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Article

Intangible and Tangible Investments and Future Earnings Volatility

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Abstract: This study delves into the impact of intangible and tangible investments on future earnings volatility within the European financial market context. Drawing from International Accounting Standards (IAS) 16 and 38, we examine the intricate relationship between fixed assets, expenses, and the uncertainty surrounding forthcoming earnings. Our analysis reveals that intangible assets, often associated with heightened uncertainty and risk, contribute to increased earnings volatility compared to capital expenditures. Furthermore, we find that capitalizing intangible assets serves to alleviate uncertainty, resulting in lower earnings volatility compared to expensing them. Our exploration of industries' effects further reinforce these findings, with the effect of intangible and tangible investments on earnings volatility being more pronounced in high-tech industries than in low-tech industries. Additionally, our robustness test, utilizing goodwill as a proxy for intangible assets and property, plant, and equipment as a proxy for tangible assets, yields consistent results, further bolstering our findings.

Keywords: intangible assets; capital expenditures; research and development expenses; advertising expenses; earnings volatility



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1. Introduction

In the contemporary economic landscape, the ascendancy of intangible investments marks a transformative shift in how businesses create and sustain value. This rise reflects a departure from traditional models centered around tangible fixed assets, such as property, plant, and equipment, towards intangible assets like research and development (R&D), intellectual property, brand reputation, and human capital. Both intangible assets and tangible fixed assets are expected to contribute to the company's operations and generate economic benefits over an extended period (IAS 16 and IAS 38).

Previous studies have primarily examined the intricacies associated with specific intangible investments like R&D (Lev 2001; Gu and Wang 2005; Elkemali and Rejeb 2015; Zhang 2015; Chen et al. 2017). They conclude that the inherent uncertainty and risk linked to both expensed and capitalized R&D affect market valuation (Lev and Sougiannis 1996; Oswald and Zarowin 2007; Li 2011; Coluccia et al. 2020; Kim et al. 2021) and subsequent earnings uncertainty (Kothari et al. 2002; Amir et al. 2007; Jeny et al. 2019).

Our study broadens this scope by exploring the complex interplay between intangible investments in general, tangible investments, and future earnings volatility. By considering a wider range of intangible assets alongside tangible fixed assets, we aim to offer a more comprehensive understanding of how various asset types impact earnings volatility over time. Firstly, we assert that, owing to their heightened uncertainty and complexity, intangible assets contribute more significantly to future earnings volatility compared to tangible fixed assets. Uncertain outcomes from intangible investments introduce unpredictability into financial reporting, as the success or failure of these investments can significantly

impact earnings from one period to another. Additionally, the subjective nature of intangible asset valuation can lead to significant fluctuations in reported earnings, further amplifying volatility. Moreover, factors like technological obsolescence and ambiguous property rights associated with intangible assets can introduce additional risks, potentially exacerbating earnings volatility. Secondly, in accordance with the IAS 38, which mandates the recognition of intangible investments as assets only if it is probable that they will generate future benefits, we propose that capitalized intangibles result in lower future earnings fluctuations compared to expensed intangibles, such as research and development (R&D) and advertising expenses. Expensing these assets may lead to higher earnings fluctuations due to the immediate impact on financial statements, without accounting for their enduring contribution to future revenues.

Following the methodology outlined by [Kothari et al. \(2002\)](#) and [Amir et al. \(2007\)](#), we utilize descriptive and regression analyses to investigate our two hypotheses using data from 1595 European firms spanning the years 2005 to 2020. Given that our methodology focuses on earnings volatility over the subsequent five years, the period from 2016 to 2020 requires data only pertaining to operating income. For our first hypothesis, we investigate the association between the current year's intangible assets, tangible fixed assets, and earnings volatility over the subsequent five years. The second hypothesis involves incorporating expensed intangibles, specifically R&D and advertising expenses, into the model to evaluate their influence on future earnings volatility in comparison to balance sheet intangible assets.

The research findings confirm that intangible assets contribute to increased future earnings uncertainty compared to tangible fixed assets. Additionally, when comparing capitalized intangibles to expensed ones, we observe that R&D and advertising expenses significantly impact earnings volatility. Capitalizing intangibles appears to alleviate uncertainty compared to expensing them. Furthermore, industry analysis supports our hypotheses, revealing a greater impact of intangible and tangible investments on earnings volatility in high-tech sectors. This suggests heightened uncertainty in high-intangible sectors compared to low-intangible ones. Robustness testing reinforces these findings, even when substituting total intangible assets with goodwill and capital expenditures with property, plant, and equipment.

Our study significantly enhances the literature by comparing the effects of intangible and tangible investments on financial aspects, especially earnings uncertainty. Through comprehensive analysis, we extend previous research, affirming the importance of recognizing assets based on their potential for future benefits. Our findings deepen the understanding of earnings volatility and risk across firms, highlighting how intangible asset capitalization reduces uncertainty compared to expensing them. These insights inform ongoing discussions on accounting standards, financial reporting practices, and their implications for investors and stakeholders. Additionally, our sectoral analysis offers valuable insights into variations in the effects of intangible and tangible investments across industries, enriching the understanding of asset dynamics in financial markets.

The remainder of the paper is organized as follows: Section 2 provides a comprehensive review of the literature and develops our hypotheses; Section 3 outlines the research design; Section 4 describes the sample used in our analysis; Section 5 presents the empirical results; and finally, Section 6 offers discussions and concluding remarks.

2. Literature and Hypotheses Development

2.1. Intangible Assets, Tangible Fixed Assets and Subsequent Earnings Volatility

Our study investigates the relationship between intangible and tangible investments and future earnings uncertainty. Our initial empirical analysis focuses on the firm's balance sheet and examines the correlation between intangible assets, tangible fixed assets, and future earnings volatility. We hypothesize that, while all future economic benefits entail uncertainty, capitalized intangible assets contribute to greater future earnings volatility compared to tangible fixed assets. This hypothesis is grounded in the widely accepted

notion that the level of uncertainty is typically higher for balance sheet intangible assets than for tangible fixed assets.

IAS 38 adopts a conservative stance on intangible assets, yet prior literature extensively demonstrates that intangible assets increase complexity and uncertainty regarding future earnings. Earlier research highlights several factors contributing to this complexity (Lev 2001; Barth et al. 2001; Barron et al. 2002; Banker et al. 2019; Barker et al. 2022).

Intangible assets often involve uncertain returns, as outcomes of R&D projects, brand-building initiatives, or software development efforts may not always translate into immediate or measurable financial gains. Additionally, tangible fixed assets operate within established markets with relatively transparent pricing mechanisms, whereas intangible assets often exist in more dynamic and less transparent markets, with valuation involving subjective and variable elements. Moreover, tangible fixed assets often require ongoing maintenance to preserve their value, while intangible assets may require continuous investment in R&D, marketing, or legal protection to maintain or enhance their value, with risks such as technological obsolescence or changes in consumer preferences potentially affecting their durability.

Empirical studies provide evidence supporting the complexity and uncertainty associated with intangible assets compared to tangible assets.

Choi et al. (2000) investigate the correlation between intangible assets, their corresponding amortization costs, and market valuation. Their findings suggest a favorable reception of reported intangible assets by the financial market. Additionally, they observe that the market assigns a lower value to a dollar of intangible assets compared to tangible fixed assets, indicating that the market perceives the benefits linked with intangible assets as more uncertain than those associated with property, plant, and equipment (PPE).

Barth et al. (2001) delve into the impact of intangible assets on analysts' motivations to cover a firm. Their findings suggest that acknowledged intangible assets are less informative compared to tangible fixed assets, a factor that leads to an increase in analyst coverage. The worth of tangible assets is generally less susceptible to information imbalance and inherent uncertainty. This is because tangible assets are less likely to be unique to a particular firm compared to intangible assets, reducing the motivation for obtaining private information.

Kothari et al. (2002) explore how R&D expenditure relates to future earnings variability, while considering factors such as capital expenditures, advertising, firm size, and financial leverage. Their findings indicate that R&D investments are more positively correlated with future earnings variability compared to capital expenditures. This evidence supports the idea that R&D carries a higher level of risk compared to investments in physical assets.

Gu and Wang (2005) analyze how analysts' forecast errors are influenced by a firm's intangible intensity, covering aspects such as R&D, advertising expenses, and total intangible assets. Given the complexity of information related to intangible assets, they discover that forecast errors tend to be higher for firms with higher intangible intensity levels compared to the industry average.

Amir et al. (2007) examine the correlation between investments in R&D, capital expenditures (tangible fixed assets), and subsequent earnings variability across various time periods and industries. Their findings indicate that R&D expenditures (capital and expenses) contribute more significantly to subsequent earnings variability compared to capital expenditures only within industries that are relatively more R&D-intensive. However, in industries characterized by a high intensity of physical assets, they do not observe similar associations. These results imply that fundamental disparities exist in the investment information regarding R&D and capital expenditures concerning subsequent earnings variability.

Li et al. (2020) illustrate that intangible assets play a significant role in explaining puzzles related to idiosyncratic volatility, particularly among companies with greater intangible asset holdings. The association between intangible intensity and stock price crash risk is examined by Wu and Lai (2020). Their findings reveal that intangible-intensive firms are linked to high crash risk. The breakdown of intangible intensity points to goodwill as the primary factor and highlights its predictability for future impairment events. Additionally, intangible intensity influences stock price crash risk primarily through heightened information asymmetry, with

the positive correlation strengthening in tandem with stock price synchronicity, CEO risk-taking incentives, and shareholder litigation risk. Lev et al. (2021) uncover that R&D projects increase technology innovation uncertainty, with the link between these expenditures and future volatility in special items being stronger than that of capital expenditures. In their study, Jung and Kho (2022) examine the variations in market responses to earnings news among U.S. firms with differing levels of intangible capital. They hypothesize that investors may struggle to interpret earnings news for firms with substantial intangible capital, resulting in more pronounced reactions to such news. By quantifying intangible capital as the combined total of externally acquired and internally generated intangible assets, they demonstrate that both immediate and delayed market responses to earnings news are more significant for firms with high levels of intangible capital. Ferrer et al. (2022) find that the uncertainty and risk associated with intangible intensity reduce analysts' forecast accuracy. When classifying companies into high- and low-intangible asset groups based on the median level of intangible assets, Elkemali (2024) observe that intangible assets amplify analysts' overreactions and underreactions to earnings announcements.

Considering these complexities and recognizing that the generation of future earnings is a primary criterion for classifying an item as an asset, our study extends previous literature by examining the impact of intangible assets on future earnings volatility compared to tangible fixed assets. We anticipate that intangible assets lead to greater earnings fluctuations compared to investments in tangible assets. This expectation stems from several inherent factors associated with intangible assets. These investments entail uncertain returns and introducing unpredictability into financial reporting, as the success or failure of intangible investments can significantly impact earnings from one period to another. Additionally, while tangible fixed assets like buildings or machinery generally have easily ascertainable values based on market prices or replacement costs, intangible assets such as patents, copyrights, or brand value are often more challenging to value due to the lack of readily available market prices and subjective or contingent values. This valuation complexity exacerbates earnings volatility, as subjective assessments of intangible asset values can lead to significant fluctuations in reported earnings. Furthermore, while consistent maintenance preserves intangible asset value, the risk of obsolescence or shifts in consumer preferences impacts the resilience of intangible assets, amplifying fluctuations in earnings volatility. Moreover, intangible assets are often subject to complex regulatory frameworks governing intellectual property rights, patents, and copyrights, and changes in regulations or legal disputes can introduce considerable uncertainty and volatility into a company's earnings. Many intangible assets, such as specialized skills or knowledge, are closely tied to human capital, and fluctuations in employee turnover rates, talent acquisition, or workforce skill levels can directly influence the value and effectiveness of these assets. Consequently, companies reliant on intangible assets may experience greater earnings uncertainty due to shifts in their human resource landscape.

Given the additional challenges posed by intangible assets compared to tangible fixed assets related to valuation, market dynamics, regulations, and dependence on human capital, we posit the first hypothesis:

Hypothesis 1 (H1). *Intangible assets contribute to greater future earnings volatility compared to tangible fixed assets.*

2.2. Capitalization and Expensing of Intangibles and Subsequent Earnings Volatility

Our study not only examines the association between asset intangibility and future earnings volatility but also delves into the impact of capitalizing (intangible assets) and expensing intangibles on future earnings volatility within the realm of intangibles. While the generally accepted accounting principles (US GAAP) require the capitalization of purchased intangibles at cost and the full expensing of internally created intangibles such as R&D and advertising expenditures, IAS 38 recognizes purchased intangibles as assets and allows capitalizing internally developed intangibles if it is expected that they will

generate future benefits to the entity. Otherwise, self-created intangibles are expensed. Internal investments in intangibles are typically perceived to entail a higher level of future earnings uncertainty compared to purchased intangibles or tangible fixed assets.

The literature extensively examines the impact of capitalized and expensed intangibles on a firm's earnings uncertainty. [Barth et al. \(2001\)](#) indicate that companies with higher levels of unrecognized intangibles receive more analyst attention, particularly those with elevated R&D and advertising expenses, reflecting higher uncertainty requiring greater coverage. [Barron et al. \(2002\)](#) note that analyst consensus forecasts a decrease in balance sheet intangibles, suggesting higher earnings uncertainty for companies investing in internal intangibles. [Amir et al. \(2007\)](#) argue that R&D capital contributes more to future earnings variability than R&D expenses, contrasting [Oswald and Zarowin's \(2007\)](#) findings, which show that capitalizing R&D generates higher future earnings and stock returns. [Pandit et al. \(2011\)](#) reveal a negative correlation between future operating performance volatility and patent quality, especially pronounced in firms with extensive R&D spending and patent portfolios, indicating less volatile future operating performance for firms with more productive R&D. [Lev \(2019\)](#) highlights the importance of recognizing internally developed intangible assets to maintain the relevance of financial statements, supported by [Chen et al. \(2017\)](#) and [Jeny and Moldovan's \(2022\)](#) findings of greater value relevance of capitalized R&D compared to expensed R&D. [Xiang et al. \(2020\)](#) find an inverse correlation between R&D expense volatility and stock returns, indicating investors' unfavorable response to fluctuations in R&D expenses. [Huang et al. \(2022\)](#) argue that investors tend to demand higher premiums from companies when assessing the future success of their research and development (R&D) endeavors. In assessing the caliber of R&D data, they formulated a metric termed R&D Information Quality (RDIQ), which links a firm's historical R&D investment (expenditures) to its innovation outcomes (sales). Their findings indicate that the impact of RDIQ shows weak correlation with commonly employed risk factors, being more pronounced for companies operating in highly uncertain business environments, and demonstrates additional pricing influence.

[Cho and Kim's \(2024\)](#) research reveals that capitalized development expenditures hold value relevance solely for firms characterized by a high level of consistency in their capitalization ratios. Furthermore, stable R&D capitalization ratios enhance the ability of stock returns to reflect more information regarding future earnings accurately. Lastly, they note that the beneficial impact of consistent capitalization ratios on the value relevance of capitalized development expenditures and the informativeness of stock prices intensifies following the adoption of International Financial Reporting Standards (IFRS).

Based on prior literature, our second hypothesis expects that capitalized intangibles contribute to lower earnings volatility compared to expensed intangibles. This anticipation arises from the accounting treatment of these assets, where capitalized intangibles are recognized on the balance sheet and amortized over their useful lives, whereas expensed intangibles are immediately charged against earnings in the period they are incurred.

Capitalized intangibles, by virtue of their recognition on the balance sheet, provide a more stable representation of the company's assets and financial position over time. Amortizing the cost of these intangibles over their useful lives smoothens the impact on earnings, distributing the expense over multiple periods rather than a significant one-time hit. This amortization process helps to mitigate earnings volatility, as the expense is spread out over time, aligning with the benefits derived from the intangible asset.

In contrast, expensed intangibles result in a direct reduction in earnings in the period they are incurred, potentially leading to significant fluctuations in reported earnings. Without the benefit of spreading the cost over multiple periods, expensed intangibles can cause spikes or dips in earnings, depending on the size and timing of the expenditure.

Furthermore, the capitalization of intangibles reflects management's judgment regarding the long-term value and sustainability of these assets. By capitalizing certain intangibles, management signals their belief in the enduring value of these assets, which

can positively influence investor perceptions and market confidence, potentially reducing market reactions to earnings fluctuations.

Overall, the hypothesis posits that the recognition and treatment of intangible assets on the balance sheet, either as capitalized or expensed, significantly influence earnings volatility. Capitalized intangibles, with their amortization over time and signaling of long-term value, are expected to contribute to lower earnings volatility compared to expensed intangibles. Capitalizing intangibles on the balance sheet implies that these costs are expected to be recuperated in the future, although the specific timing of such recuperation frequently remains unclear. Conversely, expensing internally created intangibles suggests a reduced likelihood of realizing future benefits and considerable uncertainty about when these benefits might emerge. As a result, the uncertainty surrounding recognized intangibles tends to be substantially lower than that related to expensed intangibles.

Taken together, our second hypothesis focuses on the treatment of intangibles and a specific indicator of earnings uncertainty, namely earnings volatility, and suggests the following:

Hypothesis 2 (H2). *Capitalizing intangibles contributes to lower future earnings volatility compared to expensing intangibles.*

3. Research Design

3.1. Impact of Intangible Assets and Tangible Fixed Assets on Future Earnings Volatility

To explore our first hypothesis regarding the higher impact of intangible assets compared to tangible fixed assets on future earnings volatility, we anticipate that the nature of these assets will significantly influence the stability and variability of earnings over time. Specifically, we expect that companies with higher levels of intangible assets, such as intellectual property, goodwill and brand value, may experience greater earnings volatility compared to those primarily invested in tangible fixed assets. This expectation is rooted in the recognition that intangible assets, while valuable, often involve subjective valuation methods and may be more sensitive to market fluctuations and changes in consumer preferences. Conversely, we anticipate that companies with a greater emphasis on tangible fixed assets, such as property, plant, and equipment, may exhibit more stable earnings patterns due to the physical and tangible nature of these assets. By investigating the relationship between asset composition and future earnings volatility, we aim to gain insights into the drivers of financial performance and the role of asset allocation strategies in managing risk and uncertainty. To investigate this hypothesis, we employ regression analyses (Model 1) derived from Kothari et al. (2002) and Amir et al. (2007). Specifically, we integrate intangible assets (IA) into their models. We regress future earnings volatility from year $t + 1$ to $t + 5$ (SDOI) on the current year's intangible assets (IA) and tangible fixed assets (measured by capital expenditures CAPEX), alongside financial leverage (LEV) and firm size (SIZE), serving as control variables for earnings uncertainty

$$SDOI_{i,t+1 \text{ to } t+5} = \alpha_0 + \beta_1 IA_{it} + \beta_2 CAPEX_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \zeta \quad (1)$$

where, for firm i , SDOI represents future earnings volatility calculated as the standard deviation of operating income per share before depreciation, amortization, advertising, and R&D, from $t + 1$ to $t + 5$, deflated by the beginning of the period stock price (P). A five-year period for SDOI aligns well with the typical useful life and benefit generated from investments in both tangible and intangible assets. The earnings volatility measured pertains to annual earnings rather than quarterly. While quarterly data may offer more frequent insights into earnings fluctuations, annual data provide a comprehensive view of earnings performance over a longer timeframe, aligning with standard reporting practices and facilitating comparability across firms and industries. In contrast to Kothari et al. (2002), we deduct advertising and R&D expenses to mitigate any volatility stemming from the current year. Furthermore, excluding depreciation and amortization helps minimize earnings manipulation and offers a more accurate representation of future earnings fluctuations arising from previous investments in tangible and intangible assets. IA stands for balance sheet intangible assets

scaled by lagged market value of equity (MV), with MV calculated as the end-of-fiscal-year share price multiplied by the common shares outstanding. MV is measured at the beginning of year t (End year $t - 1$) when it is used as deflator. CAPEX denotes tangible fixed assets measured by capital expenditures deflated by MV. Aligning with Kothari et al. (2002) and Amir et al. (2007), we use MV as the deflator and not total assets to ensure comparability of findings with their results. Both IA and CAPEX represent long-term assets, generating future benefits. CAPEX typically denotes investments in tangible assets made during a specific period, reflecting ongoing capital expenditure activities. These investments are recorded in the cash flow statement as a decrease in cash related to investing activities, while simultaneously increasing cumulative tangible assets on the balance sheet. Conversely, IA, as captured from the balance sheet, encompasses the cumulative stock of intangible assets held by the firm over time. We expect that the coefficient of IA will be positively higher than CAPEX, as we anticipate that the uncertainty related to intangible assets is higher than that related to tangible fixed assets, leading to higher earnings volatility.

Control variables include firm size and leverage as determinants of earnings volatility (Beaver et al. 1970; Fama and MacBeth 1973). The firm SIZE represents the logarithm of market value of equity (MV) at the end of year t , while LEV, a metric of financial leverage, is calculated by summing long-term debt and the current portion of long-term debt, then dividing by the total of long-term debt, the current portion of long-term debt, and market value of equity. Larger companies may have stronger financial stability and access to resources to weather economic downturns, reducing the likelihood of significant fluctuations in earnings. Additionally, high leverage obligates companies to meet fixed debt obligations, such as interest payments, regardless of earnings performance. Therefore, during periods of low earnings, highly leveraged companies may experience greater financial strain, leading to increased volatility in earnings.

All variables are measured at the end of the year t except SDOI, measured for the subsequent five years from $t + 1$ to $t + 5$. In cases where there are missing data for operating income (OI) for the five years, we include OI for the current year t followed by the subsequent four years of OI. If there are two missing OI data points, we start from the OI of the current year and complete the missing data with the average of the available four years' data. All variable measures are presented in Appendix A.

To mitigate the potential influence of industry-specific factors, our regression is conducted for both high-tech (HT) industries and low-tech (LT) industries based on the decomposition of Kwon 2002. This approach ensures that the effects observed are not solely driven by industry characteristics. By comparing firms within similar industry categories based on their asset composition and uncertainty, the analyses can better isolate and assess the impact of intangible assets and tangible fixed assets on various financial metrics, such as earnings volatility, without being confounded by industry-specific differences.

3.2. Impact of Capitalizing Intangibles and Expensing Intangibles on Future Earnings Volatility

In our second hypothesis, we anticipate that capitalizing intangibles will lead to lower future earnings volatility compared to expensing intangibles. This expectation is grounded in the premise that capitalizing intangibles allows for their recognition as assets on the balance sheet, thereby spreading their costs over time and potentially smoothing out fluctuations in earnings. In contrast, expensing intangibles immediately impacts earnings, which may result in more pronounced fluctuations in financial performance over time. By capitalizing intangibles, firms can better align their reported earnings with the economic benefits derived from these assets, ultimately leading to greater stability and predictability in future earnings. To test this hypothesis, our focus shifts to Model 2, an extension of Model 1, which incorporates additional variables to provide a more comprehensive understanding of the factors influencing future earnings volatility. In this expanded model, we integrate R&D (RD) expenses and Advertising (AD) expenses alongside the previously considered capitalized

intangibles (IA). Our objective is to examine the impact of these expensed intangibles in comparison to capitalized intangibles on the volatility of future earnings

$$SDOI_{i,t+1 \text{ to } t+5} = \alpha_0 + \beta_1 IA_{it} + \beta_2 CAPEX_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \beta_5 RD_{it} + \beta_6 AD_{it} + \zeta \quad (2)$$

where RD represents R&D expenses, deflated by market value (MV) to account for variations in firm size and market dynamics. AD signifies advertising expenses deflated by MV. All other variables are described in Appendix A. We anticipate that the coefficients (β_5 and β_6) associated with RD and AD expenses will be positively greater than the coefficient (β_1) linked to capitalized intangibles (IA). Furthermore, we expect the differences between the coefficients (β_5 and β_6) associated with RD and AD expenses and the coefficient (β_1) linked to IA to be statistically significant. This expectation is rooted in the understanding that expensed intangibles, such as R&D and advertising expenses, have an immediate impact on current-period earnings and signal ongoing investments in innovation and market positioning. Consequently, we predict these expenses to exert a more pronounced influence on future earnings volatility compared to capitalized intangibles. The inherent characteristics of expensed intangibles, combined with their immediate effect on earnings, are likely to lead to noticeable differences in their influence on future earnings volatility. As with Model 1, we conduct an industry effect analysis.

3.3. Robustness Test

To strengthen the robustness of our analysis, we conduct a sensitivity test by substituting, in model (2), intangible assets with goodwill, a specific item subject to higher levels of judgment and measurement issues. Goodwill, particularly when acquired under business combinations, requires the determination of fair value, which involves considerable discretion. Additionally, goodwill is characterized by an indefinite useful life and necessitates impairment testing. By replacing intangible assets with goodwill in our model, we verify the consistency and reliability of our results, providing insights into the generalizability of our conclusions across different types of intangible assets.

In addition, we replace, in model (2), capital expenditures with property, plant, and equipment (PPE) as the cumulative investment over the years (Kothari et al. 2002). PPE represents the aggregate value of physical assets utilized in business operations, accrued over time through capital expenditures. This adjustment allows us to account for the cumulative impact of investments in tangible assets on future earnings volatility, offering a more comprehensive perspective on the relationship between asset composition and financial performance. By incorporating PPE as a cumulative measure, we aim to capture the long-term implications of tangible asset investments on earnings stability. Consequently, we test the following model for the total sample, HT, and LT industries:

$$SDOI_{i,t+1 \text{ to } t+5} = \alpha_0 + \beta_1 GDWILL_{it} + \beta_2 PPE_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \beta_5 RD_{it} + \beta_6 AD_{it} + \zeta \quad (3)$$

where GDWILL is measured as goodwill deflated by lagged market value of equity MV. PPE is calculated as net PPE, deflated by lagged market value of equity. All variables are presented in Appendix A. We anticipate similar coefficient results as those provided by models 1 and 2.

4. Sample

To examine our hypotheses, we have extracted a sample from the Compustat Global Database, consisting of industrial European firms spanning from 2005 to 2020 (Table 1). Our chosen timeframe coincides with the initiation of the adoption of IFRS by the European Union, commencing in 2005 and extending until 2020, which marks the latest available year of data. Given the nature of our study, which focuses on assessing earnings volatility over a five-year period, we require, from 2016 to 2020, only data pertaining to operating income. This selection criteria ensures that we capture a comprehensive view of the post-IFRS adoption landscape and its impact on earnings volatility within the European industrial sector. By concentrating on operating income data during the specified period, we aim

to analyze any discernible patterns or trends that may emerge, thereby contributing to a deeper understanding of financial reporting dynamics and their implications for firm performance. To mitigate the impact of outlier observations, we cap variable values exceeding the 99th percentile (or falling below the 1st percentile) by setting them equal to the 99th (1st) percentile value. Therefore, our final sample includes 1595 European firms with 16,824 firm-year observations. To ensure that future earnings volatility is primarily influenced by the nature of assets rather than industry dynamics, we account for industry effects by partitioning the sample into two categories (Table 1): high-tech (HT) industries and low-tech (LT) industries, following the classification proposed by Kwon (2002). Kwon's categorization demonstrates that high-technology firms tend to exhibit higher levels of uncertainty, which can significantly impact empirical outcomes.

Table 1. Sample decomposition into high-tech (HT) industries and low-tech (LT) industries.

SIC	Industry	Number of Firms
<i>HT industries</i>		
272	Per.	4
283	Drugs	114
355	Spec. Ind. Mach.	7
357	Comp. & Off. Equip.	101
360	Elec. & Other Elec. Equip.	6
361	Elec. Dist. Equip.	9
362	Elec. Ind. Appar.	21
363	Hshld. Appl.	12
364	Elec. Lighting & Wiring Equip.	24
365	Hshld. Audio & Video Equip.	8
366	Comm. Equip.	95
367	Elec. Comp. & Acc.	127
369	Misc. Elec. Equip. & Supplies	16
381	Search and Nav. Equip.	5
382	Meas. & Ctrl. Devices	4
481	Tel. Comm.	67
484	Cable and Pay TV Serv.	12
489	Comm. Serv., NEC	6
573	Radio, TV, & Elec. Stores	7
737	Comp. and Data Proc. Serv.	137
873	Res. and Test. Serv.	5
Total		787
<i>LT industries</i>		
160	Heavy Constr.	21
202	Dair. Prod.	10
220	Text. Mill Prod.	72
240	Lumb. & Wood Prod.	13
245	Wood Bldgs. & Mbl. Hms.	24
260	Paper & Allied Prod.	102
300	Rubber & Misc. Plastics	28
308	Misc. Plastics	36
324	Cement, Hyd.	8
331	Blast Furn. & Basic Steel	74
356	Gen. Ind. Mach. & Equip.	67
371	Motor Veh. & Equip.	136
399	Misc. Mfg. Inds.	8
401	Railroads	18
421	Truck. & Courier Serv.	36
440	Water Transp.	32
451	Sched. Air Transp.	61
541	Groc. Stores	62
Total		808

5. Empirical Results

5.1. Descriptive Statistics

Table 2 outlines descriptive statistics for the entire sample and sub-groups of HT and LT industries. Capital expenditures CAPEX exceed investments in intangible assets (IA), R&D expenditures (RD) and advertising (AD), indicating a bias towards tangible investments. Comparing HT and LT industries, significant differences emerge. HT industries exhibit higher future earnings volatility and greater reliance on intangible assets and R&D expenditures, while LT industries focus more on capital expenditures and operational efficiency. Financial leverage (LEV) is higher in LT industries, suggesting a greater reliance on debt financing. Despite these differences, both groups maintain low advertising expenses, indicating a shared emphasis on cost containment.

Table 2. Descriptive statistics.

Panel A: Whole Sample						
<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Median</i>	<i>SD</i>	<i>Q1</i>	<i>Q3</i>
<i>SDOI</i>	16,824	0.18	0.12	0.21	0.07	0.25
<i>IA</i>	16,824	0.11	0.09	0.18	0.03	0.17
<i>CAPEX</i>	16,824	0.15	0.13	0.15	0.05	0.28
<i>RD</i>	16,824	0.06	0.04	0.11	0.02	0.12
<i>AD</i>	16,824	0.02	0.01	0.05	0.00	0.04
<i>LEV</i>	16,824	0.31	0.22	0.29	0.07	0.42
<i>SIZE</i>	16,824	5.26	5.01	3.42	2.21	7.11

Panel B: High-Tech (HT) Industries and Low-Tech (LT) Industries						
<i>Variable</i>	<i>HT</i>			<i>LT</i>		
	<i>Mean</i>	<i>Median</i>	<i>SD</i>	<i>Mean</i>	<i>Median</i>	<i>SD</i>
<i>SDOI</i>	0.24 ***	0.17 ***	0.28 ***	0.14	0.10	0.19
<i>IA</i>	0.21 ***	0.16 ***	0.23 ***	0.07	0.05	0.12
<i>CAPEX</i>	0.08 ***	0.06 ***	0.10 ***	0.26	0.22	0.17
<i>RD</i>	0.13 ***	0.12 ***	0.16 ***	0.04	0.03	0.06
<i>AD</i>	0.03	0.02	0.02	0.02	0.01	0.01
<i>LEV</i>	0.16 ***	0.14 ***	0.15 ***	0.35	0.31	0.29
<i>SIZE</i>	5.52	5.24	3.64	4.99	4.72	3.41

The table provides descriptive statistics of mean median, standard deviation SD, lower quartile Q1 and upper quartile Q2 for the whole sample and (panel A) with a comparison between high-tech (HT) and low-tech (LT) industries (Panel B). Symbol *** indicates significance at 1% of the comparison of means (t-test), median (t-test), medians (Wilcoxon test) and standard deviations (F-test) between HT and LT industries. SDOI is the future earnings volatility calculated as the standard deviation of operating income before depreciation, amortization, advertising and R&D, from $t + 1$ to $t + 5$, deflated by the beginning of the period stock price. IA stands for balance sheet intangible assets scaled by lagged market value of equity (MV). MV is calculated as the end of fiscal year share price multiplied by the common shares outstanding. CAPEX is tangible fixed assets measured by capital expenditures deflated by MV. SIZE is the logarithm of market value of equity. LEV, a metric of financial leverage, is calculated by adding long-term debt and the current portion of long-term debt, then dividing this sum by the total of long-term debt, the current portion of long-term debt, and market value of equity. All variable definitions are presented in Appendix A.

Table 3 reports the results of the Pearson correlation between our variables. Intangible assets exhibit a higher positive correlation (0.21) with future earnings volatility compared to capital expenditures (0.14), suggesting that even though both are non-current assets, companies with higher levels of intangible assets tend to experience higher volatility in future earnings. Moreover, R&D expenses (0.38) and advertising expenses (0.26) show a stronger relationship compared to intangible assets. This implies that capitalizing intangibles leads to lower uncertainty about future earnings volatility compared to expensing intangibles. We note that all correlations are below 0.8, implying, under the statistical rule

of thumb, that there is no multicollinearity between our independent variables in our next regressions analyses.

Table 3. Pearson’s correlation test and Variance Inflation Factor (VIF).

Variable	SDOI	IA	CAPEX	RD	AD	LEV	SIZE
SDOI	1						
IA	0.21	1					
CAPEX	0.14	0.22	1				
RD	0.38	0.33	0.25	1			
AD	0.26	0.07	0.06	0.07	1		
LEV	0.45	−0.11	0.51	−0.13	−0.05	1	
SIZE	−0.39	0.05	0.12	−0.14	−0.04	−0.13	1

Variable definitions are presented in Appendix A. All correlations above 0.06 in absolute value are significant at 1%.

It is essential to highlight that, for our analyses, the normality of our data is confirmed by the Kolmogorov–Smirnov test (see Appendix B).

5.2. Regressions Analyses

5.2.1. Impact of Intangible Assets and Tangible Fixed Assets on Future Earnings Volatility

Upon estimating Model 1 (Table 4), the results indicate that the coefficient ($\beta_1 = 0.214$) associated with intangible assets (IA) is positively greater than the coefficient ($\beta_2 = 0.138$) corresponding to capital expenditures (CAPEX). This difference is found to be statistically significant at the 1% level, as evidenced by the p -value obtained from the test of difference between the two coefficients.

Table 4. Estimations of Model 1.

		SDOI = $\alpha_0 + \beta_1$ IA + β_2 CAPEX + β_3 LEV + β_4 SIZE + ζ							
VARIABLES		Intercept	IA	CAPEX	LEV	SIZE	Adjusted R ²	Max VIF	p -Value ($\beta_1 - \beta_2$)
		α_0	β_1	β_2	β_3	β_4			
Total sample	Mean	0.151	0.214	0.138	0.236	−0.354	0.24	1.359	0.008
	t-statistics	2.12 **	5.26 ***	4.17 ***	6.86 ***	−7.45 ***			
HT	Mean	0.192	0.313	0.152	0.296	−0.363	0.29	1.482	0.000
	t-statistics	2.72 ***	7.82 ***	3.68 ***	7.03 ***	−7.86 ***			
LT	Mean	0.054	0.188	0.095	0.335	−0.345	0.19	1.287	0.006
	t-statistics	1.421	2.15 **	1.92 **	8.01 ***	−6.92 ***			

The table provides regression analysis of future earnings volatility (SDOI) as a dependent variable on intangible assets (IA), tangible fixed assets (CAPEX), financial leverage (LEV) and firm’ SIZE, for the total sample and for high-tech (HT) and low-tech (LT) industries. Symbols *** and ** indicate t-statistics significance at 1% and 5%. The p -value shows the significance of difference $\beta_1 - \beta_2$. The Max VIF represents the maximum Variance Inflation Factor. A Max VIF < 5 indicates the absence of multicollinearity between independent variables. SDOI is the future earnings volatility calculated as the standard deviation of operating income before depreciation, amortization, advertising and R&D, from $t + 1$ to $t + 5$ deflated by the beginning of the period stock price. IA stands for balance sheet intangible assets scaled by lagged market value of equity (MV). MV is calculated as the end-of-fiscal-year share price multiplied by the common shares outstanding. CAPEX is tangible fixed assets measured by capital expenditures deflated by MV. SIZE is the logarithm of market value of equity. LEV, a metric of financial leverage, is calculated by adding long-term debt and the current portion of long-term debt, then dividing this sum by the total of long-term debt, the current portion of long-term debt, and market value of equity. All variable definitions are presented in Appendix A. Panel data regressions were conducted, with the test of homogeneity (Fisher) indicating the presence of specific effects. Subsequently, the Hausman test (chi2) suggested fixed-effect regressions. According to the Schwarz criterion, the optimal model for our regression was determined to be the cross-section effect, as it yielded a smaller value compared to that of the year-fixed effect. To address heteroscedasticity, cluster-robust standard error (firm) was employed.

These results provide empirical support for our first hypothesis, which posited that intangible assets contribute to higher levels of earnings uncertainty compared to tangible fixed assets. This suggests that intangible assets, even though they are recorded on the balance sheet, can introduce greater volatility in future earnings. The increased earnings uncertainty associated with intangible assets may arise from factors such as market fluctuations, the subjective nature of valuing intangible assets, or the inherent risks associated with innovation and brand management. In summary, these findings are consistent with previous research by [Barron et al. \(2002\)](#) and [Gu and Wang \(2005\)](#), as they highlight the critical importance of effectively managing and accessing the higher impact of intangible assets on earnings uncertainty compared to capital expenditures. Table 4 also confirms prior research findings that companies with larger size exhibit lower risk and earnings volatility, and that financial leverage increases future earnings volatility ([Fama and MacBeth 1973](#)).

To mitigate the influence of industry on the relationship between intangible assets, tangible fixed assets, and subsequent earnings volatility, we conducted separate regression analyses for both HT and LT industry subgroups, as categorized by [Kwon \(2002\)](#). Our findings suggest that, in both groups, the influence of intangible assets on future earnings variability surpasses that of capital expenditures. Specifically, in HT industries, the coefficient estimate for intangible assets (0.313) exceeds that for capital expenditures (0.152), with a significant p -value indicating the difference in coefficients. Similarly, in LT industries, the coefficient estimate for intangible assets (0.188) is significantly greater than that for capital expenditures (0.095). Moreover, our comparison reveals that the relationship between intangible assets, capital expenditures, and earnings volatility is more pronounced in HT industries compared to LT industries.

These findings confirm that the uncertainty is higher for industries with a greater reliance on intangible assets ([Elkemali 2023](#); [Bessière and Elkemali 2014](#); [Gu and Wang 2005](#)), and that this uncertainty increases when evaluating intangible assets rather than tangible assets. In essence, these results underscore the significant roles of both intangible and tangible assets in shaping future earnings volatility, highlighting the importance of considering asset composition in assessing and managing financial risk.

5.2.2. Impact of Capitalizing Intangibles and Expensing Intangibles on Future Earnings Volatility

Table 5 reports the estimation of Model 2, revealing that for the entire sample, the coefficients associated with R&D expenses ($\beta_5 = 0.269$) and advertising expenses ($\beta_6 = 0.331$) surpass those of intangible assets ($\beta_1 = 0.192$) with significant p -values for the test of differences. This finding confirms that expensing intangible assets results in higher earnings volatility compared to capitalizing intangibles. It suggests that the immediate impact of expensing intangible assets, as reflected in R&D and advertising expenses, leads to greater fluctuations in earnings compared to the more smoothed-out effect of capitalizing intangibles. This highlights the importance of accounting treatment in influencing future earnings stability. In addition, capital expenditures' impact on earnings volatility is still lower than that of capitalized expensed intangibles, which confirms the uncertainty about intangible investments, regardless of the accounting treatment ([Gu and Wang 2005, 2012](#)). When comparing HT industries and LT industries, the result shows that the impact of capitalizing and expensing is greater for HT industries. These findings corroborate our second hypothesis and also suggest that the effect of how intangibles are accounted for in financial reporting is more significant for industries characterized by high levels of uncertainty and risk.

Table 5. Estimations of Model 2 for the total sample, high-tech (HT) and low-tech (LT) industries.

SDOI = $\alpha_0 + \beta_1$ IA+ β_2 CAPEX + β_3 LEV + β_4 SIZE + β_5 RD + β_6 AD + ζ												
VARIABLES		Intercept	IA	CAPEX	LEV	SIZE	RD	AD	Adjusted R2	VIF Max	p-Value ($\beta_1 - \beta_5$)	p-Value ($\beta_1 - \beta_6$)
		α_0	β_1	β_2	β_3	β_4	β_5	β_6				
Total sample	Mean	0.112	0.192	0.126	0.274	−0.322	0.269	0.331	0.33	1.214	0.006	0.000
	t-statistics	1.701 *	4.724 ***	3.335 ***	6.51 ***	−7.21 **	8.624 ***	8.875 ***				
HT	Mean	0.163	0.252	0.141	0.324	−0.284	0.378	0.392	0.39	1.307	0.012	0.000
	t-statistics	2.056 **	5.886 ***	3.315 ***	8.05 ***	−7.52 ***	9.052 ***	10.02 ***				
LT	Mean	0.056	0.171	0.113	0.221	−0.321	0.241	0.249	0.27	1.211	0.008	0.003
	t-statistics	1.332	3.023 ***	2.117 **	5.77 ***	−8.26 ***	5.204 ***	6.01 **				

The table provides regression analysis of future earnings volatility (SDOI) as a dependent variable on intangible assets (IA), tangible fixed assets (CAPEX), financial leverage (LEV) and firm' SIZE, R&D expenses (RD) and advertising expenses (AD) for the total sample and for high-tech (HT) and low-tech (LT) industries. Symbols ***, ** and * indicate t-statistics significance, respectively, at 1%, 5% and 10%. The p-value shows the significance of difference of $\beta_1 - \beta_5$ and $\beta_1 - \beta_6$. The Max VIF represents the maximum Variance Inflation Factor. The Max VIF represents the maximum Variance Inflation Factor. A Max VIF < 5 indicates the absence of multicollinearity between independent variables. SDOI is the future earnings volatility calculated as the standard deviation of operating income before depreciation, amortization, advertising and R&D, from $t + 1$ to $t + 5$ deflated by the beginning of the period stock price. IA stands for balance sheet intangible assets scaled by lagged market value of equity (MV). MV is calculated as the end-of-fiscal-year share price multiplied by the common shares outstanding. CAPEX is tangible fixed assets measured by capital expenditures deflated by MV. RD represents research and development expenses deflated by MV. AD indicates advertising expenses deflated by MV. SIZE is the logarithm of market value of equity. LEV, a metric of financial leverage, is calculated by adding long-term debt and the current portion of long-term debt, then dividing this sum by the total of long-term debt, the current portion of long-term debt, and market value of equity. All variable definitions are presented in Appendix A. Panel data regressions were conducted, with the test of homogeneity (Fisher) indicating the presence of specific effects. Subsequently, the Hausman test (chi2) suggested fixed-effect regressions. According to the Schwarz criterion, the optimal model for our regression was determined to be the cross-section effect, as it yielded a smaller value compared to that of the year-fixed effect. To address heteroscedasticity, cluster-robust standard error (firm) was employed.

5.2.3. Robustness Test

Model 3 provides further insights into the relationship between different asset categories and future earnings volatility by replacing total intangible assets and capital expenditures with goodwill and property, plant, and equipment (PPE). The analysis of this model, as presented in Table 6, indicates, for the entire sample, that the coefficient estimate for goodwill ($\beta_1 = 0.127$) suggests a greater impact on earnings volatility compared to PPE ($\beta_2 = 0.064$), with a significant difference in coefficients ($p = 0.007$), thereby supporting our initial hypothesis. However, this impact is slightly less pronounced than observed in Table 4 with total intangible assets and capital expenditures, implying that the uncertainty associated with total intangible assets is not limited to specific items but rather reflects a broader trend. Furthermore, the analysis indicates that earnings volatility is more closely linked to current-year capital expenditures than to cumulative PPE over time. Additionally, when considering the accounting treatment of intangibles, capitalized goodwill exerts a stronger influence on earnings volatility compared to expensed intangibles such as R&D and advertising expenses. R&D ($\beta_5 = 0.247$) and advertising expenses ($\beta_6 = 0.305$) exhibit a greater impact on earnings volatility than goodwill ($\beta_1 = 0.127$), with significant differences in coefficients p-values, confirming our second hypothesis. Importantly, these effects are more pronounced in HT industries compared to LT industries. In summary, the robustness tests reinforce our main findings, demonstrating the consistent impact of intangible assets, particularly goodwill, on future earnings volatility. These results contribute to the existing literature by confirming the findings of previous studies by Kothari et al. (2002) and Amir et al. (2007) regarding the effect of PPE on earnings volatility. Additionally, they highlight the significant role of goodwill in shaping earnings volatility.

Table 6. Estimations of Model 3 for the total sample, high-tech (HT) and low-tech (LT) industries.

SDOI = $\alpha_0 + \beta_1$ GDWILL + β_2 PEP + β_3 LEV + β_4 SIZE + β_5 RD + β_6 AD + ζ (3)													
VARIABLES		Intercept	GDWILL	PEP	LEV	SIZE	RD	AD	Adj-R2	VIF Max	<i>p</i> -Value ($\beta_1 - \beta_2$)	<i>p</i> -Value ($\beta_1 - \beta_5$)	<i>p</i> -Value ($\beta_1 - \beta_6$)
		α_0	β_1	β_2	β_3	β_4	β_5	β_6					
Total sample	Mean	0.103	0.127	0.064	0.236	−0.285	0.247	0.305	0.27	1.543	0.007	0.000	0.000
	t-statistics	1.565 *	3.684 ***	2.632 ***	6.289 ***	−6.633	7.934 ***	8.165 ***					
HT	Mean	0.150	0.159	0.095	0.171	−0.316	0.348	0.361	0.31	1.415	0.009	0.000	0.000
	t-statistics	1.992 **	3.975 ***	2.951 ***	4.646 ***	−6.468	8.328 ***	9.218 ***					
LT	Mean	0.052	0.101	0.058	0.299	−0.269	0.189	0.229	0.23	1.325	0.011	0.000	0.000
	t-statistics	1.225	1.761 *	1.970 **	7.148 ***	−6.679	4.788 ***	5.529 ***					

The table provides regression analysis of future earnings volatility (SDOI) as a dependent variable on goodwill (GDWILL), property, plant, and equipment (PPE), financial leverage (LEV), firm' SIZE, R&D expenses (RD) and advertising expenses (AD) for the total sample and for HT and LT industries. Symbols ***, ** and * indicate t-statistics significance, respectively, at 1%, 5% and 10%. The *p*-value shows the significance of difference of $\beta_1 - \beta_2$, $\beta_1 - \beta_5$ and $\beta_1 - \beta_6$. The Max VIF represents the maximum Variance Inflation Factor. A Max VIF < 5 indicates the absence of multicollinearity between independent variables. SDOI is the future earnings volatility calculated as the standard deviation of operating income before depreciation, amortization, advertising, and R&D, from $t + 1$ to $t + 5$ deflated by the beginning of the period stock price. GDWILL stands for balance sheet goodwill scaled by lagged market value of equity (MV) calculated as the end-of-fiscal-year share price multiplied by the common shares outstanding. PPE is the net property, plant, and equipment deflated by MV. RD represents research and development expenses deflated by MV. AD indicates advertising expenses deflated by MV. Instances where RD and AD are zero are incorporated into the sample without being treated as missing values. SIZE is the logarithm of market value of equity. LEV, a metric of financial leverage, is calculated by adding long-term debt and the current portion of long-term debt, then dividing this sum by the total of long-term debt, the current portion of long-term debt, and market value of equity. Panel data regressions were conducted, with the test of homogeneity (Fisher) indicating the presence of specific effects. Subsequently, the Hausman test (chi2) suggested fixed-effect regressions. According to the Schwarz criterion, the optimal model for our regression was determined to be the cross-section effect, as it yielded a smaller value compared to that of the year-fixed effect. To address heteroscedasticity, cluster-robust standard errors (firm) was employed.

6. Conclusions and Discussion

Our study investigates the influence of intangible and tangible investments on future earnings volatility, guided by the stipulations of International Accounting Standards (IAS) 16 and 38, which govern the recognition of assets based on their potential to generate future economic benefits. We hypothesize that intangible assets contribute to greater earnings uncertainty compared to tangible fixed assets, attributing this to the subjective valuation methods and unpredictable outcomes associated with intangible assets, compounded by market dynamics and technological advancements. Furthermore, we anticipate that capitalizing intangible assets would result in lower earnings volatility compared to expensing them, as capitalization allows for the anticipation of future earnings and the spreading of costs over time, potentially smoothing out earnings fluctuations.

Our findings, based on data from 16,824 firm-year observations in the European financial market from 2005 to 2020, support our hypotheses. We find that intangible investments exert a greater influence on future earnings volatility compared to capital expenditure. Additionally, we observe that expensed intangibles, such as R&D expenses and advertising expenses, contribute to higher earnings volatility compared to capitalized intangible assets. These relationships are more pronounced in HT industries, where investment in intangibles exceeds that in physical assets. Utilizing Goodwill and PPE instead of intangible assets and capital expenditures yields similar results. These findings align with those of [Kothari et al. \(2002\)](#) and [Amir et al. \(2007\)](#), highlighting the stronger association between R&D expenditures and subsequent earnings volatility compared to capital expenditures. Furthermore, our results suggest that balance sheet intangible assets, in general, elevate earnings fluctuations compared to tangible assets, albeit to a lesser extent than expensed intangibles recognized in the income statement. Overall, these findings indicate fundamental differences in the investment characteristics of intangible and tangible assets, particularly regarding their impact on uncertainty.

Our study contributes to the existing literature by providing empirical evidence on the impact of intangible and tangible investments on future earnings volatility and the role

of accounting practices in managing uncertainty. By focusing on total intangible assets rather than specific investments like R&D expenditures, we extend previous research and confirm the IFRS condition regarding the recognition of assets based on their potential to generate future benefits. Additionally, our analysis of different accounting treatments provides insights into their implications for future earnings volatility. We also expand beyond conventional measures by incorporating additional variables such as goodwill and property, plant, and equipment (PPE), and analyze data from both HT and LT industries, providing valuable sector-specific insights.

Our study's implications are multifaceted. For financial management practices, our findings suggest that firms should carefully consider the impact of intangible and tangible investments on future earnings volatility, with capitalizing intangible assets potentially offering more stability compared to expensing them. This insight can inform asset portfolio management and financial reporting strategies. Moreover, our study underscores the importance of accounting standards, providing empirical support for existing practices like IAS 16 and 38. Investors should also take note, as industries with high intangible assets may exhibit greater earnings volatility, influencing investment risk. Lastly, our sector-specific insights offer tailored guidance for industry stakeholders, aiding in the development of strategies to manage earnings uncertainty effectively.

While our study provides valuable insights, it is not without limitations. The unavailability of data beyond 2020 and the focus on the European financial market may limit the generalizability of our findings. Additionally, variations in financial data and accounting practices across companies and industries may impact the consistency and accuracy of our results. Future research endeavors could address these limitations by expanding the analysis to include data from other regions and markets, incorporating more recent data, and exploring the impact of external factors on investments and earnings volatility. Additionally, exploring the impact of the characteristics of intangible and tangible investments on financial analysts' forecasts and stock market volatility offers an opportunity to deepen our understanding of investment dynamics and market reactions. Such research would contribute significantly to the field of financial management and asset valuation.

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Appendix A

Table A1. Variable definitions.

Variable	Definition
<i>Dependent variable</i>	
SDOI	Future earnings volatility calculated as the standard deviation of operating income per share before depreciation, amortization, advertising, and R&D, from $t + 1$ to $t + 5$ (compustat data #13 + data #45 + data #46), deflated by the beginning of the period stock price (data #199).

Table A1. *Cont.*

Variable	Definition
<i>Independent variables</i>	
IA	Balance sheet intangible assets (data #33) at the end of year t .
CAPEX	Tangible fixed assets measured by capital expenditures (data #128) at the end of year t , deflated by lagged market value of equity (MV). MV is calculated as the fiscal year-end share price multiplied by the common shares outstanding (data #199 * data #54).
RD	Research and development expenses (data #46) at the end of year t , deflated by lagged MV.
AD	Advertising expenses (data #45) at the end of year t , deflated by lagged MV.
<i>Control variables</i>	
SIZE	The firm size, defined as the logarithm of MV at the end of year t .
LEV	Financial leverage, calculated by adding long-term debt (item #9) and the current portion of long-term debt (item #34), then dividing this sum by the total of long-term debt, the current portion of long-term debt, and MV.
<i>Robustness test variables</i>	
GDWILL	Goodwill at the end of year t (data# 204), deflated by lagged MV.
PPE	Property, plant, and equipment are calculated as the net PPE (data #8) at the end of year t , deflated by the lagged MV.

Appendix B

Table A2. Normality test–Kolmogorov–Smirnov Z.

	Asymp Sign
SDOI	0.091
IA	0.176
CAPEX	0.101
RD	0.182
AD	0.205
LEV	0.139
SIZE	0.083

Sign > 0.05 implies normality.

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