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ABSTRACT

We investigate how the accounting treatment of intangible assets on managers' likelihood of issuing voluntary earnings guidance (MEF). We find that unrecognized intangibles (immediately expensed) are negatively associated with MEF issuance, while recognized intangibles (capitalized) show a positive association. These findings hold across various factors such as analysts' coverage, industry type and for a subsample that excludes software firms permitted to capitalize software development costs under SFAS No. 86. In additional, we investigate the cross-sectional determinants of MEF issuance based on the characteristics of firm intangibility. We find a significant increase in the likelihood of MEF issuance for higher unrecognized intangibles with greater earnings uncertainty. This suggests that managers may prioritize delivering value-relevant information to market participants to alleviate uncertainty.

1. Introduction

In this study, we investigate the association between managers' voluntary decision to issue a forecast/earnings guidance (hereafter MEF) and the accounting treatment of intangible assets (recognized versus unrecognized). Investments in intangible assets may lead to differing perceptions of firm value among users of financial statements (Aboody and Lev, 2000; Lev, 2001; Barron et al., 2002), introducing the element of information risk. Managers may be motivated to elevate this risk, especially in higher information risk environments, such as in drug discovery firms, where a substantial portion of intangible assets is expensed. In response, managers

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may issue MEFs to enhance transparency, signal credibility and manage investor expectations. However, information risk may vary between recognized and unrecognized intangibles.

The conservative practice[1] of expensing most intangibles, as mandated by Generally Accepted Accounting Principles (GAAP), may lessen the information content of financial reports because of increased information asymmetry (Lev and Zarowin, 1999; Lev, 2001; Lev, 2004). This practice may complicate and potentially bias firm valuation (Amir and Lev, 1996; Sougiannis and Yaekura, 2001; Monahan, 2005; Ciftci and Darrough, 2015). In contrast, capitalizing intangible assets provides useful information to capital market participants and reduces information asymmetry concerning the value of these assets and the uncertainty regarding the timing and magnitude of earnings. Research from countries such as Australia that allow managers discretion in the treatment of intangible assets suggests that managers tend to capitalize intangible assets when they are more certain about the investment's ultimate payoff (Wyatt, 2005; Matolscy and Wyatt, 2006).

Because of the variations in information asymmetry and uncertainty related to investments in intangibles, managerial incentives to issue MEFs may differ based on the proportions of expensed and capitalized intangibles. Managers may also have reservations regarding the issuance of MEFs, particularly in high-intangibility firms, where they might prefer to retain proprietary information internally rather than risk disclosing it to competitors. Additionally, concerns about credibility damage (Williams, 1996; Hirst et al., 1999; Yang, 2012), exposure to litigation and threats to human capital related to job security (Lee et al., 2012) may deter management from providing inaccurate forward-looking forecasts.

Our primary empirical analysis examines whether managers signal the relative information risk associated with their investment in intangible assets through the voluntary disclosure of annual earnings guidance. We also investigate whether this discretionary behavior is influenced by the proportions of recognized and unrecognized intangibles. To our knowledge, this study is the first to assess how managers weigh the costs and benefits of MEFs across various degrees of recognized and unrecognized intangible assets.

Using a pooled cross-sectional logistic regression, we regress a dichotomous (1/0) variable indicating whether managers issue an earnings forecast (MEF) at time t on the relative proportions of intangible assets, both recognized and unrecognized (R&D and advertising expense), at time t–1 while controlling for earnings forecast determinants at time t–1. Our analysis reveals a significant negative association between MEFs and a firm's composition of unrecognized intangibles that is driven by the ratio of R&D to sales. This suggests that managers may prioritize concerns about the accuracy of their forecasts over addressing information asymmetry in the presence of high investment in unrecognized intangibles. In contrast, we document a significant positive association between MEF issuance and recognized intangibles. This implies that for managers, the objective of minimizing information asymmetry related to investments in recognized intangibles may outweigh concerns about potential damage to their reputation resulting from inaccurate earnings forecasts.

These findings remain robust when we account for 1) the unique U.S. GAAP treatment under Statement of Financial Accounting Standards (SFAS) No. 86, which allows the capitalization of certain software development costs, 2) the variations between high- and low-technology-oriented firms, 3) the differences between high- and low-litigation industries and 4) the number of analysts following the firm. Additionally, the robustness persists when we use operating expenses instead of sales as a scalar of R&D intensity.

We also attempt to differentiate between the impacts of information asymmetry and earnings uncertainty on the association between MEF issuance and the proportions of both recognized and unrecognized intangibles. We find no consistent evidence of an incremental information asymmetry effect on the managerial MEF issuance decision in the presence of high proportions of unrecognized intangibles.

Regarding the impact of earnings uncertainty on the MEF issuance decision, we find that managers of firms with high proportions of unrecognized intangibles are less likely to issue MEFs. However, they are more willing to provide earnings guidance with increased levels of earnings uncertainty. This trend is particularly noticeable in the context of a high proportion of R&D expenses. This analysis suggests that managers might feel compelled to convey their expectations regarding returns from investments in unrecognized intangibles to

[1] This is a form of unconditional conservatism, defined as follows: "Unconditional conservatism occurs through the consistent under-recognition of accounting net assets. Unlike conditional conservatism, unconditional conservatism does not depend on news events. Examples of unconditional conservatism include immediately expensing research and development expenditures and accelerated depreciation" (Ruch and Taylor, 2015, P. 20).

market participants, even in the face of challenges to providing precise earnings guidance. Alternatively, it could indicate managers' confidence in these investments and their ability to accurately forecast future earnings.

Our study makes several contributions to the literature. Prior research investigates the information risk of intangible assets from the perspective of analysts, examining their use of heuristics and their earnings forecast errors for intangibility-oriented firms (Barron et al., 2002; Demers, 2002; Gu and Wang, 2005; Dehning et al., 2006; Matolcsy and Wyatt, 2006; Chalmer et al., 2012). We shift the focus from external analysts to internal managers. Managers possess greater insights into the probability distribution of future payouts from investments in intangible assets than do outsiders. As a result, they are in a unique position to offer market participants insights into future payoffs through the issuance of MEFs. Importantly, we explicitly acknowledge the inherent costs associated with MEF issuance.

Furthermore, various studies in the Australian context indicate potential benefits associated with granting managers the discretion to make voluntary capitalization decisions, especially compared with more restrictive regulations in the U.S. We contribute to this line of research by exploring whether MEFs play a complementary role in signaling managers' expectations regarding future benefits from intangible investments in accounting standards regimes that provide managers with less discretion in their accounting treatment of intangibles. Therefore, the assessment of the combined effect of discretionary earnings guidance and the less discretionary accounting treatment of intangibles may contribute to the regulatory debate regarding the information content of intangibles valuation and shed light on managers' perceptions of uncertainties surrounding intangible investments.

In addition, we add to the ongoing debate regarding whether MEFs have value or are distortionary. Academic research indicates that there are negative market reactions to announcements of discontinuing quarterly earnings guidance (Chen et al., 2011),[2,3] and executives' reluctance to cease issuing MEFs (Hsieh et al., 2006).[4] Conversely, public think tanks, investor groups and industry organizations suggest that short-term guidance may encourage myopic managerial behavior, distorting investments and incentivizing earnings management (CFA Institute, 2006; The Aspen Institute, 2007; Karageorgiou and Serafeim, 2014). Our paper contributes to this debate and has the potential to inform both academics and practitioners.

The remainder of the study is organized as follows. Section 2 outlines the literature review and our hypotheses. Section 3 discusses the research design. Section 4 presents the sample selection method, descriptive statistics and Pearson correlations. Section 5 provides our empirical results. Section 6 presents additional analysis and robustness checks. Finally, Section 7 provides the conclusions.

2. Literature review and hypotheses

2.1. MEF disclosures

Barry and Brown (1985, 1986) argue that because managers have more information than investors, the latter will demand a premium for information risk. Accordingly, managers can reduce the cost of capital by reducing information risk through voluntary disclosures. MEFs are an important component of a firm's information environment (Beyer et al., 2010)[5] and is one of the key forward-looking voluntary disclosure mechanisms. Through this disclosure mechanism, managers seek to manage market earnings expectations, communicate earnings projections, preempt litigation concerns and enhance their reputation for transparent and accurate reporting (Hirst et al., 2008; Kim and Park, 2012). Consistent with this notion, Rogers et al.

[2] Other potential effects of discontinuing these disclosures include increased analyst forecast dispersion, decreased forecast accuracy (Houston et al., 2010; Chen et al., 2011) and even lower numbers of analysts following (Houston et al., 2010).

[3] Cheng et al. (2006) compare a sample of frequent guiders to non-frequent (occasional or non–) guiders and conclude that non-frequent guiders engage in less R&D, which implies that guidance contributes to managerial short-termism.

[4] The authors find that 83% of surveyed executives report that they would stop issuing guidance for fear of an increase in stock price volatility when earnings are released, a potential decline in stock prices and a loss of visibility with investors and analysts.

[5] The authors document that MEFs provide 55% of the accounting-based information in the quarter, while analyst forecasts provide only 22% and earnings announcements provide merely 8%, which suggests that MEFs are the most informative disclosures to equity investors.

(2009) find that MEFs are associated with stock price volatility, which suggests that they change investor perceptions. In a similar vein, Jiang et al. (2023) examine whether MEFs decrease the stock return seasonality associated with earnings seasonality around earnings announcements in Chinese A-share firms. They find that voluntary MEFs have a higher reduction effect than mandatory MEFs on the seasonal predictability of returns, volume and volatility around earnings announcements.

MEFs are also associated with a reduction in information asymmetry (Frankel et al., 1995; Kasznik and Lev, 1995; Coller and Yohn, 1997; Ajinkya et al., 2005, Bozanic et al., 2018). For example, Frankel et al. (1995) find evidence of a higher likelihood of MEF issuance by managers that anticipate accessing capital markets in the near future, as they hope that MEFs will reduce information asymmetry and mitigate the adverse selection problem, thus facilitating a lower cost of capital. Similarly, Bozanic et al. (2018) find that MEFs reduce information asymmetry between firms and investors, correct investors' earnings expectation errors and improve pricing efficiency.

2.2. Unrecognized versus recognized intangible assets

Intangible assets play a substantial role in today's economy and are positively correlated with market value (Sougiannis, 1994; Lev and Sougiannis, 1996). The U.S. GAAP distinguishes between two categories of intangibles: purchased and internally developed intangibles. Purchased intangibles such as acquired patents, copyrights and customer lists are recognized on the balance sheet as assets and then amortized over certain years, while goodwill is tested for amortization. With few exceptions,[6] internally developed intangible assets such as those that arise from investments in brand development, advertising and marketing and other R&D remain off the balance sheet and are expensed as incurred.

2.2.1. Unrecognized intangibles

The conservative accounting practice of immediately expensing investments in internally developed intangibles (e.g., R&D and advertising) is used because of the difficulty of forecasting future payoffs from these activities, which are characterized by high information asymmetry. Aboody and Lev (2000) highlight distinctions between R&D expenditures and other capital and financial investments with regard to information asymmetry. Unlike financial investments subject to marking-to-market and physical assets with recognized value impairments, R&D is immediately expensed. This results in a lack of reported information on changes in R&D value and productivity, which potentially contributes to increased information asymmetry. Additionally, the unique and firm-specific nature of many R&D projects, especially in areas such as drug development, limits investors' ability to gain insights from other firms in the industry. Unlike physical and financial assets traded in organized markets, R&D lacks centralized markets for price discovery external to the firm.

The immediate expensing practice of R&D investments is a matter of debate in the literature. Proponents of this treatment argue that the immediate expensing rather than capitalizing of intangibles reminds investors of the speculative nature of the payoffs from these investments; expensing thereby serves as a form of risk communication, and the expenditures disclosed in the income statement provide investors with *ex-ante* information on uncertain future payoffs (Penman, 2016).[7]

Opponents of this treatment suggest that immediate expensing of intangibles distorts the informativeness of financial reports (Amir and Lev, 1996; Lev and Sougiannis, 1996; Lev and Zarowin, 1999; Lev, 2001; Lev, 2004; Lev et al., 2005) because of misalignment between the costs and benefits of the investments in financial reports. Lev (2004) states that "the expensing mentality towards intangibles ... should be replaced by an asset mentality, P. 15." to address the mis-valuation of expensed intangibles. Lev and Zarowin (1999) present empirical evidence of a decline in the informativeness of reported earnings that is primarily linked to increased R&D spending over time. Amir and Lev (1996) demonstrate that key financial variables, such as earnings and book values, exhibit negative, excessively depressed or seemingly unrelated relationships to market values in

[6] Examples include production stage software development, R&D costs related to tangible assets that have alternative future uses and direct-response advertising under certain conditions.

[7] This important role of *ex-ante* risk communication characterizes GAAP principles and serves as a criticism of International Accounting Standards (IAS) 38, which does not require the immediate expensing of some R&D investment activities.

high-intangibility firms. Furthermore, research suggests that conservative accounting practices, particularly in R&D-intensive firms, may impair capital market participants' ability to assess firm value. As Monahan (2005) finds, R&D-intensive firms tend to have understated future earnings estimates. Sougiannis and Yaekura (2001) suggest that biases and inaccuracies observed in long-horizon earnings-based valuation models may result from the omission of intangibles from the balance sheet. These findings collectively highlight the intricate relationship between accounting treatment, intangibility and the challenges associated with accurately valuing firms or predicting the future payoffs of R&D expenditures.

2.2.2. Recognized intangibles

Capitalizing or recognizing intangible assets offers valuable information for financial statement intermediaries and, consequently, investors. This was particularly evident in the Australian context before the adoption of the International Financial Reporting Standards (IFRS). During the pre-IFRS era, managers routinely engaged in the voluntary capitalization of intangible assets, a practice permitted by the regulatory environment. Matolcsy and Wyatt (2006) find that firms with higher proportions of capitalized intangibles experienced lower analyst forecast errors, providing support for the informative role of capitalization.

The transition to the IFRS in Australia marked a shift toward more restrictive reporting guidelines for intangible assets, resulting in reduced capitalization. Chalmers et al. (2012) corroborate Matolcsy and Wyatt's (2006) findings in the pre-IFRS period but observe no decline in the association between intangible assets and analyst forecast errors post-IFRS. This indicates a potential reduction in the usefulness of financial reporting with fewer capitalized intangibles.

In the U.S. under GAAP reporting, the relationship between capitalized intangibles and analyst forecast errors appears complex. Barron et al. (2002) and Gu and Wang (2005) report a positive association, suggesting that information asymmetry arises from investments in recognized intangible assets. However, Mohd (2005) contradicts these findings, focusing on software development firms that could capitalize some R&D costs under SFAS No. 86 and revealing a negative association between capitalized intangibles and information asymmetry. Additionally, Kimbrough (2007) finds that recognized R&D investments were incorporated into equity values in business combinations under SFAS No. 141, which supports the view that capitalizing intangible assets enhances the informativeness of accounting data.

Intriguingly, Ju et al. (2019) explore the impact of IFRS enforcement on the relationship between mandatory IFRS adoption and firms' voluntary disclosure. Their findings suggest that the increase in the frequency of management forecasts after IFRS adoption was more pronounced for firms from non-IFRS-mandating countries, indicating that IFRS enforcement served as a substitute for firms' voluntary disclosure.

In summary, the distinct accounting treatment of intangible assets, whether recognized or unrecognized, plays a pivotal role in shaping managers' decisions regarding the issuance of voluntary earnings guidance. This differentiation significantly impacts information asymmetry, forecast accuracy and the overall informativeness of financial reporting across diverse regulatory environments.

2.3. MEF and intangible assets

Although there is an extensive body of literature on the accounting treatment of intangibles, to our knowledge, only a few studies investigate the relationship between voluntary disclosures and the accounting treatment of intangibles. These studies investigate the association between product market competition and capital market disclosure, relying on the proportion of R&D expenditures as a proxy for competition (e.g., Cao et al., 2018). Cao et al. (2018) investigate the association between "technological peer pressure" (the relative threat of competitors' technological advancement to a firm's technological preparedness[8]) and voluntary product press-release disclosures. They find a significant negative association between TPP and product release disclosures, which suggests that product release disclosures are characterized by economically meaningful proprietary costs. In contrast, when they substitute MEF frequency for product release disclosures, they

[8] Cao et al. (2018) rely on R&D stock to determine both measures of threats from competitors' technological advances and the firm's technological preparedness but do not consider the direct link between voluntary disclosure and R&D expenditures.

fail to find a significant association between voluntary disclosures and TPP, which suggests that MEFs provide little proprietary information to competitors.[9] Jones (2007) develops a disclosure index based on numerical and descriptive information about R&D-related activities, such as information concerning R&D spending, R&D projects in progress and development-stage R&D, but does not find a significant relationship between R&D and her voluntary disclosure index.[10]

Wang (2007) investigates a potential "chilling effect" post-Regulation Fair Disclosure (Reg FD) following the use of private MEF guidance in the pre-Reg FD period. She finds that pre-Reg FD private MEF issuers with lower information asymmetry and higher proprietary costs (proxied by the proportion of R&D expenditures to total assets) are less likely to provide public earnings guidance post-Reg FD, as they have greater incentives to stay silent.[11] Mohd (2005) finds a negative association between capitalized intangibles and information asymmetry using a sample of software development firms that are able to capitalize some R&D costs under SFAS No. 86. Kimbrough (2007) uses a sample of acquirers in business combinations required under SFAS No. 141 to estimate the fair value of the target's R&D capital and finds that recognized R&D investments are incorporated into equity values, which supports the conjecture that the process of capitalizing intangible assets supports the informativeness of accounting data. Interestingly, Gu et al. (2019) investigate whether the changes in mandatory financial reporting through IFRS enforcement affect the relationship between mandatory IFRS adoption and firms' voluntary disclosure. Their findings reveal that the increase in or the frequency of the issuance of management forecasts after IFRS adoption is higher for firms from non-IFRS-mandating countries than for those from IFRS-mandating countries, indicating that IFRS enforcement is a substitute for firms' voluntary disclosure.

2.3.1. Hypothesis 1: MEFs and unrecognized intangibles

Intangibles are characterized by greater information asymmetry between managers and investors. This asymmetry is particularly pronounced in the case of unrecognized intangibles (Barron et al., 2002). Empirical findings suggest that the immediate expensing of intangibles reduces the value relevance of financial reports, potentially distorts earnings and book values and complicates firm valuation. Hence, managers may be motivated to mitigate this asymmetry by disclosing MEFs, aiming to reduce both information asymmetry and uncertainty regarding future payoffs from investments in unrecognized intangibles. MEFs are considered one of the most informative voluntary disclosure mechanisms for equity market participants (Beyer et al., 2010) that present relatively lower proprietary cost concerns for managers (Ajinkya et al., 2005; Cao et al., 2018) compared with direct product release disclosures.[12] Therefore, MEFs could be used to manage and communicate future earnings expectations from investments in unrecognized intangibles, thus alleviating some of the information risk facing capital market participants.

Unrecognized intangibles are also characterized by greater future earnings uncertainty (Kothari et al., 2002; Amir et al., 2007; Pandit et al., 2011). The increased uncertainty in earnings associated with unrecognized intangibles could result in inaccurate managerial earnings guidance, potentially undermining management's credibility (Yang, 2012) and negatively impacting managers' job security (Lee et al., 2012). Therefore, in spite of managerial incentives to reduce information asymmetry by issuing MEFs, managers of firms with higher unrecognized intangibility might refrain from this voluntary disclosure mechanism.

Despite the competing arguments regarding managerial incentives to disclose MEFs in the presence of higher proportions of unrecognized intangibles, we argue that the costs of issuing inaccurate earnings guidance carry more weight for managers than the benefits of MEF in reducing information asymmetry. Conse-

[9] They find a weak correlation between MEF frequency and their developed disclosure measure and suggest that "managers treat product disclosures and MEFs as distinct types of disclosure, each with its own purpose" (Cao et al., 2018, p. 97).

[10] The primary difference between our study and that of Jones (2007) is that we use MEF instead of a self-developed voluntary disclosure index, which is subjective and cannot be easily replicated (Francis et al., 2008). Jones (2007) also uses R&D expenses as a proxy for proprietary costs, whereas we focus on the accounting treatment of intangibles (both recognized and unrecognized) and assess the tradeoff between information asymmetry and earnings uncertainty in MEF decisions.

[11] She finds that a one standard deviation increase in R&D expenses increases the likelihood of post-Reg FD non-disclosure by 55.15%.

[12] Ajinkya et al. (2005) do not find an association between voluntary disclosure of earnings forecasts and proprietary costs, whereas Wang (2007) finds that firms with high proportions of R&D expenses elected to replace private earnings guidance prior to the enactment of Reg FD with non-disclosures rather than with public disclosures. We thank an anonymous reviewer for this comment.

quently, we predict that the negative relationship between MEF issuance and unrecognized intangibles is driven by higher levels of earnings uncertainty.

Furthermore, firms with a high proportion of unrecognized intangibles, such as R&D expenses, may experience higher levels of information risk because of the expensing nature of these items. The inherent uncertainty in predicting future earnings accurately may lead managers to be more cautious in issuing MEFs. By refraining from providing explicit forecasts, managers aim to mitigate the potential for forecast inaccuracies and maintain a conservative approach in their communication with market participants. Therefore, we hypothesize that managers of firms with greater unrecognized intangibles will be less inclined to issue voluntary earnings guidance. We thus present our first hypothesis, in alternative form, as follows:

H1. Firms with higher proportions of unrecognized intangible assets are associated with a lower likelihood of MEF issuance.

2.3.2. Hypothesis 2: MEFs and recognized intangibles

The issuance of MEFs for firms with relatively high proportions of recognized intangible assets on the balance sheet is also a subject of debate. On the one hand, if managers regard future payoffs from investment in recognized intangibles as uncertain relative to those from investment in tangible assets because of the potential for future impairment revisions of recognized intangibles, they may refrain from issuing an MEF for fear of providing an inaccurate forecast and facing the ensuing human capital and reputational capital consequences. This argument suggests a non-significant or even negative association between the proportions of recognized intangibles and MEF issuance. Furthermore, if managers find that firms with a high proportion of recognized intangible assets have significantly more analysts following and lower analyst earnings forecast errors (Zoltan and Wyatt, 2006), they may believe that issuing MEFs to manage or communicate earnings expectations may be redundant. This notion would thus suggest no (or a negative) association between the presence of high proportions of recognized intangibles and MEFs.

On the other hand, managers of firms with a higher proportion of recognized intangible assets may be more likely to issue management earnings forecasts for several reasons. First, because recognized intangibles undergo the capitalization process, they are typically associated with more stable and predictable future cash flows. This enhanced predictability in forecasting reduces the likelihood of errors in MEFs. Managers prioritizing accurate forecasts for job security may feel more confident in issuing forecasts for firms with recognized intangibles (Healy et al., 2001). Second, recognized intangible assets that are reflected in the balance sheet provide a transparent representation of the firm's value. Managers of firms with a high proportion of recognized intangibles may issue forecasts to reinforce credibility, signal transparency and enhance investor confidence (Watts and Zimmerman, 1986). Third, capitalizing intangible assets allows investors to assess the firm's commitment to innovation and long-term value creation. Managers may issue forecasts to manage investor expectations and provide insights into the potential returns from their recognized intangible assets (Lev and Sougiannis, 1996). That is, managers may use management forecasts as a communication tool to keep stakeholders informed about the expected benefits and outcomes associated with these strategic intangible assets. Finally, recognized intangibles that are being accounted for on the balance sheet alleviate the information asymmetry between management and investors. Issuing management forecasts can further bridge this gap by providing forward-looking guidance that enhances investors' understanding of the firm's financial prospects (Barth, 2001; Kannan et al., 2023).

In summary, the capitalization of intangible assets provides a structured framework for managers to communicate valuable information to the market. By issuing MEFs, managers of firms with a higher proportion of recognized intangibles aim to enhance transparency, booster credibility, manage investors' expectations, maintain investors' confidence and foster positive perceptions of the firm's intrinsic value. Therefore, we argue that managers of firms with higher proportions of recognized intangible assets could be more inclined to issue voluntary earnings guidance. We thus present our second hypothesis, in alternative form, as follows:

H2. Firms with higher proportions of recognized intangible assets are associated with a higher likelihood of MEF issuance.

3. Research design

To test *H1* and *H2*, we investigate the association between intangibles (both recognized and unrecognized) and the likelihood of MEF issuance using the following pooled cross-sectional logistic regression, aggregating intangible assets into unrecognized (*UNREC_INTAN*) and recognized (*REC_INTAN*) subgroups, consistent with Barth et al. (2001).

$$\begin{aligned} OCCUR_{it} = {} & \beta_0 + \beta_1 UNREC\_INTAN_{it-1} + \beta_2 REC\_INTAN_{it-1} + \beta_3 LagOCCUR_{it-1} + \beta_4 CAPXS_{it-1} \\ & + \beta_5 STDRET_{it-1} + \beta_6 MTB_{it-1} + \beta_7 STDEARN_{it-1} + \beta_8 ANALYST_{it-1} + \beta_9 LEV_{it-1} \\ & + \beta_{10} LMV_{it-1} + \beta_{11} ROE_{it-1} + \beta_{12} ISSUE_{it-1} + \beta_{13} \Delta EPS_{it-1} + \beta_{14} INST_{it-1} + \beta_{15} AUDIT_{it-1} \\ & + \beta_{16} LOSS_{it-1} + \sum IndustryandYeareffects + \varepsilon_{it} \end{aligned} \quad (1)$$

Furthermore, we disaggregate *UNREC_INTAN* into *RNDS* and *ADVS*, also consistent with Barth et al. (2001), and use the following pooled cross-sectional logistic regression.

$$\begin{aligned} OCCUR_{it} = {} & \beta_0 + \beta_1 RNDS_{it-1} + \beta_2 ADVS_{it-1} + \beta_3 REC_{INTAN_{it-1}} + \sum Controls \\ & + \sum IndustryandYeareffects + \varepsilon_{it} \end{aligned} \quad (2)$$

Variable definitions are given in Appendix A. We measure the dependent variable (*OCCUR*) in Eqs. (1) and (2) in year *t* and the independent variables in year *t*–1 consistent with Cao et al. (2018) to ensure that financial statement information is available to managers before the issuance of earnings forecasts.[13] We include year and industry indicator variables in all of the estimations to control for year and industry fixed effects. We use Fama and French's (1997) 48 industry definitions for the industry indicator variables. We cluster firm-year observations by firm to eliminate autocorrelations, as recommended by Petersen (2009). To alleviate the influence of outliers, we winsorize ratio-type variables (*REC_INTAN*, *MTB*, *STDEARN*, *LEV*, *ROE*, *ISSUE*, *ΔEPS* and *INST*) at the top and bottom 1 % of their annual distributions. We winsorize the sales-deflated variables (*RNDS*, *ADVS*, and *CAPXS*) at 1.[14]

H1 predicts a significant negative association between MEF issuance and the proportion of unrecognized intangibles to total sales. Hence, we anticipate a negative coefficient for *UNREC_INTAN* (β_1) in Eq. (1) and negative coefficients for *RNDS* (β_1) and *ADVS* (β_2) in Eq. (2). *H2* predicts a significant positive association between MEF issuance and the proportion of recognized intangibles to total assets. Hence, we anticipate positive coefficients for *REC_INTAN* (β_2 in Eq. (1) and β_3 in Eq. (2)).

The control variables in our model are based on the literature (e.g., Ajinkya et al., 2005; Jones, 2007; Wang, 2007; Cao et al., 2018). We include *LagOCCUR* to control for the potential stickiness of MEF issuance following Cao et al. (2018) and capital expenditures, *CAPXS*, to control for tangible investments. Consistent with Jones (2007), we control for information asymmetry by using the standard deviation of market-adjusted daily stock returns, *STDRET*. Following Ajinkya et al. (2005), we also control for the market-to-book ratio, *MTB*, and leverage, *LEV*. Waymire (1985) documents an association between earnings volatility and the frequency of earnings forecasts. Accordingly, we control for the standard deviation of earnings (*STDEARN*). Consistent with Lang and Lundholm (1993), who document a positive association between company disclosures and analyst following, we include the log number of analysts following a firm, *ANLST*. Kasznik and Lev (1995) provide evidence of a positive association between firm size and the issuance of MEFs. Hence, we include *LMV* to control for firm size. Following Wang (2007), we control for return on equity (*ROE*) and the issuance of both debt and equity (*ISSUE*). Baginski et al. (2002) suggest that earnings news is negatively related to the issuance of MEFs. Accordingly, consistent with Baginski et al. (2002), we include *ΔEPS* in the model to control for earnings news. We include *INST* following Cao et al. (2018) and

[13] Our conclusions regarding *H1* are not affected when we use contemporaneous independent variables instead of lagged independent variables.

[14] We winsorize sales-deflated variables at 1 instead of at the top and bottom 1% of their distributions because for some observations, the sales deflator is too small. Consequently, winsorizing at the top and bottom 1% of their distributions does not eliminate extreme observations for sales-deflated variables.

Ajinkya et al. (2005) to control for institutional investors' holdings. Because firms audited by Big N auditors have better disclosures than other firms (Lang and Lundholm, 1993), we include *AUDIT*, a dichotomous variable, to control for the effects of Big N auditors. Hayn (1995) suggests that earnings are not useful in the valuation of loss-making firms. In the same vein, Ajinkya et al. (2005) suggest that managers experience more problems forecasting earnings for loss firms, and they find that loss firms are less likely to issue MEFs. Accordingly, we include a *LOSS* dichotomous variable in the regression models.

4. Sample selection, descriptive statistics and Pearson correlations

4.1. Sample selection

We use all of the firm-year observations included in the Compustat Annual Files, Center for Research in Security Prices (CRSP) and I/B/E/S files with data required for the estimation of Eq. (1). In addition, we require firm-year observations to have positive sales revenue, total assets and book value of equity. We also require firm-year observations to have at least one analyst following a firm.

Chuk et al. (2013) suggest that MEF data coverage in the pre-1998 period is incomplete, that there is a large increase in MEF data coverage after 1998 and that MEF data are more likely to cover firms with high numbers of analysts following. Therefore, our sample covers the period from 1998 to 2018. Financial data are drawn from Compustat Annual Files, analyst following and MEF data are from the I/B/E/S files and stock returns are from the CRSP. Our sample includes 14,605 firm-year observations that satisfy the above sample selection criteria.

4.2. Descriptive statistics and Pearson correlations

Table 1 presents the mean, median, bottom quartile (*Q1*), top quartile (*Q3*) and standard deviation of each variable included in Eq. (1). The mean value of *OCCUR*, MEF issuance, is 38.4 %, which suggests that approximately 40 % of our firm-year observations issue at least one MEF annually. The mean value of the R&D expense to sales ratio, *RNDS*, is 14.8 %, and the mean value of the advertising expense to sales ratio, *ADVS*, is 1.1 %, which suggests that our sample firms spend approximately 14 times more on R&D than

Table 1
Descriptive statistics.

	N	MEAN	STD	Q1	MEDIAN	Q3
OCCUR	17,228	0.384	0.486	0.000	0.000	1.000
UNREC_INTAN	17,228	0.159	0.241	0.019	0.069	0.184
RNDS	17,228	0.148	0.241	0.010	0.058	0.167
ADVS	17,228	0.011	0.028	0.000	0.000	0.007
REC_INTAN	17,228	0.297	0.319	0.021	0.190	0.481
LagOCCUR	17,228	0.364	0.481	0.000	0.000	1.000
CAPXS	17,228	0.070	0.129	0.020	0.037	0.066
STDRET	17,228	0.030	0.016	0.018	0.026	0.038
MTB	17,228	3.740	4.017	1.594	2.573	4.201
STDEARN	17,228	0.078	0.100	0.019	0.040	0.096
ANALYST	17,228	1.700	0.917	1.098	1.791	2.397
LEV	17,228	0.160	0.170	0.000	0.114	0.273
LMV	17,228	6.660	1.811	5.387	6.539	7.810
ROE	17,228	–0.025	0.420	–0.052	0.078	0.154
ISSUE	17,228	0.130	0.212	0.009	0.036	0.154
ΔEPS	17,228	–0.006	0.172	–0.023	0.003	0.021
INST	17,228	0.665	0.264	0.483	0.716	0.872
AUDIT	17,228	0.870	0.336	1.000	1.000	1.000
LOSS	17,228	0.309	0.462	0.000	0.000	1.000

Notes: This table shows the mean (MEAN), standard deviation (STD), bottom quartile (Q1), median (MEDIAN) and top quartile (Q3) of firm characteristics measured using Eq. (1). Variable definitions are presented in Appendix A.

on advertising. This finding denotes the importance of R&D investment relative to advertising. The mean *CAPXS* is 7.0 %, which suggests that our sample firms spend less than half the amount on capital expenditures that they do on R&D. The mean value of purchased intangibles, *REC_INTAN*, is approximately 30 % of total assets.

Table 2 presents the Pearson correlations. The correlation between *OCCUR* and *LagOCCUR* is 0.72, which suggests a persistent nature of MEF issuance: firms that issue MEFs in one year continue to issue them in the following year. There is a negative correlation between R&D expenditures and MEF issuance (i.e., the correlation between *RNDS* and *OCCUR* is –0.22) and a positive correlation between MEF issuance and recognized intangibles (i.e., the correlation between *REC_INTAN* and *OCCUR* is 0.29). Furthermore, advertising expenses show a slight positive correlation with MEF issuance (the correlation between *ADVS* and *OCCUR* is 0.03). Overall, these correlations suggest that R&D is inherently different from recognized intangibles with respect to MEF issuance and provide initial findings consistent with *H1* and *H2*.

There is a positive correlation between *RNDS* and *STDRET* (0.34), which suggests that information asymmetry increases with R&D expenses. However, there is a negative correlation between *REC_INTAN* and *STDRET* (–0.30), which suggests that information asymmetry decreases with recognized intangibles. These opposing correlations suggest important differences between recognized and unrecognized intangibles with respect to information asymmetry.

Table 2
Pearson Correlations.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*OCCUR*	1.00																
2	*LagOCCUR*	0.72	1.00															
3	*RNDS*	– 0.22	– 0.22	1.00														
4	*ADVS*	0.03	0.03	– 0.02	1.00													
5	*REC_INTAN*	0.29	0.29	– 0.21	0.04	1.00												
6	*CAPXS*	– 0.12	– 0.12	0.44	**– 0.00**	– 0.18	1.00											
7	*STDRET*	– 0.29	– 0.30	0.34	**0.02**	– 0.30	0.19	1.00										
8	*MTB*	0.04	0.02	0.18	0.10	– 0.10	0.05	**– 0.00**	1.00									
9	*STDEARN*	– 0.21	– 0.21	0.41	0.04	– 0.17	0.11	0.42	0.10	1.00								
10	*ANALYST*	0.27	0.27	– 0.08	0.07	0.18	**– 0.00**	– 0.35	0.14	– 0.17	1.00							
11	*LEV*	0.14	0.14	– 0.21	**0.00**	0.25	0.02	– 0.18	0.09	– 0.18	0.17	1.00						
12	*LMV*	0.33	0.31	– 0.17	0.04	0.24	– 0.04	– 0.56	0.26	– 0.29	0.74	0.21	1.00					
13	*ROE*	0.22	0.20	– 0.51	– 0.03	0.13	– 0.22	– 0.44	– 0.11	– 0.48	0.17	0.02	0.36	1.00				
14	*ISSUE*	**– 0.00**	**– 0.01**	0.18	**0.00**	0.03	0.17	0.09	0.15	0.07	– 0.05	0.27	– 0.03	– 0.17	1.00			
15	*ΔEPS*	0.03	**– 0.01**	**0.00**	**– 0.01**	**0.00**	– 0.03	– 0.05	0.05	– 0.02	– 0.03	– 0.04	0.05	0.22	**– 0.00**	1.00		
16	*INST*	0.27	0.27	– 0.18	**– 0.00**	0.25	– 0.11	– 0.51	0.05	– 0.23	0.49	0.15	0.52	0.26	**– 0.00**	**– 0.01**	1.00	
17	*AUDIT*	0.13	0.12	0.03	**0.01**	**0.01**	**0.01**	– 0.07	0.04	– 0.04	0.29	0.10	0.29	0.06	– 0.01	**– 0.00**	0.22	1.00
18	*LOSS*	– 0.25	– 0.24	0.50	0.03	– 0.13	0.21	0.45	0.03	0.41	– 0.18	– 0.08	– 0.37	– 0.63	0.11	– 0.17	– 0.27	– 0.06

Notes: This table presents the Pearson correlations. Bold correlations are NOT significant at 5%. Variable definitions are presented in Appendix A.

The correlation between *RNDS* and *STDEARN* is 0.41, that between *ADVS* and *STDEARN* is 0.04 and that between *REC_INTAN* and *STDEARN* is –0.17. These results suggest a significant positive correlation between unrecognized intangibles (i.e., R&D and advertising expenses) and earnings uncertainty and a significant negative correlation between recognized intangibles and earnings uncertainty. In addition, the correlation between R&D expenses and earnings uncertainty is approximately 10 times that between advertising expenses and earnings uncertainty. These correlations suggest important differences for recognized versus unrecognized intangibles with respect to uncertainty. R&D activities involve both technical and commercial uncertainty, while advertising and purchased intangibles involve only commercial uncertainty. Innovation is a highly uncertain endeavor. In the R&D stage, it is highly uncertain whether an innovation activity will produce new knowledge or a new product. However, once new knowledge of a product is generated and technical uncertainty is eliminated, the only form of uncertainty remaining is commercial uncertainty. Consequently, overall earnings uncertainty for R&D investments is much greater than that for advertising investments and purchased intangibles.

5. Empirical results

5.1. MEF issuance and intangibles

Table 3 presents the pooled cross-sectional logistic regression results of Eqs. (1) and (2). We include industry and year fixed effects in all of the estimations. Model (1) is the baseline model, in which we regress *OCCUR* at time *t* on *OCCUR* determinants at time *t*–1 while excluding the variables of interest (intangible invest-

Table 3
MEF Issuance and Intangibles.

H1: Firms with higher proportions of unrecognized intangible assets are associated with a lower likelihood of MEF issuance.
H2: Firms with higher proportions of recognized intangible assets are associated with a higher likelihood of MEF issuance.

	Expected Sign	Model 1	Model 2	Model 3
UNREC_INTAN (H1)	–		–1.068(–5.85)***	
RNDS	–			–1.130(–5.13)***
ADVS	–			–0.065(–0.07)
REC_INTAN (H2)	+		0.699(7.71)***	0.690(7..62***
LagOCCUR	+	2.243(40.08)***	2.243(39.67)***	2.243(39.65)***
CAPXS	+/–	–0.901(–3.93)***	–0.277(–1.14)	0.250(–1.02)
STDRET	–	–9.442(–4.12)***	–7.766(–3.35)***	–7.850(–3.39)***
MTB	–	–0.006(–0.97)	0.007(1.19)	0.007(1.18)
STDEARN	–	–1.348(–4.50)***	–1.039(–3.45)***	–1.043(–3.46)***
ANALYST	+	0.009(0.25)	0.030(0.83)	0.029(0.79)
LEV	–	0.716(4.61)***	0.203(1.23)	0.202(1.23)
LMV	+	0.240(9.12)***	0.209(7.87)***	0.208(7.84)***
ROE	+	0.202(2.20)**	0.124(1.31)	0.120(1.27)
ISSUE	+	0.225(1.99)**	0.261(2.16)**	0.267(2.21)**
ΔEPS	+	0.324(2.16)**	0.416(2.73)***	0.423(2.79)***
INST	+	0.429(3.31)***	0.392(3.01)***	0.396(3.04)***
AUDIT	+	0.158(1.74)*	0.211(2.30)**	0.212(2.31)**
LOSS	–	–0.263(–4.07)***	–0.212(–3.23)***	–0.211(–3.22)***
Constant		–2.439(–6.40)***	–2.507(–5.85)***	–2.523(–5.80)***
Industry and year effects		Yes	Yes	Yes
N		17,228	17,228	17,228
Psuedo-R^2		63.84 %	64.26 %	64.26 %
Model chi^2		37.05***	34.83***	31.96***

Z statistics are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
$OCCUR_{it} = \beta_0 + \beta_1 UNREC\_INTAN_{it-1} + \beta_2 REC\_INTAN_{it-1} + \sum Controls + \sum Industry\ and\ Year\ effects + \varepsilon_{it}$ (1).
$OCCUR_{it} = \beta_0 + \beta_1 RNDS_{it-1} + \beta_2 ADVS_{it-1} + \beta_3 REC\_INTAN_{it-1} + \sum Controls + \sum Industry\ and\ Year\ effects + \varepsilon_{it}$ (2).
Notes: This table presents the cross-sectional pooled logistic regression results for Eq. (1). The dependent variable is *OCCUR*. We include industry and year fixed effects in all of the estimations. Firm-year observations are clustered by firm to eliminate autocorrelations, as recommended by Petersen (2009). Variable definitions are presented in Appendix A.

ments). For Model (1), on average, firms with prior period earnings guidance (*LagOCCUR*), more leverage (*LEV*), of a larger size (*LMV*) and that have a higher percentage of institutional ownership (*INST*) are significantly more likely than other firms to issue contemporaneous MEFs (*OCCUR*) ($p < 0.01$). Furthermore, we find that firms experiencing greater EPS change (ΔEPS) and with greater return on equity (*ROE*) at time *t*–1 are significantly more likely than other firms to issue an MEF at time *t* ($p < 0.05$).

The findings for Model (1) also suggest that firms with higher capital expenditures (*CAPXS*), higher standard deviations of returns (*STDRET*) and higher earnings uncertainty (*STDEARN*) and firms that incur losses (*LOSS*) at time *t*–1 issue significantly fewer contemporaneous MEFs than other firms.

As shown in Table 3, Models (2) and (3) include the variables of interest in addition to the vector of *OCCUR* determinants included in Model (1). Model (2) includes an aggregate proxy for unrecognized intangible assets, *UNREC_INTAN* (the sum of *RNDS* and *ADVS*) and a proxy for recognized intangibles (*REC_INTAN*), whereas Model (3) disaggregates *UNREC_INTAN*.

The findings for Model (2) indicate a significant negative association between *OCCUR* at time *t* and *UNREC_INTAN* at time *t*–1 ($p < 0.01$) consistent with *H1* and a significant positive association between *OCCUR* and *REC_INTAN* ($p < 0.01$) consistent with *H2*. The coefficient of *REC_INTAN* in Model (2) is 0.699 ($p < 0.01$), indicating that a one standard deviation increase in purchased intangibles leads to an approximately 25 % increase in the odds of issuing MEFs.[15]

When *UNREC_INTAN* is disaggregated into *RNDS* and *ADVS*, the findings for Model (3) indicate that the negative association between *OCCUR* and *UNREC_INTAN* in Model (2) is driven by the ratio of R&D expenses to sales (*RNDS*). The coefficient of *RNDS* is –1.130 ($p < 0.01$), which suggests that MEF issuance decreases with R&D intensity, consistent with *H1*. A one standard deviation increase in *RNDS* leads to a 24 % decrease in the odds ratio of issuing an MEF. The coefficient of *ADVS* is –0.065, which is not significant; this suggests that the ratio of advertising expenses to total sales at time *t*–1 does not significantly affect managers' decision to issue an MEF at time *t*.

As discussed, there are important differences between R&D and purchased intangibles with respect to information asymmetry and earnings uncertainty, both of which are likely to affect MEF issuance. The negative association found between R&D intensity and MEF issuance suggests that the impact of earnings uncertainty dominates the impact of information asymmetry for R&D. However, the positive association found between purchased intangibles and MEF issuance suggests that the impact of information asymmetry dominates the impact of uncertainty for purchased intangibles. The non-significant result for advertising suggests that the impact of information asymmetry offsets the impact of uncertainty for intangible assets to be generated from advertising expenses and marketing spending.

Overall, the results shown in Table 3 suggest that there are important differences between intangibles with respect to information asymmetry and uncertainty, both of which lead to differences in associations between intangibles and MEF issuance.,[16,17] Furthermore, our combined results are consistent with the argument that management credibility is a leading driver of management's decision to voluntarily issue earnings forecasts for both recognized and unrecognized intangibles.

[15] % change in odds = $100[\exp(S_i\beta_i) - 1]$, where S_i is the standard deviation of variable *i* and β_i is the coefficient of variable *i*.

[16] Our findings in Table 3 are robust to alternative scaling (total assets as a scalar for *RNDS* and *ADVS* rather than sales) and the use of probit rather than logit regression analysis. In addition, given the strong correlation between *OCCUR* and *LagOCCUR*, we repeat the Table 3 analysis after excluding *LagOCCUR* and find qualitatively similar results, although the R^2 value drops from approximately 64% to 35%.

[17] To check for multicollinearity, we estimate the variance inflation factors (VIFs) for the independent variables shown in Table 3. The cutoff point for severe multicollinearity is 10 (Hair et al., 1995). We use ordinary least squares (OLS) regression when calculating the VIFs instead of logistic regression. All of the VIFs in Table 3 are less than 10, which suggests that multicollinearity is not a concern for the independent variables in Table 3.

6. Additional analysis and robustness checks

6.1. Cross-sectional analysis

In this section, we investigate the cross-sectional determinants of the relationship between intangibles and MEF issuance in an attempt to distinguish between competing arguments for MEF issuance in the presence of higher proportions of recognized and unrecognized intangible assets. Specifically, Panel A of Table 4 shows the impact of information asymmetry on the association between MEFs and both recognized and unrecognized intangibles. We use two proxies for information asymmetry (*ASYMMETRY*) identified in the literature:

Table 4
The Cross-Sectional Determinants of MEF Issuance.

Panel A: The effect of information asymmetry on the association between intangible assets and MEFs

	Information Asymmetry	
	STDRET	*AFD*
	Model 1	Model 2
RNDS	–1.265(–3.25)***	–0.842(–2.91)***
ADVS	–2.445(–1.07)	1.585(1.18)
REC_INTAN	0.861(4.81)***	0.473(3.83)***
ASYMMETRY	–7.904(–2.60)***	–3.738(–6.31)***
*RNDS*ASYMMETRY*	3.260(0.40)	–1.989(–1.29)
*ADVS*ASYMMETRY*	81.066(1.22)	–20.440(–1.71)*
*REC_INTAN*ASYMMETRY*	–6.298(–1.13)	1.088(1.00)
Constant	–2.524(–5.74)***	–2.126(–5.29)***
∑ controls	Yes	Yes
Industry and year effects	Yes	Yes
N	17,228	15,302
Psuedo-R^2	64.28 %	65.52 %
Model chi^2	28.28***	67.28***

Panel B: The effect of earnings uncertainty on the association between intangible assets and MEFs

	Earnings Uncertainty	
	PRE_STDEARN *(t–5 – t–1)*	*POST_STDEARN* *(t + 1 – t + 4)*
	Model 1	Model 2
RNDS	–1.572(–5.62)***	–1.258(–4.36)***
ADVS	–0.536(–0.41)	–1.814(–1.64)
REC_INTAN	0.659(5.76)***	0.715(6.45)***
STDEARN	–1.873(–3.54)***	–1.071(–2.79)***
*RNDS*STDEARN*	3.211(2.76)***	1.292(1.45)
*ADVS*STDEARN*	7.932(0.60)	10.543(4.31)***
*REC_INTAN*STDEARN*	0.408(0.36)	0.460(0.84)
Constant	–2.260(–5.48)***	–2.306(–4.86)***
∑ controls	Yes	Yes
Industry and year effects	Yes	Yes
N	17,228	15,058
Psuedo-R^2	64.28 %	61.18 %
Model chi^2	29.84***	26.93***

Z statistics are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

$$OCCUR_{it} = \beta_0 + \beta_1 RNDS_{it-1} + \beta_2 ADVS_{it-1} + \beta_3 REC\_INTAN_{it-1} + \beta_4 ASYMMETRY_{it-1} + \beta_5 (RNDS*ASYMMETRY)_{it-1} + \beta_6 (ADVS*ASYMMETRYT)_{it-1} + \beta_7 (REC\_INTAN*ASYMMETRY)_{it-1} + \sum \text{Controls} + \sum \text{Industry and Year effects} + \varepsilon_{it} \quad (3).$$

$$OCCUR_{it} = \beta_0 + \beta_1 RNDS_{it-1} + \beta_2 ADVS_{it-1} + \beta_3 REC\_INTAN_{it-1} + \beta_4 STDEARN_{it-1} + \beta_5 (RNDS*STDEARN)_{it-1} + \beta_6 (ADVS*STDEARN)_{it-1} + \beta_7 (REC\_INTAN*STDEARN)_{it-1} + \sum \text{Controls} + \sum \text{Industry and Year effects} + \varepsilon_{it} \quad (4).$$

Notes: This table presents the cross-sectional pooled logistic regression results for Eqs. (3) and (4). The dependent variable in all of the Table 4 analysis is *OCCUR*. We include industry and year fixed effects in all of the estimations. Firm-year observations are clustered by firm to eliminate autocorrelations, as recommended by Petersen (2009). Variable definitions are presented in Appendix A.

(1) the standard deviation of returns (*STDRET*) at time *t*–1 (Model 1) and (2) analyst earnings forecast dispersion (*AFD*) calculated as the standard deviation of these forecasts at time *t*–1 (Model 2). Panel B of Table 4 assesses the impact of earning uncertainty (*STDEARN*) on the association between MEFs and both recognized and unrecognized intangibles. We use two proxies for earnings uncertainty: (1) the standard deviation of earnings from year *t*–5 to year *t*–1 (*PRE_STDEARN*[18] in Model 1) and (2) the forward-looking standard deviation of earnings from years $t+1$ to year $t+4$ (*POST_STDEARN* in Model 2). In both panels, we disaggregate the *UNREC_INTAN* measure using *RNDS* and *ADVS* to offer detailed insights into the unique features of both intangible asset investments and provide untabulated findings on the aggregate unrecognized intangible measure (*UNREC_INTAN*). For all of the results shown in Table 4, we control for the MEF determinants identified in Eq. (1) as well as industry and year fixed effects. For brevity, Table 4 does not display the results for the MEF determinants.

In Table 4, Model 1, Panel A demonstrates a significant negative association between *RNDS* and *OCCUR* ($p < 0.01$) and a significant positive association between *REC_INTAN* and *OCCUR* ($p < 0.01$), consistent with *H1* and *H2* and the results shown in Table 3. We also find a significant negative main effect association between *OCCUR* and *ASYMMETRY* when using *STDRET* as a proxy ($p < 0.01$), which suggests that information asymmetry reduces the likelihood of MEF issuance, perhaps because of human capital considerations or fear of harm to reputational capital. We find no significant incremental effect of *ASYMMETRY* on the associations between *OCCUR* and *RNDS*, *ADVS* and *REC_INTAN*. Using the aggregate intangibility measure *UNREC_INTAN*, we also find a non-significant interaction effect.[19]

In Table 4, Model 2, Panel A uses analyst earnings forecast dispersion as a proxy for *ASYMMETRY*, which is measured by the standard deviation of these forecasts for all analysts following a specific firm at time *t*–1. The main effect findings for Model 1 shown in Table 4 hold and the main effect on *ASYMMETRY* is negative and significant ($p < 0.01$). We also find a marginally negative association between *OCCUR* and *ADVS*ASYMMETRY* ($p < 0.10$), which suggests that managers may be reluctant to issue an MEF in the period following greater analyst forecast dispersion. It may also be that high analyst dispersion could suggest high earnings uncertainty, which could result in managers' hesitance to issue MEFs.

In Table 4, Panel B assesses the effect of future earnings uncertainty (*STDEARN*) on the associations between *OCCUR* and the proportions of intangibles. Model 1 in Panel B uses *PRE_STDEARN* as a proxy for future earnings uncertainty, whereas Model 2 uses *POST_STDEARN*. Both Models 1 and 2 find a significant negative association between *OCCUR* and *RNDS* ($p < 0.01$) and a significant positive main effect association between *OCCUR* and *REC_INTAN* ($p < 0.01$), consistent with *H1* and *H2*. Furthermore, we find a significant negative main effect association between *OCCUR* and both *STDEARN* proxies (*PRE_STDEARN* and *POST_STDEARN*) ($p < 0.01$), which suggests a reduced likelihood of earnings guidance issuance in the presence of greater earnings uncertainty. Regarding the interaction effect, we find from Models 1 and 2 that more earnings uncertainty may moderate the associations between *OCCUR* and unrecognized intangibles. Specifically, Model 1 finds a significant positive association between *OCCUR* and *RNDS*STDEARN* ($p < 0.01$) and Model 2 finds a significant positive association between *OCCUR* and *ADVS*STDEARN* ($p < 0.01$).

In untabulated analysis, the association between *OCCUR* and the interaction term *UNREC_INTAN*STDEARN* is also positive and significant ($p < 0.01$ in both Models 1 and 2). This result runs counter to the argument that managers may be reluctant to issue MEFs in the presence of high earnings uncertainty. The results shown in Panel B suggest that in the presence of highly unrecognized intangibles, there may be a level of uncertainty at which managers may need to shift their focus from forecast accuracy to managing market and analyst earnings expectations in this highly uncertain environment. In addition, managers of firms with high earnings volatility and high proportions of unrecognized intangibles face a tradeoff between decreasing information asymmetry regarding future payoffs, high proprietary costs and a high likelihood of reputational capital loss inherent in providing inaccurate voluntary earnings forecasts. Given that MEFs exhibit lower proprietary

[18] This is equivalent to the *STDEARN* control variable used in Tables 1–3 and defined in Appendix A. We change the name of this variable in Table 4, Panel B to distinguish it from the *POST_STDEARN* variable.

[19] We assess the VIFs of all of the Panel A analyses, including the industry and year dichotomous variables. We find that all of the variable VIFs do not exceed the severe multicollinearity cutoff of 10 (Hair et al., 1995).

Table 5
MEF Issuance for High Analyst Following and Frequency of MEF issuance.

Dependent Variable	*OCCUR*		*FREQ*	
	High analyst following(5 or more)	Low analyst following(fewer than 5)	*FREQ*	*FREQ* = zero
	Model 1	Model 2	Model 3	Model 4
RNDS	–1.465(–4.97)***	–0.582(–2.17)**	–0.131(3.02)*	–0.926(93.48)***
ADVS	0.227(0.19)	0.194(0.12)	–0.379(2.25)	–0.279(0.55)
REC_INTAN	0.663(5.83)***	1.028(7.81)***	0.075(10.34)***	0.289(68.48)***
Constant	–2.643(–7.24)***	–4.066(–10.12)***	0.048(0.12)	–2.430(131.73)***
∑ controls	Yes	Yes	Yes	Yes
Industry and year effects	Yes	Yes	Yes	Yes
N	10,432	6,796	6,620	17,228
R^2	65.77 %	54.42 %	29.53 %	52.88 %
Model	31.80***	9.81	232.24***	83.52***

Z statistics (chi-square statistics) in Models 1 and 2 (Model 3 and 4) are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Notes: This table presents the cross-sectional pooled logistic regression results for Eq. (1) (presented in Table 3) for high analyst following (Model 1) and low analyst following (Model 2). The high (low) analyst following subsample includes firm-year observations involving at least five (fewer than five) analysts following the firm. Models 3 and 4 provide the cross-sectional pooled negative binomial regression results for Eq. (1) (presented in Table 3) after we replace the dichotomous *OCCUR* variable with a count variable (*FREQ*). Model 3 excludes all firm-year observations with missing *FREQ* values, whereas Model 4 replaces missing *FREQ* values with 0. We include industry and year fixed effects in all of the estimations. Firm-year observations are clustered by firm to eliminate autocorrelations, as recommended by Petersen (2009). Variable definitions are presented in Appendix A.

costs than product release disclosures, what appears to be a higher propensity to issue MEFs by these managers may reflect a higher likelihood of MEF issuance relative to other types of more potentially dangerous disclosures that might reveal more proprietary information to competitors. In addition, as per Garcia Osma (2020), managers may signal confidence in future cash flows using MEF disclosure because it is a credible signal that cannot be mimicked by managers who are less confident in the ultimate payoffs from their R&D investments.

6.2. Analyst following

We perform several robustness checks of the results presented in Table 3. Chuk et al. (2013) suggest that MEF data are more likely to cover firms with high analyst following. To assess the sensitivity of our findings to analyst following, we repeat our analysis presented in Table 3 for a subsample of firms with high analyst following (five or more analysts) in Model 1 of Table 5 and for a subsample of firms with low analyst following (fewer than five analysts) in Model 2 of Table 5. Regardless of analyst coverage, we still find a significant negative association between *OCCUR* and *RNDS* ($p < 0.01$ in Model 1 and $p < 0.05$ in Model 2) and a significant positive association between *OCCUR* and *REC_INTAN* ($p < 0.01$ in Models 1 and 2 of Table 5). These results suggest that the main findings presented in Table 3 are not driven by analyst coverage.

6.3. MEF frequency

In all of the analyses, we use a dichotomous (1/0) MEF issuance dependent variable as our proxy for voluntary disclosures. An alternative voluntary disclosure measure could be MEF frequency, although the two measures may be considered distinct decisions that managers make regarding voluntary disclosures. MEF frequency may be a secondary decision made after managers determine whether to issue an MEF.[20] As a robust-

[20] A major limitation of using MEF frequency concerns the reduction in sample size and thus the effect on the generalizability of the findings.

ness check, we investigate the relationship between MEF frequency (*FREQ*), a count variable, and intangibles using a generalized negative binomial model, and we present our findings for Models 3 and 4 in Table 5. Model 3 removes all of the missing *FREQ* observations, consistent with Ajinkya et al. (2005), whereas Model 4 replaces the missing *FREQ* values with 0, consistent with Cao et al. (2018).

For a reduced sample (n = 6,620), after we exclude missing *FREQ* firm-year observations, the analysis shown in Model 3 indicates a marginally significant negative association between *FREQ* and *RNDS* ($p < 0.10$) and a significant positive association between *FREQ* and *REC_INTAN* ($p < 0.01$). For the full sample (n = 17,228), after we replace missing *FREQ* values with 0, Model 4 finds that *FREQ* is negatively associated with *RNDS* ($p < 0.01$) and positively associated with *REC_INTAN* ($p < 0.01$). These findings are consistent with the findings shown in Table 3 and with *H1* and *H2*. Overall, both the decision to issue MEFs and the frequency of this issuance are influenced by the proportions of recognized and unrecognized intangibles.

6.4. Other robustness checks

According to the U.S. GAAP, SFAS No. 86 provides an exception to the immediate expensing of R&D investments, allowing for the option to capitalize some software development costs. Therefore, the accounting treatment of this subgroup may differ from that of the rest of the sample. We assess whether our results on capitalized intangibles are driven by the software industry and by SFAS No. 86 by excluding 2,446 software industry (SIC codes 7370–7373) firm-year observations. In untabulated analysis, we find evidence consistent with the full sample analysis and with the findings given in Table 3. Specifically, we find a significant negative association between *OCCUR* and *RNDS* ($p < 0.01$) and a significant positive association between *OCCUR* and *REC_INTAN* ($p < 0.01$). These findings suggest that our preliminary results are not influenced by exceptional rulings for the software firms included in our full sample.

We further assess whether our findings regarding the proportion of expensed R&D costs are driven by high-tech industries that invest heavily in R&D. We divide our sample into high-tech[21] and non-high-tech industries and repeat our analysis. Untabulated findings for the two subgroups yield similar results consistent with the findings given in Table 3 and with *H1* and *H2*.

We also reassess our findings regarding *H1* and *H2* using operating expenses rather than sales as a scalar, consistent with the methodology of Barth et al. (2001) and Barron et al. (2002). *RND_F* is firm *i*'s R&D expenses at time *t* divided by firm *i*'s total operating expenses at time *t* minus the sum of R&D expenses for firms in the industry at time *t* divided by the sum of total operating expenses for firms in the same industry at time *t*. *ADV_F* is firm *i*'s advertising expenses at time *t* divided by firm *i*'s total operating expenses at time *t* minus the sum of advertising expenses for firms in the industry at time *t* divided by the sum of total operating expenses for firms in the same industry at time *t*. *REC_INTAN_F* is the ratio of recognized intangible assets to total assets minus the median ratio of industry firms' recognized intangible assets to total assets. In untabulated analysis, we find a significant negative association between MEF and *UNREC_INTAN_F* ($p < 0.01$), consistent with the findings in Table 3 and supporting *H1*. We find a significant positive association between MEF and *REC_INTAN_F* ($p < 0.01$), consistent with the findings in Table 3 and supporting *H2*. We also find that the significant negative association between MEF and *UNREC_INTAN_F* is driven by *RND_F*, as the association between *RND_F* and MEF is negative and significant ($p < 0.01$), also consistent with the findings shown in Table 3.

Finally, we divide our sample into high- and low-litigation industries[22] to assess whether managers' fear of litigation may influence their disclosure behavior in the presence of distinct intangibles and their accounting treatments. For the low-litigation subgroup, we find that managers are more likely to issue an MEF in the presence of greater recognized intangibles *REC_INTAN*_F ($p < 0.01$), consistent with *H2*. This finding could

[21] We rely on the high-tech industry classification given by Barron et al. (2002) and use the following three-digit SIC codes: 283 (drugs), 284 (chemicals), 357 (computer and office equipment), 366 (communications equipment), 367 (electronics), 371 (motor vehicles), 382 (measurement and control devices), 384 (medical instruments) and 737 (software).

[22] We rely on the litigation risk industry classification given by Francis et al. (1994) and use the following four-digit SIC codes: 2833–2836, 3570–3577, 3600–3674 and 5200–5961.

suggest that managers are more confident in their guidance and thus less fearful of litigation for inaccurate guidance in the presence of greater recognized intangibles. For the same subgroup, we do not find significant associations between *OCCUR* and the unrecognized intangible assets (*RNDS* and *ADVS*).

7. Conclusion

Debate persists as to whether managers should continue to issue MEFs or whether MEFs should cease to exist. Another debate revolves around the immediate expensing of intangible investments. We contribute to both debates by assessing MEF disclosure behavior in the presence of varying proportions of recognized and unrecognized intangibles. Managers must assess the potential benefits of issuing guidance (e.g., reducing information asymmetry and cost of capital), particularly for high intangibility-oriented firms, against the costs of providing inaccurate forecasts (reputational damage and even turnover). We hypothesize and find that managers of intangible-intensive firms might be more likely to issue MEFs in the presence of higher proportions of recognized intangibles to reduce information asymmetry and under higher levels of predictability and capabilities to make annual modifications (i.e., impairment adjustments). We also hypothesize and find that managers provide fewer MEFs in the presence of high proportions of unrecognized intangibles as a precautionary measure against issuing inaccurate forecasts.

Research suggests that there is a greater likelihood of MEF issuance when there are more innovation outputs such as patents and citations. We focus on innovation inputs (R&D and advertising expenses) rather than on innovation outputs and on the embedded uncertainties of these investments. We find that managers are less likely to issue MEFs in the presence of high proportions of R&D expenditures. We also find that managers are more likely to issue MEFs in the presence of higher proportions of recognized intangibles.

Our paper highlights various avenues for future research. It would be interesting to identify environments and situations in which managers' incentives to reduce information asymmetries outweigh potential fears of providing earnings forecast errors for firms with high unrecognized intangibles. This may lead managers to provide additional signals conveying their optimism for firms' R&D investments, which would enhance the information content of financial reports and potentially address some documented mis-valuation of intangible-intensive firms. However, identifying situations that result in managerial hesitance to provide MEFs for firms with high recognized intangibles may signal to market participants a level of uncertainty that may need to be accounted for. Furthermore, assessing the complementary nature of managers' MEFs and analysts' earnings forecasts may contribute to the information content of high intangibility firms' financial reports.

The seemingly opposing results between MEF issuance and unrecognized/recognized intangibles reflect the complex considerations that managers face in their decision-making and provide a foundation for further exploration of the intricate interplay between concerns for forecast accuracy and information asymmetry. It is crucial to recognize that these two concerns often involve tradeoffs and that managerial decisions are likely to be influenced by various factors, as the nature of the intangible assets, industry characteristics, the competitive landscape and the regulatory environment all play a role in shaping managerial choices. Future research could further explore the tradeoffs and managerial considerations involved in navigating these complex dynamics.

Finally, our study examines the occurrence (or absence) of management forecasts but does not delve into the accuracy of management guidance. Exploring whether management guidance is indeed less accurate for firms with high unrecognized intangibles could be an interesting avenue for future research.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Definitions of variables

Variable	Definition
Dependent Variables	
OCCUR	Indicator variable equal to 1 if a firm issues an MEF in year *t* and 0 otherwise. We draw MEFs from the I/B/E/S database.
FREQ	Number of MEFs made in year *t*, from the I/B/E/S database.
Treatment and Interaction Variables	
UNREC_INTAN	Sum of RNDS and ADVS (defined below) at the end of year *t*–1.
RNDS	R&D expenses (XRD from Compustat) divided by sales (SALE from Compustat) at the end of year *t*–1. RNDS is winsorized at 1.
ADVS	Advertising expenses (XAD from Compustat) divided by sales at the end of year *t*–1. ADVS is winsorized at 1. If XAD is missing, it is set to 0.
REC_INTAN	Intangible assets (INTAN from Compustat) divided by total assets (AT from Compustat) at the end of year *t*–1. If INTAN is missing, it is set to 0.
AFD	Analyst forecast dispersion calculated by the standard deviation of these forecasts over year *t*–1.
PRE_STDEARN	Standard deviation of earnings (IB from Compustat) divided by total assets (AT from Compustat) for the past 5 years (from year *t*–1 to year *t*–5).
POST_STDEARN	Standard deviation of earnings (IB from Compustat) divided by total assets (AT from Compustat) from year $t + 1$ to year $t + 4$.
Control Variables	
LagOCCUR	Indicator variable equal to 1 if a firm issues an MEF in year *t*–1 and 0 otherwise.
CAPEX	Capital expenditures (CAPX from Compustat) divided by sales revenue at the end of year *t*–1. CAPXS is winsorized at 1.
STDRET	Standard deviation of market-adjusted daily returns over fiscal year *t*–1. Market-adjusted daily returns are calculated as a firm's daily returns (RET from CRSP) minus value-weighted daily market returns (VWRETD from CRSP).
MTB	Market-to-book ratio at the end of year *t*–1. The market-to-book ratio is calculated as the market value of equity divided by the book value of equity (CEQ from Compustat). The market value of equity is calculated as the share price (PRCC_F from Compustat) times the number of shares outstanding (CSHO from Compustat). We exclude from our sample firm-year observations with a negative book value of equity.
STDEARN	Standard deviation of earnings (IB from Compustat) divided by total assets (AT from Compustat) for the past 5 years (from year *t*–1 to year *t*–5)
ANLST	Log number of analysts issuing earnings per share (EPS) forecasts in year *t*–1. The number of analysts is drawn from I/B/E/S. We include in our sample only firm-year observations with at least one analyst following.
LEV	Leverage at the end of year *t*–1 calculated as long-term debt (DLTT from Compustat) plus the current portion of long-term debt (DLC from Compustat) divided by total assets (AT from Compustat).
LMV	Log of the market value of equity at the end of year *t*–1. The market value of equity is calculated as the stock price (PRCC_F from Compustat) times the number of shares outstanding (CSHO from Compustat).
ROE	Return on equity at the end of year *t*–1. ROE is calculated as income before extraordinary items (IB from Compustat) divided by the book value of equity (CEQ from Compustat).

Appendix A (*continued*)

Variable	Definition
ISSUE	Sum of stock and debt issuance divided by total assets in year *t*–1. Stock issuance is measured from SSTK from Compustat, and debt issuance is measured from DLTIS from Compustat.
INST	The percentage of shares owned by institutional investors in December of year *t*–1. The percentage is calculated as the number of shares owned by institutional investors (SHARES from Thomson Reuters' Institutional Holdings 13F database) divided by the number of shares outstanding (SHROUT from CRSP).
ΔEPS	Change in EPS calculated as EPS (EPSPX from Compustat) in year *t*–1 minus that in year *t*–2 divided by the stock price (PRCC_F from Compustat) at the end of year *t*–1.
AUDIT	Indicator variable equal to 1 if a company's auditor in year *t*–1 is a Big N auditor and 0 otherwise. Company auditors are identified from AU from Compustat. We identify a firm Big N as having an auditor with an AU value of 1, 3, 4, 5, 6 or 7.
LOSS	Indicator variable equal to 1 if earnings (IB from Compustat) in year *t*–1 are negative and 0 otherwise.

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