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Value Relevance in the New Economy

A Study on Changes in Value Relevance of Accounting Information

Abstract

Prior research emphasizes that the failure of accounting practices to keep pace with the emergence of a new economy has caused a deterioration in the value relevance of accounting. We therefore aim to investigate how the value relevance of accounting information in Sweden has changed as the new economy has developed. Thus, we utilize a machine learning model based on Classification and Regression Trees to examine the value relevance of 15 accounting variables and ten industry indicators for Swedish-listed firms between 2000 and 2021. Our findings demonstrate a significant decline in combined value relevance, which is driven by developments between 2011 and 2021. Notably, we also find that individual accounting items related to intangible assets and growth opportunities, which are particularly important in the new economy, have increased in value relevance. By separately analyzing New Economy and Old Economy firms, we also deduce that these trends are economy-wide, yet stronger for New Economy firms. Additionally, we find a diminishing relevance of equity book value and alternative performance measures.

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1. Introduction

Over the years, a “new economy” has arguably emerged, which is the result of a transition from a largely industrial-based economy into one based on knowledge, services and technology (Barth et al., 2023; Core et al., 2003; Lev & Gu, 2016). Simultaneously, the economic role of intangible assets has increased as major value drivers for firms have shifted to patents, brands, information technology, and human capital – items that are not faithfully accounted for on companies’ balance sheets (Lev & Gu, 2016). While the economy and capital markets have undergone these significant advances, accounting practices have arguably remained frozen in time, resulting in a decline in the value relevance of accounting information (Balachandran & Mohanram, 2011; Brown et al., 1999; Core et al., 2003; Lev & Gu, 2016; Lev & Zarowin, 1999).¹ Hence, we aim to answer the following research question:

How has the value relevance of accounting information in Sweden changed over time?

Despite the large body of research that finds a decline in the value relevance of accounting information, there still exists some contradictory conclusions and critiques. For instance, Collins et al. (1997) and Barth et al. (2023) examine the evolution of value relevance among listed firms in the United States (US), from 1953 to 1993 and 1962 to 2018 respectively, and find no decline in the combined value relevance of accounting information. Barth et al. (2023), who are the first in the field to include a comprehensive set of 18 accounting items and use a machine learning approach, also criticize prior research for not including extensive sets of accounting variables or utilizing nonlinear models – elements they deem essential for generating reliable results. Consequently, much of prior research is arguably problematic given that their inferences may have differed if nonlinearities and a higher number of value-relevant accounting items had been incorporated.

Further value relevance research, especially that which includes a broad set of accounting items and utilizes a nonlinear approach, is therefore motivated by the need to understand whether accounting information remains relevant for investor assessments of equity value in the new economy. Since Barth et al. (2023) argue that accounting items related to the new economy have increased in value relevance, additional studies are also useful in order to identify what

¹ An accounting item is deemed to be value relevant if it explains variations in share price (Barth et al., 2001, 2023). We use the terms “value relevance” and “relevance” interchangeably, unless otherwise stated.

specific accounting items have become more relevant for today's analysts and investors when valuing equity. This, therefore, also suggests that value relevance research provides beneficial insights for financial accounting standard-setters since it can contribute to deliberations of new accounting standards (Barth et al., 2001). Additionally, the identification of accounting items with increasingly high value relevance facilitates the recognition of items that may benefit from improved representation within financial reporting (Barth et al., 2023). As such, further studies in this area are essential to enable financial reporting to keep pace with changes in the economy and capital markets.

Moreover, there are multiple reasons why Sweden is a particularly interesting market to study from a value relevance perspective. Firstly, Sweden's economy has the highest share of value added from information and communication technology (ICT) of the OECD countries and is among the top ten exporters of ICT services (OECD, 2018). Secondly, according to the Global Innovation Index, Sweden is the third most innovative economy globally and the second most innovative in Europe (World Intellectual Property Organization et al., 2022). Consequently, the Swedish market is highly relevant in terms of investigating whether there has been a change in the value relevance of accounting information due to the emergence of a knowledge- and technology-based economy.

Our study is therefore based on annual relations between accounting items and share prices for Swedish-listed firms from 2000 to 2021. According to tradition in value relevance research, explanatory power (R^2) is used as the metric to measure value relevance. We, therefore, estimate out-of-sample R^2 since this avoids the upward biases present in in-sample measures (Barth et al., 2023). Furthermore, contrary to the majority of prior studies that use linear regression models, which we earlier mentioned has received criticism, we follow Barth et al. (2023) by utilizing a nonparametric machine learning approach based on Classification and Regression Trees (CART). The CART method is advantageous compared to linear models since it allows us to capture any nonlinearities and interactions between and among variables more accurately, ensuring that explanatory power is not underestimated (Barth et al., 2023; Breiman, 2001). Moreover, given that prior research is criticized for incorporating too few variables, we include earnings and equity book value as well as 13 additional accounting items included by Barth et al. (2023).² As such, our study encompasses nine accounting items considered especially

² See section 3.1 for the full list of accounting variables.

important in the new economy, such as those related to intangible assets, growth opportunities, and alternative performance measures (Barth et al., 2023). Further, ten industry indicators are included to allow for cross-industry variation, which prior research affirms is important (Barth, Elliott, et al., 1999; Barth et al., 2023).

We first investigate changes in combined value relevance of the 15 accounting items and ten industry indicators from 2000 to 2021, and consequently find a significant decline in value relevance that is driven by developments during 2011 to 2021.³ As such, our main finding supports the majority of prior value relevance research within this area. Additionally, we find that notable downturns in combined value relevance coincide with years of extreme adverse events, such as the global financial crisis and the Covid-19 pandemic. Subsequently, we estimate how much each individual accounting item contributes to the combined value relevance and whether this has changed over time. In line with prior research, we find a significant increase in the value relevance of accounting items related to intangible assets and growth opportunities (i.e., R&D expenses, intangible assets, cash, and revenue growth). However, contrary to most prior research, we find no decrease in the value relevance of earnings but a decline in the relevance of equity book value as well as items related to alternative performance measures. Lastly, we separately investigate the value relevance of accounting items for three different groups of firms: New Economy, Old Economy Profit, and Old Economy Loss firms. This is motivated by findings in prior research, which demonstrate that the value relevance of accounting information differs depending on the intangible intensity and whether firms report positive or negative earnings (Barth et al., 2023; Collins et al., 1999; Hayn, 1995; Srivastava, 2014). In this analysis, New Economy firms are defined as firms in a technology industry or that incurred a loss in the year of its initial public offering (IPO), which is in accordance with Barth et al. (2023).⁴ As a result, our findings indicate that the positive trend in value relevance for accounting items related to intangible assets and growth opportunities is present for both New Economy and Old Economy firms, although the former has the highest levels and most pronounced trends for these items. Additionally, we present evidence showing that the share of New Economy firms in the Swedish economy has risen.

³ In accordance with Barth et al. (2023), we study value relevance changes regardless of whether they are derived from real changes in the economy, changes in accounting standards or other factors.

⁴ Old Economy firms are defined as firms that are not New Economy firms. See section 3.1.3 for details.

1.1 Contribution

Our main contribution is that we investigate the evolution of value relevance in a new setting, as most value relevance studies utilize US data, and prior research based in a Swedish context is very limited. Beisland and Hamberg (2013) use Swedish data from 1983 to 2004 to investigate the value relevance of four accounting items, but contrary to our study they do not examine value relevance changes over time. Moreover, prior research findings based on US data are arguably not generalizable to the Swedish setting since the institutional and cultural contexts are different. For instance, the countries apply different accounting standards. US financial reporting is primarily governed by the Generally Accepted Accounting Principles (GAAP), while Swedish companies follow International Financial Reporting Standards (IFRS) since 2005 (European Commission, 2021; FASB, n.d.). Even though GAAP and IFRS share many similarities, there are significant distinctions between them. One is that GAAP is rule-based to a larger extent, while IFRS is more principles-based; this means that GAAP has more specific rules regarding how to account for discrete events (KPMG, 2022). Other differences also concern the treatment of inventory valuation, asset revaluation, and capitalization of development costs. In terms of cultural context, Sweden also has a higher level of societal trust than the US, which is found to impact investors' perception and utilization of financial disclosures as well reactions to earnings announcements (Pevzner et al., 2015). Given such contextual differences, our study contributes to prior research by drawing conclusions based explicitly on Swedish data. It is also of higher relevance for Swedish accounting standard-setters when deliberating how to enhance financial reporting.

Additionally, our study contributes to prior research by studying a new time period, including a comprehensive set of accounting items and utilizing a machine learning method. Notably, we include the years 2019 to 2021 in our sample period, which have yet to be admitted in a study about the evolution of value relevance. In contrast, the latest research in the field is by Barth et al. (2023) who only include data up until 2018. For instance, this therefore allows us to expand upon prior research by analyzing value relevance changes during the Covid-19 pandemic, which started in March 2020 (WHO, 2020). Moreover, the high number of variables incorporated in our study and the use of a flexible and nonparametric estimation method is what Barth et al. (2023) call for in future research to enable a more complete estimation of value relevance than in prior studies. We thus add to the existing literature since, to the best of our knowledge, no prior study on Swedish data and only one study worldwide within this specific

research area incorporates as many accounting variables and utilizes a machine learning method; our study thereby adds to a new type of value relevance research that remains scarce.

1.2 Research Boundaries

We delimit our study to only investigate Swedish-listed firms on Nasdaq OMX Stockholm, First North and Spotlight Stock Market. Due to insufficient data availability for earlier years, the sample period is also confined to the years 2000 through 2021. Further, financial firms are excluded from the sample due to their distinct capital structure. Moreover, we only consider the value relevance of accounting information in terms of its relevance for analysts and investors in equity valuation.

1.3 Outline

The remainder of the study proceeds as follows. Chapter 2 presents a review of and relates our study to prior research and describes our predictions. Next, Chapter 3 describes the research design and sample selection process, whereafter descriptive statistics and results from our statistical tests are presented in Chapter 4. Our discussion is then found in Chapter 5, which is followed by the conclusion in Chapter 6.

2. Literature Review and Theory

This chapter first presents theory and prior research within the field of accounting value relevance and relates it to our study. Based on this, we thereafter develop our predictions.

2.1 Value Relevance of Accounting Information

The extensive value relevance literature, which begins with Miller and Modigliani (1966) and Ball and Brown (1968), assesses the extent to which accounting information explains variations in share prices (Barth et al., 2001). In terms of what constitutes value relevance, the Financial Accounting Standards Board (FASB) also establishes that the two fundamental characteristics of useful financial information are relevance and faithful representation: relevant information should be able to influence the decisions made by users, while faithful representation is achieved if information is complete, neutral and free from error (FASB, 2018). According to Barth et al. (2001), value relevance tests, therefore, consider both of FASB's criteria since an accounting item will be value relevant only if it is relevant to investors in their valuation assessments and is quantified faithfully enough to manifest in share prices. In relation to this,

Barth et al. (2023) thereby argue that the value relevance of accounting items associated with the new economy, which are of particular focus in our study, must be derived mainly from relevance since they are not faithfully represented in accounting. For instance, R&D expenses are claimed to not be a faithful representation of R&D activities since they actually reflect investments in intangible assets (Lev & Sougiannis, 1996). As such, the results of this study can infer whether these accounting items are increasingly relevant and, thereby, if accounting could benefit from improvements in their faithful representation.

2.2 Trends in Value Relevance of Accounting Information

The starting point of research that examines trends in value relevance includes studies that solely investigate the association between price and earnings. Consequently, several studies demonstrate a deterioration in the quality and relevance of earnings over time, which they largely attribute to the increasing reliance on intangible assets among firms (Dichev & Tang, 2008; Lev & Zarowin, 1999; Srivastava, 2014). Because an increase in firms' intangible intensity, for example related to R&D activities, has been shown to be associated with a decline in informativeness and value relevance of earnings (Lev & Zarowin, 1999; Srivastava, 2014). Dichev and Tang (2008) further explain this phenomenon as a result of the increasingly poor matching of revenues and expenses that arises from a higher intangible intensity in the economy. However, Srivastava (2014) goes on to specify that this is mainly a result of new listed firms being more intangible-intense. Besides this, prior research also explains the decline in value relevance of earnings as related to the increasing presence of loss firms, since earnings have little relevance for firms that report losses (Collins et al., 1999; Hayn, 1995). As mentioned earlier, the conclusion that losses and intangible intensity impact value relevance therefore also motivates this study's separate analysis of New Economy firms and Old Economy Loss firms.

The subsequent set of studies includes equity book value in addition to earnings, which is in line with the valuation framework provided by Ohlson (1995). Collins et al. (1997) and Francis and Schipper (1999) find no decline in the combined value relevance of earnings and equity book value for US-listed firms, but further demonstrate that this is because the decrease in value relevance of earnings is offset by the increasing relevance of equity book value. Prior research partially attributes this shift in value relevance to the increasing presence of loss firms in the economy, since equity book value can both predict abnormal earnings and capture loss firms' liquidation option (Collins et al., 1997, 1999). The presented shift is also confirmed by Brown

et al. (1999), although they find a decline in overall combined value relevance after controlling for scale effects. In line with these results, Balachandran and Mohanram (2011) and Lev and Zarowin (1999) also demonstrate deterioration in the combined value relevance of accounting information from 1975 to 2004 and 1977 to 1996, respectively.

Several more recent studies include additional accounting items, which is increasingly motivated given that the relation between accounting information and share prices has become more nuanced over time (Barth et al., 2023). For example, Core et al. (2003) utilize linear models to investigate value relevance over 25 years in the US and includes items related to growth and intangible assets in addition to earnings and equity book value, which has the purpose of capturing expected growth from investments in intangibles.⁵ Consequently, they find that the ability of traditional financial variables to explain firm value decreases in the so-called “New Economy Period”.⁶ Similarly, Lev and Gu (2016) make use of linear regression models to present evidence that accounting information, including earnings, assets, COGS, revenue and SG&A expenses, has significantly and rapidly deteriorated in relevance for investors between 1950 and 2013 in the US. Notably, they also find a decline in the level of combined value relevance from 2000 to 2013, which is of closer proximity to our sample period.

However, in the most recent addition to the value relevance literature, Barth et al. (2023) assert the importance of including even more comprehensive sets of accounting items and using nonlinear models. Given that most prior research lacks this, they also argue that the conclusions of prior studies may not be entirely reliable. Therefore, they instead utilize a machine learning model to study the evolution of value relevance in the US between 1962 and 2018 for 18 accounting items.⁷ Consequently, they find a significant increase in combined value relevance over the full sample period, while the 2000s and 2010s exhibit no significant trends. From their study, they also infer that adverse economic conditions, such as the global financial crisis, negatively impact value relevance. Barth et al. (2023) thereby introduce a new and arguably improved method for value relevance research and subsequently call for more studies to

⁵ In addition to earnings and equity book value, Core et al. (2003) include sales growth, CAPEX, a growth proxy, R&D expenses and advertising expenses.

⁶ Core et al. (2003) define the “New Economy Period” as starting in the late 1990s.

⁷ Barth et al. (2023) include 18 different accounting items, nine of which belong to the three categories of accounting items that relate to the new economy (intangible assets, growth opportunities and, alternative performance measures).

incorporate extensive sets of accounting variables and use flexible estimation methods such as machine learning – we, therefore, pursue this method in our study.

2.3 Value Relevance of Individual Accounting Items

2.3.1 Traditional Accounting Items

The two key traditional accounting items in prior value relevance research are earnings and equity book value. These items have been justified as relevant variables for value relevance studies through Ohlson's (1995) valuation framework, and we therefore include them in our study. As previously established, prior studies largely agree that the value relevance of earnings has decreased over time, while that of equity book value has increased (Barth et al., 2023; Brown et al., 1999; Collins et al., 1997; Francis & Schipper, 1999). However, when only considering the 2000s and 2010s, the periods most equivalent to our sample period, Barth et al. (2023) instead find that equity book value decreases in value relevance.

In line with Barth et al. (2023), we also include other traditional accounting items in our study: dividends, capital expenditure, earnings growth, and total assets. Earnings of dividend-paying firms are found to be of higher quality and persistence than those of other firms, which implies that dividends are informative about earnings quality (Skinner & Soltes, 2011). Yet, Floyd et al. (2015) conclude that there is a declining propensity for firms to pay dividends. Consistent with this trend, Barth et al. (2023) also find a significant decrease in the value relevance of dividends from 1962 to 2018. Moreover, capital expenditures, which represent investments in tangible assets, also contain value relevant information since they are positively associated with excess returns (Barth et al., 2023; Kerstein & Kim, 1995). However, Barth et al. (2023) find no significant change in their relevance over time. Similarly, earnings growth is claimed to be relevant due to capturing omitted variables in regressions, but no inferences are made regarding any changes in its relevance (Barth et al., 2023; Kothari & Shanken, 2003). Lastly, for total assets, Barth et al. (2023) demonstrate a negative trend in value relevance from 1962 to 2018 and a slight decline in mean value relevance from 2000 to 2018.

2.3.2 Accounting Items Associated with the New Economy

2.3.2.1 Items Related to Intangible Assets

Our study incorporates recognized intangible assets and R&D expenses as accounting items related to intangible assets. Additionally, we include SG&A expenses since they contain employee and advertising expenses, which have become more critical in the new economy and are associated with brands and human capital (Barth et al., 2023; Peters & Taylor, 2017). Thus, these three items are included in our study in accordance with Barth et al. (2023). However, it is important to note that throughout our study, when specifically referring to the group of accounting items related to intangible assets, we only refer to R&D expenses and recognized intangible assets in order to be consistent with Barth et al. (2023).

Over the years, there has been a shift in investment rates between tangible and intangible assets, where the former has declined while the latter has increased (Lev & Gu, 2016). Hence, intangible assets have achieved greater dominance among corporate assets and have become the primary value creators for businesses (Lev & Gu, 2016). As such, prior research associates accounting items related to intangible assets with features of the new economy, but further argues that they are not faithfully representing the value of their associated activities (Barth et al., 2023; Lev & Gu, 2016). Internally generated intangible assets cause this misrepresentation through R&D or SG&A expenses, since they are generally mandated to be expensed as incurred instead of capitalized due to the limiting conditions in IAS 38 (IFRS, n.d.). Prior research, therefore, argues that this accounting treatment is what causes the decline in the value relevance of accounting information, as firms – especially newly listed ones – exhibit increasingly high intangible intensity (Dichev & Tang, 2008; Lev & Gu, 2016; Lev & Zarowin, 1999; Srivastava, 2014). In line with this growing intangible intensity, Barth et al. (2023) also prove that the value relevance of recognized intangible assets significantly rose between 1962 and 2018 and is the highest for the increasingly expanding group of New Economy firms.

In terms of SG&A and R&D expenses, previous research finds that these reflect investments in intangible assets and thereby create long-term asset value (Balachandran & Mohanram, 2011; Banker et al., 2011; Core et al., 2003; Dichev & Tang, 2008; Lev & Gu, 2016; Lev & Zarowin, 1999). For instance, advertising expenses (which are included in SG&A expenses) arguably hold value relevance since they are positively associated with brand value, which in turn is

positively associated with stock prices (Barth et al., 1998). Despite this, research findings suggest that capital market participants fail to fully price in the future value created by current R&D and SG&A expenses, which thereby supports the view that items related to intangible assets lack faithful representation in accounting (Banker et al., 2019; Lev & Sougiannis, 1996). However, Peters and Taylor (2017) still argue that brands, customer relationships, and human capital, whose associated expenses are captured in SG&A expenses, have become increasingly important in the new economy. Additionally, prior research concludes that the R&D propensity among firms has continuously increased over time (Dichev & Tang, 2008; Lev & Gu, 2016). This is, therefore, in line with Barth et al. (2023), who establish that R&D and SG&A expenses display a significant positive trend in value relevance from 1962 to 2018 and an increase in mean value relevance from 2000 to 2018.

2.3.2.2 Items Related to Growth Opportunities

Growth opportunities are also pointed out as especially important for firm value in the new economy (Barth et al., 2023). Yet, Barth et al. (2023) argue that accounting information does not reflect growth opportunities and therefore attempts to capture it in their model through cash and revenue growth - we therefore also include these accounting items as proxies for growth. Subsequently, items related to a firm's growth opportunities are found to increase in value relevance from 1962 to 2018, which is proven to be especially true for New Economy firms (Barth et al., 2023). Notably, these results also hold between 2000 and 2018. With regards to the relation between cash and growth opportunities, prior studies establish that firms with significant growth opportunities tend to hold higher cash balances relative to other assets, especially if there is limited access to capital markets (Faulkender & Wang, 2006; Opler et al., 1999). Consequently, it is argued that cash holds greater value to firms with more growth opportunities (Barth et al., 2023). Besides cash, prior studies also point out revenue growth as a suitable proxy for growth opportunities since it should reflect expected growth in earnings (Barth et al., 2023; Core et al., 2003).

2.3.2.3 Items Related to Alternative Performance Measures

In line with Barth et al. (2023), who argue that alternative performance measures are associated with the new economy, we include operating cash flow, revenue, special items, and other comprehensive income (OCI) in our study. Operating cash flows explain equity market value incremental to that of equity book value and abnormal earnings (Barth et al., 1999).

Additionally, Kumar and Krishnan (2008) demonstrate that operating cash flows are becoming more value relevant since they are increasingly important for realizing investment opportunities. In terms of revenues, findings also reveal that investors disproportionately value revenue surprises and that these predict more persistent future earnings growth (Ertimur et al., 2003; Jegadeesh & Livnat, 2006). Revenues are also more helpful than earnings or cash flows when valuing loss firms (Callen et al., 2008). Consequently, Barth et al. (2023) find that both operating cash flows and revenues increase in value relevance from 1962 to 2018.

With regards to special items and OCI, Barth et al. (2023) describe these items as common adjustments to earnings in alternative performance measures. Several studies reveal that special items now have a higher frequency and persistence than in the past (Collins et al., 1997; Donelson et al., 2011; Elliott & Hanna, 1996; Jones & Smith, 2011; Lev & Gu, 2016). Moreover, this increase is pointed out as a reason for the decline in the relevance of earnings that several studies find (Collins et al., 1997; Donelson et al., 2011; Elliott & Hanna, 1996; Lev & Gu, 2016). As such, Barth et al. (2023) argue that these items should have risen in relevance, given the simultaneous decline in earnings quality. Subsequently, they are able to confirm that special items, but not OCI, significantly increase in value relevance from 1962 to 2018.

2.4 Predictions

From the presented literature, we note that different conclusions have been drawn with regards to changes in combined value relevance. However, the largest body of literature argues that the combined value relevance of accounting information has declined over time (Balachandran & Mohanram, 2011; Brown et al., 1999; Core et al., 2003; Lev & Gu, 2016; Lev & Zarowin, 1999). As noted, the literature also associates this decline with the development of the new economy and factors such as the growing importance of intangible assets and digital technology, which is a development that has been ongoing in the 2000s and 2010s as well (World Bank, 2016). Consequently, we predict that the combined value relevance of accounting information has decreased over our sample period.

From prior research, we are also able to make predictions with regards to changes in value relevance of the individual accounting items included in our study. In line with the majority of prior research, we predict that the value relevance of earnings has decreased while that of equity book value has increased over time (Barth et al., 2023; Brown et al., 1999; Collins et al., 1997;

Francis & Schipper, 1999). However, we acknowledge that our prediction for equity book value may not materialize given that Barth et al. (2023) find a decrease in average value relevance for this accounting item between 2000 and 2018, which is a similar timeframe as the sample period of this study. For the remaining traditional accounting items, we predict that total assets and dividends will have experienced a decrease in value relevance, which is motivated by findings in Barth et al. (2023) and claims by Floyd et al. (2015) regarding firms' declining propensity to pay dividends. However, from prior research and theory, we derive no predictions regarding changes in the value relevance of earnings growth and capital expenditures, for which Barth et al. (2023) do not find any significant trends. Further, the literature regarding accounting items associated with the new economy reveals that items related to intangible assets, growth opportunities, and alternative performance measures have increased in value relevance over time, at least partially as a result of an increasing proportion of New Economy firms (Barth et al., 2023; Collins et al., 1997; Lev & Gu, 2016). Based on the presented literature we therefore predict that the value relevance of these accounting items (i.e., R&D expenses, recognized intangible assets, cash, revenue growth, operating cash flows, revenues, special items and OCI) have increased over our sample period. In addition, since brands and human capital have arguably become more important in the new economy, we also predict a growing relevance of SG&A expenses (Peters & Taylor, 2017).

Lastly, prior studies provide insights into how the value relevance of accounting information differs between New Economy and Old Economy firms. Based on research findings in this field by Barth et al. (2023), we predict that accounting items related to intangible assets, growth opportunities, and alternative performance measures have the highest value relevance for New Economy firms. Further, we expect New Economy firms to demonstrate the strongest positive trends in value relevance for these categories of accounting items. We also predict that Old Economy Loss firms exhibit the lowest value relevance of earnings as well as the highest relevance of equity book value, since prior research finds that the value relevance of losses is lower than that of profits and that equity book value captures the liquidation option for loss firms (Barth et al., 2023; Collins et al., 1997, 1999).

3. Method

This chapter provides a detailed description of our research method, including the variables incorporated in our model, and the sample selection process.

3.1 Research Design

3.1.1 Evolution in Combined Value Relevance

To evaluate any changes in the combined value relevance of accounting information, we follow the method used by Barth et al. (2023) by first estimating Equation (1) for each year between 2000 and 2021:

$$P_i = CART(VAR_i, IND_i) \quad (1)$$

P is share price three months after fiscal year end, VAR comprises 15 accounting variables, and IND constitutes ten dummy variable indicators for the Fama-French industry groups. Different firms are denoted by i .

VAR thus consists of variables for the 15 previously presented accounting items: earnings ($EARN$), equity book value (BE), R&D expense (RD), recognized intangible assets ($INTAN$), SG&A expense (SGA), cash, cash equivalents and short-term investments ($CASH$), revenue growth ($REVGR$), operating cash flow (CF), revenue (REV), special items (SPI), other comprehensive income (OCI), dividends (DIV), capital expenditure ($CAPX$), earnings growth ($EARNGR$) and total assets ($ASSETS$). These are thereby in line with the variables included by Barth et al. (2023), except for cost of goods sold and advertising expenses that are excluded due to a lack of data and income taxes that are excluded due to redundancy.⁸ Moreover, all variables are deflated by the number of shares, since this effectively mitigates issues related to scale effects (Barth & Clinch, 2009). Please refer to Appendix A for detailed variable definitions.

The ten Fama-French industry indicators (IND) are included in line with prior research and have the purpose of accounting for the fact that there are substantial cross-industry differences (Barth, Beaver, et al., 1999; Barth et al., 2023).⁹ Consequently, the industry indicators will allow the relation between price and accounting items to vary across industries and capture any interactions between accounting items and industry membership (Barth et al., 2023).

⁸ Income taxes are redundant since they do not add any incremental value relevance in our study, which implies that other variables (e.g., earnings) already capture its value relevant information.

⁹ IND thus consists of the following industry indicators: consumer non-durables ($NONDUR$), consumer durables ($DURBL$), manufacturing ($MANUF$), oil, gas and coal ($ENRGY$), computers, software and electronic equipment ($HITEC$), telephone and television ($TELCM$), wholesale and retail ($SHOPS$), healthcare and drugs ($HLTH$), utilities ($UTILS$) and mines, construction, hotels, entertainment and other ($OTHER$).

CART means the *CART* function, which is a nonparametric machine learning model that incorporates nonlinearities and interactions between and among variables as well as their implied ratios (Barth et al., 2023). This function works by repeatedly splitting each node using the best among a group of randomly chosen predictors (Liaw & Wiener, 2002). More specifically and in line with Barth et al. (2023), we utilize an algorithm specified by Breiman (2001) that simultaneously grows an ensemble of regression trees using *CART* methodology – a random forest regression. In contrast, most prior research in the value relevance field is based on linear regression models (e.g., Collins et al., 1997; Core et al., 2003; Lev & Gu, 2016; Lev & Zarowin, 1999). However, this has been criticized given the proven presence of nonlinearities in the association between accounting information and share prices, as earlier noted (Barth et al., 2001, 2023). As such, the *CART* model is preferable to linear regression models since it more fully incorporates nonlinearities and variable interactions, which thereby prevents the underestimation of explanatory power (Barth et al., 2023; Breiman, 2001). Additionally, regression trees are more suitable when studying a high number of independent variables. Consequently, *CART* is the most suitable method of choice given the high number of accounting items considered in our study and since it avoids understating value relevance. Hence, we recognize Barth et al.'s (2023) critique of prior research and instead follow their selected method in order to generate more reliable results.

Consistent with the approach used by Barth et al. (2023) and as specified by Liaw and Wiener (2002) and Hastie et al. (2008), we also tune the following hyperparameters of the *CART* function:

- (i) Each split considers all accounting items.
- (ii) 100 percent of the sample is available to be drawn randomly for each tree.
- (iii) 500 trees are estimated.
- (iv) At least five observations are required in each region.¹⁰

As per tradition in value relevance research, the metric used to assess value relevance is the R^2 (Balachandran & Mohanram, 2011; Barth et al., 2023; Basu, 1997; Brown et al., 1999; Collins et al., 1997; Core et al., 2003; Francis & Schipper, 1999). We, therefore, derive the R^2 for each year of the sample period from Equation (1). Furthermore, due to the reliance on this metric, the *CART* method provides additional benefits since it utilizes bootstrapping and thereby

¹⁰ Section 5.2.1 shows that our results are robust to tuning alternative hyperparameters.

generates out-of-bag estimates (Barth et al., 2023; Breiman, 2001).¹¹ The R^2 derived from the model thereby measures out-of-sample (OOS) explanatory power, which avoids the upward biases present in in-sample R^2 (Barth et al., 2023; Breiman, 2001).

To examine trends in combined value relevance over time, we continue to follow Barth et al. (2023) by estimating Equation (2):

$$OOSR2_t = \beta_0 + \beta_1 YEAR_t + \varepsilon_t \quad (2)$$

The $OOSR2$ in Equation (2) are the yearly R^2 values from Equation (1), and $YEAR$ is year 2000 to 2021. Observation year is indicated by t . We estimate this equation for the full sample period, as well as for two sub-periods (i.e., 2000-2010 and 2011-2021). Since we predict a significant decline in combined value relevance, we expect β_1 to be significantly negative.¹²

3.1.2 Value Relevance of Individual Accounting Items

In accordance with Barth et al. (2023), we thereafter assess how much each individual accounting item contributes to the combined value relevance ($OOSR2$) estimated in Equation (1). Next, we estimate Equation (3) to examine whether individual accounting items have become more or less value relevant over time:

$$VR_{kt} = \beta_0 + \beta_1 YEAR_t + \varepsilon_t \quad (3)$$

VR_k is the percentage of the combined value relevance ($OOSR2$) that is derived from a specific accounting variable k . We expect that β_1 is positive (negative) if we predict that an accounting item has increased (decreased) in value relevance. Consistent with the method utilized by Barth et al. (2023), VR_k corresponds to the incremental R^2 of variable k . We thereby construct VR_k by determining the incremental increase in $OOSR2$, when one variable at a time is randomly assigned to the random forest regression model, scaled by the sum of increases for all accounting items. Additionally, Equation (3) is estimated for the groups of accounting items related to intangible assets, growth opportunities, and alternative performance measures by using the sum of VR_k . In accordance with Barth et al. (2023), we thereby create and test the

¹¹ The random forest function sets aside one third of the observations in the data set, which is called the “out of bag” sample (Breiman, 2001).

¹² In accordance with Barth et al. (2023), the term “significant” refers to a significance level of 5 percent under a one-sided alternative if the sign of the β_1 coefficient (+ or -) is in line with our prediction, or else under a two-sided alternative.

following aggregated accounting variables: *Intans* (i.e., *RD* and *INTAN*), *Growth* (i.e., *CASH* and *REVGR*), and *AltPerf* (i.e., *CF*, *REV*, *SPI*, and *OCI*).

3.1.3 Value Relevance for New Economy and Old Economy Firms

To deduce whether the evolution in value relevance for individual accounting items is driven by a specific group of firms or is applicable to all firms in the economy, we estimate accounting value relevance separately for three groups of firms: New Economy firms, Old Economic Profit firms, and Old Economy Loss firms. In line with Barth et al. (2023), a New Economy firm is defined as a firm operating in a technology industry or that incurred a loss in the year of its IPO – characteristics that prior studies deem representative of the new economy (Barth et al., 2023; Collins et al., 1997; Core et al., 2003; Francis & Schipper, 1999; Lev & Gu, 2016; Srivastava, 2014).¹³ Old Economy firms are defined as firms that are not New Economy firms. Separating the analysis of New Economy, Old Economy Profit, and Old Economy Loss firms, as earlier noted, is motivated by the presented evidence that the value relevance of accounting information is affected by the level of intangible intensity and whether firms report losses or profits (Barth et al., 2023; Collins et al., 1999; Hayn, 1995; Srivastava, 2014). Hence, we divide the sample by firm group and repeat the method presented in section 3.1.2. for the three subsamples. Of note is that the value relevance of accounting items in the full sample is not simply a weighted average of the value relevance in each of the three firm groups; a specific accounting item could therefore be more or less value relevant in the full sample than for the separate estimations (Barth et al., 2023). One reason for this is that the CART model will tend to split on accounting items that are more associated with and typical of a specific firm group.

3.2 Sample Selection

This study uses two databases in order to obtain the necessary empirics: Wharton Research Data Services's Compustat Global to collect annual financial data and S&P's Capital IQ for complementary data points on the number of shares outstanding. Additionally, industry classifications based on Fama-French's industry groups are collected from Kenneth R French's data library. The Compustat Global database, which also is the one used by Barth et al. (2023), has been demonstrated to be the most exhaustive international accounting database, and it is

¹³ According to the definition by Barth et al. (2023), we define firms in a technology industry as firms with 3-digit SIC codes and large unrecognized intangible assets. Examples of such SIC codes are 283, 357, 360-368, 481, 737 and 873. These encompass industries such as software, pharmaceuticals, and telecommunications.

therefore, the primary source of our sample selection (Dai, 2012). Capital IQ data is thus only used to provide additional data points on the number of shares outstanding if this is missing in Compustat Global.¹⁴ All data from Compustat Global and Capital IQ was collected in March 2023.

The sample comprises the years 2000 to 2021 due to insufficient data availability for earlier years. However, data has also been collected for 1999 to enable the creation of variables that require lagged revenues, earnings, or assets. In terms of the sample selection process, we follow the approach used in prior research (Barth et al., 2023; Core et al., 2003). The sample is thereby selected based on the following criteria:

- (i) The firms are listed on Nasdaq OMX Stockholm, First North and Spotlight Stockmarket.
- (ii) The firms have non-missing earnings, equity book value, share price, number of shares outstanding, total assets, lagged total assets, revenue and SIC code.
- (iii) Only non-financial firms are included, due to financial firms' distinctive capital structure.
- (iv) Both active and inactive firms are included to prevent survivorship bias.

This selection process yields 6,351 firm-year observations. Please refer to *Table 1* and *Table 2* in Appendix B for further details regarding the sample removal process and the sample distribution by industry. Moreover, as per tradition in previous studies, we control for the effects of potential outliers by winsorizing the data (Barth et al., 2023; Collins et al., 1997; Core et al., 2003). We thus winsorize all variables by year, except for the industry indicators, at the 1st and 99th percentiles. Any missing items are omitted.

4. Results

This section includes results and insights from the descriptive statistics of our variables. Additionally, it presents results from the statistical tests described in section 3.1. Unless otherwise stated, the term “significant” refers to a significance level of 5 percent under a one-sided alternative if the sign (+ or –) of the trend coefficient (β_1) is in line with our prediction, or else under a two-sided alternative, which is in line with Barth et al. (2023).

¹⁴ The number of complementary data points retrieved from Capital IQ is 251.

4.1 Descriptive Statistics

Distributional statistics for our non-indicator variables as well as share price are reported in *Table 3*. These display a mean share price of 64.14 and mean earnings of 1.98. Supplementary to this, *Figure 1* also illustrates that share prices have increased over our sample period relative to the base year in 2000. This is, therefore, consistent with the distributional statistics in Barth et al. (2023), which also display an increase in mean share price relative to earlier time periods.

Table 3. Distributional Statistics

	Mean	St.Dev.		Mean	St.Dev.		Mean	St.Dev.
<i>P</i>	64.14	89.84	<i>CASH</i>	5.75	8.49	<i>DIV</i>	2.65	2.82
<i>EARN</i>	1.98	5.71	<i>REVGR</i>	3.97	16.67	<i>CAPX</i>	2.06	4.54
<i>BE</i>	23.11	29.59	<i>CF</i>	4.03	7.97	<i>EARNGR</i>	0.11	4.55
<i>RD</i>	2.14	3.09	<i>REV</i>	62.42	92.91	<i>ASSETS</i>	55.45	75.22
<i>INTAN</i>	12.21	20.32	<i>SPI</i>	-0.35	1.97			
<i>SGA</i>	11.32	15.63	<i>OCI</i>	0.14	5.53			

This table presents distributional statistics for the 6 351 firm-year observations for 724 firms from 2000 to 2021. Refer to Appendix A for variable definitions.

Figure 1. Indexed Share Price Development



This figure shows the indexed share price development of all firms in the sample over the sample period 2000-2021.

Furthermore, *Table 4* in Appendix B presents Pearson correlations, which have the purpose of simplifying comparisons between our study and prior research. From these, we deduce that earnings and dividends are the accounting items that are the most correlated with share price (0.64), followed by operating cash flows (0.59) and equity book value (0.51). Notably, R&D

and SG&A expenses also display positive correlations with share price (0.24 and 0.38, respectively), which is in line with findings by Barth et al. (2023). This, therefore, supports the previously presented arguments in section 2.3.2, which claim that these expenses reflect investments in intangible assets that generate long-term value. Moreover, it should be noted that an implication of using CART, a nonparametric method, is that estimations are not affected by skewness in variable distributions (Barth et al., 2023).

4.2 Evolution in Combined Value Relevance

Findings regarding the combined value relevance of accounting information can be found in *Table 5*, which shows that the mean R^2 over the whole sample period is 61.5. Additionally, results for the two sub-periods reveal that the mean value relevance is 65.5 from 2000 to 2010, whereafter it decreases to a mean of 57.4 for the years between 2011 and 2021. Consistent with these results, we find a significant negative trend in combined value relevance ($t = -1.87$) over the full sample period, with a trend coefficient (β_1) from Equation (2) of -0.01 . More specifically, for the sub-period 2000-2010 the coefficient is positive although no significant trend is detected, while 2011-2021 displays a significant decreasing trend ($t = -7.90$) in value relevance with a trend coefficient of -0.05 .

Table 5. Mean, Standard Deviation and Trends for Combined Value Relevance

	Mean	St.Dev.	Trend	(t-stat)	(p-value)
All Years	61.5	17.4	-0.010**	(-1.87)	(0.04)
2000-2010	65.5	16.8	0.012	(0.74)	(0.48)
2011-2021	57.4	17.7	-0.050***	(-7.90)	(0.00)

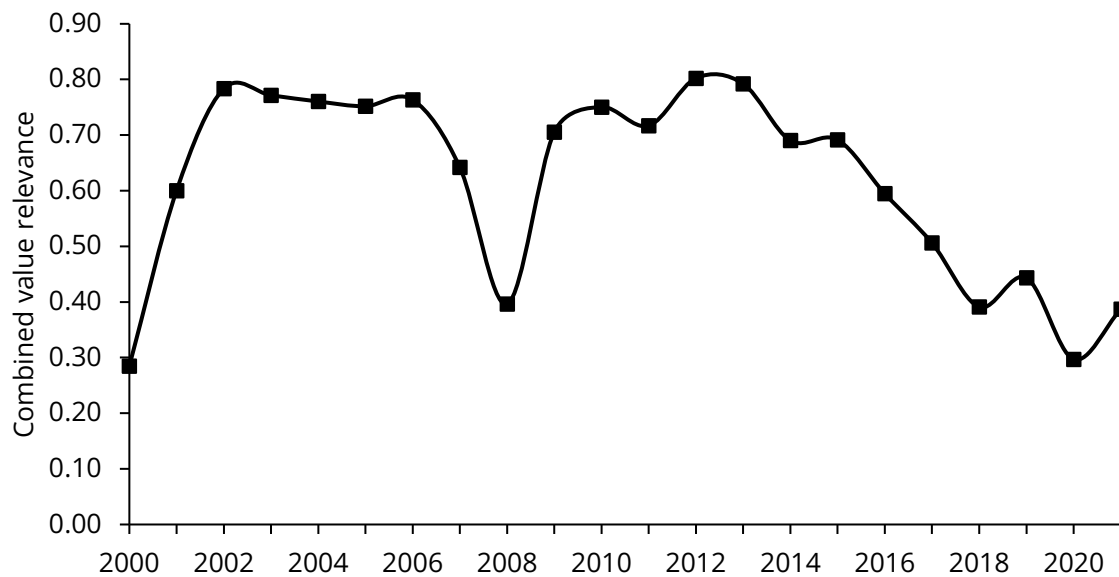
This table presents results for the combined value relevance of accounting information. Statistics concern the out-of-sample R^2 from the CART estimations including all 15 accounting items and ten industry indicators for all years (i.e., 2000-2021) as well as two sub-periods (i.e., 2000-2010 and 2011-2021). Mean, standard deviation, trend, t-value and p-value are presented. Trend refers to estimates of β_1 in Equation (2). *, **, and *** indicate significance at the 10, 5 and 1 percent levels. P-value refers to a one-sided test if the sign of the coefficient is in line with our prediction, or else a two-sided test.

Furthermore, the development of combined value relevance over the sample period is displayed in greater detail in *Figure 2*. Notably, the starting point of the sample period (i.e., year 2000) displays the lowest combined value relevance out of all years ($R^2 = 28.5$). Further, there is an evident and steep decline in combined value relevance in 2008.¹⁵ Of note is also that the

¹⁵ In section 5.2.2 we test and prove that our results are robust to excluding years of extreme adverse events.

combined value relevance increases between 2018 and 2019, whereafter it suddenly declines again in 2020.

Figure 2. Evolution of Combined Value Relevance



This figure shows the evolution of combined value relevance (out-of-sample R^2) of all 15 accounting variables and ten industry indicators over the sample period 2000-2021.

4.3 Value Relevance of Individual Accounting Items

Table 6 presents the mean value relevance for each individual accounting item over the whole sample period as well as for the sub-periods 2000 to 2010 and 2011 to 2021. Additionally, *Figure 3* in Appendix B illustrates each accounting item's value relevance in order of importance up until 95 percent of combined value relevance is explained. From these, we infer that *EARN* is the most value-relevant accounting item over the sample period (mean $VR = 23.3$), although it is surpassed by *BE* in the first sub-period. Further, *Table 6* demonstrates that the average value relevance of *EARN* increases from 17.6 to 28.9 percent between the two sub-periods. We also see that the second most value-relevant item over the sample period is *BE* (mean $VR = 20.7$), which displays its highest mean value relevance between 2000 and 2010 (mean $VR = 30.4$), whereafter it decreases for 2011 to 2021 (mean $VR = 10.9$). For the remaining traditional accounting items, the mean value relevance is shown to increase for *DIV* and *ASSETS*, while there is a decrease for *CAPX* and *EARNGR*.

In terms of accounting items associated with the new economy, there is an apparent increase in the mean value relevance of *RD*, *INTAN*, *CASH*, and *REVGR* between the two sub-periods.

Hence, items related to intangible assets and growth opportunities increase in average value relevance over the sample period. *Figure 3* in Appendix B also illustrates this, since *RD*, *INTAN*, and *REVGR* clearly have higher rankings in terms of value relevance in 2011 to 2021 than in 2000 to 2010. More specifically, the mean value relevance of *RD* and *INTAN* increases from 0.7 and 0.9 percent to 2.9 and 4.5 respectively; this is also reflected in the increase in *Intans* from 1.6 to 7.4. Further, both *CASH* and *REVGR* experience increases in mean value relevance, which is captured by the *Growth* variable that rises in average value relevance from 1.5 to 11.7. In contrast, the results reveal that *SGA* and *Altperf* decline in average value relevance over the sample period (from 1.5 and 25.8 to 0.4 and 5.9, respectively).

Table 6. Mean Value Relevance

	All Years	2000-2010	2011-2021
<i>EARN</i>	23.3	17.6	28.9
<i>BE</i>	20.7	30.4	10.9
<i>RD</i>	1.8	0.7	2.9
<i>INTAN</i>	2.7	0.9	4.5
<i>SGA</i>	1.0	1.5	0.4
<i>CASH</i>	1.6	0.9	2.4
<i>REVGR</i>	4.9	0.6	9.3
<i>CF</i>	8.0	13.5	2.5
<i>REV</i>	5.2	9.0	1.3
<i>SPI</i>	1.9	1.9	1.9
<i>OCI</i>	0.8	1.4	0.2
<i>DIV</i>	15.3	12.6	17.9
<i>CAPX</i>	0.9	1.6	0.2
<i>EARNGR</i>	4.6	5.6	3.7
<i>ASSETS</i>	7.5	2.0	13.0
<i>Intans</i>	4.5	1.6	7.4
<i>Growth</i>	6.6	1.5	11.7
<i>AltPerf</i>	15.8	25.8	5.9

This table reports the mean value relevance for each non-indicator accounting item for 2000-2021 as well as 2000-2010 and 2011-2021. Refer to Appendix A for variable definitions.

Moreover, the estimates of β_1 from Equation (3) are presented in *Table 7*. These results show whether there are any significant trends in value relevance for any of the individual accounting items from 2000 to 2021. For instance, the value relevance of *BE* is seen to exhibit a negative trend throughout the sample period ($t = -2.03$), although with a p-value of 6 percent. Hence, since the p-value is slightly above the threshold of 5 percent, we draw this conclusion with

caution. In contrast, *RD* and *REVGR*, which are related to intangible assets and growth opportunities, display significant increases in value relevance ($t = 1.84$ and 2.31). The other accounting items related to intangible assets and growth, *INTAN* and *CASH*, also demonstrate positive trends ($t = 1.63$ and 1.39), although these are only significant at a 10 percent significance level. Yet, consistent with these results, both *Intans* and *Growth* significantly increase in value relevance over the sample period ($t = 2.41$ and 2.39). On the contrary, *AltPerf* displays a significant negative trend ($t = -2.40$), which is in line with the decreases in mean value relevance that we find for *CF*, *REV*, and *OCI*. Moreover, no significant trends are found for *EARN*, *SGA*, *REV*, *SPI*, *OCI*, *DIV*, *CAPX*, *EARNGR*, and *ASSETS*.

Table 7. Trends in Value Relevance for Accounting Items

	Pred.	Coef.	(t-stat)	(p-value)
<i>EARN</i>	-	0.004	(0.56)	(0.59)
<i>BE</i>	+	-0.014*	(-2.03)	(0.06)
<i>RD</i>	+	0.002**	(1.84)	(0.04)
<i>INTAN</i>	+	0.003*	(1.63)	(0.06)
<i>SGA</i>	+	0.000	(0.18)	(0.43)
<i>CASH</i>	+	0.002*	(1.39)	(0.09)
<i>REVGR</i>	+	0.007**	(2.31)	(0.02)
<i>CF</i>	+	-0.009*	(-1.83)	(0.08)
<i>REV</i>	+	-0.004	(-0.90)	(0.38)
<i>SPI</i>	+	0.001	(0.60)	(0.28)
<i>OCI</i>	+	0.004	(0.56)	(0.29)
<i>DIV</i>	-	0.002	(0.30)	(0.77)
<i>CAPX</i>	?	-0.001	(-0.87)	(0.40)
<i>EARNGR</i>	?	0.000	(0.07)	(0.95)
<i>ASSETS</i>	-	0.008	(1.41)	(0.18)
<i>Intans</i>	+	0.005**	(2.41)	(0.01)
<i>Growth</i>	+	0.009**	(2.39)	(0.01)
<i>AltPerf</i>	+	-0.013**	(-2.40)	(0.03)

This table presents estimates of β_1 from Equation (3), along with t-values and p-values. Pred. shows the predicted sign of the coefficient for each accounting item. *, **, and *** indicate significance at the 10, 5 and 1 percent levels. P-value refers to a one-sided test if the sign of the coefficient is in line with our prediction, or else a two-sided test. Refer to Appendix A for variable definitions.

4.4 Value Relevance for New Economy and Old Economy Firms

Table 8 through Table 10, accompanied by Figure 4, present results for New Economy, Old Economy Profit, and Old Economy Loss firms from 2000 to 2021. As previously explained in section 3.1.3 it is important to note that, due to using CART, the value relevance of accounting items in the full sample is not simply a weighted average of the value relevance in each of the three firm groups (Barth et al., 2023).

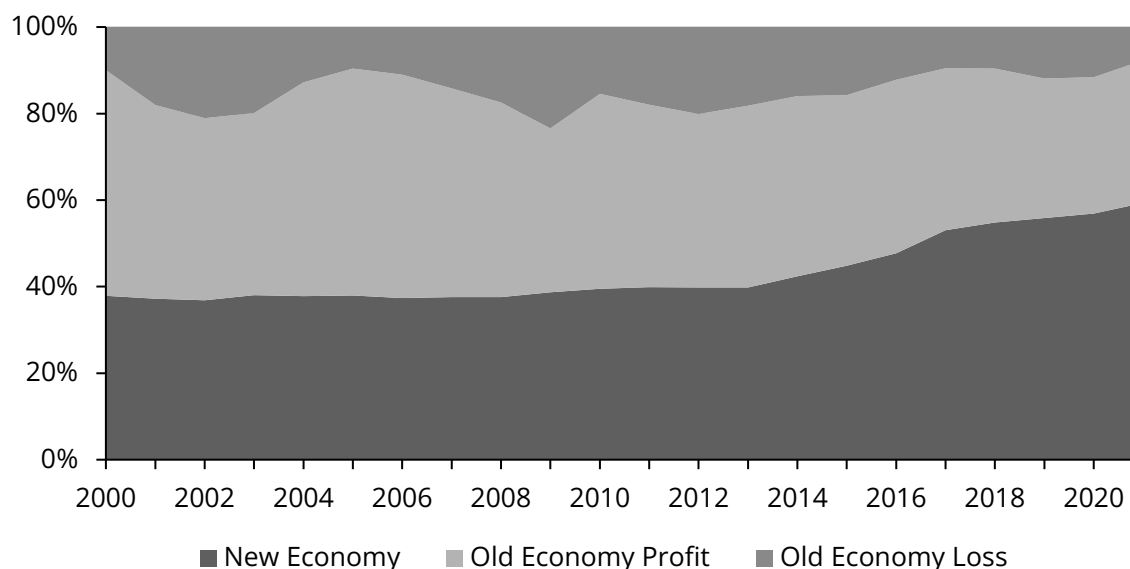
Table 8 and Figure 4 display the evolution in the proportion of firms in our sample that belong to the New Economy, Old Economy Profit, and Old Economy Loss subsamples. We find that these three groups, respectively, make up 43.2, 42.1, and 14.7 percent of the full sample on average. As expected, the proportion of New Economy firms in the sample significantly increases ($t = 8.07$) from a mean of 37.9 percent in the first sub-period to a mean of 48.6 in the second. Consistent with this finding, Old Economy Profit firms instead display a significantly negative trend ($t = -6.42$) over the sample period; the average percent of firms pertaining to this firm group declines from 46.4 to 37.8. Old Economy Loss firms also decrease in proportion over the sample period, from a mean of 15.7 percent during 2000 to 2010 to 13.7 in 2011 to 2021. However, this trend is only significant at a 10 percent significance level.

Table 8. Mean Percentage of Full Sample and Trends by Firm Group

	Mean Percent			Trend	(t-stat)	(p-value)
	All Years	2000-2010	2011-2021			
<i>New Economy</i>	43.2	37.9	48.6	0.010***	(8.07)	(0.00)
<i>Old Economy Profit</i>	42.1	46.4	37.8	-0.008***	(-6.42)	(0.00)
<i>Old Economy Loss</i>	14.7	15.7	13.7	-0.002*	(-1.78)	(0.09)

This table presents subsample composition across time. The mean percentage of firms in each subsample is presented, as well as trends over time. *, **, and *** indicate significance at the 10, 5 and 1 percent levels.

Figure 4. Sample Proportion Development by Firm Group



This figure shows the sample proportion ratio by firm group over the sample period 2000-2021.

Furthermore, the mean value relevance of each accounting item for the three groups of firms across time is found in *Table 9*. Consistent with results in the full sample, *EARN* is seen to be among the two most value-relevant items over the whole sample period for New Economy and Old Economy profit firms. Additionally, all three groups of firms experience an increase (decrease) in the average value relevance of *EARN* (*BE*). As demonstrated, *AltPerf* also exhibits a decline in average value relevance for all groups. Most notably, New Economy firms display the highest average value relevance for *Intans* and *Growth*. Over the whole sample period, the mean value relevance for *RD* and *INTAN* among New Economy firms is 4.4 and 4.2 percent, respectively, which corresponds to a mean value relevance of 8.5 percent for *Intans*. Moreover, the mean value relevance of *CASH* and *REVGR* for this firm group is 2.6 and 9.1, respectively, which results in an average value relevance of 11.7 for *Growth*. *Intans* and *Growth* thereby display notably higher value relevance for New Economy firms than for Old Economy Profit firms (mean *VR* = 3.5 and 7.4, respectively) and Old Economy Loss firms (mean *VR* = 5.0 and 9.4, respectively). In contrast, *AltPerf* has the highest average value relevance among Old Economy Loss firms (mean *VR* = 18.6), while New Economy firms only display the second highest value relevance for these items (mean *VR* = 13.5). Furthermore, Old Economy Loss firms consistently have the lowest average value relevance of *EARN* (mean *VR* = 0.9) and the highest relevance of *BE* (mean *VR* = 33.5).

Table 9. Mean Value Relevance by Firm Group

	New Economy			Old Economy Profit			Old Economy Loss		
	All Years	00-10	11-21	All Years	00-10	11-21	All Years	00-10	11-21
<i>EARN</i>	23.6	17.2	30.1	32.7	28.1	37.3	0.9	0.7	1.1
<i>BE</i>	23.7	34.7	12.7	20.9	26.0	15.8	33.5	36.1	30.9
<i>RD</i>	4.4	1.0	7.7	2.0	0.5	3.4	2.2	1.3	3.1
<i>INTAN</i>	4.2	3.1	4.7	1.6	1.2	2.0	2.8	1.9	3.5
<i>SGA</i>	1.0	1.7	0.3	1.0	0.9	1.1	6.1	3.1	9.1
<i>CASH</i>	2.6	0.7	4.5	0.5	0.8	2.0	3.7	6.5	0.9
<i>REVGR</i>	9.1	4.5	13.8	6.8	1.4	12.2	5.7	0.7	10.6
<i>CF</i>	4.7	4.7	4.7	2.1	3.5	6.8	7.3	11.8	2.9
<i>REV</i>	7.0	12.0	2.0	1.8	0.9	2.6	5.6	8.9	2.3
<i>SPI</i>	0.3	0.0	0.6	0.9	0.9	1.0	2.8	3.6	2.0
<i>OCI</i>	1.5	2.2	0.7	1.2	1.4	0.9	2.9	2.3	3.4
<i>DIV</i>	7.2	5.1	9.2	17.1	19.7	14.5	3.1	1.2	5.0
<i>CAPX</i>	0.9	1.2	0.6	0.9	0.5	1.4	4.9	6.9	2.8
<i>EARNGR</i>	4.1	5.7	2.5	5.5	9.6	1.3	9.0	7.4	10.6
<i>ASSETS</i>	5.9	5.8	6.0	5.0	4.6	5.5	9.7	7.4	11.9
<i>Intans</i>	8.5	4.7	12.4	3.5	1.6	5.4	5.0	3.3	6.7
<i>Growth</i>	11.7	5.2	18.3	7.4	2.3	12.4	9.4	7.3	11.5
<i>AltPerf</i>	13.5	18.9	8.1	6.0	6.7	5.2	18.6	26.6	10.6

This table presents the mean value relevance of all accounting items across time for New Economy, Old Economy Profit and Old Economy Loss firms. Refer to Appendix A for variable definitions.

Estimates of β_1 from Equation (3) for the three groups of firms are found in *Table 10*, which shows that positive trends for accounting items related to intangible assets and growth opportunities are not only present for New Economy firms. An increase in the average value relevance and a positive trend coefficient (β_1) for *Intans* is evident for all three groups of firms. However, only New Economy and Old Economy Profit firms display significant trends ($t = 1.96$ and 1.68 , respectively), although with the reservation that the p-value for Old Economy Profit firms is slightly high at 5.4 percent. Similarly, it is New Economy and Old Economy Profit firms that display significant increases in the value relevance of *Growth* ($t = 2.60$ and 2.40 , respectively). Notably, the trend coefficients (β_1) for *Intans* and *Growth* also have the greatest magnitudes among New Economy firms.

Table 10. Trends in Value Relevance by Firm Group

	New Economy		Old Economy Profit		Old Economy Loss	
	Coef.	(t-stat)	Coef.	(t-stat)	Coef.	(t-stat)
<i>EARN</i>	0.006	(0.68)	0.004	(0.62)	0.000	(0.70)
<i>BE</i>	-0.019**	(-2.29)	-0.007	(-1.06)	0.002	(0.22)
<i>RD</i>	0.006**	(2.08)	0.003*	(1.55)	0.001	(0.71)
<i>INTAN</i>	0.002	(0.51)	0.001	(0.85)	0.001	(0.54)
<i>SGA</i>	-0.001	(-0.67)	0.001	(1.16)	0.005	(0.99)
<i>CASH</i>	0.003**	(1.95)	-0.001**	(-2.27)	-0.004	(-1.38)
<i>REVGR</i>	0.009**	(1.92)	0.009***	(2.67)	0.001	(0.25)
<i>CF</i>	0.002	(0.50)	-0.002	(-1.65)	-0.009	(-1.46)
<i>REV</i>	-0.006	(-0.94)	0.002**	(1.76)	-0.004	(-1.10)
<i>SPI</i>	0.000	(0.61)	0.004	(0.62)	0.001	(0.27)
<i>OCI</i>	0.006	(0.68)			0.000	(0.70)
<i>DIV</i>	0.001	(0.20)	-0.008	(-1.00)	0.005*	(1.94)
<i>CAPX</i>	-0.001*	(-1.85)	0.001	(1.59)	-0.004	(-1.36)
<i>EARNGR</i>	-0.001	(-0.26)	-0.003	(-0.64)	0.004	(0.63)
<i>ASSETS</i>	0.000	(0.05)	-0.001	(-0.42)	-0.001	(-0.21)
<i>Intans</i>	0.007**	(1.96)	0.004*	(1.68)	0.002	(0.71)
<i>Growth</i>	0.012***	(2.60)	0.009**	(2.40)	-0.003	(-0.45)
<i>AltPerf</i>	-0.005	(-0.74)	0.000	(-0.20)	-0.010	(-1.40)

This table presents estimates of β_1 from Equation (3), along with t-values and p-values for New Economy, Old Economy Profit and Old Economy Loss firms. *, **, and *** indicate significance at the 10, 5 and 1 percent levels. Significance refers to a one-sided test if the sign of the coefficient is in line with our prediction, or else a two-sided test. Refer to Appendix A for variable definitions.

5. Discussion

In this chapter, the results are analyzed in section 5.1 whereafter robustness tests are presented in section 5.2. Finally, we discuss the quality of our study and perform data quality tests in section 5.3.

5.1 Analysis of Results

5.1.1 Evolution in Combined Value Relevance

In terms of combined value relevance, we test for trends over time to assess whether the value relevance of accounting information has increased or decreased. Consequently, we find a significant negative trend over the sample period, which suggests that accounting information has become less value relevant between 2000 and 2021. The results are thereby in line with our predictions. More specifically, a positive but not significant trend is detected from 2000 to 2010, while our results between 2011 and 2021 display a significant negative trend in value relevance. This, therefore, indicates that the negative trend over the full sample period is driven by the evident deterioration in combined value relevance between 2011 and 2021.

Prior research has drawn different conclusions regarding changes in combined value relevance, which at least partially is to be expected given that results are dependent on the specific sample period studied. Nevertheless, our findings support the majority of prior research that also finds a significant negative trend in combined value relevance (Balachandran & Mohanram, 2011; Brown et al., 1999; Core et al., 2003; Lev & Gu, 2016; Lev & Zarowin, 1999). As such, our results further endorse the argument that accounting has lost relevance over time as the new economy has developed. In contrast, our results do not align with the findings by Barth et al. (2023), Francis & Schipper (1999), and Collins et al. (1997). Most notably, Barth et al.'s (2023) study is most similar to ours in terms of method but displays no significant trends during the 2000s and 2010s. As such, our contrasting results could instead potentially be explained by the slight deviation in time periods studied, but also differences in the institutional and cultural contexts between the US and Sweden. The fact that Swedish financial reporting has followed IFRS since 2005, while the US adheres to GAAP could be one such meaningful difference (European Commission, 2021; FASB, n.d.). Because these accounting principles differ given that GAAP has more specific rules regarding how to handle discrete events (KPMG, 2022). Their treatment of development costs, inventory valuation, and asset revaluation also varies. Furthermore, the cultural contexts differ since the degree of societal trust is higher in Sweden,

which is found to impact investors' utilization, perception, and reaction to financial disclosures (Pevzner et al., 2015).

On a more detailed level, we also find notable declines in combined value relevance in 2008 and 2020, which respectively coincide with the global financial crisis and the Covid-19 pandemic. Further, year 2000 displays the lowest combined value relevance out of all years, which corresponds to the time of the technology bubble. These economic events could thus possibly explain the detected downturns in combined value relevance. Additionally, the positive trend coefficient for combined value relevance between 2000 and 2010 could, therefore, also be a result of recovery after the technology bubble. These inferences are also supported by Barth et al. (2023), who assert that economic crises such as the global financial crisis and technology bubble negatively affect the value relevance of accounting information. Consequently, the results indicate that such extreme adverse events negatively impact combined value relevance. Nonetheless, section 5.2.2 proves that our conclusions are robust to excluding the years of these events within our sample period.

In sum, we contribute to the existing value relevance literature by confirming that several conclusions made in prior research also apply in the Swedish context. But of note is that results are highly contingent on the sample period and national context, which implies that one should compare research within this field with caution since the sample periods are often different, and the institutional and cultural contexts differ between countries. As such, our study also contributes by investigating a new time period that includes years not previously studied in prior research (i.e., 2019-2021). Our sample period thereby also allows us to study value relevance during the time of the Covid-19 pandemic, which is not done by Barth et al. (2023) whose sample period ends in 2018. Consequently, we are able to extend Barth et al.'s (2023) findings regarding how extreme adverse events have impacted value relevance.

5.1.2 Value Relevance of Individual Accounting Items

In terms of the two key traditional accounting items included in our study, we first find that the mean value relevance of *EARN* increases over the sample period, although there is no significant trend. In contrast, *BE* decreases in value relevance with a significant negative trend at a 10 percent significance level. These results are, therefore, contradictory to our predictions and prior research that finds a significant decline in the value relevance of earnings and a shift in relevance to equity book value (Barth et al., 2023; Brown et al., 1999; Collins et al., 1997;

Dichev & Tang, 2008; Francis & Schipper, 1999; Lev & Zarowin, 1999; Srivastava, 2014). However, the deterioration in the value relevance of *BE* is not entirely unexpected given that Barth et al. (2023) report a decline in the average relevance of *BE* between the 2000s and 2010s, even though they find an increase over their full sample period. Moreover, since we find that the average percentage of Old Economy Loss firms has decreased, which is the group of firms that exhibits the highest value relevance of *BE*, this could provide one possible explanation for why the value relevance of *BE* declines over our sample period. In relation to the unexpected increase in the average value relevance of *EARN*, one should also note that Barth et al. (2023) draw the same conclusion for the 2000s, which they attribute to the recovery after the technology bubble. As such, this could be one factor that contributes to our results. However, it is also possible that the increase is partially attributed to the declining proportion of Old Economy Loss firms that we find over our sample period, since previous studies show that earnings have little value relevance for this group of firms (Collins et al., 1999; Hayn, 1995). As mentioned earlier, it is also possible that our results deviate from prior research due to the fact that our sample period differs much compared to most prior studies and due to specific circumstances and institutional factors in Sweden that differ compared to the US.

For the other traditional items, we find that *EARNGR* and *CAPX* both display a decrease in mean value relevance between our two sub-periods, while the average value relevance of *DIV* and *ASSETS* increases. However, no significant trends are found. Our results regarding capital expenditures and earnings growth are therefore in line with Barth et al. (2023), who also find no significant trends for these items. Yet, the decrease in the average value relevance for *CAPX* could still possibly reflect a shift in investments from tangible to intangible assets, which then supports findings by Lev and Gu (2016). On the contrary, our results concerning *DIV* and *ASSETS* deviate from prior research that finds a decline in the value relevance of these items (Barth et al., 2023). As such, these results are specific to our context and time period.

For accounting items associated with the new economy, we find increases in the average value relevance for *RD*, *INTAN*, *CASH*, and *REVGR*, and thereby also for *Intans* and *Growth*. Among these, *RD*, *REVGR*, *Intans*, and *Growth* display significantly positive trends. Further, no significant trend is detected for *SGA* while *AltPerf* exhibits a significant negative trend in relevance. From these results, we can firstly infer that accounting items related to intangible assets and growth opportunities (i.e., R&D expenses, recognized intangible assets, cash, and revenue growth) have become more value relevant between 2000 and 2021, which is in line

with our predictions. These findings, therefore, confirm prior research, which also finds an increase in the importance and relevance of these accounting items over time as the new economy has developed (Barth et al., 2023; Collins et al., 1997; Lev & Gu, 2016; Peters & Taylor, 2017). Since we also find that the proportion of New Economy firms increases over our sample period, which is the group of firms with the highest levels of value relevance for *Intans* and *Growth*, this could partially explain the increasing value relevance of these accounting items. This conclusion is also supported by Barth et al. (2023). However, our findings regarding *SGA* and *AltPerf* instead deviate from our expectations and Barth et al.'s (2023) findings, since we find no increase in the value relevance of SG&A expenses, and our results demonstrate a significant decrease in the relevance of alternative performance measures. This could be due to multiple factors, but the observed results for SG&A expenses could conceivably be attributable to the dominance of other expenditures within SG&A apart from employee and advertising expenses; because it is just brands and human capital that have become more relevant in the new economy according to Peters and Taylor (2017). Furthermore, our findings regarding *AltPerf* could potentially be understood given that we find an increase in the average value relevance of earnings. Because alternative performance measures are often substitutes for earnings, which implies that there could be a negative correlation between their levels of value relevance (Barth et al., 2023).

Through these results, our research thereby contributes by confirming several prior research findings in the Swedish setting, but also by adding to prior research through our set of context-specific conclusions. Given the previously presented claim by Barth et al. (2023) that accounting items associated with the new economy are not faithfully represented and the declaration by FASB (2018) that useful financial information must be both relevant and faithfully represented, our results regarding the growing relevance of *Intans* and *Growth* thereby also imply that the quality of accounting could benefit from improving the representation of these items. As such, our study further contributes by identifying the specific accounting items, within the Swedish setting, that could improve the relevance of financial reporting for investors if more properly represented.

5.1.3 Value Relevance for New Economy and Old Economy Firms

Our findings regarding New Economy and Old Economy firms largely confirm our predictions and prior research. As expected, the proportion of New Economy firms significantly increases over the sample period. Additionally, these firms are found to have the highest levels of value

relevance for items related to intangible assets and growth opportunities as well as the most pronounced positive trends for these items. However, we similarly find significant positive trends in the relevance of *Intans* and *Growth* among Old Economy Profit firms. Additionally, an increase in the average value relevance of *Intans*, albeit with no significant trend, is found for Old Economy Loss firms. Consequently, the results indicate that both New Economy and Old Economy firms drive positive trends in value relevance for accounting items related to intangible assets and growth opportunities, although the effect is most substantial among New Economy firms. This thereby confirms the findings made by Barth et al (2023). Moreover, in line with our predictions, we find that Old Economy Loss firms have the lowest (highest) value relevance of *EARN (BE)*. These results are therefore also aligned with prior research by Collins et al (1997, 1999) and Barth et al (2023). Our primary contribution in relation to the above-presented findings is, therefore, that we confirm the conclusions drawn in prior US-based studies and thereby assert that these also apply in the Swedish setting. However, unlike results in prior research, we also find that accounting items related to alternative performance measures are the most value relevant for Old Economy Loss firms rather than New Economy firms and that they do not increase in value relevance for any of the groups. As such, our results add nuance to prior research.

5.2 Robustness Tests

5.2.1 Alternative Hyperparameters

The CART function utilizes bootstrapping, which should prevent overfitting (Breiman, 2001). Yet, the model could potentially still overfit the data, especially given that the number of observations for each year and variable included in our model is limited by data availability. In accordance with Barth et al. (2023), we, therefore, assess the sensitivity of our results by estimating Equation (1) with different hyperparameters specified for the CART function. As such, we test all new combinations of the following alternative hyperparameters:

- (i) 25 or 15 variables are randomly selected at each split.
- (ii) 500 or 1000 trees are estimated.
- (iii) At least 5 or 10 observations in each region are required.

With regards to combined value relevance, the mean R^2 for all combinations of hyperparameters is 62.0, with a range from 61.0 to 62.7. The mean R^2 of our main estimation is 61.5, which lies within this range. Moreover, we find a significant negative trend in combined value relevance

over the sample period for all different combinations of hyperparameters (t ranges from -1.75 to -1.97). This suggests that our conclusion regarding combined value relevance is robust to adjusting the hyperparameters of the CART function. Please see *Table 11* for detailed results.

Our conclusions regarding individual accounting items also indicate robustness to changes in hyperparameters. *EARN* and *BE* remain the two most value-relevant accounting items for all tested hyperparameters over the full sample period. Regarding trends, *BE* decreases in value relevance (t ranges from -2.03 to -2.20), just as in our main findings. Further, *Intans* and *Growth* consistently have significant positive trends in value relevance over the sample period (t ranges from 2.41 to 2.47 and 2.39 to 2.89 , respectively), which thereby is in line with our main findings. Finally, just as in our main results, *Altperf* also exhibits a significant negative trend for all combinations of hyperparameters (t ranges from -2.08 to -2.40). This, therefore, suggests that our conclusions are robust to changes in hyperparameters.

Table 11. Alternative Combinations of Hyperparameters

	Mean	Trend	(t-stat)	(p-value)
Combination 1	61.0	-0.011**	(-1.97)	(0.03)
Combination 2	61.5	-0.010**	(-1.87)	(0.04)
Combination 3	61.0	-0.011**	(-1.97)	(0.03)
Combination 4	62.5	-0.010**	(-1.90)	(0.04)
Combination 5	62.7	-0.009**	(-1.75)	(0.05)
Combination 6	62.5	-0.010**	(-1.90)	(0.04)
Combination 7	62.7	-0.009**	(-1.75)	(0.05)

This table presents statistical results for combined value relevance of accounting information for 2000-2021 given different combinations of CART hyperparameters. *, **, and *** indicate significance at the 10, 5 and 1 percent levels. Trend refers to estimates of β_1 in Equation (2). P-value refers to a one-sided test if the sign of the coefficient is in line with our prediction, or else a two-sided test.

5.2.2 Extreme Adverse Events

As previously mentioned, notably low levels or downturns in combined value relevance seemingly coincide with the technology bubble, the global financial crisis, and the Covid-19 pandemic. This suggests that extreme adverse events, such as economic shocks, impact accounting information's value relevance negatively, which Barth et al. (2023) also confirms. Consequently, there is a possibility that our main finding is solely a result of the presence of these extremely adverse events within our sample period. We, therefore, exclude the years of these events (i.e., year 2000, 2008, and 2020) to test whether our main result regarding combined value relevance is robust when excluding these economic shocks. The result, which

is presented in *Table 12*, shows that the significant decrease in combined value relevance persists when disregarding these years. Of note is that the negative trend even increases in magnitude and significance ($\beta_1 = -0.012$ and $t = -3.16$) compared to when all years of the sample period are included. As such, the deterioration in value relevance of accounting information that we find in our main results is robust to excluding years of extreme adverse events within the sample period.

Table 12. Excluding Years of Extreme Adverse Events

	Mean	SD	Trend	(t-stat)	(p-value)
2000-2021	68.4	11.5	-0.012***	(-3.16)	(0.00)

This table presents results for the combined value relevance of accounting information when excluding years of extreme adverse events (i.e., 2000, 2008 and 2020). Statistics concern the out-of-sample R^2 from the CART estimations including all 15 accounting items and ten industry indicators. Mean, standard deviation, trend, t-value and p-value are presented. Trend refers to estimates of β_1 in Equation (2). *, **, and *** indicate significance at the 10, 5 and 1 percent levels. P-value refers to a one-sided test if the sign of the coefficient is in line with our prediction, or else a two-sided test.

5.3 Quality of Study

The validity of our study determines whether reliable conclusions can be drawn regarding how the value relevance of accounting information has changed for Swedish-listed firms between 2000 and 2021. To ensure validity of our empirical analysis, we perform data quality tests to establish reliability and detect any potential discrepancies between Compustat Global and Capital IQ. First, we pick 250 random data points with accounting data obtained from Compustat Global and compare this to hand-collected figures from financial statements. Next, we pick 50 random data points from the security data from Compustat Global and compare them with hand-collected data from financial reports. Then, as Capital IQ data is used to enrich our scaled sample, we select 50 random data points and compare this to hand-collected data from financial reports. Finally, to control for any disparities, as two different sources are used to scale the data sample, we select 50 random data points for the number of shares outstanding from Compustat Global and Capital IQ and compare the two. Our data quality test unveils minor inconsistencies that appear arbitrary and concern less than 4 percent of the observations. This outcome suggests that the data exhibits a high level of reliability; thus, any potential impact of data quality issues on our results should not be significantly material.

Moreover, other factors could impact the validity of the study. For instance, the value relevance of each individual accounting item, VR , is estimated utilizing Barth et al.'s (2023)

randomization method. Nevertheless, despite using a previously established method, we cannot rule out the possibility of measurement error from our side when it comes to interpreting and employing the method in our study. Moreover, validity could be affected by limited data availability. In particular, relatively fewer firm-year observations are available for the earlier years of the sample period and for certain accounting variables (e.g., R&D expenses). Furthermore, limited firm-year observations may also be an issue when the sample is subsequently divided by firm group, since Old Economy Loss firms only make up 14.7 percent of the sample and therefore have relatively fewer firm-year observations. This could, therefore, potentially explain why we find no significant trends for this group of firms, whereas significant trends are detected, in contrast, for the other two groups with a relatively higher number of firm-year observations. The issue of insufficient firm-year observations could therefore impact the validity of this study, especially for the analysis of earlier years and different firm groups.

Regarding the reliability of our study, future researchers should be able to replicate it and receive similar results by collecting accounting data from the same established database (i.e., WRDS's Compustat Global) and utilizing the research method and sample selection process as clearly described in Chapter 3. The replicability is further enhanced given that the research design is based on prior research and closely follows the method used by Barth et al. (2023).

Furthermore, there is limited generalizability of our study outside the scope of Swedish-listed firms and our specific sample period. As previously noted, the value relevance of accounting information can vary depending on cultural and institutional factors that may differ between countries. Consequently, the results should be cautiously applied when considering the value relevance of accounting information in other countries. Furthermore, since our study investigates changes over time, the conclusions are also explicitly tied to a distinct time period. Thus, the conclusions drawn cannot necessarily be generalized to other timeframes. As previously argued, this limited generalizability between different countries and time periods is thereby also what brings about our main contributions.

6. Conclusion

We investigate how the value relevance of accounting information has changed over time as the new economy has emerged. Yearly relationships between share prices and accounting items for Swedish-listed firms from 2000 to 2021 are thereby estimated using a machine learning

model based on Classification and Regression Trees (CART). We utilize CART since it mitigates the risk of underestimating value relevance by capturing nonlinearities and variable interactions more fully. Further, we use out-of-sample R^2 as our value relevance metric in order to prevent overstated estimations. Additionally, to ensure that the analysis incorporates a comprehensive set of accounting items, we investigate the value relevance of earnings and equity book value along with 13 other items. Out of these, nine are identified by earlier research as particularly relevant in the new economy.

Consistent with our predictions, we find that the combined value relevance of accounting information has significantly declined from 2000 to 2021. Consequently, our inferences support the majority of prior research that argues that accounting information has lost value relevance as the transition towards the new economy has occurred. Further, we deduce that this decline is driven by developments during the second half of our sample period (i.e., 2011-2021). Additionally, we infer that adverse economic conditions negatively impact the value relevance of accounting. Moreover, as anticipated, we find that the accounting items related to intangible assets and growth opportunities have become more value relevant over time, which is evident for both New Economy and Old Economy firms. However, as expected, these accounting items still display the highest levels and most prominent positive trends among New Economy firms. Given that we also find a significant increase in the percentage of New Economy firms in Sweden, this should therefore be one of the contributors to the overall positive trend in relevance for these accounting items. Furthermore, since we find that measures related to intangible assets and growth opportunities have increased in relevance economy-wide, it implies that enhancing their faithful representation in accounting could entail improved financial reporting. However, our study also draws conclusions that are contrary to most prior research and thereby specific to the Swedish context and our sample period. Out of these, we most notably infer that the mean relevance of earnings has increased, while equity book value and alternative performance measures exhibit negative trends in value relevance between 2000 and 2021.

To the best of our knowledge, we contribute to prior research by undertaking the first study of its kind on Swedish data. This allows us to generate more reliable conclusions regarding how the value relevance of accounting information has changed in Sweden, since prior findings based on US data are not fully generalizable. Therefore, our conclusions also contribute to deliberations of new Swedish accounting standards. Further, we study a new time period, which

is especially interesting since the years 2019 to 2021 have yet to be included in prior research. As a result of studying these years, we are also able to analyze value relevance of accounting information during the Covid-19 pandemic; this allows us to build upon existing research on the effects of extreme adverse events on value relevance. Lastly, we contribute by adding to the scarce domain of value relevance research that includes a comprehensive set of accounting items and utilizes a nonparametric machine learning method. As such, we answer Barth et al.'s (2023) call for further research within this area.

6.1 Limitations

We recognize that our study is subject to limitations. Firstly, our sample period only comprises the years 2000 to 2021 due to limited data availability for earlier years. This, therefore, prevents us from examining value relevance over an even longer time period, which is what most prior studies have done. In addition, due to limited data availability, there are also fewer firm-year observations for the earlier years of our sample period as well as for certain accounting items. The study is, as such, also limited by the need to exclude variables that lack sufficient data, such as advertising expenses, even though they are included by Barth et al. (2023). Therefore, the variables investigated in our study do not represent an exhaustive collection of potentially value-relevant variables. In addition, the sample sizes become relatively smaller when dividing the full sample by firm group, especially for Old Economy Loss firms that make up the smallest proportion of the full sample. Thus, we acknowledge that these limitations could be reasons for certain insignificant and unexpected results obtained in our study.

6.2 Suggestions for Future Research

Our study establishes that the value relevance of accounting information has changed over time. It would therefore be of interest to further and more specifically investigate what the changes in value relevance are attributable to, since this was outside of the scope of our study. Further, our findings indicate that economic conditions impact value relevance, which remains a relatively unexplored area within the research field. Consequently, this calls for further studies that examine how different types of economic shocks impact value relevance. Moreover, since the results of our study could be relevant for accounting standard-setters, it also necessitates additional research to better understand precisely how accounting information could be improved to meet investor needs as the economy and financial markets continuously evolve.

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Appendix

Appendix A: Variable Definitions

Variable	Definition
Share price	
<i>P</i>	Share price three months after fiscal year-end
Accounting items	
<i>EARN</i>	Earnings scaled by number of shares
<i>BE</i>	Book value of equity scaled by number of shares
<i>RD</i>	Research and development expense scaled by number of shares
<i>INTAN</i>	Recognized intangible assets scaled by number of shares
<i>SGA</i>	Selling, general and administrative expense scaled by number of shares
<i>CASH</i>	Cash, cash equivalents and short-term investments scaled by number of shares
<i>REVGR</i>	One-year revenue growth scaled by number of shares
<i>CF</i>	Operating cash flow scaled by number of shares
<i>REV</i>	Revenue scaled by number of shares
<i>SPI</i>	Special items scaled by number of shares
<i>OCI</i>	Other comprehensive income scaled by number of shares
<i>DIV</i>	Dividends to common shareholders scaled by number of shares
<i>CAPX</i>	Capital expenditure scaled by number of shares
<i>EARNGR</i>	One-year earnings growth scaled by number of shares
<i>ASSETS</i>	Total assets scaled by number of shares
<i>IND</i>	Industry indicators for the 10 Fama-French industry groups
Other	
<i>OOSR2</i>	Out-of-sample R^2 estimated using CART out-of-bag estimates
<i>YEAR</i>	Fiscal year
<i>VR</i>	Value relevance of an individual accounting item
<i>Intans</i>	Group of accounting variables related to intangible assets including <i>RD</i> and <i>INTAN</i>
<i>Growth</i>	Group of accounting variables related to growth opportunities including <i>CASH</i> and <i>REVGR</i>
<i>AltPerf</i>	Group of accounting variables related to alternative performance measures including <i>CF</i> , <i>REV</i> , <i>SPI</i> and <i>OCI</i>

Appendix B

Table 1. Sample Removal Process

	# of firm-year observations	# of firms
<i>Total sample</i>	11 268	968
<i>Financial and Real Estate companies</i>	-2 008	-198
<i>Missing financial or scaled data</i>	-2 909	-46
<i>Final main sample</i>	6 351	724

Table 2. Sample Distribution by Industry

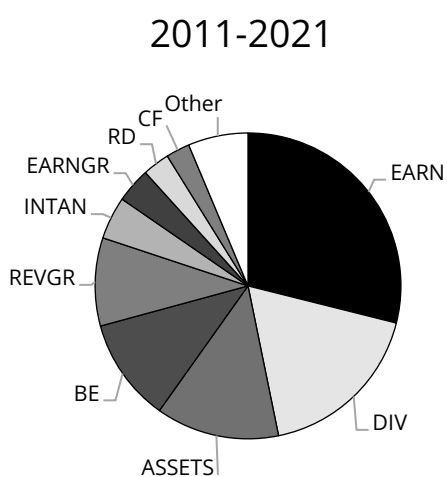
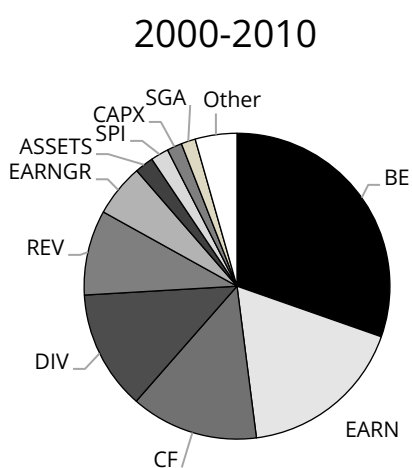
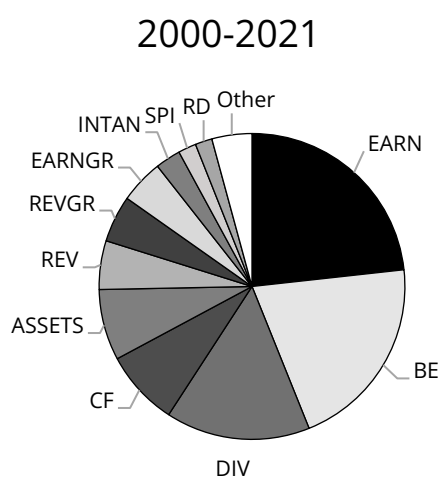
Industry	Firm-year observations	Percentage
<i>NoDur</i>	272	4.28%
<i>Durbl</i>	193	3.04%
<i>Manuf</i>	988	15.56%
<i>Enrgy</i>	107	1.68%
<i>HiTec</i>	1 793	28.23%
<i>Telcm</i>	156	2.46%
<i>Shops</i>	544	8.57%
<i>Hlth</i>	1 134	17.86%
<i>Utils</i>	16	0.25%
<i>Other</i>	1 148	18.08%
<i>Total</i>	6 351	100.00%

Table 4. Pearson Correlations

	<i>P</i>	<i>EARN</i>	<i>BE</i>	<i>RD</i>	<i>INTAN</i>	<i>SGA</i>	<i>CASH</i>	<i>REVGR</i>	<i>CF</i>	<i>REV</i>	<i>SPI</i>	<i>OCI</i>	<i>DIV</i>	<i>CAPX</i>	<i>EARNGR</i>
<i>EARN</i>	0.64														
<i>BE</i>	0.51	0.62													
<i>RD</i>	0.24	0.13	0.40												
<i>INTAN</i>	0.38	0.32	0.48	0.09											
<i>SGA</i>	0.38	0.43	0.56	0.37	0.31										
<i>CASH</i>	0.34	0.33	0.52	0.51	0.06	0.42									
<i>REVGR</i>	0.24	0.30	0.26	0.13	0.20	0.26	0.13								
<i>CF</i>	0.59	0.68	0.69	0.27	0.36	0.53	0.46	0.19							
<i>REV</i>	0.42	0.56	0.73	0.40	0.26	0.75	0.58	0.33	0.71						
<i>SPI</i>	-0.01	0.23	-0.07	-0.15	-0.13	-0.11	-0.04	0.01	-0.12	-0.11					
<i>OCI</i>	0.03	-0.15	0.07	0.06	0.05	-0.01	0.03	0.14	-0.02	0.00	-0.09				
<i>DIV</i>	0.64	0.76	0.65	0.23	0.25	0.48	0.44	0.25	0.69	0.62	0.00	0.02			
<i>CAPX</i>	0.37	0.46	0.74	0.44	0.13	0.52	0.47	0.26	0.65	0.76	-0.08	0.08	0.60		
<i>EARNGR</i>	0.16	0.45	0.09	-0.07	0.06	0.04	0.01	0.19	0.13	0.07	0.26	-0.36	0.15	-0.01	
<i>ASSETS</i>	0.49	0.60	0.90	0.46	0.46	0.65	0.61	0.30	0.73	0.88	-0.09	0.02	0.65	0.79	0.06

This table presents Pearson correlations for the 15 accounting variables as well as share price for 6 351 firm-years for 724 firms from 2000 to 2021. Refer to Appendix A for variable definitions.

Figure 3. Value Relevance of Individual Accounting Items



The pie charts present the most value-relevant accounting items in clockwise order, for both the full sample period and the two sub-periods. Accounting items are specified up until 95% of combined value relevance is explained, whereafter remaining items are grouped in “Other”.
