THE EFFECT OF REPORTING UNIT GOODWILL DISAGGREGATION ON IMPAIRMENT ASSESSMENTS: EVIDENCE FROM CRITICAL AUDIT MATTERS

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ABSTRACT

Goodwill is an intangible asset generated when the consideration paid in a business combination exceeds the fair value of the identifiable net assets received by the acquirer. Under U.S. GAAP goodwill impairment assessments are required to be conducted on reporting units at least annually. Management has discretion to disaggregate goodwill by defining more reporting units and by defining reporting units at less consolidated levels (i.e. the firm, segment, or sub-segment). Using recorded impairments, goodwill-related critical audit matters (CAMs), and hand-collected data on the number and level of reporting units, I find that the degree of goodwill disaggregation is associated with a higher likelihood of impairment and higher magnitude impairments. Using future operating cash flows, I find a positive non-linear relationship between the degree of goodwill disaggregation and the predictive value of impairments, with sub-segment-level disaggregation not providing more predictive power than segment-level disaggregation. Using the text of CAMs, I find that auditors emphasize the subjectivity of goodwill that is not disaggregated and the robustness of their related audit procedures, suggesting an association between the degree of disaggregation and the auditor's perceived business risk. Taken together, my findings suggest that changing the unit of assessment from reporting units to segments may reduce the likelihood and magnitude of impairments, but not their informativeness. These findings may be of interest to the FASB, which recently considered changes to the unit of assessment for goodwill impairment.

To Rachel, Hailey, Jake and my parents

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Goodwill is an intangible asset generated when the consideration paid in a business combination exceeds the fair value of the identifiable net assets received by the acquirer. Goodwill comprises a significant portion of the balance sheets of U.S. public companies. In 2020, U.S. public firms reported $4.3 trillion in goodwill, comprising 7.3 percent of total assets for the 30.4 percent of firms with a non-zero goodwill balance (Nunes and Warner 2022). U.S. accounting standards require annual assessment of the value of goodwill after acquisition, which can result in recording an impairment if the book value of the reporting unit exceeds its fair value. Goodwill impairments have also been substantial in recent years, rising from 288 events totaling $28.5 billion in 2016 to 318 events totaling $71.0 billion in 2019 (Nunes and Warner 2022). The subsequent accounting for goodwill has attracted interest from academics (Chen, Krishnan, and Sami 2015; Li and Sloan 2017; Linsmeier and Wheeler 2021), the business media (Weil 2025), and standard setters (FASB 2020).

U.S. accounting standards require goodwill to be allocated to "reporting units", which are components of operating segments that have discrete financial information and are regularly reviewed by segment management (ASC 350-20-35-34). Reporting units can be designated by management at the firm level, the segment level, or the sub-segment level and have no GAAP purpose outside of goodwill impairment testing. The firm's total goodwill and impairment of goodwill are then the result of summation across the reporting units. The number of reporting units, together with the level(s) at which they are defined, determine the degree of disaggregation embedded in a firm's goodwill impairment

assessment.[1] Variation in firm operations and management discretion affect the allocation of goodwill to reporting units (Beatty and Weber 2006; Ramanna and Watts 2012) and can result in variation in how management disaggregates. Goodwill disaggregation is distinct from disaggregation/aggregation permitted in other areas of accounting, such as in the context of LIFO inventory lower of cost-or-market testing (Basu 2005), due to management's flexibility to strategically allocate goodwill to different reporting units. This discretion allows management to disaggregate to avoid impairments that would have been incurred had the analysis been performed at an aggregated level, which is not possible in other contexts.

In this study, I examine four research questions. First, does the degree of goodwill disaggregation impact the likelihood of goodwill impairment? Theory suggests that a high degree of goodwill disaggregation would lead to a higher likelihood of impairment, because the firm's reporting units are less likely to include firm operations to which the associated goodwill does not directly relate (Glaum and Wyrwa 2011, 63; Linsmeier and Wheeler 2021; Beatty, Liao, and Weber 2024). However, using segments as a proxy for disaggregation, prior research finds that managers can use discretion to avoid impairments when *several* segments exist (Beatty and Weber 2006; Ramanna 2008; Ramanna and Watts 2012). This suggests that *disaggregation* allows management to use discretion to decrease the likelihood of impairment (Boennen and Glaum 2014; Martínez, Rubio, and Morales 2023). Other studies find no relationship between a firm's number of segments and the likelihood of goodwill impairment (e.g., Carcello, Neal, Reid, and Shipman 2020).

[1] I use the terms "goodwill disaggregation" and "disaggregation" interchangeably throughout this study to describe this variation in how goodwill is allocated.

Studying reporting units allows for a more precise measure of disaggregation, and its association with goodwill impairment.

Second, does the degree of goodwill disaggregation impact the magnitude of goodwill impairment? Disaggregation may reduce the magnitude of an impairment by isolating it from goodwill in other reporting units, because disaggregation decreases the value of goodwill allocated to any single reporting unit relative to the total consolidated goodwill balance. Alternatively, disaggregation may increase the likelihood of impairments across reporting units, relative to goodwill that is not disaggregated leading to higher magnitude impairments.

Third, does the degree of goodwill disaggregation impact an impairment's ability to predict future operating cash flows? Higher likelihood and higher magnitude impairments are not necessarily desirable outcomes if they are not informative to stakeholders. The informativeness of impairments are often evaluated by their ability to predict declines in future net cash flows (Jarva 2009; Lee 2011; Bostwick, Krieger, and Lambert 2016). Many market participants believe that disaggregated assessments provide more decision useful information (FASB 2020, 51). Although, disaggregated impairment assessments may be too narrow in scope or too conservative to produce impairments that reflect the condition of the firm considered as a whole. On the other hand, impairments related to goodwill that is not disaggregated may be less sensitive than other economic indicators providing a lagging measure of the firm's condition.

Fourth, does the degree of goodwill disaggregation (which determines the number of reporting units with goodwill and the number of impairment assessments required to be audited) impact auditor's perceived business risk? There are two reasons why

disaggregation could impact auditor's perceived business risk and be impounded in audit fees (Huss and Jacobs 1991; Bell, Landsman and Shackelford 2001).[2] First, if disaggregation leads to a higher likelihood of impairment, then it could be regarded as a more conservative accounting choice by management (Beyer 2012). Second, disaggregation results in variation in the availability of goodwill-relevant accounting information accessible to stakeholders. This variation impacts stakeholder's ability to credibly question management and auditor judgements relative to goodwill impairment, which can affect auditor's perceived business risk (Lennox and Li 2020; Everard and St. Pierre 2024). When goodwill is disaggregated at the firm level (least disaggregation) all the firm's disclosures are goodwill relevant. This allows stakeholders to credibly question auditors' impairment judgements and increases perceived business risk impounded in audit fees. When goodwill is disaggregated, less goodwill-relevant accounting information is disclosed, which limits stakeholders' ability to credibly question auditors' impairment judgements, decreasing perceived business risk.

The importance and timeliness of this study are underscored by deliberations by the Financial Accounting Standards Board (FASB) aimed at balancing the cost and complexity of impairment analyses with the usefulness of information provided to users (FASB 2017, para BC12; Linsmeier and Wheeler 2021). In response to feedback from firms that argues the benefits of the current goodwill accounting standards do not justify the costs, the FASB issued an Invitation to Comment on Identifiable Intangible Assets and Subsequent Accounting for Goodwill in 2019 (henceforth, "ITC") (FASB 2019). As part of the ITC,

[2] I focus on the auditor business risk element of engagement risk rather than audit risk or client business risk. Although the elements are interrelated, within-GAAP variation in goodwill disaggregation is unlikely to impact the risk of material misstatement (audit risk), or a client's survival or long-term profitability (client business risk).

the FASB sought feedback on changing the requirement to allocate and test goodwill for impairment at the reporting unit level to the segment or the firm level, which would reduce the degree of disaggregation (FASB 2020, 50; FASB 2022a).[3] Despite deprioritizing the project in 2022, the FASB continues to consider changes to goodwill accounting standards (Maurer 2022).

To construct my firm-wide measure of goodwill disaggregation (*GW Disagg*), I use voluntary goodwill allocation disclosures to manually identify each reporting unit to which goodwill is allocated.[4] This allows me to create a more precise continuous measure of the degree of goodwill disaggregation than used in extant literature.[5] I record the number of reporting units (*RU Num*), and the disaggregation level at which each reporting unit is defined (*RU Level*). If the reporting unit is defined as being the same as the firm, I record a one, if defined as the same as a reportable segment, I record a two, and if defined as a component of a segment (a sub-segment), I record a three. I then map the reporting units to the applicable reportable segment. For each segment I add the number of reporting units to the disaggregation level variable. I weight the result by the percentage of goodwill applicable to each segment before summing each segment's weighted value to construct a

[3] In its response to the ITC, KPMG states that it does not support goodwill impairment testing at the firm level, because of the potential for impairment losses to be hidden. KPMG favors impairment testing at the segment level because it aligns impairment testing with segment disclosures. However, it notes that segment-level testing could result in fewer impairments than reporting-unit testing (KPMG 2019).

[4] In robustness tests in Chapter 7.1, I explicitly model a firm's choice to voluntarily disclose their goodwill allocation structure to help address the potential for endogenous self-selection.

[5] Prior research often uses the number of segments as a proxy for reporting units because management is not required to disclose the specifics of how goodwill is allocated in SEC filings and therefore reporting unit data is not collected by data providers (e.g., Compustat). In a concurrent working paper, Beatty et al. (2024) address this issue by using Calcbench to group firms into categories based on their reporting unit structure (e.g., single unit and multi-unit/single segment). I manually collect voluntary disclosures within 10-Ks, leading to a more precise continuous measure of the degree of goodwill disaggregation—one that considers both the number of reporting units and the level at which they are defined.

firm-wide measure of disaggregation. The lowest disaggregation firms have one reporting unit which represents the operations of the full firm, and the highest disaggregation firms have several reporting units which represent components of the business defined at the sub-segment level.

To examine my first research question (i.e., does the degree of goodwill disaggregation impact the likelihood of goodwill impairment), I measure the likelihood of goodwill impairment using goodwill-related critical audit matters (CAM or CAMs) and recorded impairments. Beginning in June 2019, auditors are required to include CAMs within their audit reports for large accelerated filers (firms with a market value of publicly held stock of $700 million or more which are not eligible for smaller reporting company status). CAMs are matters discussed with the audit committee that are material, and that involved challenging, subjective, or complex auditor judgement (PCAOB 2017). The auditor's role as an independent outside source of assurance provides a different dimension in which to consider the likelihood of impairment and allows me to capture borderline impairment cases where the firm was at risk of impairment but no impairment was recorded.

To examine my second research question (i.e., does the degree of goodwill disaggregation impact the magnitude of goodwill impairment?), I measure the magnitude of goodwill impairment using recorded impairments scaled by the total value of goodwill before impairment. I find that a one standard deviation increase in the degree of goodwill disaggregation is associated with a 6.3 percentage point increase in the likelihood of impairment and a 1.2 percentage point increase in the magnitude of impairment. This indicates that impairments (goodwill-related CAMs) occur with 12.0 (24.3) percent greater

frequency when impairment assessments are conducted at the sub-segment level as opposed to the segment level without a meaningful change in the magnitude of impairments.

To examine my third research question (i.e., does the degree of goodwill disaggregation impact an impairment's ability to predict future operating cash flows?), I measure the predictive value of impairments using operating cash flows in year t+1.[6] I find that goodwill impairment assessments conducted below the firm level yield impairments that are more predictive of declines in future operating cash flows than impairment assessments conducted at the firm level. However, I do not find evidence that assessments conducted at the lowest level (sub-segment) yield impairments that are more predictive of declines in future operating cash flows compared to assessments conducted at the segment-level. This suggests a non-linear association between goodwill disaggregation and the predictive value of impairments, perhaps because firm level analysis is not granular enough, and sub-segments may not constitute a significant enough portion of the business or may be too conservative to provide predictive value. Taken together these results suggest that the likelihood and magnitude of impairments are likely to decrease following an accounting standard change from reporting unit level assessment to the segment or firm level, but that the predictive value of impairments may not be negatively affected by a change from reporting unit to segment-level assessment.

[6] I focus on future operating cash flows as opposed to the market reaction to goodwill impairments (Bens, Heltzer, and Segal 2011; Li, Shroff, Venkataraman, and Zhang 2011) to avoid confounds from financial information released concurrently with goodwill impairments in earnings announcements and quarterly and annual filings.

To examine my fourth research question (does the degree of goodwill disaggregation impact auditor's perceived business risk?), I proxy for auditor's perceived business risk by examining the text of goodwill-related CAMs, and audit fees. CAMs include both a description of the CAM and an audit response to the CAM. I find that firms with less disaggregation have longer, more uncertain descriptions of goodwill-related CAMs, but that the auditor's CAM responses are more certain. This suggests that, for firms with less disaggregation, auditors attempt to accentuate the high level of subjectivity associated with goodwill and to illustrate the robustness of the related audit procedures, which is consistent with auditors perceiving goodwill that is not disaggregated as presenting a higher business risk. I find no evidence of an association between goodwill disaggregation and audit fees. Despite a seemingly mechanical relationship between disaggregation and the number of impairment assessments that must be audited, auditors appear not to increase fees when goodwill is disaggregated. This suggests that auditors perceive risks associated with goodwill that is not disaggregated.

I conduct two sets of additional analyses. First, I examine the discussion of goodwill and goodwill impairments in earnings calls. I find that goodwill and goodwill impairments are less likely to be discussed by management in earnings calls if goodwill is disaggregated. Assuming managers share the most relevant company matters with analysts and investors on earnings calls (Bochkay, Hales, and Serafeim 2025), this suggests that the informativeness of impairments may not be negatively affected by a change from reporting unit to segment-level assessment.

Second, to support my use of goodwill related CAMs as a measure of impairment likelihood I provide evidence that goodwill-related CAMs help identify material goodwill

balances, capture borderline impairment cases, and are associated with future impairments and the magnitude of those impairments. These findings complement prior studies (Andreicovici, Jeny, and Lui 2023; Jahan and Karim 2025).

This study makes several contributions to the literature. I contribute to the goodwill impairment literature by providing a more comprehensive view of goodwill disaggregation compared with existing studies that focus on segments or categorical measures of disaggregation. My findings allow academics to better model goodwill impairments and help financial statement users better interpret impairments. From a policy perspective, I provide evidence that a financial reporting standard that changes the unit of analysis to the segment or the firm level may lead to a reduction in the likelihood and magnitude of impairments, but that the predictive value of impairments may not be negatively impacted by changing the unit of analyses to the segment level. I not only provide evidence for the direction of the association, but also its magnitude, which may be of particular use to the FASB. Additionally, I provide evidence that despite the reduction in the number of impairment analyses, the cost of auditing goodwill may not decrease in response to a change in the unit of analysis. These insights are incremental to the feedback provided to the FASB by the American Accounting Association's response to the ITC (Clor-Proell et al. 2022) and may be of interest to the standard setters as they balance the potential cost savings of a change in standard with the potential for decreased informativeness. I also contribute by introducing two novel measures to the literature on goodwill impairment. I introduce a new measure of goodwill disaggregation based on hand-collected data on the number, level, and mapping of reporting units and I introduce goodwill-related CAMs as a measure of the likelihood of goodwill impairment. Further, my finding that the text content

of auditor's goodwill-related CAMs is associated with goodwill disaggregation complements studies suggesting auditors use CAMs to reduce litigation risk (Brasel, Doxey, Grenier, and Reffett 2016; Brown, Majors, and Peecher 2020; Kachelmeier, Rimkus, Schmidt, and Valentine 2020; Liss, Riepe, and Sievers 2023).

CHAPTER 2

BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Goodwill Accounting

Goodwill, recorded by acquiring companies' concomitant with the acquisition is an intangible asset equal to the amount of consideration paid in a business combination less the fair value of the identifiable net assets received by the acquirer. Upon recognition, goodwill must be allocated to the reporting units of the acquirer that are expected to benefit from the synergies of the business combination (ASC 350-20-35-41). Goodwill is assessed for impairment at the reporting unit level annually or when there are indications that goodwill is more likely than not impaired (ASC 350-20-35-30). The fair value of the reporting unit is compared with the reporting unit's total book value. If the book value exceeds the fair value, an impairment is recognized up to the total value of goodwill recorded by the reporting unit.[7] While management's calculation of the fair value of the reporting unit is based on subjective judgements such as growth rates, discount rates, and the overall future performance of the reporting unit, I focus on a more fundamental aspect of the analysis, the determination of reporting units and specifically the degree of goodwill disaggregation resulting from this determination (Ramanna and Watts 2012; Linsmeier and Wheeler 2021).

[7] During the sample period, ASU 2017-04 *Simplifying the Test for Goodwill Impairment*, which eliminated Step 2 of the goodwill impairment assessment, became effective. The ASU is effective for annual and interim impairment tests for periods beginning after December 15, 2019, with early adoption permitted. If a firm does not adopt this ASU, they must conduct a second step in which the fair value of the reporting unit's goodwill is estimated and compared to the book value of goodwill to calculate the impairment. I control for the firm's adoption choice using the binary variable *ElimnStep2*.

2.2 Goodwill Disaggregation

Management has considerable discretion in how reporting units are determined (Beatty and Weber 2006; Ramanna and Watts 2012). Reporting units are determined using a two-step process, as depicted in Figure 1. In the first step management determines the firm's operating segments in accordance with ASC 280. An operating segment must a) represent business activities that generate revenues and expenses, b) have discrete financial information, and c) be reviewed by the chief operating decision maker at the firm.[8] In the second step, reporting units are determined within operating segments in accordance with ASC 350. A reporting unit must a) be a component of an operating segment, b) have discrete financial information, and c) be reviewed by segment management.

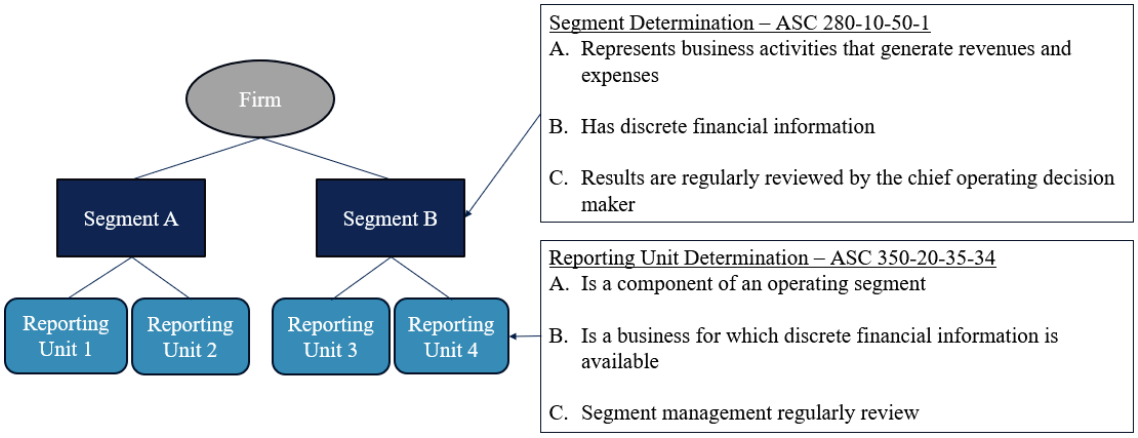

Figure 1. Determination of Segments and Reporting Units. Ovals denote the firm's full consolidated operations. Rectangles with pointed corners denote operating segments. Rectangles with rounded corners denote reporting units. A line connecting two shapes indicates that the bottom shape (a segment or reporting unit) is a subset of the operations of the shape above (a firm or segment).

[8] Multiple operating segments may be aggregated into a single segment if the segments have similar economic and qualitative characteristics and their aggregation is not inconsistent with the principles of ASC 280.

Management's identification of reporting units can lead to significant cross-sectional and longitudinal heterogeneity in goodwill disaggregation. Following the applicable guidance in ASC 280 and ASC 350, management may use discretion in at least two ways which impact disaggregation. First, management may choose the number of reporting units to which goodwill is allocated. Second, management may choose the level at which the reporting units are defined. For instance, management may conclude that firm operations cannot be disaggregated, because operations fail the criteria depicted in Figure 1. In such a case the reporting unit will be defined as the operations of the full firm (firm level) resulting in a goodwill impairment assessment with no disaggregation. An example of firm-level disaggregation is presented in Figure 2. Alternatively, management may conclude that the firm's operations meet the criteria for segment disaggregation, but that segment operations cannot be further disaggregated, because segment operations fail one of the three criteria for separate sub-segment disaggregation depicted in Figure 1. In such a case the reporting unit will be defined as the operations of the segment (segment level) resulting in a moderately disaggregated goodwill impairment assessment. An example of segment-level disaggregation is presented in Figure 2. Finally, management may conclude that firm operations are able to be disaggregated into segments and into sub-segments (sub-segment level) resulting in a highly disaggregated goodwill impairment assessment. An example of sub-segment-level disaggregation is presented in Figure 2.[9]

[9] A small percentage of firms do not disaggregate operations at the segment level (ASC 280) but do disaggregate at the sub-segment level (ASC 350). I classify these firms as sub-segment because a change in accounting standards that requires segment-level analysis of goodwill would require these firms to change their impairment assessment.

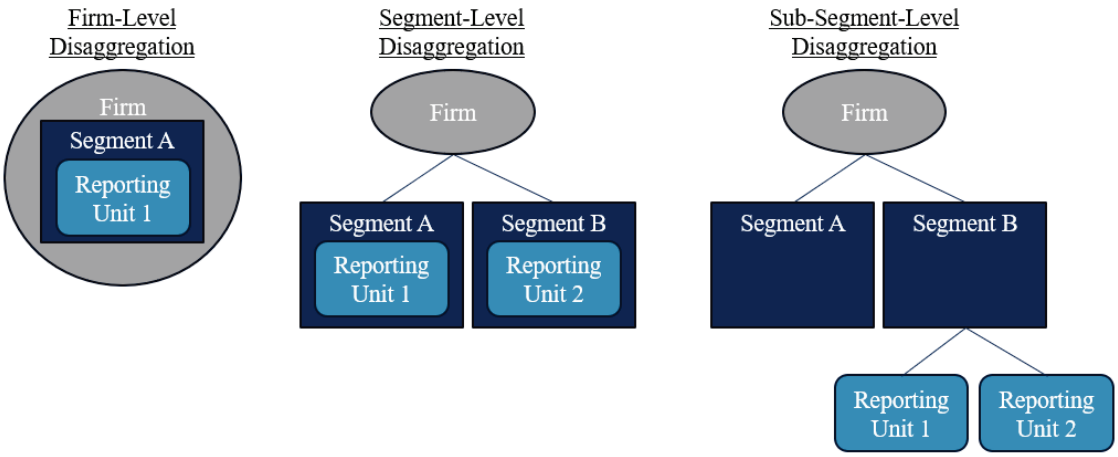

Figure 2. Variation in Disaggregation Level. When a shape is placed within another shape it indicates that the bottom shape is equivalent to the above shape. In the Sub-Segment-Level Disaggregation diagram, Segment A has not been allocated any goodwill, so no reporting unit is indicated.

The designation of an operating segment has important financial reporting implications outside of goodwill impairment assessments. Subject to certain quantitative thresholds, operating segment disclosures are required in the 10-K (Regulation S-K, Item 101(b)). Prior literature suggests that managers with high proprietary costs are incentivized to report fewer segments while managers whose firms are more dependent on external financing are likely to report more segments (Harris 1998; Botosan and Harris 2000; Ettredge, Kwon, Smith, and Stone 2006; Berger and Hann 2007; Wang, Ettredge, Huang, and Sun 2011; Nichols, Street, and Tarca 2013). Conversely, the designation of a reporting unit has no financial reporting implications outside of goodwill impairment assessments. As described by one respondent to the FASB's ITC, "allocating items to reporting units is a task that is executed only for the impairment test" (FASB 2020, 18). Management can change their reporting unit designations as a result of a reorganization, however

management must establish that this change did not prevent recognition of a goodwill impairment that existed prior to the change (PwC 2024). This is typically accomplished by conducting a goodwill impairment assessment immediately before the reorganization.

The unit of assessment for goodwill impairment has been debated by U.S. regulators since at least the formation of SFAS 142, which was released in 2001. SFAS 142 introduced the concept of a reporting unit as defined above and codified in ASC 350 Anantharaman (2014).[10] In the most recent chapter in the wider debate over goodwill accounting standards, the FASB spent four years deliberating changes to goodwill accounting, only to unanimously vote to deprioritize and remove the project from its agenda in June 2022 (FASB 2022b). Board members explained this decision by indicating that they were not convinced that the changes they were considering would result in an improvement over current practice (Lugo 2022) and that the project could be reopened if more information becomes available (Maurer 2022). As part of the ITC on this project the FASB solicited feedback on the level at which impairment assessments should be conducted by asking:

> Relative to the current impairment model, how much do you support (or oppose) providing an option to test goodwill at the entity level (or at a level other than the reporting unit)? Please explain why in your response. (FASB 2019, 15)

Before deprioritizing the project, the FASB communicated that while views were mixed, they would likely retain the reporting unit assessment level (FASB 2022a).[11] This

[10] Prior to SFAS 142, SFAS 121 took a principle-based approach, indicating that "assets shall be grouped at the lowest level for which there are identifiable cash flows that are largely independent of the cash flows of other groups of assets" for impairment testing (SFAS 121).

[11] While the current FASB goodwill accounting project has been deprioritized, debates over goodwill accounting are likely to continue. The FASB does not seem to be considering a set of standards that do not involve impairment testing (FASB 2019). It is possible that in the future, impairment testing will be combined with goodwill amortization, similar to the current private company alternative, ASU 2014-02 (FASB 2019)

inclination is at odds with feedback from respondents during the FASB's comment period. The level at which goodwill should be assessed was discussed by 70 percent of respondents. These respondents expressed more support for segment or entity level assessment than for reporting unit level assessment (FASB 2020, 50). Comments from responders suggest a tradeoff between cost/complexity and provision of decision useful disaggregated information, with more disaggregated impairment assessments being viewed as more costly and complex but providing more useful information.

2.3 Goodwill Disaggregation and Impairment

Theory suggests that absent management manipulation, goodwill assessed for impairment at the firm level (least disaggregated) may be more shielded from impairment than goodwill assessed for impairment at the sub-segment level (most disaggregated). This is because firm level reporting units are more likely to be anchored by more diverse operations and internally generated goodwill (unrecorded) (Walker 1938) from the acquiring firm's pre-acquisition operations than a disaggregated reporting unit. Said another way, disaggregated goodwill impairment assessments could be at ex-ante higher likelihood of impairment because they are less likely to be shielded by firm operations to which the associated goodwill does not directly relate (Glaum and Wyrwa 2011, 63; Linsmeier and Wheeler 2021).[12] Table 1 Panel A presents a hypothetical example of a firm that can avoid impairment by aggregating goodwill.

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and the approach prior to SFAS 142. An amortization and impairment model would reduce the impact of goodwill disaggregation but would not eliminate it. It is also possible that the FASB may allow public firms to adopt another private company alternative, ASU 2014-18, that allows other types of intangible assets generated by business acquisitions to cease being separately recorded and be subsumed into goodwill, which would magnify the impact of goodwill disaggregation on impairment assessments (FASB 2019).

[12] To the extent that the use of a qualitative impairment assessment indicates a lower likelihood of impairment this argument is consistent with Adame, Lem, and Mookerjee's (2024) finding that firms with a higher number of reporting units are less likely to use a qualitative impairment assessment.

Table 1. Impairment Assessments at Different Disaggregation Levels

Panel A: Aggregation Avoids Impairment

	(1) Segment-Level Assessment Segment 1	(2) Segment-Level Assessment Segment 2	(3) Firm-Level Assessment Consolidated Firm
Book Value of the Reporting Unit	7	3	10
Fair Value of the Reporting Unit	6	5	11
Amount Book Value Exceed Fair Value	1	-2	-1
Goodwill Value Before Assessment	1	1	2
Impairment	1	0	0

Panel B: Disaggregation Avoids Impairment

	(1) Segment-Level Assessment Segment 1	(2) Segment-Level Assessment Segment 2	(3) Firm-Level Assessment Consolidated Firm
Book Value of the Reporting Unit	7	3	10
Fair Value of the Reporting Unit	8	1	9
Amount Book Value Exceed Fair Value	-1	2	1
Goodwill Value Before Assessment	2	0	2
Impairment	0	0	1

Panel A shows a hypothetical firm that will record an impairment if performing their impairment assessment at the segment level, but not at the firm level. Panel B shows a hypothetical firm that will record an impairment if performing their impairment assessment at the firm level, but not at the segment level. The firm in Panel A avoids impairment by aggregating their operations. The firm in Panel B avoids impairment by disaggregating and allocating no goodwill to their underperforming segment (Segment 2).

The shielding effect of aggregation on impairment assessments is well known in other areas of accounting, such as in the context of LIFO inventory pools (Basu 2005) and pooled debt (Basu, Vitanza, and Wang 2020). In the context of goodwill, disaggregation is more nuanced, due to management's ability to strategically allocate goodwill to different reporting units. This discretion allows management to disaggregate to avoid impairments that would have been incurred had the analysis been performed at an aggregated level, which is not possible in other contexts, such as inventory or debt. For instance, management could use their discretion to structure reporting units to concentrate poorly performing portions of the business in one or more reporting units to which no goodwill is allocated, or management could strategically allocate goodwill across multiple reporting units in specific proportions tailored to the expected fair value of each reporting unit. Table

1 Panel B presents a hypothetical example of a firm that can avoid impairment by disaggregating.

Such an approach is consistent with findings by Beatty and Weber (2006), Ramanna (2008), and Ramanna and Watts (2012) which argue that the existence of more reporting units affords managers more discretion in avoiding impairments. Although they do not observe reporting units, Beatty and Weber (2006) expect and find that the existence of multiple segments allows managers to avoid goodwill impairment. Ramanna and Watts (2012) expect and find that the more numerous the segments and the larger the size of those segments the more flexibility management has in allocating goodwill, and that management uses allocation to strategically avoid impairments. Both Beatty and Weber (2006) and Ramanna and Watts (2012) focus on firms with book-to-market ratios above one where there is observable evidence that the market, and presumably principals, have already determined the book value of assets to be, at least, temporarily impaired, however their inferences need not be confined to such observable firms. Management can strategically allocate goodwill at the sub-segment level to avoid impairment at a segment in the same manner documented at the firm level by these studies. Research suggests that management's interest in avoiding goodwill impairments extends beyond firms with observable market indicators of impairment (Shalev, Zhang, and Zhang 2013; Zhang and Zhang 2017; Koonce, Toynbee, and White 2025). The lack of required disclosures at the sub-segment level limits stakeholders' ability to credibly question management's impairment judgements and, arguably, provides more opportunity for management to strategically allocate goodwill to avoid impairment.

The allocation of goodwill among reporting units, and the level at which reporting units are defined is not subject to SEC disclosure requirements. The lack of transparent disclosure has hindered academic research in this area, making it unclear to what extent disaggregation affects the likelihood and magnitude of impairment (Clor-Proell et al. 2022; Martínez, Rubio, and Morales 2023).[13]

Many goodwill impairment studies which seek to control for the number of reporting units use the number of segments reported in Compustat as a proxy (Ayres, Neal, Reid, and Shipman 2019; Bills, Cating, Lin, and Seidel 2025; Black, Krupa, and Minutti-Meza 2022; Jahan and Karim 2023), although not all studies expect or find an association between the number of segments and goodwill impairment (Carcello et al. 2020). Segments are a noisy proxy for the total number of reporting units. Compustat data do not differentiate between segments and entity-wide disclosures required for geographic operations (which have no relation to goodwill impairment testing). Several filters must be applied to remove entity-wide disclosures, and even after those filters are applied Compustat data often do not agree with 10-K disclosures (Botosan, Huffman, and Stanford 2021).

Extant research often does not consider the level at which the reporting unit is defined (firm, segment or sub-segment). Some studies reduce the potential for confounding results in this area by using partitioned analyses that test single segment firms and multi-segment firms separately (Li and Sloan 2017; Carcello et al. 2020). However, this approach does not necessarily guarantee that a single segment firm has only one reporting unit, nor

[13] Research on goodwill impairment under IFRS suffers from the same lack of disclosure. Robust disclosures are not required on cash generating units, the unit of impairment assessment under IFRS (Glaum, Landsman, and Wyrwa 2018).

does it indicate at what level the reporting units are defined.[14] Byzalov and Basu (2016) improve asset impairment models by adding segment data, however in the context of goodwill, research has shown that segment disclosures are not sufficient for financial statement users to predict future impairments (Hayn and Hughes 2006; Potepa and Thomas 2023).

I seek to understand the relationship between goodwill disaggregation and the likelihood of goodwill impairment leading to my first hypothesis. Guided by theory, I state my first hypothesis in the alternative form.

> H1: Goodwill disaggregation is positively associated with the likelihood of goodwill impairment.

The effect of disaggregation on the magnitude of goodwill impairment is an empirical question. On one hand, disaggregation may reduce the magnitude of impairment by isolating goodwill balances within various reporting units, thereby lowering the portion of the total consolidated goodwill that could be impaired by a single reporting unit impairment. On the other hand, disaggregation could increase the likelihood of impairment across multiple units, potentially resulting in a greater overall impairment magnitude compared to when goodwill is not disaggregated. I expect the increase in the likelihood of impairment to dominate and state my second hypothesis in the alternative form.

> H2: Goodwill disaggregation is positively associated with the magnitude of goodwill impairment.

[14] In a concurrent working paper, Beatty et al. (2024) significantly advance this approach by using Calcbench to group firms into categories based on their reporting unit structure (e.g., single unit and multi-unit/single segment) rather than segment structure.

2.4 Impairments and Future Cash Flows

Higher likelihood and higher magnitude impairments are not necessarily desirable outcomes if they are not informative to investors. The informativeness of impairments is a major focus of the FASB's efforts to amend the subsequent accounting for goodwill (FASB 2017, para BC12). Prior studies often evaluate the informativeness of impairments by their ability to predict changes in future operating cash flows (Jarva 2009; Lee 2011; Bostwick et al. 2016; Gordon and Hsu 2018).

Theory does not offer a clear ex-ante prediction of the relationship between disaggregation and the informativeness of impairments. Generally, disaggregated analysis provides more information (Fan and Zhang 2012). However, what information is lost due to aggregation depends on the underlying accounting regime. Under a fair value regime gains are offset against losses, and under a conservative regime, such as in the case of goodwill, gains are ignored (Beyer 2012). A few studies argue that aggregation may play a valuable role in financial reporting by reducing the level of conservatism inherent in accounting standards. Fan and Zhang (2012) argue that under a conservative accounting regime aggregation improves the quality of accounting information, while Beyer (2012) argues that the joint effect of aggregation and conservative accounting is preferable when predicting future cash flow uncertainty. Dye and Sridhar (2004) view disaggregation as a reliability-relevance trade off where disaggregated information is more reliable but may be less relevant. They argue that aggregation can help temper management's incentives to engage in misreporting leading to more efficient investment decisions when using aggregated reports.

Disaggregated impairment assessments may be too narrow in scope or too conservative to produce impairments that reflect the true economic outlook of the consolidated firm. On the other hand, impairments related to goodwill that is not disaggregated may lack key information, and not be sensitive enough to provide timely information, relative to other economic indicators leading to impairments functioning as a lagging measure of the firm's condition. Consistent with respondents to the FASB's ITC which suggested that disaggregated assessments provide more decision useful information I present my hypothesis in the alternative form (FASB 2020, 51).

> H3: Goodwill disaggregation is positively associated with the predictive value of goodwill impairment on future operating cash flows.

2.5 Auditor's Perceived Business Risk

I examine the association between the degree of goodwill disaggregation and auditor's perceived business risk. Ghosh and Xing (2021) show that audit effort varies based on the value of goodwill relative to total assets, whether it is impaired, and changes in relevant accounting standards. Audit effort and fees should increase monotonically as the number of reporting units to which goodwill is allocated increases (disaggregation), because this leads to a greater number of impairment analyses that need to be individually audited. This view is consistent with comments from responders to the FASB's ITC, which suggest that a requirement to test at the segment level instead of the reporting-unit level would reduce the cost of impairment testing (FASB 2020, 50). Cost savings are a major goal of the goodwill impairment standard changes the FASB has considered (FASB 2020). Some respondents to the FASB's ITC specifically highlighted the heavy involvement of auditors as a cost driver (FASB 2020, 17).

However, a common finding in the audit fee literature is that auditors price client-level audit business risk in their audit fees (Huss and Jacobs 1991; Bell et al. 2001; Johnstone and Bedard 2003; Bae, Choi, Lamoreaux, and Lee 2021). Everard and St. Pierre (2024) examine 200 lawsuits against public accounting firms and find that allegations of inappropriate GAAP valuation, such as in the case of goodwill, dominate other GAAP and GAAS issues and that allegations of fraud against auditors are increasing. This is consistent with findings by Lennox and Li (2020), which show that auditors are more likely to be sued when allegations include fictitious assets or overvalued assets, and findings that link highly subjective fair value estimates with higher auditor litigation risk (Bell and Griffin 2012; Christensen, Glover, and Wood 2012).

There are two reasons that goodwill disaggregation could decrease auditor's perceived business risk and be impounded into audit fees. First, if disaggregation leads to a higher likelihood of impairment, then it could be regarded as a more conservative accounting choice by management (Beyer 2012). Auditors which permit management not to disaggregate goodwill could be seen as complicit in management's adherence to the letter of GAAP, but not its spirit. Second, auditor judgements related to disaggregated goodwill may be less likely to be scrutinized by stakeholders. For instance, all revenue, expenses, management forecasts and market valuations of the firm in the form of stock price are disclosed at the firm level and are directly applicable to the goodwill impairment assessments conducted at the firm level (least disaggregation). This accounting information provides context to stakeholders which allows them to credibly scrutinize impairment judgements made by management and auditors and may increase the auditor's perceived business risk. When goodwill is disaggregated at the segment level only reportable segment

disclosures provide goodwill-relevant accounting information, which limits stakeholders' ability to credibly question auditors' impairment judgements.[15] There are no required disclosures at the sub-segment level, so stakeholders' have no goodwill-relevant accounting information on which to credibly question auditors' impairment judgements thus potentially reducing auditor's perceived business risk.

To understand how auditors respond to the degree of goodwill disaggregation I study auditor's assessment of their business risk by examining the content of goodwill-related CAMs and audit fees. I present my hypothesis in the alternative form.

> H4: Goodwill disaggregation is negatively associated with auditor's perceived business risk.

[15] Required reportable segment disclosures include descriptions of products and services, total assets, revenue, a measure of profit and loss, significant non-cash items, and unusual items (ASC 280).

CHAPTER 3

SAMPLE

To construct the sample, I begin by identifying 10-Ks for large accelerated filers with year ends between June 30, 2019 and December 31, 2019. These are firms that are required to adopt the CAM standard in the first wave of the phased implementation.[16] I exclude utility and financial firms (two-digit SIC codes 49, and 60–69, respectively), firms that do not report results in USD, and firms that do not have a goodwill balance before considering impairment charges for the focal period. Data is collected for the resulting sample of firms for fiscal years 2019 and 2020. Table 2 presents my sample selection. After removing observations that are missing data needed to construct necessary variables, and observations with immaterial goodwill balances there are 1,514 annual observations.[17] After further limiting this sample to firms that disclose data necessary to construct my goodwill disaggregation measure (*GW Disagg*) there are 649 annual observations for 362 unique firms.

[16] In 2017 the Public Company Accounting Oversight Board (PCAOB) adopted Auditing Standard (AS) 3101 which requires auditors to include CAMs within their audit reports. See Chapter 6.2 for a more detailed discussion of the CAM standard.

[17] Following prior literature, I define goodwill as material if the balance of goodwill before impairment is greater than or equal to 5 percent of total revenue (*%IMP Rev*) (Ayres et al. 2019; Carcello et al. 2020; Jahan and Karim 2023).

Table 2. Sample Selection

	Firm-Years with Goodwill
Unique COMPUSTAT/Audit Analytics 10-Ks for large accelerated filers (June 30, 2019 to December 31, 2020)	2,066
Less: Missing data for variable construction	(279)
Firm-years with goodwill before impairment	1,787
Less: Immaterial goodwill balance	(273)
Firm-years with material goodwill (greater than or equal to 5 percent of total revenue)	1,514
Less: Missing goodwill disaggregation disclosure	(865)
Final sample	649

Table 2 reports sample attrition by data requirement. To construct the sample of firms, I identify year ends between June 30, 2019 and December 31, 2019 (first wave of the phased CAM implementation). I exclude utility and financial firms and firms that report in currencies other than USD.

CHAPTER 4

RESEARCH DESIGN

4.1 Measuring Goodwill Disaggregation

To construct my firm-wide measure of goodwill disaggregation (*GW Disagg*), I manually inspect 10-Ks to identify each firm's reporting units and its reportable segments. I record the number of reporting units *(RU Num)*, and the disaggregation level at which each reporting unit is defined (*RU Level*). If the reporting unit is defined at the firm level, I record a one, if defined at the segment level, I record a two, and if defined at the sub-segment level, I record a three. I then map the reporting unit to the applicable reportable segment and define goodwill disaggregation as follows:

$$GW\ Disagg_i = \sum_{n=1}^{k} (C_{i,n} + L_{i,n}) * (W_{i,n}) \quad (1)$$

k = The number of reportable segments within firm-year$_i$.

C = The number of reporting units within segment$_n$ of firm-year$_i$.

L = The level of the reporting unit(s) within segment$_n$ of firm-year$_i$. Where L takes the value of 1 for firm level, 2 for segment level, and 3 for sub-segment level.

W = The percentage of goodwill at firm-year$_i$ allocated to segment$_n$.

Following the above formula, for each segment I add the number of reporting units to the disaggregation level variable. The resulting sums reflect the degree of disaggregation for each individual segment. I weight the sums by the percentage of goodwill applicable to each segment and sum each segment's weighted value to construct a firm-wide measure of disaggregation. Weighting by goodwill percentage aligns my measure with reporting unit characteristics according to the value of goodwill allocated to each segment by

management.[18] The measure has a minimum value of two for firms that assess goodwill for impairment at the firm level, and does not have a theoretical maximum value, as there is no limit to how many reporting units a firm could possibly define. Appendix B provides detailed calculations of *GW Disagg* for three example firms.

There are two important features of *GW Disagg* that should be noted. First, *RU Num* represents the number of reporting units to which goodwill is allocated by management, not all possible reporting units to which management could have allocated goodwill. This is because the concept of a reporting unit has no GAAP purpose outside of goodwill impairment testing, and firms generally limit their voluntary disclosures to reporting units that have been allocated goodwill. Segments that have not been allocated goodwill have a weight of zero in the calculation of *GW Disagg*. Consistent with prior studies, I include *Segments* (the natural logarithm of one plus the number of segments) as a proxy for the total number of possible reporting units (with and without allocated goodwill). Second, since the number of segments is commonly included in impairment models *GW Disagg* is designed to provide incremental explanatory power and therefore the number of segments is not considered in its construction. For that reason, all models that include *GW Disagg* also control for the number of segments (*Segments)*.

4.2 Empirical Models

4.2.1 Likelihood and Magnitude of Impairment

To test H1 and H2, I estimate the following ordinary least squares (OLS) model with standard errors clustered by industry based on two-digit SIC codes.

[18] The standalone variable *RU Level* is also weighted in this manner, after it is used to construct *GW Disagg*. Detailed definitions for all variables are included in Appendix A.

$$IMP\ Measure = \beta_0 + \beta_1 GW\ Disagg + \gamma \text{Controls} + \text{Industry FE} + \varepsilon \quad (2)$$

The coefficient β_1 represents the impact of goodwill disaggregation on a firm's goodwill impairment. The dependent variable, *IMP Measure* has three variants: *IMP*, *GW CAM*, and *IMP%* where *IMP* and *GW CAM* test H1 and *IMP%* tests H2. *IMP* is an indicator variable equal to one if the firm records an impairment in the current fiscal year, and zero otherwise. *GW CAM* is an indicator variable equal to one if the firm's auditor issues a goodwill-related CAM in the current fiscal year's audit opinion and zero otherwise.[19] *IMP%* is the percentage of pre-impairment goodwill that was impaired in the current fiscal year. I include industry fixed effects based on two-digit SIC codes to control for unobservable time-invariant heterogeneity across industries. In addition, I include a vector of controls to proxy for other factors associated with goodwill impairment including the natural logarithm of the number of segments (*Segments*), goodwill as a percentage of total assets (*GW%*), whether a firm has adopted ASU 2017-04 which eliminates Step 2 of the goodwill impairment assessment (*ElimStep2*), history of impairments (*HistIMP*), whether an acquisition was made in the current year (*Acq*) or the prior year (*LagAcq*), and whether the observation relates to the COVID period (*COVID*).[20] I include financial variables including size (*Size*), leverage (*Lev*), return on assets (*ROA*), whether the firm is loss generating (*Loss*), changes in operating cash flows (ΔOCF), and sales ($\Delta Sales$), annual returns (*AnnRet*), volatility of returns (*AnnRetSTD*), whether the firm has a book-to-market ratio of greater than one (*BTM>1*), and if the firm has incentive to recognize losses (*Bath*), or

[19] Goodwill-related CAMs have not been used as a measure of the likelihood of impairment in prior studies. To support the use of goodwill-related CAMs as a proxy for the likelihood of impairment I build on prior literature (Andreicovici et al. 2025; Jahan and Karim 2023) by performing validation testing for this measure in Section VI.

[20] The sample period is limited to fiscal years 2019 and 2020 so the inclusion of *COVID* in a model is equivalent to including year fixed effects.

smooth earnings (*Smooth*). For models where the dependent variable is *GW CAM*, I control for the number of non-goodwill-related CAMs issued by the auditor (*#NonGW CAMs*).

The disclosure of reporting unit goodwill allocation in annual reports, which I use to construct *GW Disagg*, is voluntary.[21] The voluntary nature of this disclosure causes sample attrition and could lead to self-selection bias. Due to the potential for self-selection bias, it is important to note that the average treatment effect of *GW Disagg* on the full population of firms with goodwill cannot be assessed. My inferences are limited to variation in the effect of *GW Disagg* within the subsample of disclosing firms. I attempt to partially address concerns about self-selection bias in Chapter 7.1 by using zero-order regression and a Heckman model to explicitly model a firm's disclosure choice (Greene 1993, 60; Hopkins, Maydew, and Venkatachalam 2015).

It is also possible that endogenous choices by management regarding the operating structure of the firm may influence both a firm's choice of goodwill disaggregation, and its impairment outcomes through operating performance rather than through disaggregation, as I argue above. To partially address this risk, in Chapter 7.4 I present univariate statistics bifurcated by level of disaggregation and use the procedure developed by Oster (2019).

4.2.2 Impairment's Ability to Predict Future Cash Flows

To test H3 I adapt the OLS model used by Gordon and Hsu (2018) and Barth, Cram, and Nelson (2001) and cluster standard errors by industry as shown below.

$$\begin{aligned} OCF\_A_{t+1} = \; & \beta_0 + \beta_1 IMP\%TA + \beta_2 GW\ Disagg + \beta_3 IMP\%TA \times GW\ Disagg + \\ & \beta_4 OCF\_A + \beta_5 \Delta OCF\_A + \beta_6 ACC + \beta_7 IndROA + \beta_8 CAPEX + \\ & \beta_9 Rest + \beta_{10} COVID + \beta_{11} Segments + \text{Industry FE} + \varepsilon \end{aligned} \quad (3)$$

[21] ASC 350-20-50-1A requires that if a reporting unit has a zero or negative carrying amount of net assets the firm must disclose the amount of goodwill allocated to the reporting unit and which reportable segment the reporting unit is included in, however compliance with this requirement does not provide sufficient information to calculate *GW Disagg*.

OCF_A_{t+1} is operating cash flows in year t+1 scaled by total assets at the beginning of year t. *IMP%TA* is the value of the goodwill impairment scaled by the total assets at the beginning of the year t. The coefficient β_3 on the interaction term represents the impact of goodwill disaggregation on the predictive value of a firm's goodwill impairment on future operating cash flows. Finding no difference in the predictive value of impairments suggests that impairments related to different goodwill disaggregation approaches are similarly informative in predicting the decline in goodwill's economic value. Finding a difference suggests that their predictive value differs. The control variables follow Gordon and Hsu (2018) except for *COVID*, and *Segments*.

4.2.3 Auditor's Perceived Business Risk: CAM Content

To understand the auditor's assessment of their business risk I examine the content of goodwill-related CAM disclosures. Experimental studies provide support for the theory that auditors use CAM disclosures to reduce their litigation risk (Brasel et al. 2016) and find that the effects are concentrated in CAMs related to areas that involve high measurement uncertainty, as is the case with goodwill impairment (Brown et al. 2020; Kachelmeier et al. 2020). A recent archival study by Liss et al. (2023) shows that intangible-related CAMs moderate the relationship between intangible assets and audit fees and supports the theory that intangible-related CAMs mitigate subject-specific auditor litigation and reputational risk. A growing literature explores how the content of CAM disclosures is interpreted by investors. Klevak, Livnat, Pei, and Suslava (2023) find that more extensive CAM disclosures are associated with greater stock price volatility.

CAMs contain two distinct sections, the first is a description of the CAM, and the second is a response explaining the actions taken by the auditor related to the CAM. Figure

3 presents an example of a CAM. Auditors may attempt to reduce business risk by providing a longer, less quantitative, and more uncertain description of the CAM to illustrate the high level of subjectivity associated with the goodwill impairment assessment. They may also provide a longer, more quantitative, and less uncertain response to the CAM to illustrate the robustness of the audit procedures executed.

Valuation of Goodwill for the Canadian Reporting Unit

Description of the Matter	At December 31, 2019, the Company's Canadian reporting unit goodwill balance was $126 million. As discussed in Notes 1 and 4 of the financial statements, goodwill is tested at the reporting unit level annually during the fourth quarter and more frequently if impairment indicators exist. Auditing management's annual goodwill impairment test was complex and highly judgmental due to the significant estimation required in assessing the fair value of the Canadian reporting unit. The fair value estimate was sensitive to significant assumptions such as the revenue growth expectations, future expected cash flows, and operating earnings, which are affected by expectations about future market or economic conditions.
How We Addressed the Matter in Our Audit	Our audit procedures included, among others obtaining an understanding, evaluating the design and testing the operating effectiveness of controls over the Company's goodwill impairment review process, including controls over management's review of the significant assumptions described above. To test the estimated fair value of the Company's Canadian reporting unit, we performed audit procedures that included, among others, assessing methodologies and involving our valuation specialists to assist in testing the significant assumptions and testing the completeness and accuracy of the underlying data used by the Company in its analysis. We compared the significant assumptions used by management to current industry and economic trends, changes to the Company's business model, customer base or product mix, and other relevant factors. We assessed the historical accuracy of management's estimates and performed sensitivity analyses of significant assumptions to evaluate the changes in the fair value of the reporting units that would result from changes in the assumptions. In addition, we reviewed the reconciliation of the fair value of the reporting units to the market capitalization of the Company.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2005.

Chicago, Illinois
February 20, 2020

Figure 3. Example Goodwill-Related CAM.

I estimate the following OLS model and cluster standard errors by industry as shown below.

$$\begin{aligned} CAM\ Content = \ & \beta_0 + \beta_1 GW\ Disagg + \beta_2 Segments + \beta_3 GW\% + \beta_4 IMP + \\ & \beta_5 COVID + \beta_6 Size + \beta_7 Loss + \beta_8 Lev + \beta_9 ROA + \beta_{10} AnnRet + \\ & \beta_{11} AnnRetSTD + \beta_{12} BTM{>}1 + \beta_{13} \Delta OCF + \beta_{14} \Delta Sales + \\ & \beta_{15} AuditFee + \beta_{16} Big4 + \beta_{17} AuditSwitch + \beta_{18} SpecAuditor + \\ & \beta_{19} \#NonGW\ CAMS + \text{Industry FE} + \varepsilon \end{aligned} \quad (4)$$

In this model, *CAM Content* has three variants: *Length*, *Quantitative*, and *Uncertain Tone*. Each of these variants is calculated separately for the description and the response section of the CAM. *Length* is the natural logarithm of one plus the number of words, *Quantitative* is the ratio of numbers to words, and *Uncertain Tone* is the ratio of uncertain words to total words in the applicable section of the CAM following Loughran and McDonald (2011). I follow Küster (2024) in identifying firm and auditor attributes as control variables for CAM contents.[22] The sample is restricted to observations where the auditor has issued a goodwill-related CAM.

4.2.4 Auditor's Perceived Business Risk: Audit Fees

As a secondary measure of auditor's perceived business risk, I study audit fees by estimating the following model:

$$\begin{aligned} AuditFee = \ & \beta_0 + \beta_1 GW\ Disagg + \beta_2 IMP + \beta_3 GW\ CAM + \beta_4 \#NonGW\ CAMs + \\ & \gamma \text{Controls} + \text{Industry FE} + \varepsilon \end{aligned} \quad (5)$$

The dependent variable *AuditFee* is the natural logarithm of one plus audit fees. A positive coefficient on the variable of interest (β_1) *GW Disagg* indicates that auditors charge a higher fee to firms that disaggregate their goodwill. The control variables are based on prior work (e.g., Bae et al. 2021; Bell et al. 2001; Eshleman and Guo 2014).

[22] Küster (2024) studies key audit matters rather than CAMs.

CHAPTER 5

RESULTS

5.1 Descriptive Statistics

Table 3, Panel A presents summary statistics for my sample. About 20.0 percent of my observations record impairments, while 41.8 percent were issued a goodwill-related CAM by their auditor.[23] Observations have an average impairment of 4.9 percent of total goodwill. The mean (median) firm has *GW Disagg* of 3.7 (3.0). Panel B presents the distribution of *GW Disagg*. *GW Disagg* ranges from 2.0 to 8.0 with 2.0 indicating the least disaggregated goodwill (a single reporting unit defined at the firm level), and 8.0 indicating the most disaggregated goodwill (multiple reporting units defined at the sub-segment level). Panel C presents the distribution of reporting unit disaggregation level. The mean (median) firm defines reporting units at the 2.1 (2.0) disaggregation level (*RU Level*). Firms that define their reporting unit at the firm level make up 17.6 percent of the sample, compared to 39.4 percent that define their reporting units at the segment level. The remaining 43.0 percent define their reporting units at the sub-segment level or use a mixed approach where some reporting units are defined at the segment level and others at the sub-segment level. The mean (median) firm has 3.3 (3.0) reporting units to which goodwill is allocated (*RU Num*), which is consistent with prior research and reports from practice (Adame et al. 2024; Nunes and Warner 2022). Panel D presents the distribution of the

[23] Jahan and Karim (2023) study large accelerated filers in fiscal years 2018 and 2019, whereas I study large accelerated files in 2019 and 2020 and exclude utility and financial firms. They report that 7.9 percent of their sample observations record a goodwill impairment and 27 percent have a goodwill-related CAM. In my sample I find 20.0 and 41.8 percent, respectively. These differences are reasonable considering that during the 2020 COVID outbreak impairments increased, and during 2018 and early 2019 CAMs were not required to be reported (Bills et al. 2025).

number of reporting units. The majority of firms (66.8 percent) allocate goodwill among one to three reporting units. The remainder of firms allocate among four to ten reporting units.

Panel E presents correlations for measures of goodwill disaggregation. My measures of goodwill disaggregation (*GW Disagg*, *RU Level*, and *RU Num*) are strongly correlated with one another (Pearson correlation coefficients are greater than 0.75). Consistent with my argument that segments are a noisy measure of goodwill disaggregation, Pearson correlation coefficients between my measures and *Segments* range from 0.0 to 0.5.

5.2 Likelihood of Impairment

Table 4 Panel A presents the results of estimating model (2). The results of testing H1 are presented in columns 1 – 4 where the dependent variables are my proxies for the likelihood of impairment (*IMP* or *GW CAM*). The results of estimating OLS (conditional logit) models are presented in columns 1 and 2 (3 and 4). The coefficient on *GW Disagg* is positive and statistically significant for each model indicating that a one standard deviation increase in *GW Disagg* is associated with an increase in the likelihood of goodwill impairment between 6.3 and 12.5 percentage-points which represents a 29.9 to 31.6 percent increase relative to the mean.[24, 25]

[24] To simplify the economic interpretation, I interpret the coefficients for the OLS models shown in columns 1 and 2. I describe the calculation for economic interpretation for column 1 here. A one standard deviation increase in *GW Disgg* is associated with a 6.3 percentage point increase in the likelihood of a goodwill impairment ($\beta 1$ × standard deviation of *GW Disagg* = 0.041 × 1.542), which translates into an economically significant 31.6 percent increase in the likelihood of impairment relative to the mean (from 20.0% to 26.3%). Economic significance is calculated as $\beta 1$ × standard deviation of *GW Disagg* / mean of *GW IMP* = 0.041 × 1.542 / 0.200 = 0.316.

[25] The positive coefficient on *ElimStep2* should be interpreted with caution as it is likely highly endogenous. Firms may only early adopt the standard after they learn that they will likely suffer an impairment, in an effort to reduce costs.

Table 3. Descriptive Statistics

Panel A: Summary Statistics

	(1) N	(2) Mean	(3) S.D.	(4) P25	(5) Median.	(6) P75
Dependent Variables						
IMP	649	0.200	0.401	0.000	0.000	0.000
GW CAM	649	0.418	0.494	0.000	0.000	1.000
IMP%	649	0.049	0.135	0.000	0.000	0.000
OCF_A$_{t+1}$	649	0.095	0.101	0.045	0.083	0.144
Length (ln) – Description	271	4.931	0.349	4.700	4.920	5.170
Length – Description	271	146.015	51.528	109.000	136.000	175.000
Quantitative – Description	271	0.053	0.019	0.040	0.052	0.064
Uncertain Tone - Description	271	0.028	0.022	0.013	0.021	0.034
Length (ln) - Response	271	4.779	0.208	4.644	4.771	4.890
Length – Response	271	120.609	26.250	103.000	117.000	132.000
Quantitative - Response	271	0.005	0.013	0.000	0.000	0.000
Uncertain Tone - Response	271	0.036	0.024	0.018	0.035	0.054
Audit Fee (ln)	649	15.055	0.777	14.519	14.963	15.558
Audit Fee (Millions)	649	4.840	5.164	2.022	3.151	5.709
Test Variables						
GW Disagg	649	3.707	1.542	3.000	3.000	4.620
RU Level	649	2.124	0.650	2.000	2.000	2.724
RU Num	649	3.331	2.322	2.000	3.000	4.000
Sub-Segment Level	649	0.190	0.392	0.000	0.000	0.000
Firm Level	649	0.176	0.381	0.000	0.000	0.000
IMP%TA	649	0.011	0.032	0.000	0.000	0.000
Control Variables						
Segments (ln)	649	1.186	0.348	1.099	1.099	1.386
Segments	649	2.475	1.200	2.000	2.000	3.000
GW%	649	0.291	0.175	0.150	0.265	0.401
ElimStep2	649	0.769	0.422	1.000	1.000	1.000
HistIMP	649	0.146	0.354	0.000	0.000	0.000
Acq	649	0.361	0.481	0.000	0.000	1.000
LagAcq	649	0.427	0.495	0.000	0.000	1.000
COVID	649	0.499	0.500	0.000	0.000	1.000
Size	649	8.260	1.259	7.328	7.986	9.078
Lev	649	0.338	0.202	0.196	0.329	0.458
ROA	649	0.021	0.099	-0.011	0.029	0.070
Loss	649	0.311	0.463	0.000	0.000	1.000
ΔOCF	649	0.003	0.066	-0.017	0.004	0.025
ΔSales	649	-0.050	0.231	-0.075	0.004	0.036
AnnRet	649	0.166	0.430	-0.116	0.113	0.379
AnnRetSTD	649	0.033	0.016	0.021	0.029	0.041
BTM>1	649	0.092	0.290	0.000	0.000	0.000
Bath	649	0.031	0.100	0.000	0.000	0.000
Smooth	649	0.010	0.036	0.000	0.000	0.000
#NonGW CAMs	649	1.242	0.802	1.000	1.000	2.000
OCF_A	649	0.087	0.086	0.047	0.082	0.130
ΔOCF_A	649	0.003	0.054	-0.019	0.006	0.027
ACC	649	-0.060	0.057	-0.083	-0.052	-0.028
IndROA	649	-0.059	0.151	-0.033	0.001	0.017
CAPEX	649	0.031	0.029	0.014	0.023	0.038
Rest	649	0.005	0.008	0.000	0.002	0.007
%IMP Rev	649	0.022	0.068	0.000	0.000	0.000
Big4	649	0.923	0.267	1.000	1.000	1.000
AuditSwitch	649	0.023	0.150	0.000	0.000	0.000
SpecAuditor	649	0.240	0.428	0.000	0.000	0.000
Age	649	29.274	20.351	12.000	25.000	45.000
ForSales%	649	0.298	0.264	0.028	0.277	0.475

Table 3. continued

	(1) N	(2) Mean	(3) S.D.	(4) P25	(5) Median.	(6) P75
Tenure	649	5.083	1.179	5.000	5.000	6.000
Busy	649	0.790	0.407	1.000	1.000	1.000
#IC Weak	649	0.063	0.320	0.000	0.000	0.000
Growth	649	0.007	0.223	-0.096	0.009	0.087
BTM	649	0.430	0.363	0.178	0.346	0.609
InvRec	649	0.199	0.135	0.092	0.173	0.276
LitRisk	649	0.262	0.440	0.000	0.000	1.000
SpecItem	649	0.945	0.229	1.000	1.000	1.000
DiscOps	649	0.159	0.366	0.000	0.000	0.000
Complex	649	0.485	0.149	0.372	0.464	0.573

Panel B: Distribution of Goodwill Disaggregation

GW Disagg	Frequency	Percentage
2	114	17.6%
3	256	39.4%
>3, <=4	73	11.2%
>4, <=5	100	15.4%
>5, <=6	49	7.6%
>6, <=7	26	4.0%
>7, <=8	31	4.8%
Total	649	100.0%

Panel C: Distribution of the Level of Reporting Units

RU Level	Level	Frequency	Percentage
1	Firm	114	17.6%
2	Segment	256	39.4%
>2, <3	Mix of Segment & Sub-Segment	156	24.0%
3	Sub-Segment	123	19.0%
Total		649	100.0%

Panel D: Distribution of the Number of Reporting Units

RU Num	Frequency	Percentage
1	146	22.5%
2	145	22.3%
3	143	22.0%
4	60	9.2%
5	55	8.5%
6	27	4.2%
7	23	3.5%
>=8	50	7.8%
Total	649	100.0%

Panel E: Correlations

Variables	*GW Disagg*	*RU Level*	*RU Num*	*Segments*
GW Disagg	1	0.998***	0.797***	0.285***
RU Level	0.983***	1	0.803***	0.290***
RU Num	0.772***	0.760***	1	0.617***
Segments	0.119**	0.020	0.493***	1

Panel A reports summary statistics. Panels B, C, and D present the distribution of how firms disaggregate goodwill (*GW Disagg*), the level at which firms define reporting units to which goodwill is allocated (*RU Level)*, and the number of reporting units to which goodwill is allocated (*RU Num)* respectively. Panel E presents correlation coefficients between different measures of disaggregation. Spearman and Pearson correlations are presented above and below the diagonal, respectively. *, **, *** Indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 4. Likelihood and Magnitude of Impairment

Panel A: Goodwill Disaggregation

	(1)	(2)	(3)	(4)	(5)	(6)
Model	OLS	OLS	Logit	Logit	OLS	Tobit
Dependent Variable	*IMP*	*GW CAM*	*IMP*	*GW CAM*	*IMP%*	*IMP%*
GW Disagg	0.041***	0.081***	0.439***	0.560***	0.008***	0.052***
	(3.255)	(6.953)	(3.516)	(5.760)	(3.229)	(3.903)
Segments	0.161***	0.354***	1.858***	2.602***	0.027*	0.218***
	(3.234)	(8.173)	(2.797)	(7.070)	(1.737)	(2.623)
GW%	0.072	-0.067	0.161	-0.566	0.037	0.068
	(0.720)	(-0.619)	(0.132)	(-0.659)	(1.315)	(0.400)
ElimStep2	0.115***	0.026	2.214***	0.211	0.019*	0.297***
	(4.034)	(0.620)	(3.894)	(0.737)	(2.011)	(4.301)
HistIMP	0.112*	0.052	0.571	0.306	0.025	0.038
	(1.872)	(0.811)	(1.447)	(0.668)	(1.234)	(0.771)
Acq	-0.057*	-0.057	-0.780*	-0.386	-0.016**	-0.112**
	(-1.924)	(-1.229)	(-1.924)	(-1.390)	(-2.040)	(-1.978)
LagAcq	-0.052	-0.064	-0.539*	-0.538**	-0.016	-0.076**
	(-1.610)	(-1.614)	(-1.887)	(-2.036)	(-1.531)	(-2.052)
COVID	-0.046	-0.038	-0.404	-0.264	-0.017**	-0.042
	(-1.628)	(-0.934)	(-1.402)	(-0.933)	(-2.165)	(-1.141)
Size	0.013	0.003	0.078	0.036	-0.002	-0.006
	(0.801)	(0.187)	(0.584)	(0.331)	(-0.591)	(-0.343)
Lev	-0.108	0.107	-1.480	0.963	-0.058*	-0.246*
	(-1.314)	(1.270)	(-1.458)	(1.573)	(-1.952)	(-1.806)
ROA	0.278	-0.228	1.907	-1.424	0.150*	0.499
	(1.173)	(-0.739)	(0.947)	(-0.588)	(1.779)	(1.551)
Loss	0.146***	0.030	1.001***	0.164	0.047***	0.167***
	(2.735)	(0.530)	(2.598)	(0.382)	(3.177)	(2.980)
Δ*OCF*	-0.196	-0.083	-2.559	-1.233	0.015	-0.175
	(-0.792)	(-0.246)	(-1.262)	(-0.596)	(0.163)	(-0.726)
Δ*Sales*	-0.154*	0.044	-0.610	0.576	-0.080*	-0.121*
	(-1.718)	(0.423)	(-0.921)	(0.873)	(-1.806)	(-1.732)
AnnRet	-0.098***	-0.071**	-0.753**	-0.718**	-0.050***	-0.171***
	(-3.210)	(-2.230)	(-1.965)	(-2.074)	(-4.220)	(-3.287)
AnnRetSTD	5.381***	3.615*	41.792***	23.263	2.243***	6.948***
	(3.331)	(1.852)	(3.246)	(1.635)	(2.943)	(4.413)
BTM>1	0.196**	0.262***	1.111*	1.729***	0.090**	0.168**
	(2.235)	(3.650)	(1.692)	(3.310)	(2.658)	(2.166)
Bath	-0.015	0.213	0.409	3.504	-0.026	-0.028
	(-0.056)	(0.969)	(0.222)	(0.823)	(-0.311)	(-0.142)
Smooth	-0.623	0.015	-6.217	2.414	-0.049	-0.351
	(-1.225)	(0.027)	(-1.122)	(0.693)	(-0.249)	(-0.534)
#NonGW CAMs		-0.177***		-1.285***		
		(-11.723)		(-10.155)		
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
Observations	649	649	649	649	649	649
Used Observations	649	649	607	614	649	649
Adj R-squared	0.316	0.400			0.319	
Pseudo R2			0.391	0.384		0.570

Table 4. continued

Panel B: Segments as a Proxy for Goodwill Disaggregation

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	*IMP*	*IMP*	*GW CAM*	*GW CAM*	*IMP%*	*IMP%*
Segments	0.170***	0.161***	0.371***	0.354***	0.029*	0.027*
	(3.441)	(3.234)	(7.067)	(8.173)	(1.826)	(1.737)
GW Disagg		0.041***		0.081***		0.008***
		(3.255)		(6.953)		(3.229)
Δ Coefficients	(0.032)		(0.064)		(0.006)	
Chi-squared	20.549***		17.803***		13.098***	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
Observations	649	649	649	649	649	649
Adj R-squared	0.294	0.316	0.343	0.400	0.313	0.319
Δ Adj R-squared	0.022		0.057		0.006	
Δ Adj R-squared %	7.5%		16.6%		1.9%	

Panel C: Decomposition of Goodwill Disaggregation

	(1)	(2)	(3)
Dependent Variable	*IMP*	*GW CAM*	*IMP%*
RU Num	0.033***	0.039***	0.001
	(3.129)	(3.043)	(0.193)
RU Level	0.029	0.110***	0.022*
	(0.985)	(3.435)	(1.964)
Joint Significance F Statistic	9.103***	28.650***	7.031***
Controls	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry
Observations	649	649	649
Adjusted R-squared	0.328	0.405	0.321

Panel D: Sub-Segment Level Disaggregation

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	*IMP*	*GW CAM*	*IMP%*	*IMP*	*GW CAM*	*IMP%*
Sub-Segment Level	0.131***	0.271***	0.031*	0.120**	0.243***	0.026
	(3.100)	(4.910)	(1.960)	(2.430)	(3.763)	(1.308)
Firm Level				-0.027	-0.076	-0.013
				(-0.457)	(-1.220)	(-0.631)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
Observations	649	649	649	649	649	649
Adj R-squared	0.307	0.383	0.319	0.307	0.383	0.318

Table 4 reports the regression results for impairment likelihood and magnitude. All models are estimated using OLS, except for those reported in Panel A columns 3, 4, and 6, which are estimated using non-linear models. t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively. Estimates related to the constant term, and control variables (after Panel A) have been excluded for brevity.

5.3 Magnitude of Impairment

The results of testing H2 are presented in columns 5 and 6 where the dependent variable is my proxy for the magnitude of impairment (*IMP*%). The results of estimating an OLS model (Tobit model with censoring at 0 percent and 100 percent) are presented in column 5 (6). The coefficient on *GW Disagg* is positive and statistically significant for both models indicating that a one standard deviation increase in *GW Disagg* is associated with an increase in the magnitude of goodwill impairment of 1.2 percentage-points which represents a 25.1 percent increase relative to the mean.

5.4 Segments As a Proxy for Goodwill Disaggregation

Panel B presents the results of comparing variants of model (2) which feature my measure, *GW Disagg* and a control for the number of segments (*Segments*) against variants of model (2) that proxy for goodwill disaggregation using only segments. The number of segments has been used in prior literature to proxy for goodwill disaggregation (Carcello et al. 2020; Black et al. 2022), so it is important to demonstrate that my measure has incremental explanatory power over *Segments* in isolation. The coefficient on *Segments* (columns 1, 3, and 5) is compared with the sum of the coefficients on *Segments* and *GW Disagg* (columns 2, 4, and 6) using a chi-squared test. The differences are statistically significant for each model suggesting that my measure is not well proxied for by *Segments*. The models that include my measure also have adjusted R-squared values between 1.9 and 16.6 percent higher than models that do not include my measure.

5.5 Decomposition of Goodwill Disaggregation

Panel C re-estimates model (2) decomposing *GW Disagg* into its components, *RU Num* and *RU Level*. The results suggest that disaggregation through *RU Num* and *RU Level*

are both associated with an increase in impairment likelihood while only *RU Level* is associated with an increase in impairment magnitude.

5.6 Sub-Segment Level Disaggregation

To directly inform the FASB's ITC inquiry into the appropriate unit of assessment for impairment testing, Panel D re-estimates model (2), substituting *GW Disagg* with *Sub-Segment Level*. *Sub-Segment Level* is an indicator variable equal to one for all observations that disaggregate goodwill at the sub-segment level and zero otherwise. These results provide estimates of the association between impairment assessments conducted at the sub-segment level and both the likelihood and magnitude of impairment. The coefficient on *Sub-Segment Level* is positive and statistically significant in all models, but one. Columns 1 – 3 present results where both firm and segment-level observations serve as the base group, although I focus on the results in columns 4 – 5 that include the control variable *Firm Level. Firm Level* is an indicator variable equal to one for all observations that disaggregate goodwill at the firm level and zero otherwise. In these models, segment-level observations serve as the base group. Segment-level disaggregation would likely be the level at which sub-segment level firms would assess goodwill for impairment should sub-segment disaggregation be disallowed. The positive and significant coefficient on *Sub-Segment Level* in column 4 (5) suggests that impairments (goodwill-related CAMs) occur with 12.0 (24.3) percent greater frequency when impairment assessments are conducted at the sub-segment level as opposed to the segment level.

5.7 Impairment's Ability to Predict Future Cash Flows

Table 5 presents the results of estimating model (3). The negative and statistically significant coefficient on *IMP%TA* in column 1 suggests that goodwill impairments predict

declines in cash flows in the year following the impairment. This finding is consistent with several prior studies (Jarva 2009; Lee 2011; Bostwick et al. 2016). The statistically insignificant coefficients on *GW Disagg* x *IMP%TA* and *Sub-Segment Level* x *IMP%TA* in columns 2 and 3, respectively suggest that impairments produced by firms that disaggregate do not predict declines in future operating cash flows incrementally better than those that do not.

The positive and statistically significant coefficient on *Firm Level* x *IMP%TA* in columns 4 and 5 offset the negative coefficient on *IMP%TA* indicating that goodwill impairments produced by firms that disaggregate goodwill at the firm level have lower predictive power relative to firms that disaggregate at the segment and subsegment level (column 4) and relative to firms that disaggregate at the segment level (column 5). This finding is consistent with the notion that more disaggregated goodwill allocations produce more informative impairments. However, in column 5 the coefficient on *Sub-Segment Level* x *IMP%TA* is statistically insignificant indicating that goodwill impairments produced by firms that disaggregate goodwill at the sub-segment level do not provide more predictive value than firms that disaggregate goodwill at the segment level. This finding is robust to the use of the alternative model presented in Gordon and Hsu (2018) (untabulated). These results suggest a non-linear positive association between disaggregation and the predictive value of impairments. Gordon and Hsu (2018, footnote 4), indicates that changes in future cash flows from impairments of intangibles are inconsistent and inconclusive. My results suggest that the disaggregation of goodwill is an important factor to consider when interpreting goodwill impairments. Taken together these

Table 5. Future Cash Flows

Dependent Variable	(1) OCF_A_{t+1}	(2) OCF_A_{t+1}	(3) OCF_A_{t+1}	(4) OCF_A_{t+1}	(5) OCF_A_{t+1}
IMP%TA	-0.213**	-0.158	-0.185*	-0.244***	-0.214*
	(-2.471)	(-0.593)	(-1.768)	(-2.729)	(-1.965)
GW Disagg		0.001			
		(0.688)			
GW Disagg x *IMP%TA*		-0.015			
		(-0.272)			
Sub-Segment Level			0.011		0.008
			(1.301)		(0.909)
Sub-Segment Level x *IMP%TA*			-0.175		-0.145
			(-0.876)		(-0.720)
Firm Level				-0.014	-0.009
				(-1.506)	(-1.051)
Firm Level x *IMP%TA*				0.263***	0.233**
				(3.190)	(2.373)
OCF_A	1.002***	1.000***	0.996***	0.995***	0.993***
	(21.980)	(22.530)	(22.026)	(21.914)	(21.932)
ΔOCF_A	-0.393***	-0.393***	-0.394***	-0.394***	-0.394***
	(-3.930)	(-3.951)	(-3.962)	(-3.934)	(-3.961)
ACC	0.170**	0.166**	0.166**	0.157**	0.159**
	(2.654)	(2.634)	(2.553)	(2.538)	(2.582)
IndROA	-0.881**	-0.875**	-0.868**	-0.875**	-0.870**
	(-2.657)	(-2.650)	(-2.628)	(-2.680)	(-2.649)
CAPEX	0.057	0.060	0.069	0.057	0.065
	(0.323)	(0.339)	(0.394)	(0.333)	(0.385)
Rest	-0.039	-0.042	-0.070	-0.052	-0.069
	(-0.137)	(-0.149)	(-0.250)	(-0.193)	(-0.256)
COVID	-0.009	-0.009	-0.009	-0.009	-0.009
	(-0.946)	(-0.937)	(-0.935)	(-0.936)	(-0.925)
Segments	-0.006	-0.007	-0.004	-0.015	-0.010
	(-0.748)	(-0.783)	(-0.472)	(-1.410)	(-1.099)
Fixed Effects	Industry	Industry	Industry	Industry	Industry
Observations	649	649	649	649	649
Adjusted R-squared	0.631	0.630	0.632	0.632	0.631

Models are estimated using OLS, and t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. Estimates related to the constant term have been excluded for brevity. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

findings suggest that the predictive value of impairments may not be negatively affected by a FASB change from reporting unit to segment-level assessments, but that changing to firm-level assessments could result in less informative impairments. These results should be interpreted with caution in the context of accounting standard setting. Managers may choose to disaggregate at the sub-segment level to maximize the informativeness of

impairments. It is possible that disallowing the use of sub-segment level disaggregation could lead to less informative impairments for sub-segment level firms, although sub-segment level disaggregation does not appear to produce more informative impairments.

5.8 Auditor's Perceived Business Risk: CAM Content

The description (response) section of CAMs are roughly 146 (120) words long, 5.3 (0.5) percent quantitative, and 2.8 (3.6) percent uncertain words. Table 6 Panel A presents the results of estimating model (4) on the text of CAM descriptions. The negative and statistically significant coefficient on *GW Disagg* in columns 1 and 3 indicate that a one standard deviation increase in *GW Disagg* is associated with 0.9 percent shorter and 11.0 percent less uncertain descriptions of goodwill-related CAMs by auditors. Panel B presents the results of estimating model (4) on the text of CAM responses. The positive and statistically significant coefficient on *GW Disagg* in column 3 indicates that a one standard deviation increase in *GW Disagg* is associated with 17.1 percent more uncertain audit responses in goodwill-related CAMs. This pattern is consistent with auditors attempting to shield themselves from the perceived business risk related to goodwill that is not disaggregated.

Table 6. Goodwill Disaggregation and CAM Content

Panel A: CAM Description

	(1)	(2)	(3)
Dependent Variable	*Length*	*Quantitative*	*Uncertain Tone*
GW Disagg	-0.028*	0.000	-0.002*
	(-1.853)	(0.225)	(-1.904)
Controls	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry
Observations	271	271	271
Adj R-squared	0.136	0.160	0.187

Panel B: CAM Audit Response

	(1)	(2)	(3)
Dependent Variable	*Length*	*Quantitative*	*Uncertain Tone*
GW Disagg	-0.015	-0.000	0.004*
	(-1.385)	(-0.203)	(1.699)
Controls	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry
Observations	271	271	271
Adj R-squared	0.152	0.182	0.272

Models are estimated using OLS, and t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. Estimates related to the constant term, and control variables have been excluded for brevity. Models are estimated using the sub-sample of all firms with a goodwill-related CAM. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

5.9 Auditor's Perceived Business Risk: Audit Fees

Table 7 presents the results of estimating model (5). The coefficient on each disaggregation measure (*GW Disagg*, *RU Num*, *RU Level,* and *Sub-Segment Level*) is statistically insignificant indicating that despite having to audit fewer goodwill impairment assessments, auditors do not decrease audit fees when goodwill is not disaggregated.[26, 27] This finding suggests that disallowing the use of sub-segment level disaggregation may not decrease audit fees.

[26] The positive and statistically significant coefficient on *#NonGW CAMs* is consistent with prior literature (Reid, Carcello, Li, Neal, and Francis 2019; Li and Lou 2023).

[27] In untabulated analyses I find that the results of model (5) are robust to an abnormal audit fee specification (Eshleman and Guo 2014).

Table 7. Audit Fees

Dependent Variable	(1) *AuditFee*	(2) *AuditFee*	(3) *AuditFee*	(4) *AuditFee*
GW Disagg	0.014			
	(1.183)			
RU Num		-0.008		
		(-0.621)		
RU Level		0.063		
		(1.386)		
Sub-Segment Level			0.054	0.021
			(0.764)	(0.278)
Firm Level				-0.092
				(-1.054)
IMP	-0.007	-0.005	-0.005	-0.007
	(-0.128)	(-0.092)	(-0.083)	(-0.129)
GW CAM	0.100**	0.101**	0.103**	0.101**
	(2.168)	(2.133)	(2.343)	(2.283)
#NonGW CAMs	0.095***	0.096***	0.095***	0.095***
	(3.745)	(3.729)	(3.698)	(3.742)
Segments	0.248**	0.238**	0.267***	0.200
	(2.561)	(2.376)	(3.332)	(1.679)
GW%	-0.051	-0.034	-0.040	-0.046
	(-0.283)	(-0.189)	(-0.229)	(-0.250)
Acq	0.014	0.011	0.012	0.013
	(0.246)	(0.194)	(0.218)	(0.226)
COVID	-0.050*	-0.055**	-0.053**	-0.053**
	(-2.009)	(-2.077)	(-2.030)	(-2.032)
Big4	0.204*	0.203*	0.205*	0.201*
	(1.834)	(1.890)	(1.789)	(1.825)
AuditSwitch	-0.006	-0.001	-0.006	-0.002
	(-0.046)	(-0.007)	(-0.048)	(-0.017)
SpecAuditor	0.034	0.034	0.034	0.034
	(0.529)	(0.516)	(0.540)	(0.543)
Age	0.001	0.001	0.001	0.001
	(0.397)	(0.450)	(0.401)	(0.423)
Size	0.446***	0.451***	0.447***	0.451***
	(15.392)	(16.969)	(15.158)	(15.792)
Lev	0.645***	0.647***	0.644***	0.644***
	(5.623)	(5.573)	(5.505)	(5.611)
ROA	-0.504	-0.510	-0.487	-0.525
	(-1.527)	(-1.561)	(-1.438)	(-1.599)
Loss	-0.024	-0.018	-0.023	-0.017
	(-0.375)	(-0.275)	(-0.363)	(-0.255)
ForSales%	0.396***	0.395***	0.392***	0.394***
	(3.610)	(3.477)	(3.546)	(3.405)
OCF_A	-1.191*	-1.218*	-1.218*	-1.207*
	(-1.955)	(-2.005)	(-1.967)	(-2.000)
Rest	8.950***	8.817***	8.872***	8.874***
	(3.366)	(3.248)	(3.256)	(3.237)
Tenure	-0.014	-0.013	-0.014	-0.014
	(-0.788)	(-0.693)	(-0.729)	(-0.735)
Busy	0.041	0.047	0.043	0.046
	(0.887)	(1.059)	(0.938)	(1.001)
#IC Weak	0.179**	0.174**	0.179**	0.174**
	(2.527)	(2.340)	(2.541)	(2.374)
Growth	0.251***	0.251***	0.248***	0.258***
	(3.567)	(3.758)	(3.349)	(3.748)

Table 7. continued

Dependent Variable	(1) *AuditFee*	(2) *AuditFee*	(3) *AuditFee*	(4) *AuditFee*
BTM	0.449***	0.447***	0.445***	0.450***
	(7.236)	(7.414)	(7.099)	(7.062)
InvRec	0.961***	0.969***	0.971***	0.949***
	(3.170)	(3.216)	(3.190)	(3.129)
LitRisk	-0.070	-0.071	-0.073	-0.071
	(-0.513)	(-0.501)	(-0.526)	(-0.496)
SpecItem	0.079	0.077	0.079	0.080
	(1.093)	(1.091)	(1.075)	(1.131)
DiscOps	0.008	0.004	0.009	0.003
	(0.098)	(0.045)	(0.121)	(0.039)
Complex	0.786***	0.778***	0.782***	0.776***
	(8.029)	(8.128)	(7.975)	(7.999)
GCO	-0.148	-0.169	-0.148	-0.176
	(-1.012)	(-1.148)	(-1.032)	(-1.147)
Fixed Effects	Industry	Industry	Industry	Industry
Observations	649	649	649	649
Adjusted R-squared	0.738	0.738	0.737	0.738

Models are estimated using OLS, and t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. Estimates related to the constant term have been excluded for brevity. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

CHAPTER 6

ADDITIONAL ANALYSES

I conduct two sets of additional analyses. First, to provide additional insights into the informativeness of impairments produced by different levels of disaggregation I examine the discussion of goodwill and goodwill impairments in earnings calls. Second, to support my use of goodwill related CAMs as a measure of impairment likelihood I provide evidence that goodwill-related CAMs help identify material goodwill balances, capture borderline impairment cases, and are associated with future impairments and the magnitude of those impairments.

6.1 Discussion of Goodwill in Earnings Calls

To corroborate my finding that disaggregated goodwill may not be more informative than goodwill that is not disaggregated I study earnings call communications. Earnings calls are important and timely events where top executives share the most relevant company matters with analysts and investors (Bochkay et al. 2025). Prior studies have documented a negative market reaction to goodwill impairments announced during earnings calls (Bens et al. 2011), and a reduction in this reaction following the adoption of SFAS 142 (Li et al. 2011; Li and Sloan 2017). If disaggregated goodwill is more informative, I expect to observe more discussion of disaggregated goodwill in earnings calls. However, if managers limit their earnings call discussion to reporting units for which stakeholders have access to goodwill-relevant accounting data I expect to observe less discussion of disaggregated goodwill in earnings calls.

I estimate the following OLS model and cluster standard errors by industry as shown below.

$$EC = \beta_0 + \beta_1 IMP + \beta_2 GW\ Disagg + \beta_3 GW\ Disagg \text{ x } IMP + \beta_4 GW\% + \beta_5 \%IMP\ Rev + \beta_6 Num\ Calls + \beta_7 Num\ Words\ Calls + \beta_8 COVID + \beta_9 Size + \beta_{10} Loss + \beta_{11} Lev + \beta_{12} ROA + \beta_{13} AnnRet + \beta_{14} AnnRetSTD + \beta_{15} BTM>1 + \beta_{16} \Delta OCF + \beta_{17} \Delta Sales + \beta_{18} InstOwn + \beta_{19} LnAF + \beta_{20} LitRisk + \beta_{21} \text{Big4} + \beta_{22} Acq + \beta_{23} Segments + \text{Industry FE} + \varepsilon \quad (6)$$

I estimate this model separately for the prepared remarks section (Prepared) and the question and answer section (Q&A) (Matsumoto, Pronk, and Roelofsen 2011). This allows me to separately assess whether management includes information on goodwill in prepared remarks or in response to follow up questions from call participants. The dependent variable, *EC* has two variants: *EC IMP*, and *EC GW*. *EC IMP* is an indicator variable which takes the value of one for observations that announce goodwill impairments in an earnings call and zero otherwise. *EC GW* is an indicator variable which takes the value of one for observations that discuss goodwill in an earnings call and zero otherwise. *Num Calls* and *Num Words* are the natural logarithm of the number of earnings calls during the fiscal year, and the natural logarithm of the mean number of words in the applicable section of those earnings calls, respectively and control for differences in the extent of earnings call communications.

Table 8 Panel A presents the results of estimating model (6) where the dependent variable is *EC IMP*. The coefficients on *GW Disagg* x *IMP* in column 1 and *Sub-Segment Level x IMP* in columns 2 and 3 are negative and statistically significant, indicating that managers are less likely to discuss impairments related to disaggregated goodwill than goodwill that is not disaggregated in the prepared section of the earnings call. The coefficients on these terms are not statistically significant in the analyses of the Q&A

section in columns 4 – 6. These results are consistent with management limiting the discussion of goodwill impairments to reporting units to which stakeholders have access to goodwill relevant accounting data and investors and analysts not viewing impairments produced by disaggregated firms as being more informative than impairments produced by firms that do not disaggregate goodwill.

In Panel B the dependent variable is *EC GW*. The coefficients on *GW Disagg* in column 1 and *Sub-Segment Level* in columns 2 and 3 are negative and statistically significant, indicating that managers are less likely to discuss goodwill in the prepared section when it is disaggregated than when it is not. The coefficients on these terms are not statistically significant in the analyses of the Q&A section in columns 4 – 6. These results are consistent with management, investors and analysts not viewing disaggregated goodwill as being more informative than goodwill that is not disaggregated. Taken together with the finding that sub-segment level disaggregation does not produce impairments that are better able to predict future operating cash flows these findings suggest that sub-segment level disaggregation may not be more informative than goodwill that is not disaggregated.

Table 8. Discussion of Goodwill During Earnings Calls

Panel A: Discussion of Goodwill Impairment

	(1)	(2)	(3)	(4)	(5)	(6)
Section of Earnings Call	Prepared	Prepared	Prepared	Q&A	Q&A	Q&A
Dependent Variable	*EC IMP*	*EC IMP*	*EC IMP*	*EC IMP*	*EC IMP*	*EC IMP*
IMP	0.828***	0.635***	0.637***	0.127	0.164***	0.166***
	(6.625)	(8.729)	(8.866)	(1.244)	(3.183)	(3.214)
GW Disagg	-0.000			-0.000		
	(-0.085)			(-0.168)		
GW Disagg x IMP	-0.056**			0.007		
	(-2.442)			(0.325)		
Sub-Segment Level		-0.000	0.010		0.006	0.026
		(-0.014)	(0.544)		(0.578)	(1.065)
Sub-Segment Level x IMP		-0.213*	-0.212*		-0.026	-0.032
		(-1.921)	(-1.874)		(-0.369)	(-0.436)
Firm Level			0.026			0.049
			(1.042)			(1.243)
Firm Level x IMP			0.149			-0.049
			(1.396)			(-0.582)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
Observations	569	569	569	569	569	569
Adj R-squared	0.661	0.663	0.662	0.194	0.194	0.196

Panel B: Discussion of Goodwill

	(1)	(2)	(3)	(4)	(5)	(6)
Section of Earnings Call	Prepared	Prepared	Prepared	Q&A	Q&A	Q&A
Dependent Variable	*EC GW*	*EC GW*	*EC GW*	*EC GW*	*EC GW*	*EC GW*
IMP	0.569***	0.570***	0.570***	0.180***	0.180***	0.182***
	(8.503)	(8.429)	(8.456)	(2.969)	(2.952)	(3.040)
GW Disagg	-0.013*			0.007		
	(-1.931)			(0.971)		
Sub-Segment Level		-0.075**	-0.075**		0.034	0.066
		(-2.601)	(-2.402)		(0.953)	(1.634)
Firm Level			0.000			0.086
			(0.013)			(1.369)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
Observations	569	569	569	569	569	569
Adj R-squared	0.561	0.564	0.563	0.120	0.121	0.127

Models are estimated using OLS, and t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. Estimates related to the constant term, and control variables have been excluded for brevity. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

6.2 Measuring Impairment Likelihood with CAMs

To support the use of goodwill-related CAMs as a proxy for the likelihood of impairment, I build on prior literature by performing validation testing. In 2017 the PCAOB adopted AS 3101 which requires auditors to include CAMs within their audit reports. A CAM is any matter arising from the audit that was communicated to or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the financial statements and (2) involved especially challenging, subjective, or complex auditor judgment.[28] The standard had a phased implementation that began with large accelerated filers with fiscal year ends on or after June 30, 2019. The standard was effective for other filers with fiscal year ends on or after December 15, 2020 (PCAOB 2017). Intangibles, and specifically goodwill impairments are among the most common CAMs reported by auditors (Burke, Hoitash, and Hoitash 2023; Jahan and Karim 2023). Goodwill-related CAMs make up about 13 percent of all CAMs issued during the first phase of adoption in 2019 (Burke et al. 2023). Goodwill-related CAMs are even more prevalent than that figure suggests considering that only approximately 30 percent of firms have a non-zero goodwill balance (Nunes and Warner 2022). Figure 3 provides an example of a typical goodwill-related CAM. The CAM refers to a specific reporting unit and relates to goodwill impairment. A review of the goodwill-related CAMs issued for firms in my sample reveals that substantially all goodwill-related CAMs relate to impairment.

CAMs have two theoretical advantages over using recorded impairments as a measure of the likelihood of impairment. First, by definition, CAMs are restricted to

[28] In determining whether a matter involves especially challenging, subjective, or complex auditor judgment, the auditor should take into account the risk of material misstatement, degree of auditor judgment in areas of significant managerial judgment, the nature and timing of transactions, the degree of auditor subjectivity and the nature and extent of audit effort.

accounts or disclosures that are material to the financial statements (Jahan and Karim 2023). Studies have used coarse means of restricting analyses to goodwill balances considered material, such as the 5 percent of revenue threshold commonly used in the literature (Ayres et al. 2019; Carcello et al. 2020; Jahan and Karim 2023). Second, due to the auditor's requirement to consider the risk of material misstatement when issuing CAMs, CAMs capture borderline cases which are at risk for impairment, but for which an impairment is not recorded (PCAOB 2017, 20). Measures based on recorded impairments ignore such cases. An association between goodwill-related key audit matters and future impairments has been documented in UK premium listed firms (Andreicovici et al. 2025) but has not been shown in the U.S. setting for CAMs.

To explore the association between goodwill-related CAMs and future goodwill impairments I estimate the following model.

$$\textit{Future Impairment} = \beta_0 + \beta_1 GW\ CAM + \gamma \text{Controls} + \text{Industry FE} + \varepsilon \quad (7)$$

In this model, *Future Impairment* has four variants: IMP_{t+1}, IMP_{t+2}, $IMP\%_{t+1}$, and $IMP\%_{t+2}$. IMP_{t+1} (IMP_{t+2}) is an indicator variable equal to one if the firm records an impairment in fiscal year t+1 (t+1 or t+2), and zero otherwise.[29] $IMP\%_{t+1}$ ($IMP\%_{t+2}$) is the percentage of pre-impairment goodwill that was impaired in fiscal year t+1 (cumulative percentage impaired in years t+1 and t+2). The control variables included in this model are consistent with those included in model (2), which is designed to estimate the likelihood of goodwill impairment. The initial sample for these test include all 1,787 firm-year observations with goodwill (Table 2).

[29] In models where the dependent variables are binary, I continue to use an OLS model rather than a logit or probit model to avoid the incidental parameters problem which could be caused using fixed effects in binary outcome models (Neyman and Scott 1948; Greene 2004). The inferences presented are robust to the use of conditional logit models (IMP_{t+1}, IMP_{t+2}) and Tobit models ($IMP\%_{t+1}$, $IMP\%_{t+2}$).

An auditor's decision to issue a goodwill-related CAM is not synonymous with the firm's recognition of an impairment. When a goodwill impairment is recorded auditors issue a goodwill-related CAM in 77.8 percent of cases (untabulated). Table 9 Panel A presents differences between observations where a goodwill-related CAM is issued and where one is not issued, within the sub-sample of firm-year observations that *record an impairment*. Observations that record an impairment where no goodwill-related CAM is issued have a lower impairment expense relative to revenue (*%IMP Rev*), a lower goodwill balance relative to total assets (*GW%*), and have more non-goodwill-related CAMs (*#NonGW CAMs*). These univariate statistics are consistent with Jahan and Karim (2023) which find that auditors issue goodwill-related CAMs on significant goodwill balances rather than on all goodwill balances that are impaired.

When no impairment expense is recorded auditors issue goodwill-related CAMs in 22.9 percent of cases (untabulated). Panel B presents differences between observations that have a goodwill-related CAM and those that do not, within the sub-sample of firm-year observations that *do not record an impairment*. Observations that do not have an impairment but have a goodwill-related CAM have a higher goodwill balance relative to total assets (*GW%*), a higher likelihood of having a market indicator of impairment risk (*BTM>1*) and have fewer non-goodwill-related CAMs (*#NonGW CAMs*). These univariate statistics are consistent with Jahan and Karim (2023) which finds auditors issue goodwill-related CAMs for firms with significant goodwill balances at elevated risk of impairment that did not record an impairment (borderline cases).

Table 9. Measuring Likelihood of Impairment with Goodwill-Related CAMs

Panel A: CAM Issuance: Impairing Firms Sub-Sample

	(1)	(2)	(3)	(4)	(5)
	N	CAM Issued (Mean)	No CAM Issued (Mean)	Difference (3) - (2)	t-statistic
IMP%	279	0.218	0.192	-0.026	(-0.744)
%IMP Rev	279	0.078	0.036	-0.042***	(-3.122)
GW%	279	0.257	0.188	-0.069***	(-2.927)
BTM>1	279	0.175	0.097	-0.078	(-1.493)
#NonGW CAMs	279	0.991	1.565	0.574***	(4.770)

Panel B: CAM Issuance: Non-Impairing Firms Sub-Sample

	(1)	(2)	(3)	(4)	(5)
	N	CAM Issued (Mean)	No CAM Issued (Mean)	Difference (3) - (2)	t-statistic
GW%	1,508	0.268	0.231	-0.036***	(-3.172)
BTM>1	1,508	0.087	0.028	-0.059***	(-4.809)
#NonGW CAMs	1,508	0.754	1.478	0.724***	(16.832)

Panel C: Issuance of CAMs and Future Impairment

	(1)	(2)	(3)	(4)
	IMP_{t+1}	IMP_{t+2}	$IMP\%_{t+1}$	$IMP\%_{t+2}$
GW CAM	0.088***	0.097***	0.022***	0.022***
	(4.093)	(3.777)	(3.595)	(2.886)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Industry	Industry	Industry	Industry
Observations	1,508	1,508	1,508	1,508
Adjusted R-squared	0.143	0.133	0.154	0.109

Panel A presents differences between observations where a goodwill-related CAM is issued, and where one is not issued in the sub-sample of all firm-years that record a goodwill impairment in the focal year. Panel B presents differences between observations where a goodwill-related CAM is issued, and where one is not issued in the sub-sample of all firm-years that do not record a goodwill impairment in the focal year. Panel C presents the regression results using OLS, and t-statistics based on industry-clustered standard errors are presented in parentheses below the coefficients. The sample is restricted to all firm-years that do not record a goodwill impairment in the focal year. Estimates related to the constant term, and control variables have been excluded for brevity. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

Panel C presents the results of estimating model (6). To isolate the association between goodwill-related CAMs and future goodwill impairments, the model is estimated on a sample of all firm-year observations with goodwill that did not record a goodwill impairment in year t. The coefficient on *GW CAM* is positive and statistically significant in each column, indicating that goodwill-related CAMs issued by auditors are associated with both the likelihood (IMP_{t+1} and IMP_{t+2}) and magnitude ($IMP\%_{t+1}$ and $IMP\%_{t+2}$) of

future goodwill impairments. This result is consistent with goodwill-related CAMs providing a novel measure of the likelihood of goodwill impairment not captured by measurements based on current year impairments. This measure also, via auditors' assessment, inherently captures the materiality of goodwill to the individual firm, thus eliminating the need for researchers to use coarse materiality thresholds to refine their sample.

CHAPTER 7

ROBUSTNESS TESTS

I perform several robustness tests to help validate my findings. First, I re-estimate model (2) on a subsample excluding observations with fiscal yearends after 2019. These untabulated results show that my findings are robust to excluding observations that were impacted by the economic shock associated with COVID that occurred mid-way through my sample period.

Second, to partially address the risk of self-selection bias I show that the results of model (2) and (3) are robust to the use of a Heckman model that explicitly models a firm's voluntary choice to disclose goodwill allocation data. This procedure also allows me to investigate the determinants of the degree of goodwill disaggregation.

Third, endogenous choices by management regarding the operating structure of the firm may influence both a firm's choice of goodwill disaggregation, and its impairment outcomes through operating performance rather than through disaggregation, as I argue above. To partially address this risk, I present descriptive statistics for the sample of firms partitioned by whether the firm disaggregates at the sub-segment level or not. t-tests indicate that disaggregating firms do not exhibit weaker operating performance than firms that do not disaggregate, but that they are more likely to impair goodwill.

7.1 Self-Selection Bias

To partially address the risk of self-selection bias I show that the results of model (2) and (3) are robust to the use of a Heckman model with zero-order regression that explicitly models a firm's voluntary choice to disclose goodwill allocation data. This

procedure also allows me to investigate the determinants of the degree of goodwill disaggregation. In a standard Heckman model the dependent variable in the second-stage is observed only if $s_i = 1$. In this case, the main dependent variables *(IMP*, *GW CAM*, *IMP%*, and OCF_A_{t+1}) are observed for all the observations in the sample, however the *variable of interest* (*GW Disagg*) is only observed when a firm voluntarily discloses it. To address this I use zero-order regression in which I treat observations with missing *GW Disagg* values as having a *GW Disagg* of zero and include an indicator variable, *NonDisc*, that takes the value of one if the firm does not disclose adequate information to calculate *GW Disagg* and zero otherwise (Greene 1993, 60; Hopkins, Maydew, and Venkatachalam 2015). This allows me to include non-disclosing firms in my sample while preserving the interpretability of model estimates for *GW Disagg*.

In the first-stage I use a probit model to explicitly model a firm's binary voluntary disclosure choice (*Disc*). Based on the first-stage probit model I manually calculate two inverse mills ratios. The first is the inverse mills ratio associated with a firm's choice *to disclose* their goodwill disaggregation. The second is the inverse mills ratio associated with a firm's choice *not to disclose* their goodwill disaggregation. The second inverse mills ratio is necessary because non-disclosing firms are included in the third-stage via zero-order regression. The second-stage of the model is a determinants model where the sample is limited to observations related to disclosing firms, whereas the third-stage directly investigates my hypotheses, and includes all observations. In the third-stage, I include the first inverse mills ratio for disclosing firms, and the negative value of the second inverse mills ratio for non-disclosing firms.[30] I estimate the following model to test the robustness

[30] In order to correctly calculate standard errors for the second- and third-stages of the model, I use the method recommended by Basu and Byzalov (2023) in which the first-stage and the second-stage (third-stage) of the

of model (2) where the dependent variable is *IMP*.[31] The control variables are consistent with those used in model (2). Fixed effects are not included in this model to avoid the incidental parameters problem which could be caused by the use of fixed effects in binary outcome models (first-stage) (Neyman and Scott 1948; Greene 2004).

Third-Stage

$$IMP = \begin{cases} \beta_0 + \beta_1 GW\ Disagg + \beta_2 NonDisc + \beta_3 Mills_1 + \gamma_1 \text{Controls} + \varepsilon, if Disc = 1, \\ \beta_0 + \beta_1 GW\ Disagg + \beta_2 NonDisc + \beta_3 Mills_2 + \gamma_1 \text{Controls} + \varepsilon, if Disc = 0, \end{cases}$$

Second-Stage

$$GWDisagg = \begin{cases} \beta_4 Mills_1 + \gamma_2 \text{Controls} + u, if Disc = 1, \\ - \quad , if Disc = 0, \end{cases} \quad (8)$$

Where:

First-Stage

$$Disc = \text{I}[\beta_5 QuartDisc + \gamma_3 \text{Controls} + v > 0]$$

The exclusion restriction requires that the first-stage has at least one variable that isn't included in the second-stage or third-stage of the model and that this variable does not affect the primary dependent variable. As an instrument, I include a proxy for firm voluntary disclosure (*QuartDisc*) in the first-stage by modifying the quarterly measure of accounting reporting complexity (ARC) introduced by Hoitash and Hoitash (2018). ARC is based on the count of distinct monetary XBRL tags within an SEC filing. I focus on the average number of distinct monetary XBRL tags within quarterly filings for two reasons. First, as described in ASC 270-10-50-1 firms are permitted to report summarized financial information in their quarterly reports which contain much less detail than annual reports

Heckman model are included in one statistical function and standard errors are bootstrapped using 1,000 iterations of that function clustered by industry.

[31] A similar approach is employed for each dependent variable used to test H1, H2, and H3.

(Hoitash, Hoitash, Morris, and Yezegel 2021).[32] Second, quarterly filings are required to be reviewed by auditors rather than audited (SEC 1999). These features accentuate management's ability to use discretion with respect to their quarterly disclosure choices relative to annual disclosures. I expect higher levels of quarterly disclosure to be positively associated with the voluntary disclosure of goodwill disaggregation within annual reports, but exogenous to the likelihood of impairment. To ensure this measure is not contaminated by quarterly goodwill or impairment disclosures I remove all XBRL tags which contain the terms "goodwill" or "impairment" before constructing the variable.

Table 10 Panel A presents the results of estimating the third-stage of model (8) on samples of all firms with goodwill regardless of whether or not they disclose their goodwill disaggregation. The coefficient on *Mills* is insignificant in three of the four models indicating that self-selection may not be a major concern. The results are consistent with my main findings.

Panel B presents the results of estimating the first-stage of model (8). As predicted, the coefficient on *QuartDisc* is positive and statistically significant indicating that the relevance assumption is likely satisfied.

[32] Due to the financial reporting flexibility permitted during quarters researchers are discouraged from using quarterly ARC as a measure of firm complexity (https://www.xbrlresearch.com/firm-complexity/).

Table 10. Self-Selection and Determinants of Goodwill Disaggregation

Panel A: Third-Stage – Robustness Testing

	(1)	(2)	(3)	(4)
Dependent Variable	*IMP*	*GW CAM*	*IMP%*	*IMP%*
GW Disagg	0.038***	0.066***	0.007***	
	(3.365)	(5.300)	(2.923)	
NonDisc	0.345	-0.633	0.188	0.121
	(0.720)	(-1.374)	(1.127)	(1.025)
Mills	0.125	-0.503*	0.106	0.070
	(0.439)	(-1.836)	(1.048)	(0.964)
IMP%TA				0.185
				(0.512)
NonDisc x *IMP%TA*				0.182
				(0.979)
Sub-Segment Level				0.011
				(1.273)
Sub-Segment Level x *IMP%TA*				-0.154
				(-0.880)
Firm Level				-0.010
				(-1.364)
Firm Level x *IMP%TA*				0.180*
				(1.906)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	No	No	No	No
Observations	1,514	1,514	1,514	1,514

Panel B: First-Stage – Disclosure of Goodwill Disaggregation

Model	Impairment Model
Dependent Variable	*Disc*
QuartDisc	0.362**
	(2.524)
Controls	Yes
Fixed Effects	No
Observations	1,514

Table 10. continued
Panel C: Second-Stage – Determinants of Goodwill Disaggregation

Dependent Variable	*GW Disgg*
Mills	-1.493
	(-1.033)
Segments	0.526
	(1.334)
GW%	-0.539
	(-0.543)
ElimStep2	0.302
	(1.629)
HistIMP	0.135
	(0.746)
Acq	0.073
	(0.335)
LagAcq	0.146
	(0.866)
COVID	0.128
	(0.773)
Size	0.098
	(0.932)
Lev	-0.197
	(-0.343)
ROA	1.561
	(0.992)
Loss	-0.392
	(-1.363)
Δ*OCF*	-0.007
	(-0.007)
Δ*Sales*	0.220
	(0.528)
AnnRet	0.155
	(0.476)
AnnRetSTD	-11.669
	(-1.407)
BTM>1	-0.673
	(-0.895)
Bath	0.888
	(0.776)
Smooth	-2.474
	(-1.137)
Constant	3.848***
	(3.756)
Fixed Effects	No
Observations	649

Panel A estimates models using OLS on a sample of all firms with material goodwill. Panel B estimates the model using probit on a sample of all firms with material goodwill. Panel C estimates the model using OLS on a sample of all disclosing firms with material goodwill. Panels A and C present t-statistics based on 1,000 iterations of bootstrap standard errors clustered by industry in parentheses below the coefficients. Panel B presents t-statistics based on industry-clustered standard errors in parentheses below the coefficients. In Panels A and B estimates related to the constant term, and control variables have been excluded for brevity. The models are estimated *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

7.2 Determinants of the Degree of Goodwill Disaggregation

Panel C presents the results of estimating the second-stage of model (8) in which I seek to understand the determinants of management's choice to disaggregate. The results lack statistical significance for any of the variables included in this model suggesting that the goodwill allocation process is idiosyncratic.[33]

7.3 Goodwill Disaggregation by Industry

To investigate whether certain types of businesses are more likely to disaggregate I present industry means of my measures of goodwill disaggregation for the industries with the ten highest and lowest mean value of *GW Disagg* in Table 11. No obvious pattern emerges which helps explain the determinants of *GW Disagg*. Column 5 reports the difference between the number of segments and reporting units. Nine of the ten industries with the highest *GW Disagg* value also have the highest difference between the number of segments and reporting units.

7.4 Endogeneity

To partially address concerns that endogenous choices by management regarding the operating structure of the firm may influence both a firm's choice of goodwill disaggregation, and its likelihood of impairment through operating performance I present descriptive statistics for the sample of firms partitioned by whether the firm disaggregates at the sub-segment level (*Sub-Segment Level*). Column 3 of Table 12 Panel A presents the results of univariate t-tests that indicate that *Sub-Segment Level* firms do not exhibit weaker

[33] In untabulated results I find that of the 583 observations that disclosure *GW Disagg* in concurrent years 18 percent (106) increased their goodwill disaggregation, 19 percent (112) decreased their disaggregation, and 63 percent (364) did not make any changes. I re-estimate my determinants analysis using a changes model and find that the only variable that is statistically significant at the 0.05 level is a negative coefficient on *HistIMP*, further illustrating the idiosyncratic nature of goodwill disaggregation.

Table 11. Goodwill Disaggregated by Industry

Industry (Two-Digit SIC)	(1) N	(2) *GW Disagg*	(3) *RU Num*	(4) *Segments*	(5) *Segments - RU Num*
Industries with the Highest Mean *GW Disagg*					
Motor Freight Transportation (42)	2	6.430	7.500	2.716	(4.500)
Primary Metal Industries (33)	7	5.514	5.429	2.686	(3.000)
Motion Pictures (78)	4	5.500	5.500	2.500	(2.500)
Automotive Dealers & Gasoline Service Stations (55)	8	5.476	5.250	2.470	(2.250)
Rubber & Miscellaneous Plastic Products (30)	2	4.542	5.000	2.514	(2.000)
Industrial Machinery & Computer Equipment (35)	61	4.267	3.967	2.344	(1.426)
Textile Mill Products (22)	4	4.211	3.250	2.404	(1.000)
Lumber & Wood Products, Except Furniture (24)	4	4.201	6.000	2.500	(2.000)
Eating & Drinking Places (58)	8	4.108	4.250	2.270	(1.625)
Heavy Construction, Contractor (16)	3	4.087	5.333	2.604	(2.333)
Industries with the Lowest Mean *GW Disagg*					
Hotels & Other Lodging Places (70)	6	3.039	2.333	2.020	0.500
Mining & Quarrying of Nonmetallic Minerals (14)	2	3.031	4.000	2.016	0.000
Construction - General Contractors (15)	1	3.000	3.000	2.000	0.000
Furniture & Fixtures (25)	2	3.000	2.000	2.000	0.000
Personal Services (72)	4	3.000	2.000	2.000	0.000
Construction - Special Trade Contractors (17)	4	3.000	3.000	2.000	0.500
Oil & Gas Extraction (13)	14	2.979	2.357	1.954	0.714
Transportation by Air (45)	5	2.400	1.000	1.400	0.800
Transportation Services (47)	1	2.000	1.000	1.000	0.000
Food Stores (54)	2	2.000	1.000	1.000	0.000

Table 11 reports industry means for the industries with the ten highest and lowest mean *GW Disagg*. *Segments* represents the raw count of segments.

operating performance than non-sub-segment level firms, but they are more likely to record an impairment and receive a goodwill-related CAM. Panel B compares *Sub-Segment Level* firms to *Firm Level.* If the operating structure of the firm influences both disaggregation, and its likelihood of impairment through operating performance, the differences in operating performance should be more apparent in this analysis. Column 3 presents the results of univariate t-tests that indicate that *Sub-Segment Level* firms do not exhibit weaker operating performance. In fact, *Firm Level* firms have lower *ROA*, are more likely to record a loss (*Loss*), and experience lower changes in operating cash flows than *Sub-Segment Level* firms. Despite the poorer operating performance *Firm Level* firms are less likely to

impair goodwill (*IMP*) or receive a goodwill-related CAM (*CAM*) and have lower magnitude impairments. (*IMP%*).

Table 12. Endogenous Operating Structure – Descriptive Statistics

Panel A*:* Sub-Segment vs. Non-Sub-Segment Level

	(1) Sub-Segment Level (N = 123) Mean	(2) Non-Sub-Segment Level (N = 526) Mean	(3) Difference (1) - (2)	(4) t-statistic
ROA	0.033	0.018	0.015	(1.512)
Loss	0.252	0.325	-0.073	(-1.576)
Δ*OCF*	0.008	0.002	0.006	(0.931)
Δ*Sales*	-0.026	-0.055	0.029	(1.248)
AnnRet	0.185	0.162	0.023	(0.525)
IMP	0.260	0.186	0.074*	(1.844)
GW CAM	0.585	0.378	0.207***	(4.243)
IMP%	0.059	0.046	0.013	(0.957)

Panel B: Sub-Segment vs. Firm Level

	(1) Sub-Segment Level (N = 123) Mean	(2) Firm Level (N = 114) Mean	(3) Difference (1) - (2)	(4) t-statistic
ROA	0.033	-0.028	0.061***	(3.922)
Loss	0.252	0.561	-0.309***	(-5.095)
Δ*OCF*	0.008	-0.007	0.015*	(1.884)
Δ*Sales*	-0.026	-0.025	-0.001	(-0.051)
AnnRet	0.185	0.278	-0.093	(-1.431)
IMP	0.260	0.018	0.243***	(5.650)
GW CAM	0.585	0.035	0.550***	(11.175)
IMP%	0.059	0.009	0.050***	(3.317)

Panel A (B) present univariate differences in mean between the observations that disaggregate at the sub-segment level and those that do not (disaggregate at the firm level). *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

To address endogeneity concerns more generally I follow other recent accounting studies (e.g. Park 2023; Stephan 2024) by employing the recommendations of Oster (2019). I use the method from Oster (2019) to assess the risk that bias arising from the omission of correlated omitted variables could drive my results.

I estimate the coefficient of proportionality, δ, by comparing the coefficients on the variable of interest and the R-squared from a model that includes only the variable of interest and another model that includes the full set of observable controls. The value of δ is used to gauge whether unobserved variables are likely to bias results by measuring how significant an unobservable factor would need to be to overturn my results. If the value of δ is greater (less) than one (negative one) it is unlikely that my results are driven by the omission of correlated variables (Oster 2019; Bernard, Kaya, and Wertz 2021). In Table 13, I follow Oster (2019) and calculate R_{max}, as 1.3 times the within-R-squared from the regression with all controls and find that δ is greater (less) than one (negative one) for all models in my main analyses suggesting that my results are unlikely to be driven by potential correlated, omitted variables.

Table 13. Tests of Endogeneity

	(1)		(2)		(3)		(4)	
Dependent Variable	*IMP*		*GW CAM*		*IMP%*		*OCF_A$_{t+1}$*	
Variable of Interest	*GW Disagg*		*GW Disagg*		*GW Disagg*		*Firm Level* x *IMP%TA*	
Coefficient	0.041***		0.081***		0.008***		0.233**	
Oster (2019) test with Fixed Effects								
R_{max} Parameter = 1.3 × R-squared	0.496		0.596		0.499		0.862	
Uncontrolled Coefficient [R-squared]	0.042	[0.027]	0.097	[0.092]	0.007	[0.006]	-0.235	[0.000]
Controlled Coefficient [R-squared]	0.041	[0.382]	0.081	[0.458]	0.008	[0.384]	0.233	[0.663]
δ for Coefficient given R_{max}	**12.481**		**4.661**		**-1476.688**		**-1.556**	

Table 13 reports the results of our robustness tests of endogeneity for variables of interest based on Oster (2019). I follow the suggested approach of utilizing a R_{max} parameter = 1.3 × R-squared and the threshold of the absolute value of δ greater than 1 to identify robust results. Models are estimated using OLS. *, **, *** indicate two-tailed significance at the 0.10, 0.05, and 0.01 levels, respectively.

CHAPTER 8

CONCLUSION

I investigate the association between goodwill disaggregation and the likelihood, and magnitude of goodwill impairment and whether impairments based on disaggregated goodwill impairment assessments are predictive of declines in future operating cash flows. Due to the lack of mandatory disclosure requirements, information about goodwill disaggregation is challenging to acquire which has limited academic research on the topic. I find evidence that goodwill disaggregation is associated with a higher likelihood of impairment and higher magnitude impairments. I provide estimates of the size of the effect that may be of interest to the FASB. My measure of goodwill disaggregation provides incremental explanatory power beyond the most common proxy for disaggregation used in the literature, the number of segments.

Further, I find evidence of a positive non-linear relationship between goodwill disaggregation and the predictive value of impairments on future operating cash flows. These findings suggest that there may not be a meaningful reduction in predictive value should the FASB change the unit of assessment from the reporting unit level to the segment level, but changing to the firm level may lead to a reduction in the predictive value of impairments (FASB 2022a). I also find that disaggregated goodwill impairments are less likely to be discussed in earnings calls than impairments related to goodwill that is not disaggregated, further suggesting that the informativeness of impairments may not be negatively impacted by a change in the unit of assessment from the reporting unit level to the segment level.

I also find that firms with less disaggregation have longer, more uncertain descriptions of goodwill-related CAMs, but that the auditor's CAM responses are more certain. These findings suggest that auditors may perceive firms that do not disaggregate goodwill as presenting a higher business risk. I find evidence that audit fees are not associated with the degree of goodwill disaggregation. These findings suggest that changes in the level of impairment testing from the reporting unit level to the segment or firm level may not reduce audit costs as argued by respondents to the FASB ITC (FASB 2019).

This study is subject to a few limitations. The voluntary nature of goodwill disaggregation disclosure introduces the potential for self-selection bias. I attempt to partially address this by using a Heckman model, however I cannot fully eliminate this risk. It is also possible that unobserved factors influence both a firm's choice of goodwill disaggregation, and the dependent variables employed in my models resulting in endogeneity.[34] I attempt to partially address this risk through inclusion of a battery of control variables, use of an industry fixed effects structure, and through robustness testing, however I cannot rule out this possibility. Further, although my results suggest sub-segment disaggregation does not produce impairments that are more predictive than segment-level disaggregation, if firms disaggregate to maximize the informativeness of impairments, it is possible that forcing these firms to switch to segment-level assessment may weaken the predictive power of their impairments.

Notwithstanding these limitations my findings should be of interest to several groups. My novel measures of goodwill disaggregation and CAMs as a measure of the

[34] To the extent that firms which overpay for acquisitions strategically aggregate goodwill to reduce their risk of impairment more than firms that do not overpay, the effect sizes I present can be interpreted as a low-end estimate of the association between the likelihood of goodwill impairment and the degree of disaggregation.

likelihood of goodwill impairment help shed light on the associations between the degree of goodwill disaggregation and impairment outcomes. As such, my findings should be of interest to academics studying these areas. These findings, as well as my findings that audit fees are not associated with goodwill disaggregation, and that impairments resulting from sub-segment impairment assessments are not more predictive of future operating cash flows, should also be of interest to the FASB and other standard-setting bodies responsible for the accounting standards governing goodwill impairment.

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APPENDIX A

VARIABLE DEFINITIONS

Variable Name	Description
Dependent Variables	
IMP	Indicator variable equal to one for all observations with an impairment of goodwill and zero otherwise. (Source: 10-K Hand Collected)
GW CAM	Indicator variable equal to one for all observations with a critical audit matter related to goodwill or goodwill and intangible assets as classified by Audit Analytics and zero otherwise. (Source: Audit Analytics)
IMP%	The value of the goodwill impairment scaled by the total value of goodwill before impairment. (Source: 10-K Hand Collected)
OCF_A_{t+1}	Operating cash flows in year t+1 (OANCF) scaled by total assets (AT) at the beginning of year t. (Source: COMPUSTAT)
Length	The natural log of one plus the number of words in the applicable section of the CAM (description or response) after removing stop words. (Source: Audit Analytics)
Quantitative	The ratio of numbers to words in the applicable section of the CAM (description or response) after removing stop words. (Source: Audit Analytics)
Uncertain Tone	The ratio of uncertain words to words in the applicable section of the CAM (description or response) after removing stop words. Uncertain words are constructed by Loughran and McDonald (2011) (Source: Audit Analytics & https://sraf.nd.edu/)
AuditFee	The natural logarithm of one plus audit fees. (Source: Audit Analytics)
Test Variables	
GW Disagg	Firm-wide measure of goodwill disaggregation. See Chapter 4.1 for a detailed description of this variable. Appendix B provides detailed calculations for three example firms that define their reporting units at the firm, segment and sub-segment levels, respectively. (Source: 10-K Hand Collected)
RU Level	Firm-wide measure of the disaggregation level at which reporting units are defined, calculated as the disaggregation level for each reporting unit weighted by the percentage of goodwill allocated to the segment containing the reporting unit. If the reporting unit is defined at the firm level then disaggregation level equals one, if defined at the segment level disaggregation level equals two, and if defined at the sub-segment level disaggregation level equals three. (Source: 10-K Hand Collected)
RU Num	The number of reporting units to which goodwill is allocated. (Source: 10-K Hand Collected)
Sub-Segment Level	Indicator variable equal to one for all observations that disaggregate goodwill at the sub-segment level and zero otherwise. (Source: 10-K Hand Collected)
Firm Level	Indicator variable equal to one for all observations that disaggregate goodwill at the firm level and zero otherwise. (Source: 10-K Hand Collected)
IMP%TA	The value of the goodwill impairment scaled by the total assets at the beginning of the year. (Source: COMPUSTAT & 10-K Hand Collected)

Impairment Controls

Segments	The natural logarithm of one plus the number of reportable segments. Segments with zero sales and zero goodwill that have descriptions indicating they represent corporate or administrative functions (e.g., "adjustments", "administrative", "corporate & eliminations", etc..) rather than true operating segments are removed. (Source: 10-K Hand Collected)
GW%	Goodwill before impairment scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT & 10-K Hand Collected)
ElimStep2	Indicator variable equal to one for all observations where the firm adopted ASU 2017-04 which eliminates Step 2 of the goodwill impairment assessment and zero otherwise. Step 2 requires a hypothetical purchase price allocation to calculate the amount of goodwill impairment. The ASU is effective for annual and interim impairment tests for periods beginning after December 15, 2019. Early adoption is permitted. (Source: 10-K Hand Collected)
HistIMP	Indicator variable equal to one for all observations with an impairment of goodwill (GDWLIP) in year t-1 and zero otherwise. (Source: COMPUSTAT)
Acq	Indicator variable equal to one for all observations with a business acquisition (ACQGDWL>0) and zero otherwise. (Source: COMPUSTAT)
LagAcq	Indicator variable equal to one for all observations with a business acquisition (ACQGDWL>0) in the year t-1 and zero otherwise. (Source: COMPUSTAT)
COVID	Indicator variable equal to one for all observations where the fiscal year is 2020 and zero otherwise. (Source: COMPUSTAT)
Size	The natural logarithm of total market capitalization (CSHO*PRCC_F) at the beginning of the year. (Source: COMPUSTAT)
Lev	The total short-term debt (DLC) and long-term debt (DLTT), divided by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)
ROA	Earnings before extraordinary items (IB) and manually collected goodwill impairments scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT & 10-K Hand Collected)
Loss	Indicator variable equal to one for all observations with a loss before goodwill impairment (NI+manually collected goodwill impairments), and zero otherwise. (Source: COMPUSTAT & 10-K Hand Collected)
Δ*OCF*	Change in operating cash flows (OANCF) from year t-1 to year t, scaled by market value of equity (PRCC_F*CSHO) at the beginning of the year. (Source: COMPUSTAT)
Δ*Sales*	Change in sales (SALE) from year t-1 to year t, scaled by market value of equity (PRCC_F*CSHO) at the beginning of the year. (Source: COMPUSTAT)
AnnRet	Daily compounded stock return for the 12-month period of the fiscal year (RET). (Source: CRSP)
AnnRetSTD	Standard deviation of the daily stock return for the 12-month period of the fiscal year (RET). (Source: CRSP)
BTM>1	Indicator variable equal to one for all observations with a book to market ratio (CEQ/(PRCC_F*CSHO) in year t-1 greater than 1, and zero otherwise. (Source: COMPUSTAT)
Bath	ΔE if ΔE is below the median of the negative tail of ΔE, and 0 otherwise. ΔE is the change in pre-impairment earnings in year t (PI-WDP-GDWLIP), scaled by market value of equity (PRCC_F*CSHO) at the beginning of the year. (Source: COMPUSTAT)

Smooth	ΔE if ΔE is above the median of the positive tail of ΔE, and 0 otherwise. ΔE is the change in pre-impairment earnings in year t (PI-WDP-GDWLIP), scaled by market value of equity (PRCC_F*CSHO) at the beginning of the year. (Source: COMPUSTAT)
#NonGW CAMs	The number of non-goodwill-related critical audit matters as classified by Audit Analytics. (Source: Audit Analytics)

Future Operating Cash Flows Controls

OCF_A	Operating cash flows (OANCF) scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)
Δ*OCF_A*	Change in operating cash flows (OANCF) scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)
ACC	Accrual components excluding goodwill impairments and restructuring charges (IB–OANCF+manually collected goodwill impairments+RCP) scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT & 10-K Hand Collected)
IndROA	Median of a firm's industry return on assets. Industry classification is based on two-digit SIC codes. (Source: COMPUSTAT)
CAPEX	Capital expenditure (CAPX) scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)
Rest	Restructuring charges (RCP) scaled by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)

Audit Control Variables

Big4	Indicator variable equal to one if the firm is audited by a Big4 firm, and zero otherwise. (Source: Audit Analytics)
AuditSwitch	Indicator variable equal to one if the firm changed auditors during the year, and zero otherwise. (Source: Audit Analytics)
SpecAuditor	Indicator variable equal to one for industries where the audit office has the top market share during a given year, and zero otherwise based on the ratio of audit fees that an audit office generates in a two-digit SIC industry to the total audit fees generated in that industry in a Metropolitan Statistical Area (MSA) for a given year. To qualify the auditor must have a 10 percent or greater market share lead, and there must be at least two audit firms in the MSA. (Source: Audit Analytics)
Age	The number of years a firm has been tracked by COMPUSTAT. (Source: COMPUSTAT)
ForSales%	The percentage of foreign sales. (Source: COMPUSTAT)
Tenure	The number of years the auditor has audited the firm. (Source: Audit Analytics)
Busy	Indicator variable equal to one for all observations which have a December year end and zero otherwise. (Source: Audit Analytics)
#IC Weak	The number of internal control weaknesses. (Source: Audit Analytics)
Growth	Change in revenue over prior year revenue (REVT). (Source: COMPUSTAT)
BTM	Book to market ratio (CEQ/(PRCC_F*CSHO) in year t-1. (Source: COMPUSTAT)
InvRec	The total inventory (INVT) and receivables (RECT), divided by total assets (AT) at the beginning of the year. (Source: COMPUSTAT)
LitRisk	Indicator variable equal to one if the firm has the following SIC codes, and zero otherwise, following Reichelt and Wang (2010): 2833–2836, 3570–3577, 3600–3674, 5200–5961, 7370–7370. (Source: COMPUSTAT)

SpecItem	Indicator variable equal to one if the firm has special items (SPI) greater than one, and zero otherwise. (Source: COMPUSTAT)
DiscOps	Indicator variable equal to one if the firm has extraordinary operations and discontinued operations (XIDO) greater than one, and zero otherwise. (Source: COMPUSTAT)
Complex	Text-based firm complexity measure from Loughran and McDonald (2024). (Source: https://sraf.nd.edu/complexity/)
GCO	Indicator variable equal to one for all observations that received a going concern opinion and zero otherwise. (Source: Audit Analytics)

Earnings Call Variables

EC IMP	Indicator variable equal to one for all observations where management uses the terms "goodwill" and "impair" in an earnings conference call related to the fiscal year, and zero otherwise. (Source: FACTSET)
EC GW	Indicator variable equal to one for all observations where management uses the terms "goodwill" in an earnings conference call related to the fiscal year, and zero otherwise. (Source: FACTSET)
Num Calls	The natural logarithm of the number of earnings conference calls for each firm year. (Source: FACTSET)
Num Words	The natural logarithm of the annual average number of words in an earnings call transcript after removing stop words. (Source: FACTSET)

Other Variables

%IMP Rev	Goodwill impairment scaled by revenue (REVT). (Source: COMPUSTAT & 10-K Hand Collected)
IMP_{t+1}	Indicator variable equal to one for all observations with a goodwill impairment in year t +1 (GDWLIP>0) and zero otherwise. (Source: COMPUSTAT)
IMP_{t+2}	Indicator variable equal to one for all observations with a goodwill impairment in year t +1 or t+2 (GDWLIP>0) and zero otherwise. (Source: COMPUSTAT)
$IMP\%_{t+1}$	Impairment in year t+1 (GDWLIP) scaled by total goodwill before impairment (GDWL + GDWLIP) in year t+1. (Source: COMPUSTAT)
$IMP\%_{t+2}$	The sum of impairments (GDWLIP) scaled by total goodwill before impairment (GDWL + GDWLIP) in years t+1 and t+2. (Source: COMPUSTAT)
NonDisc	Indicator variable equal to one for firms that do not disclose goodwill disaggregation data, and zero otherwise. (Source: 10-K Hand Collected)
Disc	Indicator variable equal to one for firms that disclose goodwill allocation data necessary to calculate *GW Disagg* and zero otherwise. (Source: 10-K Hand Collected)
QuartDisc	The natural logarithm of one plus the average number of distinct monetary XBRL tags within the current year's 10-Q filings after removing tags which contain the terms "goodwill" or "impairment." (Source: EDGAR & https://www.xbrlresearch.com/firm-complexity/)

APPENDIX B

MEASUREMENT OF GOODWILL DISAGREGATION

Figure 4 presents three examples of how *GW Disagg* is calculated for different firms in my sample. The examples correspond to the disaggregation approaches shown in Figure 2. Firms that define their reporting unit as the entire operations of the firm (firm level) make up 17.6 percent of my sample. American Airlines Group is an example of such a firm. In 2013 American Airlines Group Inc. merged with US Airways Group resulting in the recognition of a $4.1 billion goodwill asset. The goodwill associated with this merger is assessed for impairment based on the full consolidated operations of the newly formed firm. Firms that define their reporting units as being equal to their reportable segments (segment level) make up 39.4 percent of my sample. TopBuild Corporation is an example of such a firm. Finally, firms that define their reporting units as a component of a segment (sub-segment level) make up 19.0 percent of my sample. Vonage Holding Corp is an example of such a firm. The remaining 24.0 percent of my sample use a mix of segment and sub-segment level disaggregation. Figure 5 presents 10-K disclosures exemplifying the differences in the level at which reporting units are defined for the three firms referred to above and detailed calculations for *GW Disagg* for each of the example firms.

Note that, as detailed in the example, Vonage and TopBuild have the same number of segments and reporting units, however Vonage has a higher level of goodwill disaggregation (*GW Disagg* = 5 for Vonage vs 3 for TopBuild). This is due to the differing levels at which the firms have defined their reporting units. Vonage disaggregates at the sub-segment level, whereas TopBuild disaggregates at the segment level. This nuance is captured by my measure, *GW Disagg.*

American Airlines Group Inc:

(1+1) * 1.00 [Air Transportation Segment]

2.00 [*GW Disagg*]

TopBuild Corp:

(1+2) * 0.33 [Distribution Segment]

+ (1+2) * 0.67 [Installation Segment]

3.00 [*GW Disagg*]

Vonage Holding Corp:

(2+3) * 1.00 [Business Segment]

+ (0+0) * 0.00 [Consumer Segment]

5.00 [*GW Disagg*]

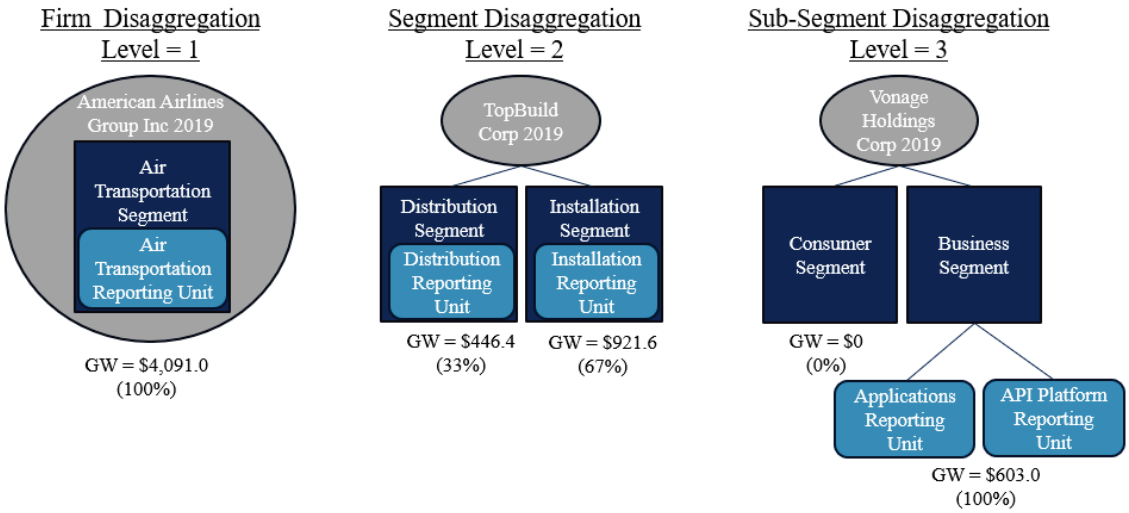

Figure 4. Example *GW Disagg* Calculations. Ovals denote the firm's full consolidated operations. Rectangles with pointed corners denote reportable segments. Rectangles with rounded corners denote reporting units. A line connecting two shapes indicates that the bottom shape (a segment or reporting unit) is a subset of the operations of the shape above (a firm or segment). When a shape is placed within another shape it indicates that the bottom shape is equivalent to the above shape. GW is the amount of goodwill in millions allocated to each segment. Before being used to construct the firm-wide measure, *GW Disagg* is calculated for each segment as follows: (number of reporting units + disaggregation level) * the percentage of goodwill allocated to the segment.

American Airlines Group Inc.'s 2019 10-K

American is managed as a single business unit that provides air transportation… Goodwill is not amortized but assessed for impairment annually on October 1 or more frequently if events or circumstances indicate that goodwill may be impaired. **American has one consolidated reporting unit.**

TopBuild Corporation's 2019 10-K

We have two reporting units, which are also our operating and reporting segments: Installation and Distribution. Both reporting units contain goodwill.

Vonage Holding Corporation's 2019 10-K

The Company tests for goodwill at the reporting unit level, which is identified by assessing whether the components of the Company's operating segments constitute businesses for which discrete financial information is available. **With respect to the annual goodwill impairment test on October 1st, the Company identified the Applications Group and API Platform Group reporting units which collectively represent the Business segment as of that date.**

Figure 5. Examples of Goodwill Disaggregation Level Disclosures.