DOES FAIR EQUAL RELEVANT?

A study of the value relevance of the fair values reported by Swedish closed-end investment companies

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Abstract

Publicly traded Swedish closed-end investment companies that comply with the IFRS 13 reports the fair values of their portfolio companies according to the three-level fair value hierarchy. Using hand-collected samples of 800 portfolio company-year observations and 79 closed-end investment company-year observations from 2019-2023, we conclude that net income is more value-relevant for portfolio companies that are valued using Level 1 fair values compared to those using Level 3 fair values. Our results do not allow us to draw the same conclusion regarding the difference between the value relevance of book value of equity. Additionally, our empirics are not able to suggest whether investors find the fair values reported by the closed-end investment companies reliable.

Keywords:
Fair value hierarchy; Value relevance; Closed-end investment companies; Management discretion; IFRS 13

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List of Abbreviations

AE	Abnormal Earnings
ASC	Accounting Standards Codification
BC	Basis for Conclusions
BVE	Book Value of Equity
CEF	Closed-End Fund
EQ.	Equation
CSR	Clear Surplus Relation
FASB	Financial Accounting Standards Board
FV	Fair Value
FVA	Fair Value Accounting
FVM	Fair Value Measurement
GAAP	Generally Accepted Accounting Principles
HC2	Heteroskedasticity-Consistent (standard errors type 2)
HCA	Historical Cost Accounting
H1	Hypothesis 1
H2	Hypothesis 2
H3	Hypothesis 3
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
LPE	Listed Private Equity
MVE	Market Value of Equity
NAV	Net Asset Value
NI	Net Income
OLS	Ordinary Least Squared
PVED	Present Value of Expected Dividends
SFAS	Statement of Financial Accounting Standards

1. Introduction

Closed-end investment companies[1] represent a unique investment vehicle within financial markets. Compared to conventional mutual funds, closed-end investment companies issue a fixed number of shares that are non-redeemable. Closed-end investment companies and closed-end funds (CEF)[2] share structural similarities, albeit exhibit notable differences that necessitate clarification. Swedish closed-end investment companies are distinct entities, due to their ownership concentration, portfolio structure, taxes, as well as, their significant role in the Swedish financial market since the 1980s (Hjelström, 2007). They are characterised by active involvement in their portfolio companies and long-term investment strategies, reflecting the influence of family ownership and governance (Holmén & Högfeldt, 2009). Their business model consists of holding a portfolio of financial assets (i.e., shares in other firms), called portfolio companies[3], that are both listed and unlisted, which contrasts the US counterpart that predominantly consists of public securities (Hjelström, 2007). Furthermore, Hjelström (2007) states that closed-end investment companies have significant influence over the Swedish stock market, with a small number of firms controlling nearly 30% of the voting power on the Stockholm Stock Exchange.

Despite these differences, the pricing anomalies seen in both closed-end investment companies and the general CEFs. CEFs typically trade at market prices that deviate from their NAV, a phenomenon known as the "closed-end fund puzzle," which persists across various markets (Cherkes et al., 2009). Further, studies such as Hjelström (2007) highlight that Swedish closed-end investment companies have traded at an average discount[4] of

[1] In this thesis, by "closed-end investment companies" and "companies", we refer to specifically to Swedish closed-end investment companies, such as Investor, Industrivärden, and Svolder.
[2] In this thesis, by "closed-end fund", we refer to the broader umbrella term encompassing all closed-end investment vehicles, independent of country of origin, acting as exchange-listed corporations which hold annual shareholder meetings, elect a board of directors, pay dividends, and hire external portfolio-management advisors (Cherkes, 2012).
[3] In this thesis, by "portfolio companies" and "firms", we refer to closed-end investment companies investees.
[4] The positive difference between the NAV and the market capitalisation, known as a NAV discount. This can appear to be an arbitrage opportunity, where one could theoretically buy all the shares and sell the underlying assets to profit from the difference.

22% compared to net asset values (NAV)[5], hypothesised to be mostly driven by agency costs, illiquidity, and ownership concentration. The current discounts applied to NAVs in Swedish closed-end investment companies vary, for example, Linc reports a 6% premium (Linc, 2024), whereas Kinnevik reports 37% discount (Kinnevik, 2024).

Publicly traded Swedish closed-end investment companies on regulated markets adhere to International Financial Reporting Standards (IFRS), particularly IFRS 13, which governs fair value measurement (FVM). Introduced by the International Accounting Standards Board (IASB), IFRS 13 was designed to enhance the comparability, consistency, and transparency of FVMs. IFRS 13 also introduces a three-level hierarchy for FVMs, helping to balance the need for market-based measurements with the realities of limited data availability in particular circumstances. Level 1 uses market-based inputs (i.e., quoted prices), Level 2 incorporates inputs derived from observable data other than quoted prices, and Level 3 relies on unobservable inputs which are subject to managerial discretion. This hierarchy reflects a trade-off between the reliability and relevance of fair value estimates, particularly as inputs become less observable. While IFRS 13 aims to improve transparency, the standard also underscores the potential challenges in valuing less observable assets. These assets rely on assumptions and models, increasing the scope for subjectivity and the risk of earnings management (Ronen, 2008). This aspect is particularly salient for closed-end investment companies, that often hold illiquid or unlisted assets lacking observable prices (IFRS 13). The reliance on Level 3 valuations raises concerns about the reported figures' reliability and value relevance[6]. Riedl & Serafeim (2011) argue that companies with higher proportions of Level 3 assets face higher implied costs of capital from investors, reflecting investor scepticism toward these valuations due to higher information asymmetry.

The concept of value relevance provides a framework for assessing the impact of fair value disclosures. Investors may perceive Level 3 valuations as less value relevant since,

[5] Hjelström (2007) findings are from the period 1973 to 2004.

[6] In this thesis, by "value relevance", we refer to the ability of financial information to explain stock prices or returns. This definition is in alignment with Francis & Schipper (1999) and Barth et al. (2001), which focus on the ex-post statistical association between financial statement information and market values. It is important to note that this approach does not specifically assess the predictive or ex-ante relevance of accounting information. Instead, the ex-post perspective reflects whether the disclosed information has been incorporated into market prices, offering insights into its usefulness after the fact.

by nature, Level 3 fair values are subject to management discretion due to the usage of management forecasts and self-developed valuation methods. In this thesis, henceforth, management discretion refers to the excessive use of discretion by management, particularly in the context of valuation leading to biased valuations. This thesis aims to contribute to the literature by examining the value relevance of fair value disclosures within Swedish closed-end investment companies, since previous research mainly focuses on the US and/or UK. Given the unique characteristics of the Swedish market compared to other CEFs, including concentrated ownership and portfolio structure, this study seeks to address the following research questions:

1. *How do portfolio companies' financial statement-based figures map into the estimates of their fair values reported by closed-end investment companies?*
2. *How does the use of management discretion affect the market value of equity for closed-end investment companies?*

To address these questions, this study is conducted using hand-collected fair value data over a five-year period (2019-2023) from Swedish closed-end investment companies listed on the Stockholm Stock Exchange. Key data points collected include, but are not limited to, fair values, fundamental financials of closed-end investment and portfolio companies, and levels of FVMs. Due to unavailability of data in any existing database, we manually collected information of the fair values, resulting in a final sample of 800 portfolio companies, the closed-end investment company's ownership stakes, and the total NAVs reported by the closed-end investment companies. This data was sourced from the annual reports of closed-end investment companies within the five-year sample period. An adjusted version of the Ohlson (1995) model serves as the analytical framework, linking accounting fundamentals to market valuation. This model facilitates the exploration of the value relevance of FVMs across different hierarchy levels. We find that net income (NI) is more value relevant for portfolio companies valued using Level 1 inputs compared to portfolio companies valued using Level 3 inputs. This is interpreted as management in closed-end investment companies are using other basis of valuation for their Level 3 portfolio companies than the market is using for their Level 1 portfolio companies. We are, however, not able to establish a relationship between the excessive

use of management discretion in the valuation of Level 3 assets and the market value of equity for closed-end investment companies.

The scope of this study is limited to closed-end investment companies that primarily focus on managing portfolio companies, rather than operational work with the companies, these firms are defined as *pure-play* and *hybrid* closed-end investment companies.[7] Companies with significant operational involvement (e.g., industrial groups or conglomerates) were excluded to maintain a clear focus on financial asset valuation. This focus ensures consistency in analysing the FVMs but may limit the generalisability of the findings to more diverse organisational structures.

Further, our findings may not be generalisable to other geographical markets due to variations in regulations and market structures. After a process of selecting firms based on predefined criteria, we initially aimed to include other Nordic countries in the sample.[8] However, due to the rather small sample of closed-end investment companies in the other Nordic countries, we concluded that we would not be able to draw general conclusions regarding each country's market, since these other countries' samples would have been too small. Therefore, a study of solely the Swedish market is not only justified, but it makes theoretical sense to conduct.

Additionally, our sample of portfolio companies was also reduced due to differences in disclosure requirements. In particular, the lack of detailed financial disclosures for private firms in some countries made it challenging to align observations with our research objectives, particularly for unlisted firms' financial fundamentals. Further, this study focuses on data from 2019-2023, a period chosen to ensure the relevance of the findings considering the adoption of IFRS 13. However, this limited time frame might not capture long-term trends or macroeconomic shifts influencing valuation practices. Due to time constraints and the manual process of hand-collecting and reviewing data, the five-year period was considered appropriate to allow for the mature application of IFRS 13 and to avoid transitional effects.

[7] See Section 2.1.1 for more details on the closed-end investment company categories defined by Von Essen (1997).
[8] See Appendix A1, for more details on the predefined criteria and exclusion of other Nordic closed-end investment companies.

To the best of our knowledge, this study is the first to explicitly investigate the value relevance of fair value hierarchy levels within Swedish closed-end investment companies under IFRS 13. This analysis thus makes an empirical contribution, using hand-collected data, to extend the broader literature on fair value accounting (FVA) in a unique institutional and geographical setting. Our findings have implications for both standard-setters and practitioners, underscoring the importance of transparency and governance in mitigating investor scepticism regarding fair value estimates. By addressing the concerns of agency costs and management discretion, we further investigate how these factors affect investors' perceptions of the reliability of market values.

The paper proceeds as follows: Section 2 presents a summary of the existing literature and the theoretical background. Section 3 details the methodological framework, including the data collection process and the analytical approach to this thesis. Section 4 outlines the results and analysis, followed by Section 5, which concludes the implications of these findings in the context of the research questions, followed by the key findings, limitations, and suggested further research.

2. Literature review

In Section 2.1 the history and categorisation of the closed-end investment companies and their position in the Swedish market are described, followed by a discussion regarding the closed-end fund puzzle and agency theory. In Section 2.2 the IFRS 13 and its implications are introduced, followed by the definition and theoretical approaches to measuring value relevance. Further, a review of historical and ex-ante research will be presented, followed by empirical evidence of the value relevance of the fair value hierarchy. Finally, Section 2.3 presents the hypothesis development and a summary of the theoretical framework.

2.1 Closed-end investment companies

2.1.1 History and categorisation of closed-end investment companies

The origins of Swedish closed-end investment companies trace back to the early modernization of the Swedish economy when sourcing capital for new investments posed challenges. In 1922, regulations were introduced, prohibiting banks from owning shares

in trading companies. By 1933, further regulations stipulated that banks could only hold stocks in companies under certain distressed asset protection circumstances (Larsson, 1998). As a result, banks had to divest their holdings in companies they had acquired as collateral during the Kreuger crisis.[9] At that time, Swedish companies had low valuations in the stock market, prompting banks to transfer assets to holding companies rather than selling them at a loss. Skandinaviska Enskilda Banken formed the holding company Custos in 1937, and Handelsbanken established Industrivärden in 1944 (Boksjö & Lönnborg-Andersson, 1994). These closed-end investment companies came to possess stocks that the banks had secured during the Kreuger crisis (Boksjö & Lönnborg-Andersson, 1994). The bank-founded closed-end investment companies that emerged from this period have since evolved into some of the most prominent companies on the Swedish stock market. Other entrepreneurs also entered the market by establishing family-controlled closed-end investment companies. For example, Lundbergs was founded in 1944 by Lars Erik Lundberg and has been publicly listed on the Stockholm Stock Exchange since 1983, with the Lundberg family keeping their majority ownership (Lundsberg, 2024). Similarly, the previously publicly listed company Melker Schörling AB, created in 1999, originated from Melker Schörling's earlier ventures with Securitas (Schörling, n.d.).

In its pure form, investment companies manage capital primarily by investing and managing other companies, commonly referred to as portfolio companies, which collectively form their investment portfolio. According to Von Essen (1997), the objective of closed-end investment companies is to enhance and increase the value of their portfolio holdings and, in turn, the shares owned by their investors through long-term equity investments. Often, investment companies assume an active role in their portfolio companies, either directly or indirectly. In cases of significant direct involvement, particularly with majority-owned portfolio companies, investment companies may exercise influence through board representation and by strategically selecting management teams (Von Essen, 1997).

[9] In the 1920s, Swedish entrepreneur Ivar Kreuger established a conglomerate. After Kreuger's death, it was revealed that his companies had manipulated their financial statements, heavily impacting Swedish commercial banks, which had substantial investments in his companies. The value of these investments decreased, leading to significant financial losses for the banks (Boksjö & Lönnborg-Andersson, 1994).

Von Essen (1997) classifies closed-end investment companies into three main categories based on their ownership structures and management approaches namely, *pure-play*, *operational*, and *hybrid* investment companies.[10] *Pure-play* investment companies are characterised by their focus on capital management rather than direct control over their portfolio companies. Generally, smaller ownership stakes and limited governance involvement define this category, which emphasises financial oversight rather than operational intervention. *Operational investment companies* typically hold majority stakes in their portfolio companies and actively engage in their governance. These companies frequently exercise direct influence through board participation and leadership appointments, aiming for active operational involvement. *Hybrid investment companies* combine the characteristics of the first two categories. While they prioritise capital management, they may also engage in direct or indirect governance of their portfolio companies to varying degrees.

2.1.2 Empirical evidence on the closed-end fund puzzle

Closed-end investment companies have evolved to become an essential part of the investment landscape, both in Sweden and globally. As stated in Section 1, a typical feature of both closed-end investment companies and CEFs is the persistent pricing anomaly known as the "closed-end fund puzzle." This puzzle refers to the phenomenon where these companies frequently trade at either a discount or a premium relative to their NAV, a phenomenon that continues to intrigue both practitioners and academics. The first academic documentation of these discounts was made by Pratt (1966) who concluded that there is no logical explanation for the discount, however, he concluded that the discounts are a result of a lack of public understanding and sales effort. Later, Malkiel (1977) provided a more detailed analysis and found that none of the prevailing explanations were entirely sufficient to account for the discrepancy, labelling it a market imperfection in capital-asset pricing. Over the years, various hypotheses have been examined, yet no single theory has been able to fully explain the puzzle (Lee et al., 1991; Cherkes, 2012; Datar, 2001; Malkiel, 1977; Ross, 2002).

[10] Von Essen's (1997) classification of closed-end investment companies will support our sample selection in Section 3.3. See Appendix A2 for more details on the classification of the Swedish closed-end investment companies into these three categories.

Common hypotheses[11] include, illiquidity of assets, agency cost, individual investor sentiment, and diversification (Datar, 2001; Dimson & Minio-Kozerski, 1999; Lee et al., 1991). The hypotheses can be divided into two main groups of explanations: *rational* and *behavioural. Rational explanations* assume that the market is efficient or operates close to efficient (Berk & Stanton, 2007; Fletcher, 2013). In such a market, the reported NAVs of the CEFs reflect the value of the fund's underlying assets. However, the NAV may not account for additional factors that influence investor returns, such as *agency costs or illiquidity of assets*. These factors can lead to discrepancies between the NAV and the market price of the fund. The *rational explanations* conclude that discounts or premiums to NAV are not anomalies, but are instead consistent with an efficient market that incorporates these additional risks and costs into the fund's market price (Berk & Stanton, 2007).

The *behavioural explanations* suggest that the market does not always operate with complete rationality, but rather due to irrational investor decisions (Berk & Stanton, 2007; Fletcher, 2013). Research in this area examines factors such as *individual investor sentiment* and *diversification*. *Individual sentiment* refers to trading patterns influenced by unpredictable emotional or psychological drivers, while *diversification* considers how over-diversification may lead to discounts by diluting focus and reducing a fund's potential returns (Baker & Wurgler, 2007; Berger & Ofek, 1995; Hjelström, 2007; Lee et al., 1991).

The discounts observed in CEFs highlight complex market dynamics that existing theories only partially explain. Many explanations, including *diversification* and *asset illiquidity*, are discussed to relate to agency costs. First, Denis et al. (1997) argue that diversification can lead to agency costs as it may serve to enhance a manager's status or job security rather than shareholder value. Managers benefit from diversification by becoming more indispensable, but they do not bear its costs unless they have ownership stakes in the firm. Second, the illiquidity of assets is often associated with information asymmetries (Fletcher, 2013). Investing in restricted stock is a key factor behind funds trading at a discount, reflecting the illiquidity of such assets. This aligns with the rational

[11] See Appendix A3 & A4, for more details and discussion of each of the suggested hypotheses.

market features, including liquidity constraints and information asymmetries within markets that influence rational investor decisions (Malkiel, 1977).

2.1.3 Agency theory in the context of closed-end investment companies

Agency theory, formalised by Jensen & Meckling (1976), provides a framework to understand the conflicts that arise in principal-agent relationships. This theory is especially relevant to closed-end investment companies, where the separation between ownership (the shareholders) and control (the management) often leads to divergent interests.

This separation introduces potential conflicts because, as Jensen & Meckling (1976) note, when agents are motivated by self-interest and possess discretionary power, they may not act in ways that maximise the principal's wealth. The inherent assumption is that individuals, including agents, act to maximise their utility, which can manifest as actions that do not align with the best interests of the principals when unchecked. The misalignment of interests within an agency relationship can result in agency costs, which Jensen & Meckling (1976) identify as the sum of monitoring expenditures by the principal, bonding costs by the agent, and the residual loss. These conflicts are exacerbated by information asymmetry, where managers possess superior knowledge of the company's operations, creating an imbalance that complicates monitoring (Eisenhardt, 1989). Baik et al., (2007) highlight that information asymmetry is particularly pronounced for unlisted firms due to the absence of market prices, which makes valuation and verification more difficult and subjective.

This asymmetry can lead to adverse selection, where managers exploit informational advantages, and moral hazard, where riskier decisions are made without direct consequences for the agent. Such dynamics underline the challenges shareholders face in aligning managerial incentives with long-term organisational goals. Schroeder et al. (2023) describe agency theory as a descriptive lens through which the dynamics of self-interest and delegation of control are analysed. Danbolt & Rees (2008) studies UK-based investment vehicles, more specifically real estate and investment companies, and found that fair value income, while more relevant than historical cost income, is susceptible to

managerial manipulation. The inherent subjectivity of unobservable valuation metrics enables managers to influence reported outcomes, often at the expense of shareholders.

Holthausen & Watts (2001) offer insights into how managerial incentives, with the presence of information asymmetry, may drive misrepresentation of financial performance. They highlight that managers are often evaluated and compensated based on accounting performance measures derived from published financial statements, as well as stock price performance, both of which can be temporarily influenced by misstatements. According to their paper, this creates tension between the agent's incentives and the principal's long-term interests. Therefore, they underscore that managers might manipulate financial reporting to achieve personal objectives, such as meeting performance targets or securing bonuses. Moreover, Healy (1985) and Watts & Zimmerman (1986) highlight that managers may also have incentives to bias accounting numbers downward in certain scenarios, such as meeting debt covenants or manipulating earnings to align with bonus thresholds. Additionally, management may introduce noise and bias in financial reporting to obscure their manipulation from auditors or the market (Watts & Zimmerman, 1986).

2.2 Fair value measurement and value relevance implications

2.2.1 IFRS 13 and fair value measurement

IFRS 13 was introduced by the IASB in 2011[12], making consequential amendments to FVMs in other standards[13] and consolidating them into a single, comprehensive framework for FVA. It defines fair value as "*the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date under current market conditions"* (IFRS 13, §9). This means that fair value should reflect the amount you would receive if you sold the asset, the exit price received, or the amount you would have to pay to transfer a liability, at a specific point in time. The emphasis on the exit price contrasts with the earlier IASB definition,

[12] IFRS 13 was originally issued in May 2011 by the IASB and applies to annual periods beginning on or after 1 January 2013. IFRS 13 offers detailed instructions for conducting FVMs under IFRS, and this guidance has been converged with US GAAP. In the US, FAS 157 was introduced in 2006, a framework for fair value estimation using a three-level hierarchy.
[13] E.g., IAS 39 Financial Instruments and IAS 40 Investment Property.

which lacked clarity on whether the measurement was from the buyer's or seller's perspective (International Valuation Standards Committee, 2004).

The introduction of IFRS 13 strengthened the requirements for FVMs of certain assets and liabilities (IFRS 13). The new requirement provides a definition, framework, and detailed guidance on FVMs (Palea, 2014). IFRS 13 mandates that entities disclose detailed information about FVMs, including the valuation techniques and the inputs used. This transparency enables users of financial statements to better assess the impact of FVMs on financial performance (IFRS 13, §91). As noted in the Basis for Conclusions (IFRS 13, §BC 6), the IASB sought to develop a unified approach to FVM that could be applied across different types of assets and liabilities, reducing ambiguities, and increasing comparability between financial statements. This structure helps mitigate the risks associated with the manipulation of fair value estimates by requiring more detailed disclosures and justifications for their use (IFRS 13, §BC 6-7).

Besides increased disclosure requirements, IFRS 13 demands that fair value should be reported based on hierarchical levels[14] that reflect the inputs used to determine the FVM. When determining the fair value, an entity must prioritise the use of observable inputs (i.e., Level 1), while reducing reliance on unobservable inputs (i.e., Level 3). The three-level fair value hierarchy ranks inputs based on their reliability. Level 3 inputs, which rank the lowest in the hierarchy, involve unobservable data and are used when observable inputs are unavailable or irrelevant. These inputs rely heavily on the reporting entity's assumptions about how market participants would price the asset or liability. The use of Level 3 inputs necessitates enhanced disclosures, including the assumptions made in the valuation process and their impact on the financial statements (IFRS 13, §86-90).

Beyond the fair value hierarchy, IFRS 13 emphasises the importance of market participant perspectives in determining fair values. The fair value should always reflect the price that would be received in an orderly transaction between market participants rather than the price that an entity would subjectively prefer or expect. Even in cases where Level 3 inputs are used, entities are required to base their assumptions on how market participants

[14] See Appendix A5, for more details on the hierarchical levels.

would behave under current market conditions, thus maintaining the objectivity of the measurement (IFRS 13, §BC 31-32).

2.2.2 Definition and theoretical approaches to measuring value relevance

2.2.2.1 Defining value relevance

Value relevance is defined as the ability of financial statement information to capture and interpret market prices, reflecting accounting information's association with equity market values (Barth et al., 2001; Francis & Schipper, 1999). The concept of value relevance is further emphasised by the IASB, which highlights that financial information must be capable of influencing users' decision-making processes. According to the IFRS Conceptual Framework, information is relevant if it possesses predictive value, confirmatory value, or both. Information should ensure that users, ranging from existing and potential investors to creditors and analysts, can assess a reporting entity's financial position and its potential future performance accurately. The IASB also emphasises that relevance must be paired with faithful representation for financial information to be truly useful.[15] Faithful representation requires that financial data be complete, neutral, and free from error, supporting users in making well-informed decisions (IFRS Foundation, 2018).

Barth et al. (2001) build on this by arguing that value relevance research should incorporate both relevance and faithful representation. Financial data is regarded as value relevant when a demonstrable statistical association exists between accounting figures, such as the book value of equity and net income, and the market value of equity. Additionally, Barth et al. (2001) distinguish between value relevance and decision relevance. They explain that under SFAC No. 5[16], information does not need to be entirely new to users to be considered relevant. A key role of accounting is to summarise or compile information already available from other sources. Importantly, value relevance reflects the connection between financial information and stock valuations, while decision relevance focuses on the direct impact of this information on users' decisions.

[15] In defining what constitutes value relevance, the Financial Accounting Standards Board (FASB) aligns with the IASB, ensuring that relevant financial information must be capable of influencing user decisions, while faithful representation is achieved when information is complete, neutral, and free from material error (FASB, 2010). The FASB's conceptual framework builds on this and states that *"relevant financial information is capable of making a difference in the decisions made by users."*

[16] SFAC No. 5 is a framework issued by the FASB that defines the essential criteria for recognising and measuring financial information in financial statements.

Consequently, accounting information can remain value relevant even if it has been overtaken by more recent data, as its statistical association with market outcomes remains significant (Barth et al., 2001).

2.2.2.2 Theoretical approach to measuring value relevance

Value relevance research has extensively used various valuation models to examine the relationship between accounting information and equity market values, with the primary objective of evaluating the relevance and reliability of financial statement figures. The field of value relevance research experienced a significant development with the introduction of Ohlson's (1995) model, which linked market value to a firm's accounting figures.[17]

The Ohlsson model (1995) is based on three key assumptions, (i) that the present value of expected dividends (PVED) determines the market value of equity, (ii) the clean surplus relation (CSR)[18] holds, and (iii) that stochastic time-series behaviour of abnormal earnings is framed by a linear model. This means information dynamics allows value to be expressed as a function of contemporaneous data. Based on assumptions (i-iii), this model posits that a firm's P, the market value of the firm's share equity for the fiscal year-end, can be expressed as a linear function of its book value of equity (BVE), abnormal earnings (AE), and other non-accounting value relevant information (V), thereby bridging traditional accounting metrics with firm valuation practices. The Ohlson (1995) model's formulation is: $P_t = BVE_t + \beta_1 AE_t + \beta_2 V_t$, where β_1 and β_2 are the coefficients capturing the explanatory power of AE and V, respectively.

This model underscores that the intrinsic value of a firm is captured not only in its BVE but also in its AE. The Ohlson (1995) model is used to assess whether disclosed financial information is relevant and reliable for investors. When financial data disclosed by a firm is value relevant, it signals its information usefulness to investors, indicating that such information has been effectively incorporated into market pricing.

[17] There is no well-accepted model of equity valuation in imperfect and incomplete markets. Thus, value relevance research uses perfect and complete market models, e.g., the Ohlson model, as a basis for tests (Barth et al. 2001).
[18] All changes in book value of equity are reported either as accounting earnings or dividends.

While the original Ohlson (1995) model provides a strong theoretical base, it has been modified in subsequent studies to address practical considerations. For instance, many researchers, including Collins et al. (1997), adapted the model by replacing AE with NI, reflecting the broader availability of NI data and its use in financial reporting. This adaptation has become a standard approach for testing value relevance, and versions of it have been used in various value relevance studies (e.g., Barth et al. (1996), Collins et al. (1997), and Francis & Schipper (1999)). Another important extension comes from more recent studies including Song et al. (2010), Goh et al. (2015) and Ferreria et al. (2019). For example, Ferreira et al. (2019), use a respecified Ohlson model to measure the value relevance of fair value hierarchy disclosures. Their study examines the association between market values and fundamental financials, including Level 1 and Level 3 fair value inputs, NI, and related interaction terms. This approach highlights the importance of adapting the Ohlson (1995) framework to evaluate specific aspects of financial reporting.

2.2.3 Review of historical perspectives and ex-ante[19] research on value relevance

2.2.3.1 Historical perspectives on the value relevance of FVA

The shift towards FVA has brought renewed focus to the historical debate about its implications. This debate centers on the trade-off between relevance and reliability; FVA enhances relevance by reflecting current market conditions but often reduces reliability, especially for less observable or illiquid assets (Hung & Subramanyam, 2007). Advocates of FVA claim that it increases transparency and relevance as the assets' and liabilities' values are based on current market conditions, compared to the previously used historical cost accounting (HCA)[20] (Barlev & Haddad, 2003; Palea, 2014, 2014).

Landsman (2007) explains that fair values reported in financial statements are informative; however, their usefulness is significantly influenced by the accuracy and reliability of the estimates, which can be impacted by measurement errors. These errors can be either systematic or unsystematic (Barth & Landsman, 1995). Systematic errors

[19] Before the introduction of IFRS 13.
[20] Under HCA: (a) an asset is initially measured at the time of the asset's acquisition or construction at an amount equal to the value of the consideration given to acquire the asset; (b) a liability is initially measured at the time the liability is incurred at an amount equal to the value of the consideration received (IFRS Foundation, 2018).

are caused by specific factors within a company, such as how management makes estimates, which can lead to biased results. Critics argue that FVA introduces uncertainty, where reliance on management's assumptions for valuation estimates increases. This allows managers to use discretion, opening for opportunistic managers to advance their interests (Holthausen & Watts, 2001[21]). Similarly, Ronen (2008) further discusses that, while subjectivity in these assumptions can lead to concerns about the accuracy and reliability of reported figures, this does not necessarily imply manipulation, but it does highlight the potential for increased managerial discretion. Even though assumption-based values may seem subjective and unreliable, they play a critical role in establishing values for items that only exist in hypothetical markets (Power, 2010). *Unsystematic* errors, on the other hand, are due to external factors like general market uncertainty and are not tied to a particular company (Barth & Landsman, 1995). Penman (2007) criticises FVA during financial crises, such as in 2008, for introducing volatility that can distort financial statements and misrepresent a firm's long-term value. This highlights the tension within accounting standards between achieving relevance and reliability during periods of economic uncertainty. Penman (2007) and Power (2010) argue that these periods amplify the risks of unsystematic errors, particularly in illiquid markets where uncertainty opens opportunities for managerial discretion and potential bias in valuations.

Although FVA has its challenges, Barth et al. (2001) find that fair value estimates are more value relevant than acquisition cost figures, particularly for actively traded securities. Furthermore, there is limited evidence to suggest that management-based valuations are perceived differently by investors. This implies that private information may enhance the accuracy of value estimates, even though such valuations remain particularly vulnerable to management bias (Barth et al., 1998). Supporters of FVA argue that its reliance on market-based information ensures that assets and liabilities are reported at their true or market value, enhancing transparency and reliability (Power, 2010). This approach enables early identification of financial issues,[22] which might remain undetected under other valuation methods. Research further demonstrates that fair

[21] Holthausen & Watts (2001) explains that verification is concerned with preventing misrepresentation. Misrepresentation in financial statements occurs because the management responsible for preparing the statements has better information than the auditor and the investors and has an incentive to misrepresent.
[22] E.g., pension deficits or underperforming loans (Power, 2010).

value is a robust valuation approach, closely aligning with firms' stock market values (Barth et al., 1996; Barth & Clinch, 1998)

2.2.3.2 Review of ex-ante value relevance research on FVM

Value relevance research has long been concerned with the relationship between accounting figures and market values. Miller & Modigliani (1966) were among the first to examine how accounting numbers relate to firm value, providing an essential foundation for subsequent studies.[23] Subsequent empirical studies, such as those by Barth et al. (1996) and Nelson (1996), have explored whether FVMs offer additional insights compared to book values. Nelson (1996) found that while the fair values of investment securities in commercial banks provide some incremental value relevance beyond book values, fair value disclosures for other financial instruments, such as loans, long-term debt, deposits, and off-balance-sheet items, do not significantly explain security prices. On the other hand, Barth et al. (1996) consistently found that FVMs of loans had incremental explanatory power for banks' share prices.

Over time, studies began exploring the broader implications of value relevance, not just for investors but also for accounting standard-setters. For example, Barth et al. (2001) emphasised that value relevance studies could inform debates on accounting quality, particularly by addressing the reliability and relevance of various financial statement disclosures. Holthausen & Watts (2001) critiqued the applicability of value relevance research for standard-setting, arguing that such studies often neglect key economic functions of accounting, particularly its role in facilitating contracts, ensuring stewardship, and supporting governance mechanisms. They argue that this narrow scope fails to capture the broader objectives and influences that shape accounting standards. However, Barth et al. (2001) answered these critiques, clarifying that while value relevance is not explicitly stated as a criterion by the FASB, it aligns with the board's goals of relevance and reliability. They argued that value relevance research empirically tests whether accounting information reflects investor-relevant data and is measured reliably enough to impact share prices.

[23] Miller & Modigliani (1966) examined equity values and the cost of capital in the electric utility sector.

A major turning point in the literature came with the introduction of the fair value hierarchy in standards: SFAS 157[24] in the United States in 2006 and IFRS 13 for IASB member countries in 2011. This hierarchy has enabled researchers to investigate whether markets place greater weight on more objective measures, such as Level 1 and Level 2 fair values, compared to Level 3, which is subject to higher levels of managerial discretion.

2.2.4 Empirical evidence on the value relevance of the fair value hierarchy

The following section incorporates evidence from closed-end funds and broader empirical research on financial institutions[25], offering detailed insights into the application and value relevance of the different hierarchy levels.[26] Currently, there is a lack of research specifically addressing the value relevance of closed-end investment companies in Sweden. Therefore, studies on closed-end funds and financial institutions conducted in the United States, and other parts of Europe, provide a foundational basis for this literature review. Carroll et al. (2003) examine U.S. closed-end funds from 1982-1997 and conclude that estimated fair values are value relevant across a broad range of funds, including funds that hold financial assets and liabilities not traded in an active market.[27] With a similar U.S. closed-end fund company setting, Lawrence et al. (2016) found insignificant differences in the value relevance of Level 1, Level 2, and Level 3 measurements and argues that Level 3 fair value estimates are of similar usefulness to investors as Level 1 and Level 2 fair value estimates.

On the contrary, Ferreira et al. (2019), studying UK-based listed private equity funds (LPEs), found that FVMs appear to distinguish between Level 1 and Level 3 inputs, the fair values estimates reflect the portfolio company NI to a lesser extent for Level 3 inputs. The authors are focusing on the value relevance of the accounting information in the

[24] The Financial Accounting Standards Board's Statement of Financial Accounting Standard No. 157 was the original standard issued by the FASB in 2006 to define and establish a framework for measuring fair value and to require related disclosures.
[25] See Appendix A6, for a summary table of previous research on value relevance of fair value hierarchy.
[26] The research on the *fair value hierarchy* remains limited, with only a handful of notable studies that will be discussed in the following section. However, there are also some additional PhD theses and working papers that touch upon this topic, including Bosch (2012) and Adwan et al. (2020).
[27] The study by Carroll et al. (2003) was conducted before the concept of the *fair value hierarchy* was established, therefore, it is unclear whether the securities would fall under Level 2 or Level 3. However, we can observe that they are not Level 1 securities, as the securities were not actively traded.

annual reports rather than examining the more commonly used variables such as diversification, ownership concentration, and share of unlisted holdings, they can get a better understanding of the relationship between fair values and market prices through the fair value hierarchy. They show that FVMs reflect the BVE and NI. Additionally, they find that LPE fund investors do not assign a discount when valuing their equity in the fund in cases where fund managers apply discretion[28] in estimating the fair values of investments (Ferreira et al., 2019).

Further, Cullinan & Zheng (2014) examine how fair value levels affected the pricing of closed-end funds. The findings of their study corroborate the notion that investors discount Level 3 assets because of the discretion associated with their valuation, as only Level 3 valuations were found to be a factor in fund price discounts. Valuation scepticism is especially relevant for funds trading at a discount, as investors question the reliability of the Level 3 asset valuations (Cullinan & Zheng, 2014). Fortin et al. (2020) extend these findings by demonstrating how Level 3 valuations in equity-specialised funds seem to be the greatest contributor to discounts, i.e., equities display a clear rank order in value relevance (Level 1 > Level 2 > Level 3). Their study supports the conclusion that fair value estimates of equities are generally more value relevant when they are based on observable market data. In these cases, Level 3 inputs are less reliable due to their complexity and opacity, which makes them less useful for investors attempting to determine the actual value of the underlying assets (Fortin et al., 2020). Their findings are consistent with the broader fair value literature[29], which suggests that Level 1 fair values are highly correlated with market prices, whereas Level 3 valuations demonstrate a comparatively weaker correlation.

Closed-end investment companies and other financial institutions (i.e., banks) share important similarities, as both manage portfolios of financial assets and face valuation challenges, particularly for illiquid or complex instruments. Moreover, the fair value hierarchy is adopted for financial instruments in financial institutions similar to the holdings of closed-end investment companies, providing a consistent framework for analysing value relevance. Research consistently shows that the fair value of financial

[28]According to Ferreria et al (2019, p.19), discretion is present when LPE fund managers are *"using information beyond the investee's financial statement fundamentals."*
[29] E.g., Song et al. (2010); Riedel & Serafeim (2011); Cullinan & Zheng (2014).

instruments, particularly those measured using observable inputs, provides incremental value relevance (Barth et al., 1996; Eccher et al., 1996). Before the introduction of SFAS 157 (now codified as ASC 820[30]) in the U.S. and IFRS 13, financial statement users could identify whether FVMs were applied to assets and liabilities but lacked detailed information about the specific measurement category based on observability. This meant there was no distinction between items valued using observable market prices (Level 1), market-derived inputs (Level 2), or unobservable mark-to-model techniques (Level 3). Song et al. (2010) contribute significantly to the literature by analysing U.S. financial institutions during the 2008 financial crisis. Their findings indicate that Level 1 and 2 fair value assets display higher value relevance compared to Level 3 fair value assets.

Song et al. (2010) align with prior U.S.-based research on financial institutions by Kolev (2008), who observed that although all three levels of the fair value hierarchy demonstrate value relevance, Level 2 and Level 3 valuations exhibit weaker correlations with stock prices compared to Level 1, particularly during the financial crisis when liquidity constraints reduced the reliability of Level 2 and Level 3 inputs. Specifically, Kolev (2008) identifies a discount of approximately 35% for Level 3 financial instruments relative to Level 1, while Song et al. (2010) report a discount of around 30% for Level 3 financial instruments. Goh et al. (2015) expanded upon the findings of Song et al. (2010) by extending the study's time frame confirming that all levels of FVMs demonstrate value relevance. Their analysis revealed that Level 1 and Level 2 fair value assets exhibit greater value relevance compared to Level 3 fair value assets, providing evidence that the conclusions drawn by Song et al. (2010) remain consistent over time.

While much of the research has focused on the U.S., Siekkinen (2016) and Siekkinen (2017) offer insights into the European context. These studies examine the impact of IFRS 13 on the value relevance of fair value estimates within European financial institutions. Siekkinen (2016) examines the value relevance of fair value estimates during 2012-2014 across Europe and finds that Level 1 assets are more value relevant than Level 2 or Level 3. Level 1 and 2 fair values (FV) liabilities are more value relevant than Level 3 FV liabilities. All FV levels are value relevant in countries with a strong or medium investor

[30] The Accounting Standards Codification Topic 820 is a framework established by the FASB in 2009 that defines how to measure fair value and provides guidance on disclosures related to FVMs. ASC 820 codified and incorporated SFAS 157 into the broader GAAP framework.

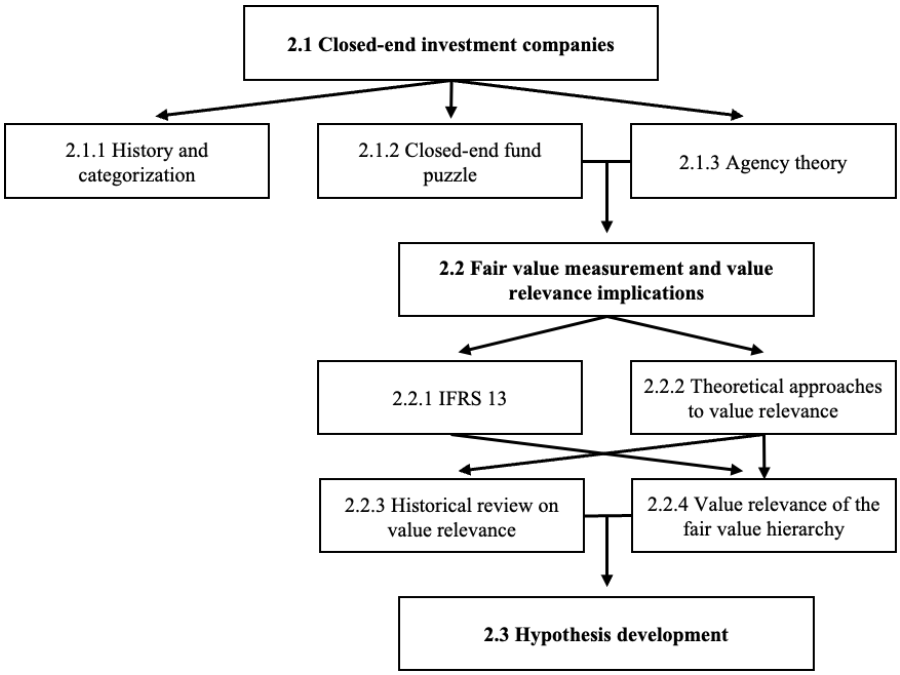
protection environment. In markets with weak investor protections, only assets measured in Level 1 are value relevant. This increase in value relevance was particularly pronounced in environments with strong corporate governance and investor protection, underscoring the role of institutional factors in shaping the perceived reliability of FVMs. In a follow-up study, Siekkinen (2017) demonstrates that corporate governance can mitigate concerns surrounding Level 3 valuations. The study finds that post-IFRS 13, all three levels of fair value exhibit value relevance when boards are independent, large, and heterogeneous. Furthermore, the adoption of IFRS 13 has significantly reduced the differences in value relevance among Levels 1, 2, and 3, improving transparency and minimising information asymmetry traditionally linked to Level 3 inputs.

2.3 Hypothesis development

This study builds upon accounting-based valuation theory and agency theory to investigate the value relevance of FVM in the context of closed-end investment companies. Figure 1 illustratively presents the theoretical framework of this paper.

Figure 1

THEORETICAL FRAMEWORK



Note: Section names are simplified.

Accounting-based valuation theory, as modelled by Ohlson (1995), provides the conceptual foundation for understanding value relevance, emphasising that accounting measures should be reflected in stock prices within an efficient market. The introduction of IFRS 13 in 2013 marked a shift for listed closed-end investment companies, introducing a fair value hierarchy that prioritises the reliability of inputs. Empirical research using this hierarchy consistently demonstrates that Level 1 inputs exhibit the highest value relevance due to their transparency, objectivity, and observability (e.g., Song et al., 2010; Fortin et al., 2020; Ferreira et al., 2019; Siekkinen, 2016). In contrast, Level 3 inputs rely on unobservable data and managerial assumptions, which introduces potential estimation errors and biases. Despite studies suggesting contradictory findings[31], the significant information asymmetry between managers and investors in Level 3 valuations, as discussed by Ferreira et al. (2019), highlights the reduced trust in such measurements. This distinction underscores the hypothesis that Level 1 valuations will be regarded as more reliable and relevant than Level 3 valuations in market settings. This reasoning leads to our first and second hypotheses, stated in alternative form:

H1: Book value of equity is less value relevant for fair value estimates of Level 3 portfolio companies

H2: Net income is less value relevant for fair value estimates of Level 3 portfolio companies

Fair value estimates are inherently subject to managerial discretion, particularly for unobservable inputs (Danbolt & Rees, 2008). This discretion creates the potential for information asymmetry, where managers may leverage their informational advantage for personal benefit, leading to adverse selection. Song et al. (2010) emphasise that intrinsic estimation error and management-induced biases in FVMs can reduce their reliability, particularly for assets requiring greater subjectivity. Riedl & Serafeim (2011) find that firms with higher proportions of less observable fair value inputs tend to face greater investor scepticism, as evidenced by higher implied costs of capital.[32] Their findings align

[31] Lawrence (2016) suggests that there are no significant differences in the value relevance of Level 1 and Level 3 inputs.

[32] Riedl and Serafeim (2011) examine U.S. financial institutions and find that firms with a higher proportion of Level 3 assets frequently face higher implied costs of capital by analyst forecasts. The

with agency theory, which underscores the challenges posed by managerial incentives that may diverge from shareholder interests in contexts dominated by subjective valuations.

The closed-end fund puzzle further supports these hypotheses by illustrating how persistent discounts in closed-end funds often reflect agency costs. These costs include managerial discretion in estimating unobservable market values, as well as issues related to illiquidity and diversification (Cherkes et al., 2009; Denis et al., 1997; Fletcher, 2013; Malkiel, 1977). For instance, Cherkes et al. (2009) identify that closed-end funds with higher proportions of illiquid or unlisted assets face greater market discounts, as investors demand compensation for the increased risk and lack of transparency. The unsystematic errors, as highlighted by Barth et al. (1995), stem from management exercising discretion in determining fair values, which is particularly relevant for unlisted portfolio companies without quoted prices. This study posits that investors place greater discounts on fair value estimates that are perceived to involve higher degrees of managerial discretion or deviation from portfolio company fundamental financials, leading to the following hypothesis, stated in the alternative form:

H3: The use of management discretion negatively affects the market value of equity for closed-end investment companies

3. Method

To examine the value relevance of Level 1 and 3 fair values reported by closed-end investment companies and the effect of management discretion on the market value of the companies, the following chapter presents the empirical framework and methodology used for testing our three hypotheses. In Section 3.1, we present our research philosophy. In Section 3.2 our research design is outlined. In Section 3.3 the sample selection process is described. In Section 3.4 our data collection is presented. Lastly, in Section 3.5 the statistical methods are introduced.

authors estimate the implicit beta for financial instruments across Levels 1, 2, and 3, revealing a progressively greater contribution to Capital Asset Pricing Model beta as the hierarchy moves from Level 1 to Level 3 (Riedel & Serafeim, 2011).

3.1 Research philosophy

In our research, we adopt an objective ontological stance, viewing reality as external, objective, and independent of social actors. Ontology, the study of reality and existence, considers whether entities exist independently of individual perception (Saunders et al., 2019). In this context, elements such as the fair-value hierarchy and accounting fundamentals are regarded as existing independently of individual or collective mental processes. In our research, the content of the financial reports and market values are therefore regarded as objective. Accordingly, we approach this objective reality through a positivist epistemological framework, which supports the idea that knowledge can be derived through objective observation and systematic measurement. Epistemology, the study of knowledge, explores what constitutes acceptable knowledge, its sources, and its limitations. Positivist epistemology emphasises empirical evidence and statistical analysis, asserting that only observable phenomena produce credible data and facts (Saunders et al., 2019). By employing quantitative methods, this study aims to provide objective, measurable insights into the value relevance of portfolio company's fair values within closed-end investment companies. Consistent with positivist principles that prioritise precision and impartiality, we utilise statistical techniques to evaluate value relevance, grounding our findings in observable, quantitative data.

3.2 Research design

Our study on Swedish closed-end investment companies has been designed to allow us to test our three hypotheses. These consider the value relevance of the fundamental financials of Level 1 and Level 3 portfolio companies' fair values, as well as how the use of management discretion affects the market value of equity of closed-end investment companies. In order to perform this study, data had to be hand-collected to perform the regressions necessary for testing the hypotheses H1-H3. This data was supplemented by data provided by secondary sources i.e., databases.

3.3 Sample selection

This study focuses on Sweden, a country with a well-established ecosystem of closed-end investment companies. Historically, Sweden's financial landscape has been shaped by regulations and market conditions that encouraged the creation of such entities,

particularly following the financial crises of the early 20th century. Banks divested their equity stakes into holding companies including Investor AB and Industrivärden, which became central to the Swedish market. As of today, the Swedish market includes a significant number of closed-end investment companies, compared to other Nordic countries.[33] The choice of Sweden is also motivated by its adherence to IFRS since 2005, ensuring a consistent and transparent financial reporting framework. Swedish closed-end investment companies operate under clearly defined accounting regulations, making them ideal for analysing the relevance of FVMs.

The study focuses on listed closed-end investment companies due to the accessibility of market data and fair values for financial instruments. In contrast, non-listed companies in Sweden that apply K3[34] under Swedish Generally Accepted Accounting Principles (GAAP) have the option to use either cost-based valuation or fair value valuation for financial instruments under ÅRL[35] regulations. This flexibility in accounting choices introduces inconsistencies in fair value reporting, making listed companies more suitable for this study's objectives. All sampled companies are listed on Stockholm Stock Exchange, covering the Large Cap Stockholm, Mid Cap Stockholm, Small Cap Stockholm, and First North Stockholm markets.

Closed-end investment companies were chosen because their primary function is to manage financial investments, and their value is typically rooted in portfolio holdings rather than direct business operations.[36] This distinction ensures the study's focus on the role of fair value disclosures in financial reporting without the confounding effects of operational activities. The initial sample of companies, obtained from Avanza and Capital IQ, comprised a range of companies categorised as closed-end investment companies. These included private equity-style firms, conglomerates, and other entities with varying degrees of investment focus. However, this study aims to examine closed-end investment companies specifically. The selection process sought to identify firms that aligned with

[33] See Appendix A1 for an overview of closed-end investment companies in the Nordics.
[34] K3 is the Swedish regulatory framework for accounting established by the Swedish Accounting Standards Board. It primarily applies to medium-sized entities that are not required to follow IFRS.
[35] Swedish legislation that governs the preparation of annual financial statements and consolidated accounts for companies operating in Sweden.
[36] In our current sample of closed-end investment companies there are several firms that are engaged in operational activities with their portfolio companies, however, this is not seen as their core business.

the study's definition, focusing on those that derive their value primarily from equity stakes and securities while not having significant operational involvements in their portfolio companies.

The selection process was thus centred around companies that provided detailed and transparent information, such as NAV portfolio values and shareholding data, which are critical for assessing FVMs. The selection process highlights that there are few *pure-play* investment companies, and that significant variation exists in how firms categorise and report their activities. For instance, companies such as Ratos were excluded because their annual reports explicitly classify them as an "industry group," reflecting a shift toward operational involvement and private equity-like activities. Similarly, Lagercrantz was excluded due to its operational focus, which includes managing its portfolio firms as part of an industrial group. Lagercrantz's activities include restructuring and integrating its investments into its broader operational framework, making it unsuitable for this study's focus. These exclusions were necessary to ensure that the final sample represented firms where investment activities, rather than operational management, are the primary drivers of value.

Hybrid structures, such as Investor AB, were also carefully considered. Investor AB combines traditional investment company activities with operational involvement through its subsidiary, Patricia Industries, which oversees the management of wholly owned businesses. The inclusion of entities such as Investor AB depended on whether their financial reporting emphasised financial asset management over operational activities. This nuanced approach acknowledged the complexity of the Swedish market, where hybrid models are common, while remaining consistent with the study's objectives.

The exclusion criteria were based on two key factors: (1) the lack of relevant data, such as NAV and portfolio value disclosures, and (2) how companies presented their activities in financial statements and annual reports. This approach was necessitated by the absence of a universally accepted definition of closed-end investment companies and their categories, as even definitive lists from databases included a wide range of entities with varying characteristics. By applying these criteria, the study ensured a focused sample

aligned with its objective of analysing FVA practices in entities primarily engaged in financial investments.

The study spans a five-year period from 2019 to 2023 using panel data, providing a comprehensive industry-specific analysis of FVA practices under IFRS 13. This time frame reflects the mature application of IFRS 13, avoiding transitional effects and inconsistencies typically associated with its early adoption. By 2019, market participants would likely have internalised the standard, enabling consistent reporting practices among the sampled companies. Unlike studies that examine the immediate post-implementation effects, this research investigates fair value disclosures within a more stable and general context, free from the potential distortions caused by early adoption phases. The chosen period also aligns with practical considerations, particularly the manual data collection process. Collecting financial data by hand is a time-intensive task, and extending the analysis beyond five years would risk compromising data quality and manageability. Thus, the five-year scope strikes a balance between operational feasibility and the need for robust empirical evidence.

3.4 Data collection

3.4.1 Data collection of closed-end investment companies

The investor sample consists of all unique Swedish closed-end investment companies identified via Avanza and Capital IQ[37] that were active at any time between 2019 and 2023. The initial sample comprised of 69 unique companies, which after a systematic data-cleaning process, was narrowed down to a final sample of 18 unique closed-end investment companies. The data selection criteria for these closed-end investment companies involved the following steps: (1) Removal of entities not classified as *pure-play* or *hybrid* closed-end investment companies; (2) Removal of companies not adhering to IFRS reporting standards; (3) Removal of observations with missing, inconsistent, or unavailable financial data, which is essential for conducting our analysis.[38] This final

[37] To compile a list of companies, data was extracted from Avanza under the "Themes-Lists" section for closed-end investment companies. Additionally, the SIC codes "6799 - Investors, Not Elsewhere Classified" and "9998 - Multi-Sector Holdings" were used in Capital IQ to further refine the list.
[38] Financial data includes NAV, fair values of portfolio companies and market capitalisation.

sample, with a panel structure, forms the basis for examining the Swedish closed-end investment companies in our study.

Table 1
LIST OF SELECTED CLOSED-END INVESTMENT COMPANIES

Process	*Observations*
Unique observations found on Avanza & Capital IQ	69
Less: Companies not being *pure-play* or *hybrid* closed-end investment companies	(27)
Less: Companies not reporting under IFRS	(19)
Less: Missing/inconsistent/unavailable portfolio company financials all years (2019-2023)	(5)
Final sample of closed-end investment companies	18

Table 1 describes the sample selection process for the closed-end investment companies used in this study. The final sample of 18 companies are Swedish closed-end investment companies meeting the selection criteria of being *pure-play* or *hybrid*, report under IFRS, and having portfolio companies with available financials. *Source: Avanza and Capital IQ.*

Table 2
SAMPLE SELECTION OF CLOSED-END INVESTMENT COMPANY-YEAR OBSERVATIONS

Process	*Observations*
Unique year observations	83
Less: Missing closed-end investment company financials	(1)
Sample used for Eq. (4)	**82**
Less: Missing portfolio company financials	(3)
Sample used for Eqs. (7) and (10)	**79**

Table 2 describes the sample selection of the closed-end investment company-year observations. These are based on the 18 companies provided from Table 1 during the period 2019-2023. For Eq. (4), one observation was dropped due to missing company financials (both *BVE_FV1* and *BVE_FV3* missing). For Eqs. (7) and (10) three observations were dropped due to missing portfolio company financials in a given year. *Source: Avanza and Capital IQ.*

With the final sample of companies, we collected net income (*NI*) and book value of equity (*BVE*) from Capital IQ for the fiscal years 2019-2023. Further, market

capitalisation three months after fiscal year end (*MVE*)[39] was retrieved from Capital IQ. The following table (Table 2) demonstrates the company year sample selection. Initially, there were 83 company year observations, then one observation had to be dropped as it missed key financial figures, resulting in 82 observations. These 82 company year observations are the sample that will be used with Eq. (4) in our initial tests of H3. To run all our regressions for H3, we need to drop three additional observations as their portfolio companies have missing financials which are needed in order to use Eqs. (7) and (10), resulting in a sample for these tests of 79 company year observations.

3.4.2 Data collection of portfolio companies

To construct the portfolio company dataset, we manually collected data on ownership stakes and fair values from the annual financial reports of the closed-end investment companies[40] in our final sample from Section 3.4.1, covering the period from 2019 to 2023. This initial dataset included 1359 unique portfolio company-year observations. For portfolio companies with fair values denominated in currencies other than SEK, we converted these values to SEK using the respective year-end exchange rates.[41] The second phase involved gathering data on net income (*NI*) and book value of equity (*BVE*) from Valu8[42]. All collected information was then compiled into a merged dataset. As part of our exclusion criteria 441 portfolio companies were excluded on the basis of missing fundamental financials. Another 118 portfolio companies were excluded based on missing ownership data, resulting in a final portfolio company sample of 800 portfolio company-year observations.

We estimate that we in total spent approximately 100 hours with data collection and review.[43]

[39] Using the market value three months after the fiscal year-end is consistent with prior studies (e.g., Ferreria et al. (2019)), and is used to ensure that the financial markets have absorbed the information reported by the company.
[40] Due to the unavailability of portfolio company fair value data in any existing database, we followed the approach of Ferreira et al. (2019) in their UK study, opting to manually collect the necessary information from closed-end investment companies' annual reports.
[41] The exchange rates used for currency translation to SEK were fetched from the Swedish Riksbank.
[42] Valu8 aggregates a large range of data sources of company, financial and ownership data for European companies.
[43] See Appendix A7, for a breakdown of the hours spent collecting data.

Table 3
SAMPLE SELECTION OF PORTFOLIO COMPANY YEAR OBSERVATIONS

Process	*Observations*
Unique hand-collected year observations	1359
Less: Missing portfolio company fundamental financials	(441)
Less: Missing ownership data	(118)
Final sample of portfolio company-year observations	800

Table 3 describes the sample selection process for the portfolio company-year observations used to test H1 and H2. The 800 portfolio company-year observations have ownership data (fair values and shareholding data (%) from closed-end investment companies' annual report) and fundamental financials (*NI* and *BVE*). *Source: Avanza and Capital IQ.*

3.4.3 Potential measurement errors

We hand-collected the fair value and ownership data of the portfolio companies due to the limited availability of this data in available databases. The process of hand-collecting data is a time-intensive and detail-oriented process, reducing the ease of replicability of this study. This method introduces the potential for input errors. To address this issue, we carefully and iteratively reviewed our data in Stata[44] to identify and correct any inconsistencies in the datasets. The repeated validation efforts should ensure that the quality and accuracy of the final dataset could be regarded as high, supporting the reliability of the findings.

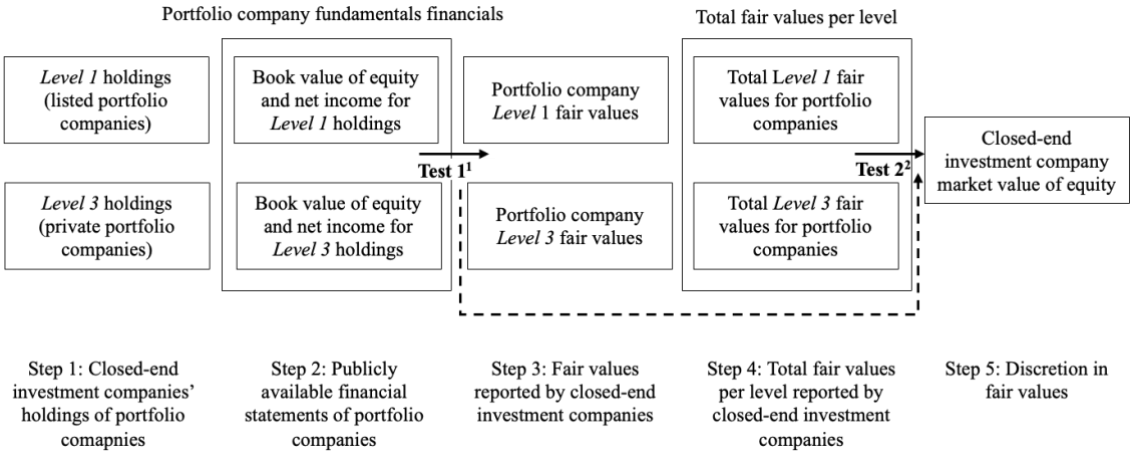
3.5 Statistical methods

Figure 2 illustrates the statistical methods that will be presented in the following sections to test our three hypotheses.

[44] Stata is a statistical software program.

Figure 2

AN ILLUSTRATION OF THE HYPOTHESIS TESTING



Note: 1) Section 3.5.1: Mapping portfolio company economic fundamentals into portfolio company valuations; 2) Section 3.5.2: Evaluating the value relevance of disclosed fair values by closed-end investment companies.

3.5.1 Mapping portfolio companies' economic fundamentals into their valuations

The use of valuation models for value relevance studies is, according to Barth et al. (2001), appropriate and allows for relevant insights for standard setters, even though an optimal accounting system cannot be derived (cf. Holthausen & Watts, 2001). To understand and map out the underlying fundamental financials used by closed-end investment companies in assigning fair values to their holdings of portfolio companies, a respecified Ohlson model (Ohlson, 1995) has been used.[45] This is in line with Ferreria et al. (2019) who further specified the model with variables to account for the differences in value relevance for the Level 1 and 3 fair values (see Section 3.5.1.2).

3.5.1.1 The Ohlson model

The Ohlson model (Ohlson, 1995) is an established and widely used model in the value relevance literature, with market value of equity as its dependent variable (Barth et al., 2001). Our study considers both Level 1 and 3 fair values and will thus have fair value

[45] The Ohlson model builds upon several assumptions which are stated in Section 2.2.2.2, including that markets are efficient. We do not perform a valuation study and does not seek to find or draw any conclusions regarding the "true values" of the portfolio companies, rather our study focuses on the informativeness of accounting information and how well it is reflected in the closed-end investment companies' reported fair values. Thus, we do not need to assume market efficiency and will instead assume that the market prices fully reflect the "consensus valuation", an assumption that is less controversial (Barth et al., 2001).

(*FV*) as the dependent variable instead, in line with Ferreria et al. (2019). The basic specification of the model done by Collins et al. (1997) with the adjustment of the dependent variable is:

$$FV_{ijt} = \beta_0 + \beta_1 BVE_{jt} + \beta_2 NI_{jt} + \varepsilon_{ijt} \quad (1)$$

Where[46]:

***FV*$_{ijt}$** is the fair value of portfolio company *j* in year *t* by closed-end investment company *i*

***BVE*$_{jt}$** is the equity book value of portfolio company *j* in year *t*

***NI*$_{jt}$** is the net income of portfolio company *j* in year *t*

The fair value in FV_{ijt} is either the Level 1 or 3 fair value of the portfolio company depending on the valuation method used by the company. The Level 3 fair values were calculated by dividing the value of the company's holding by the ownership share available in the company's annual reports (Ferreira et al., 2019), whereas publicly available market values were used for the Level 1 fair values. In Eq. (1) and the following Eqs. (2), (3), and (4) standard errors are clustered by closed-end investment company. [47] HC_2[48] clustered standard errors with adjusted degrees of freedom are used for the clustering due to the limited number of clusters in our study, this procedure reduces the small sample bias otherwise created by having few clusters (Bell & McCaffrey, 2002; Imbens & Kolesar, 2016).

3.5.1.2 Respecified Ohlson model with loss indicator variable

The inclusion of the indicator variable, $Loss_{jt}$, that is set to one if earnings are negative and zero otherwise, as well as the interaction term $NI_{jt} \times Loss_{jt}$ are introduced in Eq. (2). The inclusion of $Loss_{jt}$ and $NI_{jt} \times Loss_{jt}$ is to control for the difference between the equity valuation multiples of firms with negative and positive earnings (Barth et al., 2023; Barth

[46] See Appendix A8, for a full list of all variables with definitions and data sources.
[47] Applying clustered standard errors is commonly used in the value relevance literature to correct for potential heteroskedasticity issues (see Ferreria et al. (2019) and Song et al., (2010)).
[48] HC_2 is a type of heteroskedasticity-consistent standard errors with leverage adjusted residuals (Long & Ervin, 2000; MacKinnon & White, 1985).

& Clinch, 1998; Ferreira et al., 2019; Hayn, 1995). Building on Eq. (1) with the aforementioned additional specifications, we get the following regression model[49]:

$$FV_{ijt} = \beta_0 + \beta_1 BVE_{jt} + \beta_2 NI_{jt} + \beta_3 Loss_{jt} + \beta_4 NI \times Loss_{jt} + \varepsilon_{ijt} \qquad (2)$$

Where:

Loss$_{jt}$ is an indicator variable that equals one if portfolio company *j* reported a loss in year *t*, and zero otherwise

Both year fixed effects[50] and company fixed effects[51] were used in Eq. (2), (both in combination and with only year fixed effects) to reduce potential noise related to either (or both) the specific years or (and) the specific closed-end investment companies.

3.5.1.3 Respecified Ohlson model with *Loss* and *Level3* indicator variables

Holthausen & Watts (2001) argue that value relevance studies frequently employ aggregate data of fair values, which can obscure the specific ways in which accounting information impacts various types of investments. We emphasise, in line with Ferreira et al. (2019), that the fair value estimates are calculated at the portfolio company level rather than the company level. As we seek to map out the value relevance of accounting-based information in closed-end investment companies' valuations of their portfolio companies, we introduce the indicator variable *Level3$_{jt}$*.[52] In addition to the introduction of *Level3$_{jt}$*, several interaction terms between *Level3$_{jt}$* and the independent variables specified in Eq. (2)[53] were also introduced to be able to capture the differences between the Level 1 and 3 portfolio company valuations. Our third regression model is thus specified as follows:

[49] This model is used both with the entire portfolio company sample (800 observations), and when splitting the sample between Level 1 portfolio companies (521 observations) and Level 3 portfolio companies (279 observations).

[50] In line with Ferreira et al. (2019) and Petersen (2009), we include year fixed effects in estimating Eq. (2) and Eq. (3).

[51] Company fixed effects, where company refers to closed-end investment company, are used as a substitute for the fund fixed effects used by Ferreria et al. (2019) to control for specific characteristics related to the closed-end investment companies, e.g., investment strategy.

[52] Level 2 is excluded from our sample due to very few fair value estimates.

[53] Including the interaction term $NI \times Loss_{jt}$.

$$FV_{ijt} = \beta_0 + \beta_1 BVE_{jt} + \beta_2 NI_{jt} + \beta_3 Loss_{jt} + \beta_4 NI \times Loss_{jt} + \beta_5 Level3_{jt} + \beta_6 Level3 \times BVE_{jt} + \beta_7 Level3 \times NI_{jt} + \beta_8 Level3 \times Loss_{jt} + \beta_9 Level3 \times NI \times Loss_{jt} + \varepsilon_{ijt} \quad (3)$$

Where:

***Level3**$_{jt}$* is an indicator variable that equals one if portfolio company *j* was valued with level 3 inputs in year *t*, and zero otherwise

Similarly to Eq. (2), Eq. (3) is estimated including year fixed effects, and with and without company fixed effects. It should be noted that the closed-end investment companies could potentially have access to other data than the publicly available one, and that their valuations thus might be influenced by additional information. However, we assume that the publicly available financial information from the portfolio companies is of use for deriving estimates of fair values and that it should therefore be suitable for estimating the reliability of Level 3 fair values (Ferreira et al., 2019).

3.5.2 Evaluating the value relevance of disclosed fair values by closed-end investment companies

The following tests focus on assessing the value relevance of the FVM disclosed to investors in closed-end investment companies, employing a value relevance approach. Section 3.5.2.1 examines the relationship between the FVM of these closed-end investment companies and the fair values of their portfolio companies. The following Section 3.5.2.2 emphasises the relationship between the components of NAVs reported by closed-end investment companies and the market value of the closed-end investment companies' equity.

3.5.2.1 Value relevance of the total Level 1 and Level 3 investments

In Eq. (4) we start to examine the relation between and value relevance of the market value of equity of closed-end investment companies and the total fair values reported by the companies using Level 1 and Level 3 inputs.

$$MVE_{it} = \beta_0 + \beta_1 BVE_Other_{it} + \beta_2 BVE_FV1_{it} + \beta_3 BVE_FV3_{it} + \beta_4 NI_{it} + \beta_5 Loss_{it} + \beta_6 NI \times Loss_{it} + \varepsilon_{it} \quad (4)$$

Where:

MVE$_{it}$ is the market value of equity of closed-end investment company *i* in year *t*

BVE_Other$_{it}$ *is* the difference between equity book value and the sum of *BVE_FV1$_{it}$* and *BVE_FV3$_{it}$* of closed-end investment company *i* in year *t*

BVE_FV1$_{it}$ is the total fair value of Level 1 holdings of closed-end investment company *i* in year *t*

BVE_FV3$_{it}$ is the total fair value of Level 3 holdings of closed-end investment company *i* in year *t*

NI$_{it}$ is the net income of closed-end investment company *i* in year *t*

Loss$_{it}$ is an indicator variable that equals one if closed-end investment company *i* reported a loss in year *t*, and zero otherwise

Eq. (4) with market value of equity of the closed-end investment companies as the dependent variable and the total fair values of Level 1 (*BVE_FV1$_{it}$*) and 3 holdings (*BVE_FV3$_{it}$*) as well as the other book value of equity (*BVE_Other$_{it}$*) as independent variables allows for differing valuation coefficients for the equity book value components. These differing coefficients will depend on the FVM (Level 1, Level 3, or Other) used for each equity book value component. Standard errors are clustered by closed-end investment company in Eq. (4) and in the following Eq. (7) and (10), in line with Ferreria et al. (2019), using the same procedure as is described in Section 3.5.1.1. Eq. (4) is estimated both with and without year fixed effects, whilst company fixed effects are not used since we do not intend to control for their differences in this test as we did in Eqs. (1-3).

3.5.2.2 The effects of managerial discretion on value relevance

To address H3: "*The use of management discretion negatively affects the market value of equity for closed-end investment companies"*, we estimate modified versions of Eq. (4) that allows the *BV_FV1$_{it}$* and *BV_FV3$_{it}$* coefficients to vary for the closed-end investment companies who apply management discretion in their valuations. In line with Ferreria et

al. (2019), we have created two variables, *High_Resid1*$_{it}$ (*High_Resid3*$_{it}$) and *Pos_Resid1*$_{it}$ (*Pos_Resid3*$_{it}$) to investigate whether there is any impact on the market value of equity for the companies depending on if the management applies discretion. The variables ending with a 1 and the variables ending on a 3 are for Level 1 and 3 fair value estimates respectively. In both Eqs. (7) and (10) year fixed effects are used, and standard errors are clustered by closed-end investment company using the same procedure as in Section 3.5.1.1.

The variable *High_Resid1*$_{it}$ (*High_Resid3*$_{it}$) is an indicator variable that is equal to one if the weighted average absolute residual ratio, *Res_Ratio1*$_{it}$ (*Res_Ratio3*$_{it}$) [54], for a given closed-end investment company *i* is above the sample median in that specific year *t*. *Res_Ratio1*$_{it}$ and *Res_Ratio3*$_{it}$ are calculated in the following ways[55]:

$$Res_Ratio1_{it} = \sum_{j=1}^{J1} \frac{|Res1_j|}{|FV_fit_j|} \times \frac{FV_j}{\sum_{j=1}^{J1} FV_j} \quad (5)$$

and

$$Res_Ratio3_{it} = \sum_{j=1}^{J3} \frac{|Res3_j|}{|FV_fit_j|} \times \frac{FV_j}{\sum_{j=1}^{J3} FV_j} \quad (6)$$

Where:

***FV*$_j$** is the fair value of portfolio company *j*

***FV_fit*$_j$** is the fitted fair value of portfolio company *j* from Eq. (3)

Res1*$_j$ *(Res3*$_j$*) is the residual value for Level 1 (Level 3) portfolio company *j*, subtracting the fitted value (*FV_fit*$_j$) from the *FV*$_j$

In the two preceding equations, the absolute value of *Res1*$_j$ (*Res3*$_j$) is divided by the absolute value of *FV_fit*$_j$ to create a residual ratio. This ratio shows the absolute difference between the fitted fair values from Eq. (3) and the reported Level 1 (Level 3) fair values. The ratio is multiplied with the Level 1 (Level 3) fair values of the portfolio companies divided by the total portfolio company Level 1 (Level 3) fair value for company *i* in year

[54] *Res_Ratio1*$_{it}$ and *Res_Ratio3*$_{it}$ are winsorized at the 5th and 95th percentiles in line with Ferreria et al. (2019).

[55] We have set *Res_Ratio1*$_{it}$ (*Res_Ratio3*$_{it}$) to zero in the cases where a company *j* has no Level 1 or 3 investments *i* in year *t*.

t. The sum of the products gives us the *Res_Ratio1*$_{it}$ (*Res_Ratio3*$_{it}$), which provides an understanding of to what extent the management of company *i* applies discretion in their Level 1 (Level 3) valuations in year *t*. If the management of a company in a given year applies more discretion than the median discretion applied by all companies in the sample the same year for their Level 1 (Level 3) investments, that company gets assigned a one in *High_Resid1*$_{it}$ (*High_Resid3*$_{it}$). Including the *High_Resid1*$_{it}$ and *High_Resid3*$_{it}$ variables in Eq. (4), as well as the interaction terms *BVE_FV1* $\times$ *High_Resid1*$_{it}$ and *BVE_FV3* $\times$ *High_Resid3*$_{it}$ gives us the following equation (Eq. (7)). This allows us to test the effect on market value of equity of a company having a high weighted average absolute residual ratio each year.

$$\begin{aligned} MVE_{it} = \beta_0 + \beta_1 BVE_Other_{it} + \beta_2 BVE_FV1_{it} + \beta_3 BVE_FV3_{it} \\ + \beta_4 High_Resid1_{it} + \beta_5 High_Resid3_{it} \\ + \beta_6 BVE_FV1 \times High_Resid1_{it} \\ + \beta_7 BVE_FV3 \times High_Resid3_{it} + \beta_8 NI_{it} + \beta_9 Loss_{it} \\ + \beta_{10} NI \times Loss_{it} + \varepsilon_{it} \end{aligned} \quad (7)$$

Where:

***High_Resid1*$_{it}$** is an indicator variable that equals one if closed-end investment company *i* has a *Res_Ratio1*$_{it}$ above the sample median in year *t*, and zero otherwise

***High_Resid3*$_{it}$** is an indicator variable that equals one if closed-end investment company *i* has a *Res_Ratio3*$_{it}$ above the sample median in year *t*, and zero otherwise

Similar to *High_Resid*1$_{it}$ (*High_Resid3*$_{it}$), the variable *Pos_Resid1*$_{it}$ (*Pos_Resid3*$_{it}$) is an indicator variable that equals one if *Res_Sign1*$_{it}$ (*Res_Sign3*$_{it}$) is greater than zero, and zero otherwise. *Res_Sign1*$_{it}$ (*Res_Sign3*$_{it}$)[56] replaces the absolute values of |*Res1*$_j$|/|*FV_fit*$_j$| (|*Res3j*|/|*FV_fit*$_j$|) with the signed value *Res1*$_j$ (*Res3*$_j$) in Eq. (5) (and (6)), and is calculated as follows:

$$Res_Sign1_{it} = \sum_{j=1}^{J1} Res1_j \times \frac{FV_j}{\sum_{j=1}^{J1} FV_j} \quad (8)$$

[56] We have set *Res_Sign1*$_{it}$ (*Res_Sign3*$_{it}$) to zero in the cases where a company *j* has no Level 1 or 3 investments *i* in year *t*.

and

$$Res_Sign3_{it} = \sum_{j=1}^{J3} Res3_j \times \frac{FV_j}{\sum_{j=1}^{J3} FV_j} \quad (9)$$

The *Res_Sign1*$_{it}$ (*Res_Sign3*$_{it}$) can be both greater and smaller than zero, contrary to the *Res_Ratio1*$_{it}$ (*Res_Ratio3*$_{it}$) which can only be equal to or greater than zero. This is due to *Res1*$_j$ (*Res3*$_j$) being a signed value, allowing it to be both positive and negative. *Res1*$_j$ (*Res3*$_j$) in Eq. (8) (Eq. (9)) is multiplied by the Level 1 (Level 3) fair value of the investment divided by the total portfolio company Level 1 (Level 3) fair values for company *i* each year *t*. However, since the *Res1*$_j$ (*Res3*$_j$) is not divided by the fitted fair values from Eq. (3), the sum of the products in Eqs. (8) and (9) does not produce a ratio, but a weighted average residual for company *i* in year *t*. *Pos_Resid1*$_{it}$ (*Pos_Resid3*$_{it}$) gives us, similar to *High_Res1*$_{it}$ (*High_Res3*$_{it}$), insight into the discretion used by management when valuing Level 1 (Level 3) holdings. The key difference between the variables is that a company gets assigned a one in *Pos_Resid1*$_{it}$ (*Pos_Resid3*$_{it}$) in a given year if the weighted average residual is greater than zero, which would indicate that management have positively biased Level 1 (Level 3) valuations that year. Including the *Pos_Resid1*$_{it}$ and *Pos_Resid3*$_{it}$ variables in Eq. (4), as well as the interaction terms *BVE_FV1* $\times$ *Pos_Resid1*$_{it}$ and *BVE_FV3* $\times$ *Pos_Resid3*$_{it}$ gives us the following equation (Eq. (10)). This allows us to test the effect on market value of equity of a company that has positive weighted average residuals each year.

$$\begin{aligned} MVE_{it} = \beta_0 + \beta_1 BVE_Other_{it} + \beta_2 BVE_FV1_{it} + \beta_3 BVE_FV3_{it} \\ + \beta_4 Pos_Resid1_{it} + \beta_5 Pos_Resid3_{it} \\ + \beta_6 BVE_FV1 \times Pos_Resid1_{it} \\ + \beta_7 BVE_FV3 \times Pos_Resid3_{it} + \beta_8 NI_{it} + \beta_9 Loss_{it} \\ + \beta_{10} NI \times Loss_{it} + \varepsilon_{it} \end{aligned} \quad (10)$$

Where:

***Pos_Resid1*$_{it}$** is an indicator variable that equals one if closed-end investment company *i* has a *Res_Sign1*$_{it}$ above zero in year *t*, and zero otherwise

Pos_Resid3$_{it}$ is an indicator variable that equals one if closed-end investment company *i* has a *Res_Sign3$_{it}$* above zero in year *t*, and zero otherwise

As discussed by Ferreria et al. (2019), for the LPE setting, if investors perceive that the discretion exercised by managers of closed-end investment companies in estimating the fair values of Level 3 assets leads to unreliable valuations, they are likely to assign a lower valuation coefficient to the equity book values associated with these Level 3 assets. In this context, the interaction term *BVE_FV3 × High_Resid3$_{it}$* would likely exhibit a negative coefficient. Conversely, if investors believe that managerial discretion regarding Level 3 valuations produces reliable estimates, the expectation would be that the coefficient on *BVE_FV3 × High_Resid3$_{it}$* remains neutral or close to zero. Similarly, should investors suspect that such discretion results in positively biased valuations, they might apply a reduced valuation weight to equity book values tied to Level 3 assets, yielding a negative coefficient on *BVE_FV3 × Pos_Resid3$_{it}$***.** Additionally, we incorporate the indicator variables *High_Resid1$_{it}$* and *Pos_Resid1$_{it}$* to examine their interactions with *BVE_FV1$_{it}$* in our estimations of Eqs. (7) and (10). This approach addresses the potential that investors discount closed-end investment company managers' fair value estimates, even for assets classified as Level 1. However, given that Level 1 valuations are derived from observable inputs, we do not anticipate any significant discounting evidence in these cases as closed-end investment companies shall not be able to apply any discretion to their Level 1 portfolio company valuations.

4. Results and analysis

In the following chapter the results from our regressions will be presented, interpreted, and analysed. In Section 4.1 the descriptive statistics are presented. In Section 4.2 the findings related to H1 and H2 are presented. Finally, in Section 4.3 presents the findings related to H3.

4.1 Descriptive statistics

To get a better understanding of the samples used in our regression analyses, an overview of the descriptive statistics is provided in Tables 4 and 5. The first table, Table 4, describes

the sample used in Section 4.2. The second table, Table 5, describes the sample used in Section 4.3.

Table 4
DESCRIPTIVE STATISTICS: PORTFOLIO COMPANIES

Variables	N	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Group I Descriptive statistics – Portfolio companies								
FV	800	45258.2	161902.8	5.1	565.7	3439.3	20672.5	2183228.0
BVE	800	15663.4	37658.1	0.7	158.5	799.0	5831.5	196030.0
NI	800	2187.7	6117.7	-1722.4	-8.1	64.6	701.4	34142.6
Level3	800	0.4	0.5	0.0	0.0	0.0	1.0	1.0
Group II Descriptive statistics – Portfolio companies Level 1								
FV	521	67072.8	197102.2	10.0	1421.0	6190.0	47672.2	2183228.0
BVE	521	23545.9	44669.9	0.7	541.6	1945.0	23203.0	196030.0
NI	521	3334.2	7316.1	-1722.4	7.5	237.0	2097.0	34142.6
Level3	521	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Group III Descriptive statistics – Portfolio companies Level 3								
FV	279	4522.1	10603.0	5.1	123.9	818.5	4676.0	80910.1
BVE	279	943.9	3093.4	0.7	22.0	124.1	498.4	29433.9
NI	279	46.9	619.8	-1722.4	-23.2	-1.2	37.7	7212.4
Level3	279	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 4 provides descriptive statistics for portfolio companies used to test the H1 and H2. The descriptive statistics are divided into three groups, I, II, and III, which represents the full sample, the Level 1 portfolio companies sample, and the Level 3 portfolio companies sample, respectively. See Appendix A8 for the definition of the variables. Included descriptive statistics are number of observations ('N'), mean, standard deviation ('Std. Dev.'), minimum ('Min'), 1st quartile ('Q1'), median, 3rd quartile ('Q3'), and max.

Table 5
DESCRIPTIVE STATISTICS: CLOSED-END INVESTMENT COMPANIES

Variables	N	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Group IV Descriptive statistics – Closed-end investment companies								
MVE	79	70161.7	152121.4	0.0	2669.3	6264.9	85663.9	819793.6
BVE_Other	79	-2223.5	26941.1	-114716.0	-14.7	760.3	2530.0	49638.0
BVE_Level1	79	54333.6	124962.8	0.0	1064.0	4174.1	64202.0	625825.0
BVE_Level3	79	11873.2	28117.3	0.0	968.2	968.2	3161.1	126882.0
High_Resid1	79	0.5	0.5	0.0	0.0	0.0	1.0	1.0
High_Resid3	79	0.5	0.5	0.0	0.0	0.0	1.0	1.0
Pos_Resid1	79	0.6	0.5	0.0	0.0	1.0	1.0	1.0
Pos_Resid3	79	0.4	0.5	0.0	0.0	0.0	1.0	1.0
NI	79	8181.3	33510.2	-74681	-19.0	619.0	4377.0	228065.0
Loss	79	0.3	0.4	0.0	0.0	0.0	1.0	1.0

Table 5 provides descriptive statistics for the closed-end investment companies used to test H3. See Appendix A8 for the definition of the variables. Included descriptive statistics are number of observations ('N'), mean, standard deviation ('Std. Dev.'), minimum ('Min'), 1st quartile ('Q1'), median, 3rd quartile ('Q3'), and max.

Tables 4 and 5 describe the final samples presented in Sections 3.4.1 and 3.4.2 (see Tables 2 and 3). Included in the tables below are the independent and dependent variables, excluding the interaction terms, for Eq. (3) in Table 4 and Eqs. (7) and (10) in Table 5. To ensure the robustness of all the results presented in Sections 4.2 and 4.3, multicollinearity, heteroskedasticity, and autocorrelation has been addressed.[57]

4.2 Value relevance of portfolio company fundamental financials

Table 6
REGRESSIONS RESULTS FROM THE RESPECIFIED OHLSON MODEL EQS. (1) & (2)

Variables	*Predicted signs*	*Ohlson (1)*	*Respecified Ohlson (2)*	*Respecified Ohlson* (3)
BVE	+	1.28	1.22	2.03
		(0.88)	(0.93)	(1.21)
NI	+	10.51*	10.89**	8.72**
		(2.37)	(2.11)	(1.22)
Loss	-		111.17	-2,544.02
			(5,225.07)	(3,936.19)
NI × *Loss*	-		-16.72	-17.32
			(10.35)	(9.60)
Constant	+	2,223.97	430.50	5,003.44
		(4,576.85)	(10,988.04)	(18,510.58)
Observations		800	800	800
R^2		0.46	0.46	0.53
Adj R^2		0.46	0.45	0.52
Year FE		No	Yes	Yes
Company FE		No	No	Yes

Table 6 presents summary statistics for the regressions from Eqs. (1) and (2). Standard errors are clustered by closed-end investment company using HC_2 standard errors with adjusted degrees of freedom. The continuous variables in all of the regressions presented in the table have been winsorized at the 1st and 99th

[57] See Appendix B, for further discussions on robustness.

percentiles. Standard errors in parentheses. The following symbols *, **, and *** indicate the respective statistical significance at the 10%, 5%, and 1% levels.

The regression summary for Eqs. (1) and (2) are presented in Table 6 with three regression outputs where the dependent variable is the portfolio company *FV*. Across all three regressions, the dependent variable *NI's* coefficients were found to be significantly positive, in the regression in column (1) at a 10% level and at a 5% level in the following two columns (2) and (3). The coefficient ranges from 8.72 in column (3) to 10.89 in column (2). A key difference is the application of company fixed effects to the regression in column (3), compared to column (2), yielding the lowest coefficient. This is however not the case for *BVE*, where its coefficient was not found to be significant in any regression, it is however positive and ranging from 1.22 in column (2) to 2.03 in column (3). In the case of *BVE*, compared to *NI*, the coefficient increases when company fixed effects are applied. Since significance was only found for the *NI* variable, we cannot comment on the general relationship between *BVE* and *FV*. However, we can observe that there is an association between *NI* and *FV*. Considering the indicator variable *Loss* and the interaction term *NI* × *Loss*, we can observe that their coefficients are not significant. The R^2 and the adjusted R^2 ranges from 0.46 to 0.53 and 0.45 to 0.52 respectively, where the higher values in both ranges were found in column (3) which indicates that the addition of company fixed effects explains more of the variance in the *FV* than the regressions without company fixed effects.

The results presented above are not fully in line with previous literature. The established relationship between *BVE* and *FV* variables (Barth et al., 2001; Collins et al., 1997; Ohlson, 1995) is consistently found to be insignificant in our study. One possible explanation for this deviation might be that investors and companies place a lesser emphasis on *BVE* rather than *NI* in their valuations of the portfolio companies in our sample. Additionally, the *Loss* indicator variable is also found to be insignificant (cf. Ferreria et al., 2019). The insignificance might relate to possible incoherence among the valuation methods and expectations used by investors and closed-end investment companies to value loss making portfolio companies in our sample.

Table 7
REGRESSIONS RESULTS FROM THE RESPECIFIED OHLSON MODEL (LEVELS) EQS. (2) & (3)

Variables	*Predicted signs*	*Level1: FV (1)*	*Level3: FV (2)*	*FV (3)*	*FV (4)*
BVE	+	1.90	0.70	1.22	1.96
		(1.19)	(1.35)	(0.95)	(1.20)
NI	+	8.69**	1.19	10.97**	8.90**
		(1.28)	(1.64)	(2.13)	(1.28)
Loss	-	-1,619.18	-2,014.66	1,350.43	-5,067.20
		(6,149.51)	(1,601.75)	(7,606.65)	(8,431.17)
NI × Loss	-	-23.17*	-4.76	-17.40	-19.79
		(10.37)	(6.03)	(15.54)	(14.57)
Level3	*?*			4,617.44	-15,936.65
				(8,755.03)	(13,672.49)
Level3× BVE	+			-0.45	3.54
				(0.86)	(4.89)
Level3 × NI	-			-7.93	-17.21
				(4.06)	(8.20)
Level3 × Loss	*?*			-5,454.82	7,281.78
				(9,586.33)	(10,867.30)
Level3 × NI × Loss	*?*			8.05	40.59
				(14.96)	(43.58)
Constant	+	7,830.05	147.24	-244.86	12,142.20
		(4,841.48)	(669.69)	(7,425.91)	(7,742.90)
Observations		521	279	800	800
R^2		0.53	0.37	0.46	0.54
Adj R^2		0.51	0.32	0.45	0.52
Year FE		Yes	Yes	Yes	Yes
Company FE		Yes	Yes	No	Yes

Table 7 presents summary statistics for the regressions from Eqs. (2) and (3). Standard errors are clustered by closed-end investment company using HC_2 standard errors with adjusted degrees of freedom. The continuous variables in all of the regressions presented in the table have been winsorized at the 1st and 99th percentiles. Standard errors in parentheses. The following symbols *, **, and *** indicate the respective statistical significance at the 10%, 5%, and 1% levels.

Using the closed-end investment company Kinnevik as an example, their investment strategy is focused on investing in firms that are so-called “challengers” (Kinnevik, n.d.).

It is not uncommon that this type of firm is unprofitable as they are young, growing, and with high expenditures, yet to become incumbents in their respective markets. This means that they are likely valued on another basis than current earnings. This resonates well with the findings of Hayn (1995) who finds that loss-making firms bias earnings coefficients downwards in pooled samples with both loss-making and profitable firms.

In Table 7, the Eq. (2) regression results after splitting the portfolio company sample into the two subsamples Level 1 portfolio companies and Level 3 portfolio companies can be seen in column (1) and (2), as well as the regression result for Eq. (3) with and without company fixed effects in column (3) and (4). The purpose of splitting the sample is to allow the *BVE* and *NI* coefficients to take on different values for Level 1 and Level 3 portfolio companies to test H1 and H2. Including both regressions with a split sample in columns (1) and (2) and regressions with interaction terms in columns (3) and (4) in the same table is not very common, however we believe that it gives the reader a better understanding of the results and it is in line with the regression summary statistics presented by Ferreria et al. (2019). Similarly to Table 6, the coefficients for *BVE* are found to be insignificant in all regressions, whilst being positive and ranging from 0.70 to 1.96. We can thus not claim here either that there is a statistical relationship between the *BVE* and *FV* for the portfolio companies in our sample or claim any difference in value relevance. In contrast, Ferreria et al. (2019) are able to draw the conclusion that there is no value relevance difference between Level 1 and 3 portfolio companies' *BVE*. One observation that we can make is that *BVE* is correlated with *FV* in for the entire sample with a correlation of 0.65.[58]

NI is significant at a 5% level in all of the regressions in Table 7 except for the Level 3 portfolio company subsample, these findings are in line with the findings of Ferreria et al. (2019). This indicates that there is a statistically significant relationship between *NI* and *FV* for Level 1 companies. The same cannot be said about Level 3 portfolio companies, which suggests that *NI* for Level 3 portfolio companies is less value relevant than the *NI* for Level 1 portfolio companies. The lower value relevance of the *NI* for Level 3 portfolio companies resonates well with the findings of Goh et al. (2015) and Song et al. (2010) who find that Level 3 fair values in the financial institution setting have lower

[58] See Appendix A9, for correlation table.

value relevance. This contrasts with the findings of Lawrence et al. (2016), examining a closed-end fund setting, who finds that there is no such difference in value relevance for Level 1 and Level 3 fair values.

In column (4), none of the interaction terms are found to be significant. This is slightly surprising given the value relevance difference for *NI* for Level 1 and Level 3 portfolio companies presented in columns (1) and (2), and we expected the *Level3* × *NI* to be significantly negative which would have been in line with the findings of Ferreria et al. (2019). Untabulated results using clustered standard errors without the HC_2 clustering and the adjusted degrees of freedom alteration yield a significantly negative coefficient for the interaction term of -7.93 at the 1% significance level. However, we do not intend to draw any conclusions from these untabulated findings since we believe they are subject to small sample bias due to the few number of clusters. If the unadjusted clustering procedure had been used, which would have been in line with the value relevance literature (Ferreira et al., 2019; Song et al., 2010), a pre-emptive conclusion would likely have been drawn claiming that the *NI* coefficient is smaller for Level 3 portfolio companies.

In the regression output for the Level 1 sample, in column (1) the interaction term *NI* × *Loss* is significantly negative at the 10% level; the same observation cannot be made in any of the other regressions. This indicates that when a Level 1 firm is loss making, its *NI* coefficient should instead be read as -14.48[59], which in turn would suggest, at a 10% significance level, that for each additional one million SEK lost by a portfolio company, its fair value would be 14.48 million SEK lower. This illustrative example should be regarded as just that, an illustrative example, since the significance level of neither the *NI* coefficient nor the *NI* × *Loss* coefficient is significant at the 1% level.

All four regressions presented in Table 7 have an R^2 and an adjusted R^2 in the range of 0.37 to 0.54 and 0.32 to 0.52 respectively, with the one presented in column (2) having the lowest R^2 and adjusted R^2 which might be due its smaller sample size. This might also be an indication that, as neither *BVE* nor *NI* is significant in the Level 3 regression, other information to a greater extent has been used for valuing Level 3 portfolio companies. It

[59] This "new" coefficient for *NI* is calculated by subtracting the interaction term's coefficient -23.17 from the "original" coefficient of *NI* which is 8.69 summing up to -14.48.

is not improbable to assume that alternative valuation methods have been used in valuing Level 3 portfolio companies as we believe other information has been used in the valuation process. This conforms well with Baik et al. (2007), who point out the potential risk of information asymmetry increases when valuation and verification are more challenging, which is the case with non-public companies valued at Level 3. As these fair values are valued internally by the closed-end investment companies due to their illiquidity and lack of market values, several researchers have hypothesised that NAV discounts are negatively affected by illiquidity. This discount is believed to be related to the agency costs arising from the potential bias created by management valuation (Cherkes et al., 2009). On the one hand, management is incentivised to increase valuation driven by long- or short term incentives (Holthausen & Watts, 2001), whilst on the other hand, mitigating significant losses in their investments to manipulate earnings to not breach potential debt covenants or to align with bonus thresholds (Healy, 1985; Watts & Zimmerman, 1986).

These biases, which are hypothesised to exist in the valuations, align well with the lower value relevance for *NI* of Level 3 portfolio companies, as neither of the fundamental financials tested by the respecified Ohlson (1995) model is significant in column (2) in Table 7. It is important to note that several fair value critics have criticised the use of FVA and the related potential agency costs that could follow by the application of it. However, as Ronen (2008) notes, even though there are unobservable inputs, this does not necessarily imply accounting manipulation.

Similarly to Table 6, both the R^2 and adjusted R^2 increase as company fixed effects are applied. An additional observation one can make is that the *NI* coefficient is consistently lower for the significant results when company fixed effects are applied, specifically comparing columns (1), (3), and (4) in Table 7. The smaller coefficients might be due to the biases related to the closed-end investment companies which are captured by the *NI* variable when the closed-end investment companies are not controlled for, thus leading to a higher coefficient when the company fixed effect is not applied.

4.3 The effects of managerial discretion on closed-end investment companies

Table 8
REGRESSIONS RESULTS FROM CLOSED-END INVESTMENT COMPANIES – HIGH & POSITIVE RESIDUALS, EQS. (4) & (7)

Variables	*Predicted signs*	*MVE*	*MVE*	*High_Resid MVE*	*Pos_Resid MVE*
		(1)	*(2)*	(3)	*(4)*
BVE_Other	+	-0.00	-0.02	0.02	-0.02
		(0.37)	(0.35)	(0.42)	(0.37)
BVE_Level1	+	1.11**	1.10**	1.06***	1.08**
		(0.23)	(0.22)	(0.16)	(0.17)
BVE_Level3	+	1.08	1.07	1.36	1.27
		(0.72)	(0.67)	(0.88)	(0.92)
NI	+	-0.62	-0.57	-0.67	-0.81
		(0.51)	(0.51)	(0.77)	(0.83)
Loss	-	-2,404.58	-3,684.71	-4,801.17	-7,605.30
		(2,817.51)	(3,742.96)	(4,982.39)	(6,133.77)
NI x Loss	-	0.81	0.62	0.99	1.31
		(1.16)	(1.18)	(2.12)	(2.18)
High_Resid1	*?*			-2,971.11	
				(6,237.97)	
High_Resid3	*?*			2,197.38	
				(3,629.75)	
BVE_Level1 × High_Resid1	*?*			0.17	
				(0.30)	
BVE_Level3 × High_Resid3	-			-0.78	
				(0.63)	
Pos_Resid1	*?*				-4,239.45
					(5,374.12)
Pos_Resid3	*?*				15,696.11
					(10,354.72)
BVE_Level1 × Pos_Resid1	-				0.21
					(0.32)
BVE_Level3 × Pos_Resid3	-				-0.95
					(0.54)
Constant	+	4,123.61	-8,492.12	-7,246.87	-9,860.48
		(3,357.91)	(5,865.71)	(5,399.41)	(6,158.38)
Observations		82	82	79	79
R^2		0.98	0.99	0.99	0.99
Adj R^2		0.98	0.98	0.99	0.99
Year FE		No	Yes	Yes	Yes

Table 8 presents summary statistics for the regressions from Eqs. (4) and (7). Standard errors are clustered by closed-end investment company using HC_2 standard errors with adjusted degrees of freedom. The

continuous variables in all of the regressions presented in the table have been winsorized at the 1st and 99th percentiles. Standard errors in parentheses. The following symbols *, **, and *** indicate the respective statistical significance at the 10%, 5%, and 1% levels.

In Table 8, H3 is tested, where the market value of equity three months after the fiscal year of the closed-end investment companies are regressed on their book value of equity components (*BVE_Other*, *BVE_Level1*, and *BVE_Level3)* and management discretion (*High_Resid1*, *High_Resid3*, *Pos_Resid1, and Pos_Resid1)*[60] controlling for *NI* and *Loss*.

In these two regressions, neither the *High_Resid1* and *High_Resid3* variables nor the *Pos_Resid1* and *Pos_Resid3* variables are incorporated. In all regressions throughout the table, we can conclude that *BVE_Level1* is significantly positive, whereas *BVE_Other* and *BVE_Level3* are not significant. In columns (1) and (2), the size of the *BVE_Level1* coefficient is larger than the *BVE_Level3* coefficient. This is however not the case in either column (3) or (4) where the variables for capturing management discretion are introduced. The coefficient for *BVE_Level3* is 1.36 and 1.27 in columns (3) and (4) respectively with the *BVE_Level1* coefficients in the same columns being 1.06 and 1.08. Compared to column (2), which includes year fixed effects, the coefficients are 1.07 and 1.10 respectively for *BVE_Level3* and *BVE_Level1*. No other coefficients in any of the columns in Table 8 were found to be significant. The lack of significance in the *BVE_Level3, BVE_Other*, and *NI* variables is rather unexpected, and contrasts the findings of Ferreria et al. (2019)'s findings where all of the previously mentioned variables were found to be significant. These insignificant results might be due to our comparatively small sample of 79 observations used to test H3. Thus, from these regressions, we can thus not draw any conclusions regarding the effect of the use of management discretion in the valuation of either Level 1 or Level 3 portfolio companies. Furthermore, we cannot draw any conclusions from the significant *BVE_Level1* results in any of the regressions presented in Table 8 due to high levels of multicollinearity and correlation between the variables *BVE_Level1* and *BVE_Level3.*[61] These findings are not surprising as Ferreria et al. (2019) were neither able to draw any conclusions regarding

[60] We aim to capture management discretion in the variables *High_Resid1* & *High_Resid3* with relating interaction terms *BVE_Level1* × *High_Resid1* & *BVE_Level3* × *High_Resid3,* and *Pos_Resid1* & *Pos_Resid3* with the relating interaction terms *BVE_Level1* × *Pos_Resid1* & *BVE_Level3* × *Pos_Resid3* in Table 8.

[61] See Appendix A10 and Appendix B, for correlation table and further discussions regarding robustness tests.

the use of management discretion due to insignificant results. The R^2 and the adjusted R^2 are 0.98 or greater in all regressions in Table 8, which is to be expected given that the sum of the dependent variables which are the equity components should reflect the market value of equity of closed-end investment companies quite closely since these companies have little to no other operations.

In Section 4.2, we observe that the value relevance of *NI* for Level 3 portfolio companies is lower than for Level 1 portfolio companies, which we discussed might be due to the use of alternative valuation methods. The similar finding by Ferriera et al. (2019), in combination with the increased opportunity for accounting manipulation and the related potential agency costs (Danbolt & Rees, 2008; Ronen, 2008; Watts & Zimmerman, 1986), still motivates this additional research to test for managerial discretion in another setting. Taken together, although Ferreria et al (2019) did not find any statistical significance between the use of managerial discretion and the *MVE* of LPEs, we hypothesised that this relationship could be present for closed-end investment companies in the Swedish market and thus decided to examine it.

5. Conclusion

This study investigates the Swedish closed-end investment company setting to examine value relevance under the IFRS 13 fair value hierarchy. A general critique of FVMs supports the claim that reliability decreases with the use of fair values, particularly with unobservable inputs (i.e., Level 3). The use of Level 3 inputs may open up for excessive managerial discretion when managers have incentives to act strategically, which is further supported by the agency theory that claims that information asymmetry and managerial opportunistic behaviour may introduce agency costs. This leads to our empirical assessment of the value relevance of FVMs using Ohlson's (1995) respecified model based on the fundamental financials: *BVE* and *NI*.

Following our findings, we can partly answer our first research question, in the Swedish setting, "*How do portfolio companies' financial statement-based figures map into the estimates of their fair values reported by closed-end investment companies?"*. First, we are, to a certain degree, able to capture the accounting-based financial information that has been used by investors in the market to value closed-end investment companies' Level

1 portfolio companies. The empirics show that *NI* has been used to value the portfolio companies, whilst we cannot have the same claim regarding *BVE*. Furthermore, for the *FV* of the Level 3 portfolio companies, we cannot state to have been able to capture on what basis they are valued, as all results related to the Level 3 sample were found to be insignificant. This difference between the Level 1 and Level 3 portfolio companies signifies the increased value relevance of *NI* for Level 1 portfolio companies and to which extent financial statement-based figures have been used in the valuations.

Regarding our second research question "*How does the use of management discretion affect the market value of equity for closed-end investment companies?"*, we are not able to draw any conclusions since we did not find a relationship between the use of managerial discretion and the *MVE* of the closed-end investment companies. Ferreria et al. (2019), who used the same methodology to capture management discretion, suggested that investors find the fair values presented by the LPEs to be reliable. A key difference between their results and ours is that *BVE_Level1* and *BVE_Level3* were both found to be significant in their regressions, and they did not state to have had issues with multicollinearity. Due to these differences, we are hesitant to even suggest that investors find the fair values reliable as the relationship between *BVE_Level3* and *FV* was not found to be significant. These results are not in line with the principal-agency relationship and the broad fair value literature, which would argue that investors would consider the Level 3 fair values to be unreliable in cases where high levels of management discretion have been used.

5.1 Limitations and further research

First, the manual collection of fair value data and reliance on annual reports introduce the potential for measurement error. The exclusion of firms with incomplete or inconsistent disclosures reduces the sample size and might omit relevant observations. Furthermore, the non-random selection of closed-end investment companies limits our ability to generalise findings beyond the sampled firms. Second, the adoption of the Ohlson (1995) model provides a robust framework for linking financial statement fundamentals to market valuations. However, in this study, we employ a simplified version of the model, which does not explicitly account for other non-accounting value relevant information included in the original model. Third, a key focus of this study is the role of managerial

discretion in determining Level 3 fair values, which rely on unobservable inputs. However, our methodological approach relies on publicly available financial data and does not have access to the underlying models, assumptions, or governance processes that influence managerial decisions. This limitation makes it challenging to differentiate between genuine valuation challenges (e.g., illiquidity or complexity of assets) and potential earnings management or bias. It further complicates the process of quantifying the exact extent of managerial discretion in specific valuation scenarios.

One closed-end investment company in our sample employs a long-term incentive plan, referred to as the long-term variable remuneration program, where incentives are tied to the NAV. Therefore, further extensions to this study would be to investigate the incentive structures within firms, as discussed by Holthausen & Watts (2001), since this could provide valuable insights into how managerial compensation schemes and performance metrics shape the application and reliability of fair value estimates and thus be an alternative way to measure management discretion. Another suggestion for further research is to employ a 10-year time series from the adoption of IFRS 13 in 2013 until 2023. This approach could uncover whether the effects of FVM on value relevance have evolved and provide a more comprehensive understanding of its long-term impact. Another area of interest lies in cross-country comparisons among jurisdictions adopting IFRS 13 to analyse the influence of country-specific factors, such as corporate governance structures or institutional differences, on the relevance of FVMs. Expanding the scope to examine different segments of investment vehicles, such as real estate investment trusts or mutual funds, could shed light on whether the value relevance of fair values differs among the sectors. Furthermore, exploring whether the size of ownership stakes impacts the reliability and relevance of FVMs is another direction, drawing inspiration from Hjelström's (2007) work on ownership concentration of closed-end investment companies. His findings indicate that high ownership concentration can lead to agency costs, especially when controlling shareholders prioritise their own interests over those of the minority shareholders potentially compromising fairness and governance, and how this might affect the value relevance of Level 3 fair values.

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7. Appendix

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Appendix A – Additional Tables

Table A1
EXCLUSION CRITERIA FOR SELECTED CLOSED-END INVESTMENT COMPANIES

Process	*Sweden*	*Norway*	*Denmark*	*Finland*
Unique observations found on Avanza & Capital IQ	69	13	13	8
Less: Companies not being *pure-play* or *hybrid* closed-end investment companies	(27)	(10)	(9)	(5)
Less: Companies not reporting under IFRS	(19)	(0)	(0)	(0)
Less: Missing/inconsistent/unavailable observations	(5)	(1)	(4)	(1)
Sample of closed-end investment companies in the Nordics after removals	18	2	0	2
Final sample of closed-end investment companies	**18**	**-**	**-**	**-**

Source: Avanza and Capital IQ.

Table A2
MAPPING CLOSED-END INVESTMENT COMPANIES BY VON ESSEN'S (1997) CATEGORIES

Category	*Discussion*
Operational investment companies	Companies like Bure and Ratos invest in non-listed companies but hold substantial ownership stakes, making them comparable to *operational investment companies*. Ratos, for example, transitioned to a private equity model under CEO Arne Karlsson in 1999, showcasing the evolving nature of closed-end funds in Sweden (Ratos, 2004). Furthermore, Ratos describes itself a private equity conglomerate that creates added value through acquisitions, development, and sales of primarily unlisted companies (Ratos, 2014). Lagercrantz adopts a similar approach, treating its investments as part of its operational strategy, effectively functioning as an industrial group.
Hybrid investment companies	Some companies adopt *hybrid models.* For example, Investor AB, the largest investment company in Sweden, integrates its wholly-owned subsidiary, Patricia Industries, and portfolio firms by providing strategic guidance and operational expertise in mergers and acquisitions. This approach blurs the distinction between passive investing and active management. Another example is Melker Schörling AB, which holds a majority stake in Hexagon and holds significant influence, including direct involvement in corporate decision-making.
Pure-play investment company	Even among companies that are closer to the *pure-play* investment company model, diverse strategies are pursued. Industrivärden and Öresund maintain concentrated portfolios focused predominantly on Swedish-listed stocks, with limited exposure to unlisted assets. In contrast, Svolder invests primarily in smaller Swedish companies without active participation on their boards, reflecting a preference for management-led operations over direct governance involvement.

Source: Von Essen (1997); Investment companies' annual reports.

Table A3

COLLECTION OF EXPLANATIONS IN CLOSED-END FUND PUZZLE LITERATURE

Rational explanations	*Behavioural explanations*
Illiquidity of assets	Individual investor sentiment
Agency costs / Managerial abilities	Diversification

Note: These explanations are further described in Table A4.

Table A4

DESCRIPTION OF EXPLANATIONS IN CLOSED-END FUND PUZZLE LITERATURE

Rational explainations	
Illiquidity of assets	Hjelström (2007) suggests that the *illiquidity of assets*, e.g., unlisted assets, in a closed-end fund's portfolio, being typically inaccessible to individual investors, can justify a higher NAV for the fund. Unlisted assets, often considered more challenging for individual investors to access, can provide benefits and might warrant a higher valuation of the fund's NAV (Cherkes et al., 2009). Cherkes, et al. (2009) developed a model in which the discount is determined by investors' tradeoffs between management fees paid and illiquidity premium, which includes the benefits that accrue through holding the closed-end investment company, rather than holding the underlying assets directly. However, this benefit can be countered by the increased illiquidity associated with unlisted holdings, which can amplify discounts as investors demand higher returns for the associated risks (Cherkes et al., 2009; Datar, 2001). Further, Carroll et al., (2003) argue that this illiquidity and information asymmetry lead to a NAV discount, rather than a premium, further entangling the puzzle. However, Lee et al. (1991) argue that portfolio composition cannot fully account for this discount, as most of the funds they studied did not hold restricted stock yet still traded at discounted prices.
Agency costs	The *agency costs* hypothesis addresses the theory that discounts could reflect excessive management fees or poor management performance. Dimson & Minio-Kozerski (1999) explored how management fees and inefficiencies in fund management could explain persistent discounts. While management fees alone may not account for the magnitude of the discounts (Malkiel, 1977), agency issues such as performance and investor expectations certainly play a role. Malkiel (1977) further finds that restricted stocks is one reasons that closed-end funds trades at discounts, related to the nature of the restrictiveness and illiquidity of the stocks. Berk & Stanton (2007) argue that market discounts reflect their expectations about a fund's future performance, which is closely tied to the perceived skill and ability of fund managers to effectively oversee and grow the investment portfolio reliably. Similarly, Ross (2004) emphasises the role of management fees in explaining these discounts and suggests that high or unjustified management fees, which are deducted from the fund's assets, directly reduce the value available to shareholders. Malkiel (1995) suggests that significant insider ownership may increase discounts, as these insider investors might disproportionately benefit if the fund is liquidated at NAV. As noted by Hjelström (2007), controlling shareholders often leverage their formal voting power, enhanced through dual-class shares, to extract private benefits, both pecuniary and non-pecuniary, at the expense of non-controlling shareholders.

Behavioural explanations	
Individual investor sentiment	*Individual investor sentiment* has emerged as a critical factor in attempts to explain the closed-end fund puzzle. Individual investor sentiment refers to the distinct attitudes and behaviours of individual non-institutional investors in trading closed-end investment companies' shares, which differ from those investing directly in the underlying assets, leading to unique patterns in fund pricing and discounts. Lee et al. (1991) argue that fluctuations in investor sentiment, particularly among individual investors, have a substantial impact on CEF pricing. When investors are optimistic, discounts tend to shrink, while periods of pessimism lead to larger discounts. This is especially relevant given that individual investors, rather than institutions, are the primary owners of closed-end investment companies, making their prices more susceptible to the mood of the market as these investors are more prone to sentiment-driven behaviours (Lee et al., 1991; Baker & Wurgler, 2007). In contrast, Doukas & Milonas (2004) against the claim that investor sentiment represents an independent and systematic risk factor in asset pricing.
Diversification	An uncorrelated mix of companies within a closed-end funds, referred to as *diversification*, may play a role in explaining the closed-end fund puzzle. The presence of an uncorrelated range of companies, *diversification*, within CEF portfolios could contribute to explaining the observed discount. Hjelström (2007) suggests that while diversification reduces firm-specific risk, over-diversification may diminish the attractiveness of a fund. Over-diversified portfolios tend to increase the NAV discount, as institutional investors prefer less diversified investments that offer greater potential for returns, i.e., a negative relationship between stock concentration and fund discounts, meaning that funds with higher stock concentration tend to trade at smaller discounts. These discounts are particularly significant in cross-industry portfolios, where the benefits of diversification are outweighed by the reduced focus and potential (Berger & Ofek, 1995). Denis et al. (1997) argue that diversification can lead to agency costs as it may serve to enhance a manager's status or job security rather than shareholder value. Managers benefit from diversification by becoming more indispensable, but they do not bear its costs unless they have ownership stakes in the firm. Consequently, diversification tends to be negatively correlated with management equity ownership, highlighting its potential misalignment with shareholder interests.

Table A5

THE FAIR VALUE HIERARCHY

Classification	*Description*
Level 1	Level 1 inputs**,** considered the most reliable, consist of unadjusted quoted prices for identical assets or liabilities in active markets. IFRS 13 describes an active market as one where transactions involving the asset or liability occur frequently and in sufficient volume to continuously provide pricing information.[62] Entities must use Level 1 inputs whenever available, as they offer the clearest representation of fair value at the measurement date (IFRS 13, §76-80). If Level 1 inputs are unavailable, deciding whether a FVM relies on Level 2 or Level 3 inputs depends on two factors: i) whether the inputs are observable or unobservable, and ii) the extent of their relevance.
Level 2	Inputs are derived from observable market data but may not be directly quoted for a specific asset or liability being valued. Fair value are derived from i) quoited market prices for similar assets or liabilities from an active market; ii) quoted prices for identical or similar assets or liabilities in markets that are not active; iii) inputs other than quoted prices that are observables for the asset or liabilities; iv) inputs that are derived principally from or corroborates by observable market data by correlation or other means. While Level 2 inputs are based on market data, they require more judgment and adjustments than Level 1 inputs (IFRS 13, §81-85).
Level 3	Inputs are unobservable and require significant judgement or estimation. Level 3 inputs are used when values for Level 1 or 2 are not available. For example, in valuing a complex financial derivative for which no market exists, an entity may need to develop a model that includes forecasts of future cash flows, discount rates, and risk assumptions (IFRS 13, §86-90).

Source: IFRS 13 Fair Value Measurement.

[62] The IASB determined that, despite variations in wording, the definition aligns with the descriptions of an active market already present in existing IFRS standards, e.g., IASs 36, 38, and 41, where stated that an active markets is one which (a) homogenous items are traded, (b) willing buyers and sellers can normally be found, and (c) publicly available prices. (IFRS 13, §BC 169).

Table A6

SUMMARY OF EMPIRICAL STUDIES ON VALUE RELEVANCE OF FAIR VALUE HIERARCHY

Author (year)	*Sample – market & period*	*Standard*	*Value relevance test method*	*Key findings*
Ferreira et al., 2019	UK listed private equity funds (venture capital trusts), 2019	Fair value hierarchy according to IFRS 7	Measures the association between market values and various financial variables, including reported fair value levels of investments (Level 1, Level 3), NI, and losses, along with interactions between NI and losses (Respecified Ohlsson (1995) model)	Found that fair value estimates are value relevant, but the relevance decreases from Level 1 to Level 3
Carroll et al. (2003)	U.S. closed-end funds, 1982-1997	Joint Working Group of International Standard Setters	Equity price of a closed-end fund as a function of the value of the fund's net asset other than carried at fair values, and fair values of the investment securities portfolio	They conclude that estimated fair values are value relevant across a broad range of funds, including funds that hold financial assets and liabilities not traded in active markets[63]
Lawrence (2016)	US. closed-end funds, 2010-2011	SFAS 157 (ASC 820)	Regressing stock price on the Level 1, Level 2, Level 3 fair values, other net assets, and cum-dividend change in NAV	Level 3 assets were found to be as relevant as Level 1 and 2. Their findings indicate that the outcomes of prior research can be explained by a correlated omitted variable bias, which stems from the lack of fair value data, e.g., for banks

[63] The study by Carroll et al. (2003) was conducted before the concept of the fair value hierarchy was established, so it is unclear whether the securities would fall under Level 2 or Level 3. However, we can confirm that they are not Level 1 securities, as they were not actively traded.

Author (year)	*Sample – market & period*	*Standard*	*Value relevance test method*	*Key findings*
Fortin et al. (2020)	U.S. closed-end funds, 2009-2011	SFAS 157 (ASC 820)	Association between market values and fair value levels, non-fair valued net assets, preferred shares issued by funds	The value relevance of securities, held by the closed-end funds, varies significantly across fair value levels, both within and across different types of securities. For example, equities display a clear rank order in value relevance (Level 1 > Level 2 > Level 3), while for corporate bonds, Levels 2 and 3 often more value relevant
Song et al. (2010)	U.S. financial institutions, Q1-Q3 2008	SFAS 157 (ASC 820)	Association between share prices and fair values levels of assets and liabilities (respecified residual income model proposed by Ohlson (1995))	Found that Levels 1 and 2 are more value relevant than Level 3 fair values due to uncertainty, but strong governance can enhance the relevance of Level 3 estimates
Kolev (2008)	U.S. financial institutions, Q1-Q3 2008	SFAS 157 (ASC 820)	Association between market prices and Level 1, Level 2, and Level 3 fair value estimates (balance-sheet approach)	Investors apply a higher discount to Level 3 fair values compared to Level 1 fair values. However, investors still perceive these mark-to-model (Level 3) fair value estimates to be reliable

Author (year)	*Sample – market & period*	*Standard*	*Value relevance test method*	*Key findings*
Goh et al. (2015)[64]	U.S. financial institutions, 2008-2011	SFAS 157 (ASC 820)	Examines the association between stock prices and fair value levels (Level 1, Level 2, Level 3) of assets, and earnings per share (respecified residual income model proposed by Ohlson (1995))	Investors price Level 1, Level 2, and Level 3 fair value assets differently, with Level 3 fair values typically priced lower. Differences in pricing across levels reduced over time, suggesting improved confidence in Level 3 estimates as market conditions stabilised
Siekkinen (2016)	European financial institutions, 2012-2014	IFRS 13	Examines the value relevance of fair values within the fair value hierarchy using a respecified version of the Ohlson (1995) model, as proposed by Song et al. (2010) and Goh et al. (2015)	Level 1 assets are more value relevant than Level 2 or Level 3. Level 1 and 2 FV liabilities are more value relevant than Level 3 FV liabilities. All FV levels are value relevant in countries with a strong or medium investor protection environment. Weak investor protections, only assets measured in Level 1 are value relevant

[64] Goh et al. (2015) extended the study by Song et al. (2010) by analysing a longer time period. They found that all fair values are value relevant, with Level 1 and 2 being more value relevant than Level 3, reinforcing the conclusion that the results of Song et al. (2010) hold over time.

Table A7
BREAKDOWN OF TOTAL TIME SPENT COLLECTING AND REVIEWING MANUAL DATA

Manual data collection stages	*Observations*	*Estimated minutes per observation*	*Total minutes*	*Total hours*
Nordic investment companies	103	10	1030	17.2
Closed-end investment company-year observations	83	5	415	6.9
Portfolio company-year observations	1359	2	4077	68.0
Additional manual data cleaning and gathering				30.0
Total time spent collecting data				**99.4**

Table A8
VARIABLES, DEFINITIONS, AND DATA SOURCES

Variable (label)	*Type*	*Definition*	*Data sources*
Variables related to H1 & H2			
FV_{ijt}	Continuous (Dependent)	The fair value of portfolio company *j* in year *t* by closed-end investment company *i*	Manually collected from companies' annual reports (Level 3) or Capital IQ (Level 1)
BVE_{jt}	Continuous	The equity book value of portfolio company *j* in year *t*	Valu8 and Capital IQ
NI_{jt}	Continuous	The net income of portfolio company *j* in year *t*	Valu8 and Capital IQ
$Loss_{jt}$	Indicator	Indicator variable that equals one if portfolio company *j* reported a loss in year *t*, and zero otherwise	Manually created
$Level3_{jt}$	Indicator	Indicator variable that equals one if portfolio company *j* was valued with Level 3 inputs in year *t*, and zero otherwise.	Manually collected from companies' annual reports
Variables related to H3			
MVE_{it}	Continuous (Dependent)	The market value of equity of closed-end investment company *i* in year *t*	Capital IQ
BVE_Other_{it}	Continuous	The difference between the equity book value and the sum of BVE_FV1_{it} and BVE_FV3_{it} of closed-end investment company *i* in year *t*	Manually created

BVE_FV1_{it}	Continuous	The total fair value of Level 1 holdings of a closed-end investment company *i* in year *t*	Manually created
BVE_FV3_{it}	Continuous	The total fair value of Level 3 holdings of closed-end investment company *i* in year *t*	Manually created
NI_{it}	Continuous	The net income of the closed-end investment company *i* in year *t*	Capital IQ
$Loss_{it}$	Indicator	Indicator variable that equals one if closed-end investment company i reported a loss in year *t*, and zero otherwise	Manually created
$High_Resid1_{it}$	Indicator	Indicator variable that equals one if closed-end investment company *i* has a Res_Ratio1_{it} above the sample median in year *t*, and zero otherwise	Manually created
$High_Resid3_{it}$	Indicator	Indicator variable that equals one if closed-end investment company *i* has a Res_Ratio3_{it} above the sample median in year *t*, and zero otherwise	Manually created
Pos_Resid1_{it}	Indicator	Indicator variable that equals one if closed-end investment company *i* has a Res_Sign1_{it} above zero in year *t*, and zero otherwise	Manually created
Pos_Resid3_{it}	Indicator	Indicator variable that equals one if closed-end investment company *i* has a Res_Sign3_{it} above zero in year *t*, and zero otherwise	Manually created
Variables related to Eqs. (4), (5), (8), and (9)			
FV_j	Continuous	The fair value of portfolio company *j*	Manually collected from companies' annual reports (Level 3) or Capital IQ (Level 1)
FV_fit_j	Continuous	The fitted fair value of portfolio company *j* from Eq. (3)	Manually created
$Res1_j$ ($Res3_j$)	Continuous	The residual value for Level 1 (Level 3) portfolio company *j*, subtracting the fitted value (FV_fit_j) from the FV_j	Manually created

Table A9

PAIRWISE CORRELATION TABLE – RELATED TO H1 & H2

Variables	(1)	(2)	(3)	(4)
(1) *FV*	1.000			
(2) *BVE*	0.651	1.000		
	(0.000)			
(3) *NI*	0.662	0.890	1.000	
	(0.000)	(0.000)		
(4) *Level3*	-0.184	-0.286	-0.256	1.000
	(0.000)	(0.000)	(0.000)	

The table reports the pairwise correlations for the variables, excluding interaction terms, used in H1 and H2. P-values are presented in parenthesis.

Table A10

PAIRWISE CORRELATION TABLE – RELATED TO H3

Variables	(1)	(2)	(3)	(4)
(1) *MVE*	1.000			
(2*) BVE_Other*	-0.316	1.000		
	(0.005)			
(3) *BVE_Level1*	0.986	-0.261	1.000	
	(0.000)	(0.020)		
(4) *BVE_Level3*	0.941	-0.505	0.918	1.000
	(0.000)	(0.000)	(0.000)	

The table reports the pairwise correlations for the variables, excluding interaction terms, used in H3. P-values are presented in parenthesis.

Appendix B – Robustness tests

In all three of our hypothesis tests Ordinary Least Squared (OLS) regressions have been used. To reliably be able to interpret the results of the regressions the Gauss-Markov assumptions should be fulfilled and are discussed below.

Multicollinearity

In our portfolio company sample, no significant amount of multicollinearity was found. We conducted a variance inflation factor (VIF) test, with Eq. (3), yielding a mean VIF of 2.67, with the highest values 5.58 and 5.51 for *BVE* and *NI* respectively, with all scores being below the rules of thumb of 10 (Neter et al., 1983 p.392). In the closed-end investment company sample, we do find multicollinearity in the *BVE_Level1* and *BVE_Level3* variables when conducting the VIF test, yielding VIF scores of above 20 for both and a mean VIF of approximately 10, using both Eqs. (7) and (10). Since the test variables were found to be insignificant in these regressions, we did not attempt to draw any conclusions regarding the other variables due to high VIF scores.

Heteroskedasticity

In both our portfolio company and our closed-end investment company samples, heteroskedasticity was present. Running the Breusch-Pagan test for all of our regression models resulted in all of them rejecting the null hypothesis of homoskedasticity of the error term at a 1% level, allowing us to assume heteroskedasticity in the error terms. To control for the heteroskedasticity present in both datasets HC_2 clustered standard errors with degrees of freedom adjustments have been used (see Section 3.5.1.1, for a more detailed description).

Autocorrelation

The use of clustered standard errors as well as the use of fixed effects can be used to mitigate potential autocorrelation issues (Colin Cameron & Miller, 2015). Since we applied clustered standard errors to our regression models after having conducted the Breusch-Pagan tests, concluding that heteroskedasticity was present in our samples, our concerns regarding potential autocorrelation have been soothed. We do thus not believe that potential autocorrelation in our data would disqualify our result from our regressions, as this should be controlled for.

Appendix C – Artificial intelligence

Coding process

During the coding process for our data analysis, ChatGPT was used as a sounding-board to generate preliminary code and troubleshoot coding errors as it has a fundamental level of understanding of Stata. However, it was mostly used in the earlier stages of the coding process as it could only handle easier tasks, e.g., writing code for importing data, cleaning the data, and creating new variables. These AI-assisted lines of code were carefully reviewed, tested, and modified to align with the thesis's research methodology and were always checked against both other internet sources and the Stata handbook. The use of AI reduced the time spent on easier coding tasks, which allowed us to run our regressions sooner, but it was not sufficient when it came to more advanced prompts. An example of where ChatGPT was not able to assist us and gave directly incorrect information, was when we performed robustness tests and used HC2 clustered standard error. It mixed up information and gave us faulty code as it did not have access to the latest version of Stata (Stata 18) and our clustering issue was a rather niche one. In the end, we found ourselves not relying on ChatGPT for our coding as its Stata coding capabilities were below our expectations, resulting in us being more frustrated than satisfied with its answers.

Grammar and style checks

Grammarly[65] was used to enhance the linguistic quality throughout the thesis writing process. The tool assisted us in identifying and correcting grammar, spelling, and stylistic inconsistencies across the thesis. Additionally, the tool provided suggestions for improving sentence structure and overall readability. While Grammarly provided valuable assistance, human judgment remained central to the editing process. Each recommendation was manually evaluated to ensure it did not alter the intended meaning or compromise academic integrity. After careful evaluation, some of the suggestions were adopted, while others were used as a starting point and modified to ensure they aligned with the thesis's academic tone and context. This careful process was particularly important because, at times, Grammarly offered suggestions that were stylistically sound but inappropriate for the academic context.

[65] Grammarly is a language AI assistant for writing and communication.