077]

(A); (B)	*OCF*	Ratio between operating cash flows and total assets	Orbis [15514] & [13077]

APPENDIX 2. Questionnaire Kingdon's Framework

This questionnaire explores the tax treatment of cryptocurrencies, adopting an interdisciplinary approach at the intersection of digital studies and tax accounting.
It aims to provide a better understanding of the policy-making process underlying the tax classification and fiscal treatment of cryptocurrencies.
Respondents, who have experience in both accounting and taxation, are asked to adopt the perspective of a policymaker and to indicate their preferred approach.

1	**Gender** ☐ Female ☐ Male
2	**Education** ☐ High school diploma ☐ Bachelor's degree ☐ Master's degree ☐ PhD
3	Professional background (field of study or expertise):
4	Current occupation:
5	Years of professional experience:
6	Experience in taxation:
7	How would you define the main problem related to the taxation of cryptocurrencies?
8	Which policy solutions do you consider most viable for their tax treatment?
9	To what extent do political factors influence your preferred classification?