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The Financial and Sustainability Consequences of R&D and Intangible Investments: UK Evidence

Theses of the doctoral (PhD) dissertation

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Sopron
2026

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DECLARATION ON IDENTITY

I, the undersigned **Asma Mechta**, declare that **the printed and electronic versions** of the doctoral dissertation and thesis booklet **are identical in all respects**.

Sopron, 2026/03/30

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1. INTRODUCTION

1.1 Background of Research

The global economy has undergone a profound transformation over recent decades, shifting from a production system dominated by tangible capital to one increasingly driven by intangible and knowledge-based resources. Investments in research and development (R&D), software, data, organisational processes, and human capital have become the primary engines of corporate value creation (Corrado et al., 2022; Barker et al., 2022). In advanced economies such as the United Kingdom, intangible investment now exceeds tangible investment, fundamentally reshaping firm behaviour, financial reporting, and capital-market dynamics.

Despite their growing importance, intangible assets pose significant challenges for accounting and financial analysis. Under International Financial Reporting Standards (IFRS), and particularly IAS 38 Intangible Assets, most internally generated intangibles remain unrecognised on the balance sheet, while others are subject to restrictive recognition criteria and managerial discretion (IFRS Foundation, 2024). This creates a persistent gap between firms' economic reality and their accounting representation, increasing information asymmetry between managers and external stakeholders.

These accounting challenges have direct implications for corporate financial behaviour. Innovation-related investments are typically uncertain, irreversible, and non-collateralisable, limiting firms' access to

external finance and increasing reliance on internal liquidity (Hall & Lerner, 2009). As a result, innovation-intensive firms often adopt conservative liquidity strategies by holding substantial cash reserves (Opler et al., 1999; Falato et al., 2022). At the same time, the discretion inherent in accounting for R&D and intangible assets may increase opportunities for earnings management, raising concerns about financial reporting quality and transparency (Cazavan-Jeny & Jeanjean, 2006; Kothari et al., 2005).

In parallel with these financial challenges, sustainability and ESG performance have become central dimensions of corporate strategy and stakeholder evaluation. Investors, regulators, and society increasingly expect firms to demonstrate responsible environmental, social, and governance practices, supported by credible and transparent disclosures (Friede et al., 2015). However, the relationship between innovation investment and ESG performance remains theoretically ambiguous. While innovation can support sustainability through cleaner technologies and improved efficiency (Flammer, 2021), it may also compete with ESG initiatives for limited organisational resources, particularly when R&D is not explicitly sustainability-oriented.

Against this backdrop, understanding how R&D and intangible investments simultaneously influence liquidity policy, earnings management, and ESG performance has become both an academic and practical priority. The UK provides a particularly relevant institutional setting, combining a principles-based IFRS regime with strong corporate

governance standards and advanced sustainability disclosure requirements such as TCFD. This unique configuration makes it possible to examine how innovation-related investments shape corporate behaviour under conditions of both discretion and accountability.

1.2 Research Motivation

The motivation for this research arises from four interrelated developments. First, the rapid growth of intangible investment has outpaced the evolution of accounting standards, raising concerns about the relevance and reliability of financial statements for innovation-intensive firms (Barker et al., 2022). Second, innovation-driven firms face heightened financial risk and financing constraints, making liquidity management a strategic concern (Duchin, 2010). Third, accounting discretion associated with R&D and intangible assets increases the potential for earnings management, undermining investor confidence (Dechow et al., 1995). Fourth, ESG performance has emerged as a critical determinant of firm legitimacy and long-term value, yet its relationship with innovation remains insufficiently understood.

Existing research typically examines these issues in isolation. Studies on cash holdings focus on financing frictions, earnings management research concentrates on accrual behaviour, and ESG studies often treat innovation as an auxiliary variable rather than a central driver. This fragmentation limits our understanding of how innovation-related investments jointly affect financial and sustainability outcomes.

Moreover, much of the empirical evidence is US-centric, leaving the UK context underexplored despite its distinctive institutional features.

This study is therefore motivated by the need to integrate these strands of literature within a single analytical framework and to provide UK-specific evidence that informs ongoing debates on intangible asset reporting, financial transparency, and sustainability accountability.

1.3 Research Problem and Research Questions

The central research problem addressed in this thesis is the lack of integrated empirical evidence on how innovation-related investments influence corporate financial strategies and ESG performance under IFRS. The overarching research question is:

How do R&D and intangible investments influence corporate cash holdings, earnings management, and ESG performance in UK-listed firms?

This question is operationalised through six sub-questions:

1. How does R&D investment relate to corporate cash holdings?
2. What is the relationship between R&D investment and earnings management?
3. How does R&D investment affect ESG performance?
4. What is the impact of intangible asset investment on corporate cash holdings?
5. How does intangible investment influence earnings management?

6. Is there a relationship between intangible investment and ESG performance?

1.4 Research Objectives

The study pursues the following objectives:

- To analyse the impact of R&D and intangible investments on corporate liquidity behaviour
- To examine the role of innovation-related accounting discretion in earnings management
- To assess the relationship between innovation investment and ESG performance
- To compare the financial and sustainability effects of R&D intensity and intangible asset intensity
- To provide UK-specific evidence relevant to policymakers, investors, and standard setters

1.5 Research Hypotheses

Based on precautionary motive theory, agency theory, and sustainability frameworks, the study formulates six hypotheses:

- **H1:** There is a relationship between R&D investment and cash holding.
- **H2:** There is a relationship between R&D investment and earnings management.
- **H3:** There is a relationship between R&D investment and ESG performance.

- **H4:** There is a relationship between intangible investment and cash holding.
- **H5:** There is a relationship between intangible investment and earnings management
- **H6:** There is a relationship between intangible investment and ESG performance.

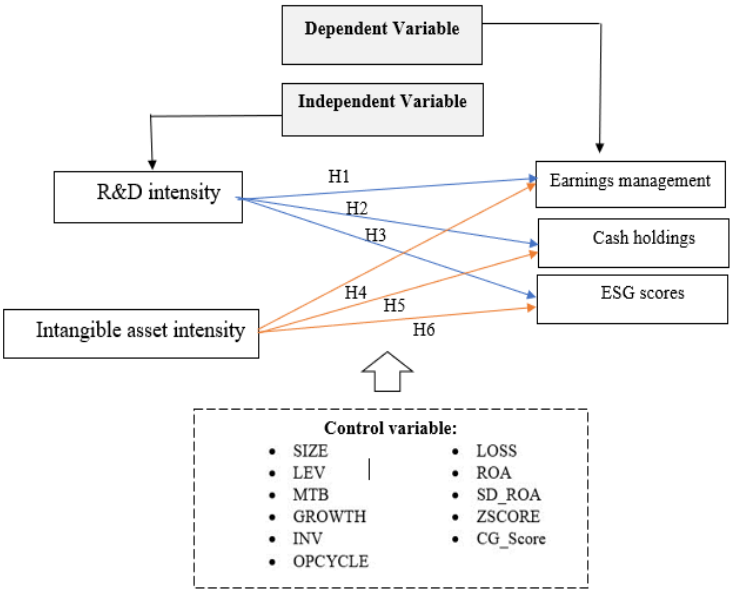

Figure 1. Research Framework
Source: Researcher's construction

2. RESEARCH QUESTIONS AND METHODS

2.1 Methodological Approach

This study adopts an explanatory sequential mixed-methods research design, which combines quantitative and qualitative approaches in a structured and complementary manner. The choice of this methodology is motivated by the complex and multi-dimensional nature of innovation-related investments, which simultaneously influence financial behaviour, accounting practices, and sustainability outcomes. Quantitative methods allow for the identification of systematic relationships between R&D intensity, intangible asset intensity, and corporate outcomes, while qualitative methods provide contextual understanding of the underlying mechanisms driving these relationships.

In the first phase, quantitative analysis is employed to test the hypothesised relationships using longitudinal firm-level data. This phase establishes the direction, magnitude, and statistical significance of the effects of innovation-related investments on cash holdings, earnings management, and ESG performance. In the second phase, qualitative insights are used to interpret and enrich the quantitative findings by exploring managerial judgement, reporting discretion under IFRS, and institutional factors specific to the UK context. The integration of these two phases enhances the explanatory power of the study and reduces the risk of purely statistical interpretation detached from real-world corporate decision-making.

This mixed-methods approach is particularly appropriate for research conducted under a principles-based accounting regime, where professional judgement and institutional context play a decisive role in shaping observed outcomes.

2.2 Quantitative Method

The quantitative analysis is based on an unbalanced panel dataset comprising 160 UK-listed non-financial firms observed over the period 2011–2023, yielding a total of 2,075 firm-year observations. Financial data and ESG indicators are obtained from the Refinitiv Eikon database, ensuring consistency, comparability, and broad coverage across industries.

The study employs fixed-effects panel regression models to control for unobservable firm-specific heterogeneity and time-invariant characteristics that may influence both innovation investment and corporate outcomes. Firm-clustered robust standard errors are used to address heteroskedasticity and within-firm correlation. Year fixed effects are included to account for macroeconomic conditions, regulatory changes, and systemic shocks affecting UK firms during the observation period. The dependent variables capture three key dimensions of corporate behaviour: cash holdings, earnings management, and ESG performance. The main explanatory variables are R&D intensity and intangible asset intensity, measured in line with established literature. Control variables are included to isolate the effects of innovation-related investments from other firm characteristics, such as size, leverage,

profitability, and growth opportunities. This econometric framework allows for a rigorous and internally consistent examination of the research hypotheses.

Table 1. variable definitions

Variable Name	**Symbol**	**Measurement/Formula**
Cash Holdings	Cash_holding	Cash and cash equivalents / Total assets
Earnings Management (Discretionary Working Capital Accruals)	DisWCA	Measure proposed by (P. M. Dechow & Dichev, 2002) developed by (Francis et al., 2005)
ESG Performance	ESG	ESG score from Refinitiv Eikon database
R&D Intensity	R&D	R&D expenditure / Total Sales
Intangible Intensity	Intang	Intangible assets / Total assets
Firm Size	SIZE	Natural log of total assets
Leverage	LEV	Total debt / Total assets
Market to Book	MTB	(Liabilities + Market Cap) / Total assets
Sales Growth	GROWTH	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$
Inventory Intensity	INV	Inventory / Total assets
Operating Cycle	OPCYCLE	DIO + DSO
Loss	LOSS	1 if Net Income < 0, 0 otherwise
Return on Assets	ROA	Net income / Total assets
ROA Volatility	SD_ROA	Std. dev. of ROA over 3 years

Altman's Z-score	ZSCORE	Standard Z-score formula
Corporate Governance	CG_Score	ESG governance component Eikon database

Source: Researcher's construction

The quantitative analysis adopts a panel-data approach consistent with methodological practices reported in sustainability, governance, and innovation research (Danisman & Demirel, 2019; Mahmood et al., 2018; Rustam et al., 2019).

Model 1: Effect of R&D Intensity

$$Y_{it}=\alpha + \beta_1 R\&D + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

Model 2: Effect of Intangible Asset Intensity

$$Y_{it}=\alpha + \beta_1 Intang + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it}$$

2.3 Qualitative Method

To complement the quantitative findings, the study incorporates a qualitative research component based on semi-structured expert interviews. Five academic and professional experts with specialised knowledge in innovation accounting, corporate reporting, and ESG practices in the UK are interviewed. This expert-based approach is particularly suitable for investigating areas characterised by high judgement and discretion, such as R&D capitalisation decisions, intangible asset valuation, and ESG disclosure practices.

The interviews are analysed using thematic analysis, enabling the systematic identification of recurring themes related to managerial incentives, reporting behaviour, governance mechanisms, and regulatory influences. The qualitative findings provide explanatory depth by clarifying why firms adopt certain liquidity strategies, how accounting discretion is exercised under IAS 38, and how organisational capabilities embedded in intangible assets support ESG performance. The integration of qualitative insights strengthens the interpretation of the quantitative results and enhances the overall credibility of the study.

Table 2. Interview Participant Profiles

ID	A/P Title	Affiliation	Area of Expertise
A	Professor	Bangor University	Corporate narrative reporting, Corporate finance, Intangible assets, Standard-setting, ESG
B	Assistant Professor	Bangor University	Financial reporting, International accounting, CSR
C	Associate Professor	University of Glasgow	Corporate disclosure, ESG, Climate reporting
D	Associate Professor	ST. Andres University	Disclosure, Textual analysis, Governance, ESG
E	Professional Expert	KPMG UK	Intangible assets, Standard-setting, Blockchain, ESG

Source: Researcher's construction

3. RESULTS AND NEW SCIENTIFIC FINDINGS

3.1 Cash Holdings

The empirical results reveal a strong and statistically significant positive relationship between both R&D intensity and intangible asset intensity and corporate cash holdings. Firms with higher levels of innovation-related investment systematically maintain larger liquidity buffers. This behaviour reflects the heightened uncertainty, irreversibility, and financing frictions associated with intangible-driven business models.

R&D-intensive firms rely heavily on internal funds to sustain long-term innovation projects, particularly when external financing is constrained by limited collateral value and information asymmetry. Similarly, firms with high intangible asset intensity face restricted borrowing capacity due to the non-physical nature of their assets, reinforcing the precautionary motive for cash accumulation. These findings provide robust support for precautionary motive theory and demonstrate that innovation strategy and liquidity management are deeply interconnected in the UK context.

3.2 Earnings Management

The results further indicate that both R&D intensity and intangible asset intensity are positively associated with earnings management, although the underlying mechanisms differ. R&D intensity increases reporting discretion primarily through the capitalisation of development costs under IAS 38, allowing managers to influence the timing of expense recognition and smooth earnings volatility. Intangible asset intensity, by contrast, facilitates earnings management through subjective valuation,

amortisation assumptions, and impairment testing, particularly under IAS 36.

These findings highlight an important tension within IFRS-based reporting systems: while principles-based standards provide flexibility and relevance, they also expand managerial discretion in innovation-intensive firms. The evidence suggests that increased reliance on intangible investments may come at the cost of reduced earnings quality, raising concerns for investors and regulators regarding transparency and comparability.

3.3 ESG Performance

The analysis reveals a negative association between R&D intensity and ESG performance, indicating that innovation investment does not automatically translate into improved sustainability outcomes. General R&D expenditure may compete with ESG initiatives for financial and managerial resources, particularly when innovation is not explicitly aligned with environmental or social objectives. This finding challenges the assumption that innovation and sustainability are inherently complementary.

In contrast, intangible asset intensity is positively related to ESG performance. Firms with stronger stocks of intangible assets—such as human capital, organisational culture, governance quality, and reputational capital—exhibit superior ESG outcomes. These assets function as organisational enablers that support stakeholder engagement, governance effectiveness, and credible sustainability reporting. The

results suggest that sustainability performance depends less on innovation activity alone and more on the embedded capabilities that allow firms to operationalise and govern sustainability commitments.

Table 3. Summary of Hypothesis Testing Results

Hypothesis	Statement	Expected Sign	Regression Result	Supported?
H1	R&D intensity is positively associated with cash holdings.	+	$\beta = 0.085, p < 0.01$	**Supported**
H2	R&D intensity is positively associated with earnings management.	+	$\beta = 0.090, p < 0.01$	**Supported**
H3	R&D intensity is negatively associated with ESG performance.	–	$\beta = -3.269, p < 0.05$	**Supported**
H4	Intangible asset intensity is positively associated with cash holdings.	+	$\beta = 0.007, p < 0.05$	**Supported**
H5	Intangible asset intensity is positively associated with earnings management.	+	$\beta = 0.002, p < 0.01$	**Supported**
H6	Intangible asset intensity is positively associated with ESG performance.	+	$\beta = 0.437, p < 0.01$	**Supported**

Source: Researcher's construction

3.4 New Scientific Results

This study provides the following key contributions:

- R&D investment and intangible asset investment are distinct innovation constructs that produce asymmetric financial and sustainability effects.
- Innovation-driven cash accumulation reflects structural financing frictions under IFRS, rather than short-term opportunistic behaviour.
- Intangible assets act as foundational enablers of ESG performance, whereas R&D investment alone may weaken sustainability alignment.
- The mixed-methods approach provides richer explanatory insight into how accounting discretion, governance, and institutional context jointly shape innovation outcomes.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The study concludes that innovation-related investments fundamentally reshape corporate financial and sustainability behaviour, but their effects depend critically on the type and maturity of innovation resources. R&D investment intensifies financial risk, liquidity hoarding, and reporting discretion, while recognised intangible assets strengthen ESG performance despite similar accounting challenges. These findings demonstrate that innovation is not a homogeneous driver of corporate outcomes and must be analysed through a differentiated lens.

4.2 Recommendations

Based on the findings, the following recommendations are proposed:

- ✓ Managers should align R&D strategies more closely with long-term sustainability objectives and strengthen internal governance over innovation-related reporting decisions.
- ✓ Investors should distinguish between short-term R&D activity and embedded intangible capabilities when evaluating firm value, risk, and ESG credibility.
- ✓ Regulators and standard setters should enhance disclosure requirements for intangible-intensive firms and promote stronger integration between financial reporting and sustainability reporting frameworks.

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