

Beneath the Layers of Business Groups with Private Subsidiaries: Cost of Capital, Earnings Management, and Risk Ring-Fencing

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Abstract

Complex subsidiary networks inside U.S. public firms matter for both pricing and reporting. Using a new panel that links each public parent to all controlled affiliates, including indirect and private subsidiaries, we find that equity markets distinguish sharply between the two dimensions of business group structure: depth (the number of ownership layers) and breadth (the share of subsidiaries that sit directly under the parent). Broader, flatter groups face a higher implied cost of capital, consistent with investors charging more when risks and obligations are located closer to the parent. By contrast, deeper groups face a lower implied cost of capital once paired with credible external monitoring, with the discount concentrated in firms with Big 4 auditors and in the post-2018 disclosure and monitoring environment. This pattern suggests that investors reward depth when they can verify that it functions as a credible liability shield, not just as opacity. We test the mechanism directly using civil lawsuits. As depth increases, a smaller share of suits names the public parent, and the parent's announcement-window stock reaction is less negative when litigation targets lower-tier affiliates. Legal and reputational shocks are therefore increasingly absorbed within the structure rather than borne at the top, consistent with the concept of ring-fencing. Finally, we demonstrate that deeper groups tend to engage more in accrual-based earnings management but do not systematically reduce discretionary expenses, suggesting a reliance on accounting adjustments rather than actual activity changes. We also find that before 2018 and outside the Big 4 tier, greater depth is associated with recognizing less equity-method income from influenced affiliates at the parent level, consistent with more earnings remaining in lower tiers; after 2018, and particularly under Big 4 assurance, depth and breadth are instead associated with more equity-method income recognized at the parent. Overall, the firm's internal structure is priced. Markets view organizational depth as a form of protection. Organizational breadth is treated as exposure. These structural features help explain variations in financing costs, litigation spillovers, and how performance from partially hidden affiliates reaches public shareholders.

Keywords: Business groups, cost of capital, Big 4 auditors, lawsuits, earnings management, subsidiary networks, network complexity.

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Introduction

Do firms' subsidiaries matter, and in what ways do they shape the financial outcomes of the parent company? A rich stream of research in corporate finance examines how mergers and acquisitions alter firm behavior, typically focusing on publicly listed acquirers and targets. Yet, less attention has been paid to the long-term role of acquired firms as they integrate into the parent firm's subsidiary network. In the United States, in particular, these subsidiary-level dynamics often remain below the radar of investors and analysts, who generally focus on consolidated earnings or major M&A deals. This gap in understanding is particularly evident in the presence of private affiliates, where disclosure requirements are minimal. In practice, these private subsidiaries can meaningfully influence the parent's resource allocation, earnings management, and risk-taking strategies.

In many other economies, such as in Europe, Japan, and Korea, scholars have long recognized the importance of complex business groups. One-third of European firms belong to a business group, and intricate or pyramidal ownership structures remain common in East Asia. A substantial body of literature demonstrates that these multilayered ownership arrangements can facilitate internal capital markets, enable tunneling or earnings manipulation, and alter a firm's access to external financing. Seminal contributions by Faccio, Lang, and Young (2001) and Claessens, Djankov, Fan, and Lang (2002) reveal that controlling shareholders use cross-holdings and pyramids to transfer resources in ways that outsiders cannot easily track. While those findings focus on European and East Asian contexts, they naturally prompt a question: Could U.S. public firms with extensive private subsidiary networks exhibit parallel opportunities for obfuscation or resource reallocation?

Despite the significance of this issue, prior work on U.S. firms has often been constrained by

data limitations. Much of the existing evidence focuses on the direct subsidiaries of public corporations, overlooking deeper layers of ownership where many affiliates may be fully controlled yet absent from standard disclosures. Because private subsidiaries are subject to fewer reporting requirements, they typically escape the notice of mainstream databases, limiting the ability to document their role in shaping parent-level outcomes. As a result, potentially crucial mechanisms – such as whether the parent strategically shifts profits among private subsidiaries to manage consolidated earnings or shields reputationally risky projects in distant affiliates – remain underexplored in the U.S. context.

In this paper, we aim to fill that gap by examining a comprehensive sample of U.S. public firms' subsidiary structures, including both direct and indirect ownership links. We measure business-group complexity using indicators such as the longest ownership chain from parent to subsidiary (Business Group Depth), and the share of “endpoint” subsidiaries (Business Group Breadth). We then connect these structural dimensions to essential corporate finance outcomes. First, we study how business-group complexity impacts the implied cost of capital (ICC). The notion that opacity increases a firm's cost of capital is well established in the literature, for example, as mentioned earlier by La Porta, Lopez-de-Silanes, and Shleifer (1999) and Fan and Wong (2002). More recent work, such as Belenzon, Berkovitz, and Rios (2013), provides evidence that layered corporate groups impede information flow, thereby increasing uncertainty and prompting investors to demand higher expected returns. Yet multilayered groups also confer liability-shielding, tax, and internal-capital-market benefits that can reduce the parent's perceived risk (Almeida et al., 2015; Belenzon et al., 2013).

Using a regression-based approach in the spirit of Gebhardt et al. (2001) and Hou et al. (2012), and also employed by Donangelo (2014), İmrohoroglu and Tüzel (2014), and Pastor et al. (2022),

we estimate the implied cost of capital (ICC) for U.S. public firms. We find that investors distinguish sharply between different dimensions of internal organizational complexity. Groups that are broad and flat - i.e., many directly held endpoint subsidiaries relative to the total number of subsidiaries - face a higher required return. Moving from the 25th to the 75th percentile of Breadth is associated with an increase in the ICC of roughly 6 basis points (bp) per month, or about 70–75 bp per year. By contrast, hierarchical layering is priced as protective. In the pooled specification, moving from the 25th to the 75th percentile of Depth (approximately two additional ownership layers) is associated with a decrease in the ICC of about 5 bp per month, or roughly 60 bp per year.

These effects become considerably sharper once we account for external monitoring. We allow the pricing of Depth to vary with audit quality and with the post-2018 disclosure and audit-reporting regime. Under those conditions, the benefit of Depth expands substantially. For Depth, without Big 4 assurance before 2018, an interquartile increase is associated with a higher ICC of about 4 bp per month (about 45 bp per year). Introducing either Big 4 assurance or the post-2018 regime flips the sign: the same interquartile increase is associated with a decline of about 3–4 bp per month (about 35–40 bp per year) with Big 4 before 2018, about 1–2 bp per month (about 15–20 bp per year) with post-2018 absent Big 4, and about 8–9 bp per month (roughly 100 bp per year) when both Big 4 and the post-2018 regime are present. Breadth shows the complementary monitoring pattern. For a non-Big 4 firm before 2018, widening the group from the 25th to the 75th percentile increases the ICC by approximately 6–7 basis points per month (approximately 80 basis points per year). Under Big 4 assurance, that Breadth penalty compresses to roughly 0.6 bp per month (approximately 7 bp per year), with the smallest effect after 2017; without Big 4, the post-2018 regime by itself leaves the Breadth penalty essentially unchanged at about 6 bp per

month (around 70–75 bp per year). In other words, stronger monitoring does not eliminate the pricing of internal structure; rather, it concentrates investor concern on sprawling, endpoint-heavy groups and rewards hierarchies that appear capable of containing shocks. This interpretation is consistent with work arguing that credible assurance mitigates opacity and lowers perceived risk (DeFond and Zhang, 2014; Francis, LaFond, Olsson, and Schipper, 2005).¹

We then examine the mechanism by analyzing civil lawsuits. Litigation provides plausibly exogenous shocks that reveal who in the group bears legal risk and how much of that risk is passed on to the parent's equity. Two patterns emerge. First, while controlling for the number of subsidiaries, as depth increases, a smaller share of a group's cases name the public parent, and the probability that the parent is sued in a given quarter falls stepwise with depth. Second, announcement-window returns are markedly less negative when the defendant sits lower in the hierarchy, with the largest attenuation when the case targets entities three or more steps below the parent. These event-level results validate the interpretation of the ICC tests: investors appear to reward structures that ring-fence shocks and penalize organizations that are endpoint-heavy.

To understand why investors reward depth most strongly under credible monitoring, we examine how complexity is reflected in the group's financial reporting. Prior research argues that multi-layered ownership structures and private affiliates reduce transparency and weaken external scrutiny, thereby facilitating accrual-based earnings management (Dechow, Sloan, and Sweeney,

¹ The interaction results may also suggest a second interpretation. After 2018, and under Big 4 oversight, scrutiny is strict where it is most visible - at the public parent and its directly held core subsidiaries - but that scrutiny does not necessarily extend several tiers down the ownership chain. In that environment, depth may be valued not only because it ring-fences shocks, but also because it preserves organizationally remote affiliates that can absorb higher-liability, compliance-intensive, or reputationally sensitive activity outside the most visible reporting perimeter. Under this view, investors reward deep groups most strongly when top-tier monitoring is strict, because those groups appear able to satisfy heightened audit and disclosure demands at the core while containing certain exposures elsewhere. This interpretation aligns with evidence that firms sometimes isolate controversial, high-litigation, or compliance-intensive exposure in less visible affiliates to protect the flagship entity's standing with regulators, investors, and counterparties (Healy and Palepu, 2003; Karpoff, Lee, and Martin, 2008).

1995; Roychowdhury, 2006). We find that greater hierarchical depth is associated with higher absolute accruals scaled by average assets. In baseline settings without a Big 4 auditor and prior to 2018, moving from the 25th to the 75th percentile of Depth (approximately two additional ownership tiers) corresponds to an increase in absolute accruals on the order of 15 to 40 percent of the sample mean. By contrast, this relation is sharply attenuated for firms audited by a Big 4 auditor. Under Big 4 assurance, the same depth increase is associated with only a minimal incremental change in accrual intensity (approximately 5-10 percent of the mean) and is statistically weaker. The post-2018 disclosure and audit-reporting regime produces modest dampening of the depth–accruals slope. These patterns are consistent with the idea that deeper structures create more scope for accrual-based earnings management when external monitoring is weak, and that high-quality audit oversight disciplines this channel (Francis and Wang, 2008).

Breadth provides a complementary result. Groups that are broad and flat – many directly held endpoints relative to total subsidiaries – do not exhibit systematically higher accrual-based manipulation. We also find that the marginal effect of Breadth on accrual intensity is negative, , and the Breadth $\times$ Big 4 interaction further reduces accruals. This suggests that audit quality curbs accrual discretion not only in deep pyramids but also in sprawling, endpoint-heavy groups.

Taken together, the ICC and accrual results indicate two distinct channels. First, higher depth has two effects. In weakly monitored settings, additional ownership tiers are associated with more accrual-based earnings management, consistent with opacity in deeper corporate trees. Under credible monitoring (especially Big 4 assurance, and more modestly the post-2018 regime), that accrual-intensive channel is reduced, and investors begin to price depth as a credible ring fence that lowers the parent’s required return, with the benefit most pronounced when Big 4 coincides with the post-2018 regime. Second, breadth operates through a different mechanism. Broader and

flatter groups do not exhibit higher accrual manipulation; if anything, accrual intensity is slightly lower. Nevertheless, breadth is associated with a higher implied cost of capital in weakly monitored settings, consistent with investors viewing endpoint-heavy structures as exposing the parent directly to subsidiary-level legal and reputational shocks; this breadth penalty is compressed under stronger audit assurance.

We then ask whether complexity instead operates through real earnings management, whereby firms alter operating policies (e.g., by cutting discretionary expenditures) to meet reporting objectives (Roychowdhury, 2006). We continue to find little economically meaningful evidence that either Depth or Breadth systematically induces real-activities manipulation. In pre-2018 settings without Big 4 assurance, some coefficients on Depth are statistically different from zero and negative, but their magnitudes are small; with Big 4 assurance or in the post-2018 regime, these relations are further attenuated and generally indistinguishable from zero. Breadth likewise shows no robust association with real manipulation; a modest positive tilt in post-2018 interactions appears in some specifications but is economically minor and insignificant.

Finally, we study the location of reported subsidiary income. We test whether earnings from unconsolidated but significantly influenced subsidiaries (equity-method income) are retained in lower-tier entities or recognized at the parent company level. In weakly monitored settings before 2018 and without Big 4 assurance, greater hierarchical depth is associated with less equity-method income reported at the parent, consistent with income remaining deeper in the group. Under stronger monitoring and disclosure, this relationship reverses: the post-2018 regime (and especially the Big 4 in the post-2018 period) is associated with greater equity-method income recognized at the parent as depth increases. Breadth shows little association in baseline, but under credible monitoring—most notably with Big 4 assurance—broader groups report more equity-

method income at the parent. Taken together with the cost-of-capital results, these patterns suggest that investors value depth when they can verify credible containment of downside risk, while enhanced monitoring and disclosure shift subsidiary results toward greater visibility at the parent rather than systematic retention in lower tiers.

Lastly, we exploit a pre-2018 versus post-2018 split that coincides with material changes to disclosure, audit reporting, and information production aimed at increasing transparency and audit accountability.² We find that the market's response to internal structure becomes sharper in this regime. The cost-of-capital discount to hierarchical depth has strengthened since 2018, whereas the link between depth and accrual-based manipulation is economically smaller and already strongly muted for Big 4 clients. We also document changes in how results from partially owned affiliates are recognized: before 2018, deeper and broader groups report less equity-method income at the parent, consistent with earnings and liability being retained in lower tiers; after 2018, more of that subsidiary performance becomes visible at the parent, particularly when combined with Big 4 oversight. Together, these findings suggest that both audit quality and the post-2018 information environment influence how firms utilize subsidiary networks and shape investors' valuation of organizational complexity.

Our analysis contributes to four primary strands of research. First, it extends studies on business groups and their consequences for capital allocation, earnings manipulation, and tunneling, most of which focus on East Asian or European settings. By turning to the United States,

² Specifically: the Tax Cuts and Jobs Act of 2017 (including GILTI, BEAT, FDII, and section 163(j)) became effective for tax years beginning after 2017; PCAOB Auditing Standard 3101 expanded the auditor's report for fiscal years ending on or after December 15, 2017, and PCAOB Form AP began naming engagement partners in 2017; ASC 606 took effect in 2018 for most public filers; MiFID II went live on January 3, 2018; and OECD BEPS Action 13 country-by-country reporting and EU beneficial-ownership registers saw broader use in 2017–2018. Together these changes increased visibility into group structures and cross-entity transactions, tightened audit oversight, and reshaped analyst coverage, making 2018 a natural breakpoint.

we address a data gap surrounding private affiliates that remain invisible in most U.S. financial reporting. Second, we contribute to the cost-of-capital literature by demonstrating that investors price organizational complexity: higher breadth raises required returns, whereas greater depth lowers them, especially when accompanied by Big 4 assurance and/or during periods of heightened transparency and audit accountability. We also utilize lawsuit incidence and announcement-window returns to document how group depth reallocates legal risk within the network. Third, we enrich the discussion on earnings management by clarifying how managers in complex organizations weigh the trade-off between accrual-based and real-based methods. Our finding that complex groups tend to facilitate accrual manipulation, but not real manipulation, supports the view of operational stability combined with accounting flexibility. Fourth, we extend the audit-quality literature by showing that Big 4 auditors moderate the pricing of complexity.

Our paper thus highlights that subsidiaries do indeed matter, especially when private affiliates are interspersed through multiple ownership layers. We show how these structures can simultaneously facilitate earnings manipulation, particularly through accruals, and materially affect the cost of capital that outside investors require. Beyond casting light on a less understood area of U.S. corporate finance, this work encourages policymakers, standard-setters, and regulators to consider whether current disclosure regimes are sufficient to capture the complexities of subsidiary networks. It also prompts future research on whether exogenous shocks or institutional reforms might induce firms to simplify their ownership chains or reevaluate their use of distant affiliates. We hope our analysis advances the conversation on subsidiary governance, internal capital markets, and market perceptions of risk, underscoring that seemingly hidden segments of a firm's organizational chart can have far-reaching implications for its financial behavior and overall valuation.

1. Literature Review and Hypotheses Development

1.1. Literature review

Corporate ownership structures featuring multiple layers of subsidiaries and a mix of public and private affiliates have long attracted scholarly attention across accounting, finance, and economics. A consistent insight is that complex business groups can both facilitate earnings manipulation and heighten information asymmetry, thereby influencing how investors price risk and capital. The subsections that follow synthesize the evidence on these channels – the cost of capital, accrual versus real activity management, and the moderating role of external audit quality – in settings characterized by deep, often opaque subsidiary networks.

1.1.1. Cost of Capital Under Complex Ownership

The idea that opacity and information asymmetry elevate a firm's cost of capital is a cornerstone of modern finance. La Porta, Lopez-de-Silanes, and Shleifer (1999) demonstrate that countries with weaker legal protections and more complex ownership structures typically face a higher equity risk premium. Fan and Wong (2002) refine this argument in the East Asian context by showing that concentrated ownership hinders the informativeness of earnings.

Belenzon, Berkovitz, and Rios (2013) demonstrate that highly layered corporate groups hinder the flow of reliable information, prompting investors to demand additional risk premiums. While their sample focuses on European firms, the theoretical foundations apply broadly, including U.S. settings in which public parents control private affiliates scattered across jurisdictions and industries.

Yet, multilayered groups also confer liability shielding, tax, and internal capital market benefits that can reduce the parent's perceived risk (Almeida et al., 2015; Belenzon et al., 2013). Deep

chains insulate the listed parent from subsidiary distress, ring-fence volatile assets, and create options to abandon low-tier affiliates. Investors may therefore accept lower required returns when ownership pyramids are long but penalize groups that are flat yet sprawling, where losses pass directly to the parent's balance sheet.

1.1.2. Legal Risk, Litigation, and Organizational Ring-Fencing

Litigation is a salient, plausibly exogenous manifestation of firm-level risk that generates measurable capital-market reactions. Previous research shows that legal shocks - allegations, filings, and resolutions - trigger economically meaningful abnormal returns and spillover costs (e.g., Karpoff, Lee, and Martin, 2008; Gande and Lewis, 2009). In parallel, theory and evidence on internal capital markets and group organization suggest that multi-tier corporate structures can compartmentalize shocks, limiting the extent to which local adverse events contaminate the ultimate owner (Gertner, Scharfstein, and Stein, 1994; Almeida, Kim, and Kim, 2015). Taken together, this literature implies an externally testable prediction: if hierarchical depth acts as a liability shield, parents of deeper groups should (i) face lower parent-level exposure to lawsuits and (ii) exhibit muted market spillovers when affiliates, rather than the parent, are sued. We therefore use lawsuit incidence and CARs as orthogonal validation of the ICC findings: the same ring-fencing that investors appear to price should be visible in the legal data.

1.1.3. Ownership Complexity, Opacity, and Earnings Manipulation

Previous finance research highlights how complex ownership chains facilitate the diversion or reallocation of resources. Faccio, Lang, and Young (2001) show that pyramidal structures can entrench controlling shareholders, who then extract private benefits by selectively diverting corporate earnings. Claessens, Djankov, Fan, and Lang (2002) offer complementary evidence from East Asian corporations, revealing that multilayer organizational designs increase the scope for

expropriation. Almeida, Kim, and Kim (2015) further demonstrate that large business groups can channel funds internally across affiliates in ways that are difficult to detect. Their analysis of internal capital markets suggests that such transfers may blur the distinction between legitimate resource reallocation and earnings manipulation, particularly when some subsidiaries are private and face limited disclosure obligations. Similarly, Cheung, Rau, and Stouratis (2006) investigate “connected transactions” involving controlling shareholders in Hong Kong and document how complex ownership structures reduce transparency, raising concerns about hidden tunneling or selective profit shifting. Another strand of research examines tunneling, in which controlling insiders channel resources from transparent or minority-owned entities into less visible subsidiaries. Bertrand, Mehta, and Mullainathan (2002) highlight how multi-layered business groups in India facilitate such transfers by evading external oversight. Though emerging-market settings differ in institutional details, the principle that deep ownership tiers enable resource reallocation without clear disclosure applies equally to large U.S. conglomerates with unconsolidated subsidiaries.

From an accounting perspective, multiple layers can obscure the true locus of discretionary accruals. Dechow, Sloan, and Sweeney (1995) show that accrual manipulation is a powerful tool for meeting earnings thresholds; however, detecting such manipulation relies on external scrutiny. Caskey and Laux (2017) argue that gaps in corporate governance can either enhance or constrain managers’ ability to manipulate earnings, depending on the visibility of internal transactions. These governance gaps are particularly relevant when private affiliates are deeply embedded in the ownership chain, thereby limiting analysts’ ability to audit or reconcile intercompany flows.

Overall, the above studies affirm that business-group complexity can be associated with higher accrual-based manipulation - a core tenet of our analysis. Private or deeply held affiliates - often

unconsolidated - thus pose monitoring challenges for external investors, which can foster accrual-based earnings management.

1.1.4 Real Activities vs. Accrual-Based Management

Managers can engage in real activities manipulation by adjusting genuine operations -cutting R&D, altering production, or modifying SG&A expenditures - to boost near-term earnings. Roychowdhury (2006) documents such behavior in U.S. public firms, and Zang (2012) demonstrates that managers trade off accrual and real manipulation based on cost-benefit considerations. Real manipulation often imposes tangible costs (e.g., underinvestment in innovation or marketing), and these operational decisions can be more visible to stakeholders when they involve significant changes to the public firm's day-to-day operations.

In contrast, accrual manipulation can remain hidden for more extended periods, particularly when private affiliates do not disclose detailed financial information. Chen, Harford, and Lin (2015) find that strong analyst coverage can reduce the extent of real manipulation by enhancing overall governance. However, in multi-layer ownership scenarios, the lack of analyst coverage of private or distant subsidiaries likely encourages accrual rather than operational adjustments. Additionally, Dou, Hope, Thomas, and Zou (2018) highlight that the heterogeneity of block holders and dispersed oversight can enable different forms of managerial opportunism. In a complex business group, such heterogeneity can magnify the obscurity of affiliate-level financials, prompting managers to rely on accrual-based maneuvers that are less readily discernible in official statements.

Consequently, existing evidence suggests that business group complexity may amplify the preference for accrual manipulation over real activities, as affiliates shield operational details from outside scrutiny and generate minimal real-time signals that might alarm investors or regulators.

1.1.5. Internal capital markets and subsidiary income flows

Complex groups influence how earnings generated by subsidiaries flow to the listed parent. Almeida et al. (2015) illustrate that internal capital markets in Korean chaebols channel cash in opaque ways, while Bertrand, Mehta, and Mullainathan (2002) document tunnelling in Indian pyramids. Within U.S. conglomerates, unconsolidated subsidiaries accounted for under the equity method can mask the extent to which profits are retained or transferred (Belenzon & Berkovitz 2010). When monitoring is weak, deeper chains may sequester income at distant nodes, reducing equity-method earnings reported by the parent and complicating valuation.

1.1.6 Audit quality and assurance in complex groups

High-quality auditors are a first-order mechanism for disciplining complex organizations. Big 4 firms supply more specialist knowledge, face higher reputation and litigation risks, and devote greater resources to group-level consolidation procedures (Francis and Wang, 2008). Moreover, Gul, Chen, and Tsui (2003) find that the value relevance of earnings is higher for firms audited by industry-specialist Big 4 offices.

Audit research also suggests that the pricing of complex structures hinges on the credibility of external assurance. Big 4 auditors, who possess deeper industry expertise and greater litigation risk, can mitigate information asymmetry even in opaque settings (DeFond and Zhang 2014; Francis, LaFond, Olsson, and Schipper 2005). We build on this insight by exploring whether high-quality audits (a) allow investors to perceive hierarchical depth as a liability shield rather than a source of heightened uncertainty and (b) temper the positive link between depth and accrual-based manipulation.

1.2. Hypotheses

1.2.1. Cost of Capital and Complexity

While a long tradition in corporate finance links opacity to a higher discount rate (La Porta, Lopez-de-Silanes, and Shleifer 1999; Fan and Wong 2002), multilayered ownership can also create internal ring-fences that insulate the listed parent from subsidiary-level shocks. In deep pyramids, the parent's cash-flow rights in distant affiliates are usually limited, and its legal liability is limited; creditors of a lower-tier entity generally cannot seize the parent's assets beyond explicit guarantees. Such shielding — documented in Almeida, Kim, and Kim (2015) for Korean chaebols and in Belenzon, Berkovitz, and Rios (2013) for European groups — reduces the probability that an adverse event in one pocket of the network jeopardizes the group as a whole. Investors, recognizing this built-in risk compartmentalization, may therefore accept lower required returns for parents that operate with greater hierarchical depth and larger internal scope. By contrast, breadth — a structure in which many subsidiaries sit directly under the parent as endpoint entities — leaves the parent visibly exposed to operating, legal, and reputational shocks from those units, and increases coordination and oversight costs at the top. We therefore distinguish two dimensions of internal structure: (i) depth-driven complexity, captured by longer ownership chains and a larger controlled network; and (ii) breadth-driven complexity, captured by a higher share of directly held endpoint subsidiaries.

Hypothesis 1: *Holding firm fundamentals constant, (i) greater hierarchical depth is associated with a lower implied cost of capital, and (ii) greater breadth is associated with a higher implied cost of capital.*

1.2.2. Complexity and Accrual-Based Earnings Management

Multi-layer ownership chains create organizational distance between the public parent and the operating entity that books revenues and expenses. That distance reduces external scrutiny because many lower-tier affiliates are private, have less stringent disclosure requirements, and receive little or no analyst attention. Managers can therefore shift or time accruals within those affiliates and transmit the resulting effects up the chain, consistent with the idea that opacity facilitates accrual-based earnings management (Dechow, Sloan, and Sweeney 1995; Roychowdhury 2006). We refer to this as the depth channel: greater hierarchical depth makes it easier to manage reported performance through accounting entries rather than through operating changes.

Breadth operates differently. A broad, flat structure – in which many subsidiaries are held directly by the parent as endpoint entities – concentrates activity near the public firm, where oversight is most visible to auditors, investors, and litigants. Because these directly held subsidiaries sit at the surface of the group, they may face tighter direct review, leaving less scope to shift accruals. Under this view, depth should increase accrual-based earnings management, while breadth should not. If anything, breadth may constrain accrual discretion.

Hypothesis 2a: Greater hierarchical depth is positively associated with accrual-based earnings management.

Hypothesis 2b: Greater breadth is not positively associated with accrual-based earnings management.

1.2.3. Real Earnings Management

Real earnings management requires observable operating actions, such as cutting research and development, deferring selling and administrative expenses, or accelerating revenue recognition at the expense of future performance. These actions are costly to reverse and visible at the level of

the consolidated parent. Accrual-based management, in contrast, can be booked into partially opaque affiliates and transmitted through consolidation without visibly altering operations at the parent. Suppose complex internal structures are used primarily to shift reported numbers rather than to change production or spending. In that case, organizational complexity should not be strongly associated with systematic real-activity manipulation. This applies to both hierarchical depth and breadth.

Hypothesis 3: *Business-group complexity, including both greater hierarchical depth and greater breadth, is not positively associated with real-activity earnings management.*

1.2.4. Subsidiary Cash-Flow Retention

Deeper ownership chains weaken the parent's immediate cash-flow rights in distant affiliates and increase the cost of direct monitoring. Both features increase the scope for keeping earnings within lower-tier entities rather than upstreaming them. Similarly, when the group is broad and the parent oversees many directly held endpoint subsidiaries, the parent may allow partially owned or unconsolidated affiliates to retain performance at the periphery rather than recognizing it at the top. In both cases, the public parent may appear cleaner to outside investors while income and associated risks remain elsewhere.

Hypothesis 4: *Both greater hierarchical depth and greater breadth are associated with a smaller amount of equity-method income recognized by the parent, consistent with a larger share of subsidiary earnings being retained in lower-tier or peripheral affiliates.*

1.2.5. The Moderating Role of Audit Quality

Big 4 auditors provide industry-leading expertise and reputational capital (DeFond and Zhang, 2014), which enhances the credibility of group-level reporting and reduces information risk faced by outside investors (Francis, LaFond, Olsson, and Schipper, 2005). In the context of complex subsidiary networks, high-quality external assurance can matter for three reasons.

First, credible audits can help outside investors verify whether hierarchical depth truly limits the parent's exposure to legal, financial, and reputational shocks arising in lower-tier affiliates. If investors become more confident that depth functions as a risk shield, they should demand a lower required return from firms with deeper ownership structures. At the same time, credible audits can reduce concern that a broad and flat structure leaves the parent fully exposed to subsidiary-level shocks. In that case, breadth should be penalized less for required return when credible monitoring is present.

Second, stronger audit scrutiny can constrain accrual-based discretion inside complex groups. In particular, high-quality auditors can limit the scope for managers in deep hierarchies to shift income or expenses across affiliates in ways that inflate reported performance. The same scrutiny can also reduce accrual flexibility in sprawling, endpoint-heavy groups.

Third, high-quality auditors can increase the salience of performance generated in partly owned or unconsolidated affiliates by improving the traceability of internal flows. This mechanism implies that credible audits should make it more difficult to keep income or losses entirely within legally remote subsidiaries, particularly in groups with a large number of directly held subsidiaries.

Hypothesis 5: *High-quality external assurance (Big 4 auditor) moderates the relations in H1–H4 as follows:*

(i) It strengthens the expected negative association between hierarchical depth and the implied cost of capital, and weakens the expected positive association between breadth and the implied cost of capital.

(ii) It weakens the expected positive association between depth and accrual-based earnings management and further limits accrual-based discretion in breadth-heavy groups.

(iii) It increases the expected visibility of subsidiary performance at the parent by making income from partly owned affiliates more likely to appear in parent-level reporting, especially in breadth-heavy groups.

1.2.6. The 2018 audit, disclosure, and monitoring regime changes

We treat 2018 as the onset of a materially different information environment for U.S. public firms with complex subsidiary networks. Several changes, effective in 2018, increased the observability of intragroup activity and strengthened external monitoring. These include the Tax Cuts and Jobs Act (TCJA), which applied to tax years beginning after 2017 and introduced new regimes such as global intangible low-taxed income (GILTI) and base erosion and anti-abuse tax (BEAT), raising scrutiny of income location and internal funding structures; the adoption of ASC 606 on revenue recognition for most public filers in 2018, which standardized recognition policies across related entities and increased auditor attention to cross-entity flows; and enhancements to public audit reporting following Public Company Accounting Oversight Board (PCAOB) Auditing Standard 3101, which expanded required disclosures for fiscal years ending on or after December 15, 2017, including the later rollout of Critical Audit Matters (CAMs). In parallel, regulatory and tax authorities have increased reliance on cross-border reporting and beneficial ownership information. Together, these changes plausibly made it easier for investors and auditors to observe

how subsidiary structures allocate risk, recognize income, and manage earnings.

If post-2018 monitoring increases transparency at the parent and its core subsidiaries, but also clarifies the position of lower-tier and partially owned affiliates, then two predictions follow. First, investors should be more willing to view hierarchical depth as a credible liability and a reputation shield, and less willing to tolerate exposure arising from broad, endpoint-heavy structures. This implies a sharper valuation reward for depth and a weaker valuation penalty for breadth. Second, stronger monitoring should limit managers' ability to exercise internal accounting discretion within deep structures and increase the visibility of income generated in more remote affiliates to the parent.³

Hypothesis 6: *Relative to the pre-2018 period, the post-2018 monitoring regime is expected to:*

- (i) strengthen the negative association between hierarchical depth and the implied cost of capital, and weaken the positive association between breadth and the implied cost of capital, because investors can more credibly evaluate how internal structure allocates legal and reputational risk;*
- (ii) attenuate the positive association between hierarchical depth and accrual-based earnings management, and*
- (iii) increase the visibility of subsidiary performance at the parent level, so that income from more remote affiliates is more likely to be recognized by the parent rather than contained entirely in*

³ TCJA signed December 22, 2017, generally effective for tax years beginning after December 31, 2017, introducing GILTI, BEAT, FDII, and section 163(j) interest limits under a largely territorial framework. ASC 606 effective for public entities for annual periods beginning after December 15, 2017, yielding 2018 adoption for most filers. PCAOB AS 3101 adopted in 2017 with expanded report elements for fiscal years ending on or after December 15, 2017, and CAMs phasing in later; PCAOB Form AP partner disclosure has been in place since early 2017 and continued through 2018. MiFID II effective January 3, 2018, with 2017 implementation effects. OECD BEPS Action 13 CbCR applied to fiscal years beginning in 2016, with first exchanges and use expanding in 2017–2018. EU beneficial-ownership registers mandated under the 4th Anti-Money Laundering Directive were operational by 2017 with further implementation and enforcement momentum in 2018.

lower-tier entities.

2. Describing the Business Groups

Intuitively, firms within a business group (BG) can differ in profitability, access to financing, or even tax advantages. Due to these varied attributes, a single firm's importance to the broader business group (BG) cannot be inferred solely from its standalone characteristics. Instead, a firm's significance arises from how its attributes intersect with BG's overall strategic needs.⁴ For instance, a subsidiary that grants access to favorable tax regimes and oversees multiple downstream firms often holds greater overall value for the parent company than a comparable subsidiary with no further ownership links.

A helpful illustration is provided by the findings of Almeida et al. (2015), who analyze Korean Chaebols and conclude that subsidiaries located far from the ultimate owner are more easily relinquished. In their framework, if a key node within the ownership chain defaults or is acquired by an external entity, the ultimate owner effectively loses control over all downstream subsidiaries. Hence, the distance from the BG's apex inversely correlates with how the parent values that subsidiary. The more remote the node, the greater the likelihood that it will be dropped if the ownership path is disrupted. Building on these insights, we propose a series of measures capturing both group complexity and firm criticality within BG.

2.1 Business Group Complexity

Among the most intuitive indicators of BG complexity are:

⁴ This perspective mirrors how an asset's risk can depend not only on the asset itself, but on the portfolio or system in which it is embedded.

- The total number of subsidiaries, denoted $(BG) sN$,
- The number of hierarchical levels (layers) in the BG, captured by $BG Depth$. It is the maximum distance (in ownership layers) between the ultimate parent and any of its subsidiaries, thus representing the vertical dimension of the organizational design

Belenzon et al. (2013) suggest that a greater number of managerial layers typically aligns with increased complexity.⁵ In existing studies, authors typically restrict the BG architecture to firms directly controlled (i.e., those with at least a 50% share in each ownership link). This approach, however, could exclude subsidiaries jointly controlled by the group, provided there is a single ownership link below the majority ownership threshold. Additionally, in certain countries, there may be restrictions on single foreign ownership; therefore, we use a 10 percent ownership threshold as the minimum to classify a subsidiary as BG co-owned and to calculate overall control.

[Figure 1]

Figure 1 offers representative examples of BG formations at differing levels of complexity.⁶ As we move from example (1) to (3), the parent firm becomes increasingly removed from front-line operations, and the total subsidiary count grows accordingly. Example (1) portrays a pure subsidiary setup, in which the parent firm directly owns all subsidiaries. This arrangement allows for rapid internal financing and more transparent oversight, but increases the parent's exposure - including potential liability if any subsidiary faces distress. Conversely, examples (2) and (3) illustrate deeper, more complex BGs (three and five layers, respectively), incorporating

⁵ In the sensitivity analysis, we do not assume a purely linear relation between BG Depth and outcomes. Our approach also includes categorizing BG Depth into discrete bins to capture the effect of varying complexity; see the data section and Appendix for details.

⁶ The theoretical foundation for these illustrative structures aligns with the idea of a “root graph” (or “tree”) in graph theory. See, e.g., Harary (1969), Bondy & Murty (1976).

between six and eleven subsidiaries.

A second angle on BG structure focuses on the question: Where do most subsidiaries lie within the ownership chain? Are they top-heavy, centralized in intermediate layers, or located in deeper tiers? To represent these spatial aspects, we use *BG Breadth*, defined as the share of subsidiaries that do not themselves own any other firm (i.e., endpoints), divided by the group's total subsidiary count, NF . The variable *BG Breadth* ranges from $1/NF$ to 1. In a less broad but highly layered BG (Figure 1, column 3), the parent can more readily isolate itself from risky or reputation-damaging subsidiaries, relying on limited liability to protect itself. However, this same elongation complicates internal profit flows. By contrast, a broader yet shallower BG (Figure 1, column 1) simplifies resource transfers but exposes the parent to direct accountability across multiple subsidiaries.⁷

Another approach to examining group centrality and/or the existence of well-connected BG centers is the TMH measure. THC (Tendency to make a hub) is defined as the ratio of the sum of the squared centrality degrees of each subsidiary to the total sum of their centralities. This measure is significantly increasing in the presence of one or more centers, while controlling for the other subsidiaries. The measure was initially widely used in neuroscience and later in network analysis, capturing connectivity and the existence of centers and flows within the structure.⁸ (Saber et al., 2021, Morrison et al., 2022). See the Appendix for the complete list of variables and their definitions.

⁷ Endpoints denote subsidiaries that own no further firms. For instance, in Example (2), A, C, E, and G are endpoints. Formally, $1/NF \leq BG \text{ Breadth} \leq 1$. At the low extreme, the structure is a long ownership chain with only one endpoint; at the upper extreme, every subsidiary is directly owned by the parent, resembling Example (1). In Examples (2) and (3), *BG Breadth* is $4/6=2/3$ and $5/10=1/2$, respectively.

⁸ Formally, $1 \leq TMH \leq O(N)$. At the low extreme, the structure is a pure subsidiary; all subsidiaries have centrality degree equal to one, resembling Example (1), and $TMH = 1$. At the upper extreme, the center is located one level down the root, with a subsidiary structure. In Examples (2) and (3), TMH is $17/9 \approx 1.89$ and $35/17 \approx 2.06$, respectively.

3. Sample Creation

3.1. Ownership data and creation of the business group

The ownership data for this project were sourced from the ORBIS Historical dataset (Moody's), which comprises several sections. First, each company and subject, including the physical owner, has a unique ID number in the database. The ID can be used for linking separately provided financial, sectoral, geographical, and ownership information. The ownership database is stored separately for each year, from 2007 to 2022. It primarily contains information on the links between a target firm and its owner(s) (shareholders), the nature of the relationship, the reporting date, and the percentage of ownership.⁹ To be precise, the provided information is more detailed; due to multiple sources, dates, and definitions, we observe several duplicates in the data, with the same ownership link reported multiple times.¹⁰

Therefore, the first task is to remove duplicate links and to resolve the shareholder structure for each year, ensuring that the sum of all ownership shares in each company does not exceed 100 percent. While Moody's provides a unique ID for each entity, it sometimes links to a generic and broad name, such as "foreign private owner," etc. Therefore, to avoid creating "false" or misidentified structures, we designated this as an anonymous owner and set the head of the group

⁹ The original data file is structured as follows: the BVDID of the target company, the target company's independence indicator (a special classification of Moody's for the ownership concentration), the shareholder BVDID, the shareholder's independence indicator, the type of relation, the percentage of ownership (both direct and total), the source of the information, and the information date.

¹⁰ The relationship involves a simple shareholder, a domestic ultimate owner (DUO), and a global ultimate owner (GUO) – possibly following different definitions of ultimate ownership and the level of control (25% and 50%, single and combined). The exact relationship could be reported through various sources and at different times. Therefore, to handle duplicates properly, one must select a date (as we opted for December 31, or the closest date before the end of the year) and a sequence of data sources. We merged records with DUO and GUO on different levels, presenting them as a variable containing the ID of DUO and GUO to remove duplicates without losing any information. Finally, in our dataset, the relationship between A and B, A->B, is represented as one data record per year.

one level down to ensure the correct business group structure.

3.2. Business group creation

We use direct ownership links to sequentially construct the business group ownership structure. Most of the algorithms used in the literature for building business groups typically begin by reconstructing all direct and indirect ownership links. They construct the ownership chain from the bottom up (Belenzon & Berkovitz, 2010) and match the names of the ultimate owners to assemble the business group (Belenzon et al., 2019).¹¹

Although constructing BG from bottom-up or top-down should yield the same results, we employ the top-down approach, starting with the individuals or firms that represent the ultimate owner. It is essential to note that some ownership identifiers correspond to vaguely defined (anonymous) owners, which may lead to the misclassification of some firms as having the same owners. Therefore, we first filter out vaguely defined ultimate owners by applying our algorithm in successive iterations. Because the unique identification of top owners is central to our analysis, a top-down approach is preferred in creating our business groups. The top-down approach has another advantage. To develop the BG structure, we can apply existing graph algorithms to “root” graphs, where the ultimate owner is at the top, and identify the levels and firms in the oriented root graph with the specified ultimate owner at the top. For brevity, we do not provide details of the business group construction here. We refer to the Technical Appendix and Figure A.1, which presents the search algorithm in a structural form. For graph algorithms, we refer to projects such as NetworkX implemented in Python or similar ones in R (see, e.g., Hagberg and Conway, 2020;

¹¹ The ORBIS database now provides an “independence” indicator for each firm, which can be used to distinguish between stand-alone firms and business group members. However, it cannot be used to characterize the business group to which the firms belong, nor can any grouping by the ultimate owner help either.

Platt, 2019).

3.3. Lawsuit sample creation

To analyze whether parent companies shift risk to their subsidiaries, we examine the incidence and market reactions to civil lawsuits. To construct a dataset of civil lawsuits, we draw on the Federal Judicial Center dataset and apply fuzzy matching to link lawsuits to our sample of public and private companies in Orbis. We retain only lawsuits in which the defendant is clearly identified as a company, has a single defendant, and the defendant company can be identified with certainty. This yields a sample of more than 55,000 civil lawsuits.

3.4. Descriptive statistics and sample distribution

Panel A of Table 1 reports descriptive statistics for the main variables used in the analysis. We include measures of subsidiary earnings, accrual-based earnings management, real-activity earnings management, analyst forecast error and dispersion, and standard firm-level controls (size, book-to-market ratio, return on assets, leverage, and analyst coverage). Subsidiary earnings, defined as equity in the net income or loss of unconsolidated but significantly influenced subsidiaries, take on both positive and negative values, with a mean of -0.498 and a large standard deviation of 50.08 . This dispersion indicates substantial heterogeneity in how partly owned affiliates contribute to, or drain from, the parent's reported performance. Absolute accruals average 0.079 with a standard deviation of 0.167 , consistent with economically meaningful variation in accrual intensity across firms and over time. Our proxy for abnormal real-activity earnings management averages -0.054 (standard deviation 2.298), suggesting minor but nontrivial deviations in operating behavior relative to expected benchmarks.

We also provide descriptive statistics for control variables. Firm size (log of total assets) ranges from approximately 3.58 at the 5th percentile to 10.13 at the 95th percentile, indicating the

presence of both relatively small and very large public parents in the sample. The implied cost of capital averages 1.736 percent per month, with an interquartile range from 0.40 to 2.40 percent, based on 422,614 firm months. This spread highlights significant cross-sectional differences in perceived risk and required return.

Finally, Panel A summarizes our measures of business group complexity. The average group depth (the maximum number of 50 percent-plus control layers from the public parent to the most distant controlled subsidiary) is 3.158, with the 25th percentile at 2 layers and the 75th percentile at 4 layers. Breadth, defined as the share of endpoint subsidiaries relative to the total number of majority-controlled subsidiaries, has a mean of 0.84 and an interquartile range of 0.75-1.00. These distributions indicate that (i) many U.S. business groups extend beyond a simple two-tier structure, and (ii) many groups are highly “endpoint-heavy,” with a substantial fraction of subsidiaries sitting directly at the edge of the network.

[Table 1]

Panel B of Table 1 describes the sample distribution across fiscal years (2007–2022) and across discrete depth categories. The annual coverage is balanced, with each year accounting for roughly 5.7 percent to 6.9 percent of the observations, so no single period dominates the sample. When we classify groups by depth, 16.3 percent of firm-years exhibit a one-tier structure ($BG_depth = 1$), 32.9 percent have two tiers ($BG_depth = 2$), and 50.7 percent have at least three tiers ($BG_depth \geq 3$). Thus, about one-half of firm-years fall into multi-tier structures with three or more control layers. This mix underscores that both “moderately layered” and “highly layered” organizational forms are common in the United States. It motivates the testing of how depth and breadth map into the cost of capital, earnings management, and the internal reporting of subsidiary results.

Table 2 reports the correlation matrix for the business group (BG) complexity measures.

BG_depth is the maximum number of 50-percent-plus control layers from the public parent to the most distant controlled affiliate. *BG_breadth* is the ratio of endpoint subsidiaries to the total number of majority-owned subsidiaries. The two measures are negatively correlated ($r = -0.28$), consistent with the idea that groups with greater hierarchical layering tend to have, in proportional terms, fewer direct endpoints. The magnitude of this correlation is moderate rather than extreme, suggesting that depth and breadth capture related yet distinct dimensions of structure.

[Table 2]

The total number of majority-controlled subsidiaries (*sN*) is positively correlated with *BG_depth* (0.46), indicating that larger groups tend to add layers as they grow. By contrast, *sN* is essentially uncorrelated with *BG_breadth* (-0.02), implying that having many subsidiaries does not automatically make the group “broad” in the sense of being endpoint-heavy. The Tendency to Make a Hub (*TMH*) measure is positively related to both *sN* (0.54) and *BG_depth* (0.21), consistent with larger and more layered groups developing internal hubs, but *TMH* is only very weakly related to *BG_breadth* (-0.04). Overall, these correlations indicate that (i) depth and breadth are not simple scale effects, and (ii) groups can be deep without being broad, broad without being deep, or both. That motivates treating depth and breadth separately in the empirical analysis.

4. Results

4.1. Implied Cost of Capital

In this section, we analyze how business group complexity impacts the implied cost of capital (*ICC*) for the publicly traded parent company. The implied cost of capital (*ICC*) is crucial for several corporate decisions, including setting the hurdle rate for new projects, determining a company’s capital structure, and evaluating the long-term profitability of its operations. To

estimate the ICC, we adopt the regression-based approach proposed by Gebhardt et al. (2001) and further developed by Hou et al. (2012), which forecasts a firm's future earnings using historical data rather than relying on analyst estimates. The same regression-based approach has also been employed in previous work by Donangelo (2014), İmrohoroglu and Tüzel (2014), and Pastor et al. (2022), underscoring its usefulness in capturing cost-of-capital dynamics across a broad range of firms.

Following Pastor et al. (2022), we employ the Gebhardt et al. (2001) model to estimate the ICC, as it yields the most precise expected-return estimates in the cross-section (Lee et al., 2021). Consistent with the methodology of Hou et al. (2012), we employ regression-based forecasts derived from historical data for each industry to obtain earnings-per-share forecasts. The implied cost of capital is the internal rate of return that equates the present value of future dividends to the current stock price.¹² Following this methodology, we then calculate the ICC for each stock month. The results are presented in Table 3.

[Table 3, Panel A]

Panel A shows two central patterns. First, BG Depth enters with a negative and statistically significant coefficient across specifications. This indicates that firms with longer ownership chains tend to face a lower required return. Economically, the magnitude is meaningful. Moving from the 25th to the 75th percentile of Depth in our sample is roughly equivalent to adding about two additional ownership tiers. Using the coefficients in Columns (1) and (2), the interquartile increase

¹² Hou et al. (2012) employ ten years of industry data to project each firm's earnings for three years, then assume the firm's return on equity converges to the industry average from years four through twelve, culminating in a perpetual horizon beyond year twelve. They also hold the dividend payout ratio constant throughout the entire period. The discount rate required to equate these projected cash flows with the current stock price is determined by iterating through a combination of bisection and Newton-Raphson algorithms. If those two methods yield conflicting discount rates, the authors discard the observation. For full methodological details, see Lee et al. (2021) and Pastor et al. (2022, online appendix).

in Depth is associated with an ICC reduction of approximately 5 to 6 basis points per month, or roughly 60 to 70 basis points per year. This is consistent with the idea that deeper hierarchies allow firms to segment and contain legal and reputational shocks inside the group.

On the other hand, BG Breadth has a positive and significant coefficient. Breadth is defined as the share of endpoints among majority-owned subsidiaries, so a high Breadth value corresponds to a flat, endpoint-heavy, relatively shallow structure. The point estimates indicate that moving from the 25th to the 75th percentile of Breadth increases the ICC by approximately 6-7 basis points per month, or roughly 70-80 basis points per year. Investors thus appear to penalize broad, top-level exposure. This is consistent with the interpretation that when many affiliates sit directly under the parent, shocks to those affiliates are more likely to spill over onto the parent's balance sheet and the parent's public equity.¹³

[Table 3, Panel B]

Panel B incorporates two sources of external monitoring: an indicator for Big 4 audit engagements, and interactions among indicators for Big 4, an indicator for 2018 and later, and the structural measures.¹⁴ This specification is designed to test whether markets reward depth only when they can trust that depth genuinely insulates risk. Once we allow for these interactions, the standalone coefficient on Depth (which now captures non-Big 4 firms before 2018) is positive and statistically significant, indicating that in weakly monitored settings, additional ownership tiers are

¹³ The Tendency to Make a Hub (TMH) variable is positive and significant, suggesting that investors demand a slightly higher return when internal activity appears to funnel through concentrated nodes. By contrast, the coefficient on the total number of majority-owned subsidiaries (sN) is small in magnitude and negative. We include the variable sN as a scale control but do not treat it as a primary channel. sN is highly correlated with both Depth and Breadth (Table 2), and its sign is sensitive to whether we partial out those shape measures. In the full specification, it becomes slightly negative, consistent with larger, more layered groups being perceived as better able to compartmentalize risk; however, our interpretation focuses on the structural shape, Depth and Breadth, rather than raw subsidiary count.

¹⁴ Indicator for 2018 and later, by itself, is not included in our regression because it is perfectly correlated with annual fixed effects.

initially priced as risk-increasing. Moving from the 25th to the 75th percentile of Depth (roughly two additional ownership layers) is associated with an increase in the ICC of about 4 bp per month (about 45 bp per year). However, the $\text{Depth} \times \text{Big 4}$ and $\text{Depth} \times \text{Post-2018}$ interaction terms are both substantial and negative, indicating that stronger monitoring reverses this baseline pattern. Evaluated at the Big 4 coefficient before 2018, the interquartile depth shift lowers the ICC by about 3–4 bp per month (around 35–40 bp per year). For firms without Big 4 audit but in the post-2018 regime, the implied effect is a modest decline of about 1–2 bp per month (about 15–20 bp per year), while combining Big 4 assurance with the post-2018 environment generates the most substantial discount: an interquartile increase in BG depth is then associated with an ICC reduction on the order of 8–9 bp per month (roughly 100 bp per year). In short, depth appears to be priced as risk-enhancing when monitoring is weak but becomes materially protective once outsiders can verify that it segments and contains risk.

Breadth again exhibits a complementary monitoring pattern. The leading Breadth coefficient in Panel B is positive and highly significant, implying that in non-Big 4, pre-2018 settings, widening the group from the 25th to the 75th percentile of Breadth is associated with an increase in the ICC of roughly 6–7 bp per month (about 80 bp per year).¹⁵ This is consistent with investors penalizing flat, endpoint-heavy structures that leave the parent visibly exposed. The $\text{Breadth} \times \text{Big 4}$ and $\text{Breadth} \times \text{Post-2018}$ interactions are strongly negative, indicating that improved audit quality and the new reporting regime substantially compress the breadth-related premium. Under Big 4 assurance, the incremental ICC cost of Breadth declines to approximately 0.6 bp per month (approximately 7 bp per year), with the effect on Big 4 clients after 2018

¹⁵ The Big 4 indicator on its own is negative and significant, consistent with the standard view that high-quality external assurance lowers perceived information risk.

negligible. By contrast, for non-Big 4 firms, the post-2018 regime, on its own, leaves the breadth penalty essentially unchanged at approximately 6 bp per month (around 70–75 bp per year). Taken together, these results suggest that credible external monitoring does not eliminate the market’s sensitivity to group shape but instead allows investors to distinguish sprawling structures that truly threaten to transmit subsidiary shocks directly to the listed parent from those whose risks are more effectively ring-fenced.

A less benevolent interpretation of these interactions is that they involve regulatory and reputational segmentation. Depth may allow the parent to offload legally or reputationally sensitive activities into subsidiaries that sit sufficiently deep in the ownership chain to fall outside the most demanding layer of scrutiny. The post-2018 disclosure and audit-reporting reforms, as well as Big 4 oversight, tighten monitoring where it is most visible – at the public parent and its directly held core subsidiaries – but they do not guarantee equivalent transparency several layers below. Investors may therefore reward deep groups not only because depth ring-fences downside risk, but also because depth preserves an insulated zone in which higher-liability or higher-friction activity can be housed away from the monitored core. In that sense, depth is especially valuable precisely when top-tier entities face stricter auditing and disclosure demands. This interpretation aligns with evidence that firms sometimes isolate controversial, high-litigation, or compliance-intensive exposure in less visible affiliates to protect the flagship entity’s standing with regulators, investors, and counterparties (Healy and Palepu, 2003; Karpoff, Lee, and Martin, 2008).

Overall, Table 3 supports H1, H5, and H6. Investors are not simply pricing by size. They are pricing the business group shape. Broad, endpoint-heavy groups are penalized, especially when monitoring is weak. Deep, layered groups are rewarded, especially when the market can verify that depth actually segments risk. The post-2018 environment and Big 4 assurance both appear to

increase the credibility of that verification, and the implied cost of capital adjusts accordingly.

These findings raise an important question about the extent to which tax-related incentives and regulatory-oversight avoidance contribute to the complex organizational structures observed in business groups, as well as the implications for the ICC. Publicly traded firms frequently employ subsidiaries in tax havens to mitigate tax liabilities; however, such arrangements have broader consequences for transparency, firm valuation, and regulatory monitoring. Prior research highlighted the central role of auditors, particularly the Big 4, in these environments and documented how business-group configurations and tax-haven networks shape tax-avoidance strategies, financial reporting outcomes, market responses, and the efficacy of policy interventions (Jones, Temouri, & Cobham, 2017).

Recent transparency shocks, most prominently the Panama Papers, demonstrate that opaque offshore vehicles facilitate not only tax avoidance but also corruption and shareholder expropriation. Subsequent evidence suggests that reductions in statutory tax rates alone are insufficient to deter the use of such structures (Jones & Temouri, 2016; O'Donovan, Wagner, & Zeume, 2019). Importantly, low effective tax rates do not uniformly indicate aggressive tax planning. Many firms achieve low tax burdens through benign mechanisms, such as substantial net operating loss carryforwards, and therefore do not exhibit higher tax risk or volatility (Christensen, Kenchington, & Laux, 2020).

Investor assessments further differentiate between types of offshore engagement. Firms directly incorporated in offshore financial centers (OFCs) tend to face valuation discounts and higher borrowing costs due to perceived governance and opacity risks. In contrast, firms with OFC-based subsidiaries often receive higher valuations, possibly because investors underestimate the agency costs embedded in these structures (Durnev, Li, & Magnan, 2016). The auditing

profession remains deeply intertwined in this landscape: multinational enterprises audited by Big 4 firms are more likely to maintain extensive tax-haven networks, and regulatory interventions governing auditor-provided tax advisory services can materially influence corporate tax-avoidance behavior (Jones, Temouri, & Cobham, 2017).

Therefore, we trace the countries of incorporation and tax domiciles for the subsidiaries in each BG and create two additional dummy variables: *TaxH* (=1 if a subsidiary is in a tax haven¹⁶) and *TaxG* (if a subsidiary is in a tax grey jurisdiction¹⁷, as classified by OESC and the EU). For tax and hiding motives, we consider the BG structural variables interacting with *TaxH* (*TaxG*), *y2018*, and the *BIG4* dummy variables. Table 4, Panel A, presents the results for the effect of tax haven jurisdictions.

[Table 4, Panel A]

[Table 4, Panel B]

4.2. *Lawsuits and Risk Ring-Fencing*

Let us explore the BG ring-fencing mechanism by using civil lawsuits to test the complexity synergies behind the ICC results. Litigation provides discrete, plausibly exogenous shocks to firm risk that generate measurable market reactions. If hierarchical depth operates as a liability shield, then legal shocks should be increasingly compartmentalized as they occur further from the parent

¹⁶ Here is the list of common tax haven jurisdictions considered in the paper: Andorra (AD), Bahamas (BS), Barbados (BB), Bermuda (BM), British Virgin Islands (VG), Cayman Islands (KY), Curaçao (CW), Cyprus (CY), Gibraltar (GI), Guernsey (GG), Hong Kong (HK), Ireland (IE), Isle of Man (IM), Jersey (JE), Liechtenstein (LI), Luxembourg (LU), Malta (MT), Mauritius (MU), Monaco (MC), Panama (PA), Samoa (WS), Singapore (SG), Switzerland (CH), United Arab Emirates (AE), and Vanuatu (VU).

¹⁷ We consider together black list countries, grey jurisdiction and non-cooperating tax jurisdictions: American Samoa (AS), Anguilla (AI), Antigua and Barbuda (AG), Belize (BZ), British Virgin Islands (VG), Brunei Darussalam (BN), Eswatini (SZ), Fiji (FJ), Greenland (GL), Guam (GU), Jordan (JO), Montenegro (ME), Morocco (MA), Palau (PW), Panama (PA), Russian Federation (RU), Samoa (WS), Seychelles (SC), Trinidad and Tobago (TT), Türkiye (TR), U.S. Virgin Islands (VI), and Vanuatu (VU).

in the ownership tree, and investors should discount parent equity less when lower-tier affiliates buffer the shock. Lawsuit incidence and announcement-window return, therefore, offer an event-level validation of the risk insulation that investors appear to price in ICC.

We study two dimensions. First, we examine exposure: within a business group, what fraction of filed lawsuits name the public parent, and how does the probability that the parent is sued in a given quarter vary with group structure. Second, we examine market reactions: how cumulative abnormal returns around lawsuit filings differ by the level of the hierarchy at which the named defendant sits. To implement these tests, we assemble a large sample of single-defendant corporate civil cases and link each case to the public parent and its affiliates. We record (i) whether the parent is sued at all in a given quarter, (ii) the share of all suits in the group that directly hit the parent, and (iii) the ownership “distance” between the sued entity and the parent. The incidence tests address who bears legal risk within the group; the event-study tests address how much of that risk spillovers to parent shareholders. Together, they allow us to ask whether the same structural features that the market appears to price into ICC actually appear in the legal channel.

Table 5 reports the share of a group’s lawsuits that name the public parent, by business-group depth, using indicator variables, with depth = 1 (a pure, one-tier subsidiary structure) as the omitted category. The depth indicators enter with large, negative, and precisely estimated coefficients. Relative to depth = 1, depth = 2 is associated with about a 9 percentage point lower parent-hit share, depth = 3 with roughly a 16 percentage point reduction, and depth ≥ 4 with about a 28 percentage point reduction. These are economically significant effects: as ownership chains lengthen, a substantially smaller fraction of the group’s legal actions touches the listed parent. Breadth enters with a positive sign but is not statistically significant in this specification. The number of subsidiaries (and its square) shows a mild inverted-U shape when the quadratic term is

included, but we view this primarily as a scale-control effect rather than a core channel. Among firm-level controls, higher profitability is associated with a smaller parent-hit share, while greater analyst coverage is associated with a larger parent-hit share; other controls are comparatively muted. Overall, Table 5 indicates that organizational depth materially shifts who bears litigation risk inside the group: more layers mean that fewer suits directly reach the public parent.

[Table 5]

Table 6 turns from intensity to incidence. We estimate a linear probability model for whether the public parent is sued in a given quarter. Again, depth indicators (with depth = 1 omitted) are negative. Relative to depth = 1, depth = 2 is essentially flat in the most stripped-down specification but becomes economically and statistically negative when standard controls are included, by about −0.77 percentage points. Depth = 3 is consistently negative and large, around −2.1 percentage points when controls are included. Depth ≥ 4 is also negative once controls are included, by approximately 1.27 percentage points. Breadth is positive and significant in the baseline column, consistent with the idea that flatter, endpoint-heavy structures expose the parent more directly to being named. The number of subsidiaries again mainly matters through functional form: with a quadratic, we see an inverted-U; without the quadratic, the linear term turns negative and significant, consistent with larger and deeper groups channeling suits away from the parent. Among controls, size (log assets) is strongly positive: a one-unit increase in log assets raises the parent-sued probability by roughly 2.5 percentage points. Analyst coverage is also positively associated with being sued. Other firm controls have weaker effects. In sum, deeper ownership chains are associated with a significantly lower probability that the listed parent is named directly in litigation, which is precisely the pattern we would expect if depth ring-fenced legal exposure.

[Table 5]

Table 6 presents event-study regressions of cumulative abnormal returns (CAR) around lawsuit filings, using lawsuits that directly name the parent (distance = 0) as the omitted category. We classify each suit by the “distance” of the sued entity from the parent in the ownership tree (1 step below the parent, 2 steps below, or 3+ steps below) and estimate CARs over four symmetric windows: $(-14,14)$, $(-7,7)$, $(-5,5)$, and $(-3,3)$ trading days. Across windows, coefficients on the distance buckets are generally positive, increase with distance, and are statistically strongest for longer distances and longer windows. For example, for $CAR(-14,14)$, distance = 1 corresponds to roughly +0.21 percentage points, distance = 2 to about +0.17 percentage points, and distance = 3 to about +0.26 percentage points, all significant. In $CAR(-7,7)$, the distance = 3 category is about +0.45 percentage points and highly significant, while distance = 1 and 2 are smaller and imprecise. In $CAR(-5,5)$, distance = 3 is about +0.43 percentage points and significant; distance = 1 is about +0.06 percentage points and significant at conventional levels; distance = 2 is positive but not significant. Even within the tight $CAR(-3,3)$ window, distance = 3 remains economically and statistically meaningful at approximately +0.18 percentage points, and distance = 1 is approximately +0.05 percentage points and marginally significant. These magnitudes show that when a case is filed against a lower-tier affiliate rather than against the parent itself, the announcement-window penalty to the parent’s equity is substantially attenuated, often by several tenths of a percentage point, with the most substantial attenuation when the defendant sits three or more steps below the parent.

[Table 7]

The control variables in Table 7 have the expected signs. Windows that overlap Federal Reserve quantitative easing announcements load strongly positive, consistent with broad market tailwinds. Larger firms and those with higher book-to-market ratios tend to have more positive CAR

coefficients. In contrast, higher return on assets tends to load negatively, consistent with higher profitability making downside surprises more salient. Lagged return controls and fixed effects absorb background performance and time-varying market conditions.

Taken together, Tables 5–7 show that hierarchical depth materially reduces parent-level legal exposure along three distinct margins. First, the fraction of all suits in the group that directly hit the parent falls stepwise as depth increases. Second, the quarter-by-quarter probability that the parent is named at all also declines with depth and increases with breadth, especially after accounting for firm size and analyst attention. Third, when lawsuits are brought against lower-tier affiliates rather than the parent, the stock price decline at the announcement is much smaller, and the relief is most significant when the defendant is several tiers down. These findings provide event-level validation of risk ring-fencing and complement the evidence from the ICC. It suggests that investors may reward deep structures and penalize flat, endpoint-heavy structures because depth allows for the absorption of legal shocks before they reach the listed parent.

4.3. Accounting accruals

Earnings management involves altering reported numbers to present a more favorable and enduring picture of a firm's financial performance (Dechow et al., 2010; Bergstresser and Philippon, 2006). A considerable literature examines how earnings management influences profitability, the persistence of reported earnings, and executive compensation. For instance, Rangan (1998) shows that firms with positive abnormal accruals often experience subsequent earnings reversals and underperform in the stock market. Bergstresser and Philippon (2006) find that when firms engage in greater earnings management, managers are more likely to exercise stock options and insiders sell their holdings more aggressively. Barth et al. (2013) further document that lower earnings management correlates with lower costs of capital.

Intuitively, the earnings of public parent companies with larger and more complex subsidiary structures are more influenced by the performance of those subsidiaries. This wider influence provides greater scope for managing earnings through accruals, because multiple layers of subsidiaries make it more difficult for external parties to trace how revenues and expenses are recognized. We therefore test whether subsidiary structure is associated with accrual-based earnings management, in line with Hypothesis 2. Specifically, we use the absolute value of accruals scaled by average assets over the past two accounting periods.¹⁸ The results are presented in Table 8.

[Table 8]

Panel A shows two systematic patterns. First, hierarchical depth is positively and significantly associated with absolute accruals across all specifications. The statistically significant coefficient on Depth ranges from about 0.006 to 0.008 per additional ownership layer. Moving from the 25th to the 75th percentile in Depth implies an increase in absolute accruals of 0.012-0.016, approximately 15-20 percent relative to the sample mean. This is consistent with the view that deeper structures create greater scope for reclassification or the shifting of accounting items in ways that are difficult for outsiders to monitor.

Second, Breadth has negative, statistically significant coefficients of approximately -0.03 in the core regressions. An interquartile shift in Breadth implies a change in absolute accruals of about -0.005 to -0.008 , which is roughly 6 to 10 percent of the mean. In other words, flatter groups with many directly held endpoints do not appear to rely more heavily on accrual-based adjustments. If anything, they exhibit slightly lower absolute accrual intensity. This supports the

¹⁸ Since earnings management involves the transfer of earnings from one period to another, using the absolute value of accruals allows us to detect the earnings management without being sensitive to the precise timing of when earnings are increased or decreased. This approach is consistent with previous literature (e.g., Bergstresser and Philippon, 2006).

idea that the accrual channel is driven primarily by hierarchical layering, rather than by the raw proliferation of subsidiaries at the surface.

Other complexity controls in Panel A, such as the total number of majority-owned subsidiaries (sN) and the tendency to make hubs (TMH), are of small magnitude. We include sN as scale control, but we do not view it as a first-order mechanism. sN is correlated with both Depth and Breadth (see Table 8), and its sign is sensitive to whether those shape measures are included. In the full specification, it is slightly negative, which is consistent with larger, more layered groups being perceived as better able to contain internal shocks.

Panel B introduces two sources of monitoring, Big 4 audit status and an indicator for 2018 and later, and allows both Depth and Breadth to interact with these monitors. Three results emerge.

First, the baseline relationship between Depth and accrual intensity is statistically and economically significant for firms without a Big 4 auditor before 2018. In that baseline, the coefficient on Depth is about 0.015. Using the same interquartile increase in Depth (approximately two additional ownership tiers), this maps to a rise in absolute accruals of roughly 0.03. Relative to the sample mean of absolute accruals, this corresponds to an effect on the order of 15 to 40 percent of the mean. This is consistent with Hypothesis 2, which predicts that deeper ownership structures create more scope for accrual discretion in environments with weaker external scrutiny.

Second, audit quality materially constrains that channel. The interaction of Depth and the Big 4 indicator is negative and statistically significant, about -0.012. This implies that for Big 4 clients, the net Depth effect on accruals is much smaller. Taking the leading Depth coefficient (about 0.015) and adding the Depth $\times$ Big 4 interaction (about -0.012) leaves an implied slope of roughly 0.003 per additional layer. Over an interquartile increase in Depth, that corresponds to an increase in absolute accruals of only about 0.007 to 0.008, which is on the order of 5 to 10 percent

of the mean and statistically weaker. The interactions of Depth with the post-2018 indicator are economically small and not precisely estimated, implying a modest dampening of the depth–accruals slope in the later reporting regime but leaving Big 4 assurance as the main disciplining force. This pattern is consistent with Hypothesis 5, which posits that high-quality external assurance limits the scope for using hierarchical depth in accrual-based earnings management.

Third, Breadth also interacts with monitoring. Breadth, on its own, is negative (about -0.031) and statistically significant, indicating that broader, more endpoint-heavy groups are associated with slightly lower absolute accruals, even in the non–Big 4, pre-2018 baseline. The Breadth $\times$ Big 4 interaction is further negative (around -0.014) though insignificant, suggesting that for firms subject to Big 4 assurance, flatter, endpoint-heavy structures tend to exhibit even lower accrual intensity, although the incremental effect is modest. The Breadth $\times$ post-2018 interaction is small and positive, partially offsetting the negative main effect but not overturning it. Together, these results indicate that audit quality curbs accrual discretion not only in deep pyramids but also, to a lesser extent, in sprawling groups in which many units report directly to the parent. In contrast, the post-2018 regime makes only incremental contributions in this dimension.

Taken together, Table 8 supports Hypothesis 2 and is consistent with Hypotheses 5 and 6. Deeper ownership hierarchies are associated with higher absolute accruals in weakly monitored environments. This finding is consistent with the idea that multi-tier structures expand the scope for accrual-based earnings management, and this association is sharply reduced for firms with high-quality external assurance. Breadth plays a different role. Broad, endpoint-heavy structures do not show systematically higher accrual intensity; if anything, Breadth is associated with slightly lower absolute accruals, and this disciplining effect is somewhat more substantial under Big 4

audit oversight. These results align with the story from the cost of capital tests: investors reward depth, and penalize breadth, when they can verify that depth actually contains risk and when they believe that breadth leaves the parent exposed, while the accrual evidence shows that depth creates room for accrual discretion unless disciplined by credible monitoring, and breadth does not appear to push accrual manipulation upward.

4.4 Real earnings management

As shown in the previous section, more complex structures exhibit a greater propensity to manage earnings through accounting accruals. However, Graham et al. (2005) report that more than 80% of CEOs polled indicated they would reduce discretionary expenses somewhat to meet the earnings target, rather than use accounting accruals. This practice is defined as real earnings management, whereby managers use changes in real activity, rather than accruals, to manage earnings upward. To measure the abnormal discretionary expenses (XSGA), we follow Roychowdhury (2006) and run the following cross-sectional model for each industry and quarter:

$$\frac{XSGA_{it}}{Assets_{i,t-4}} = \beta_1 * \frac{1}{Assets_{i,t-4}} + \beta_2 * \frac{Sales_{i,t-4}}{Assets_{i,t-4}} + \epsilon_{it} , \quad (3)$$

where $XSGA_{it}$ denotes SG&A costs, including marketing and R&D for firm i in quarter t .¹⁹ Negative residuals in this framework indicate that managers are cutting these costs below normal levels to elevate near-term earnings. The results are presented in Table 9.

[Table 9]

Panel A shows that hierarchical depth is negatively related to our proxy for real earnings

¹⁹ Roychowdhury (2006) analyzes annual statements in his paper, since CEOs have a higher incentive to meet yearly earnings expectations. However, the measure can also be constructed at the quarterly level, given that the assets and sales are lagged by one year, to account for the seasonality of earnings (Roychowdhury, 2006).

management. The coefficient on Depth is negative and statistically significant in several specifications (approximately -0.003 to -0.004), but the implied magnitude is small. Breadth is not significantly different from zero. These results are consistent with Hypothesis 3. Deeper groups do not appear to rely on broad cuts to discretionary spending (e.g., SG&A or R&D) to meet reporting targets. If anything, the relation between depth and abnormal discretionary expense cuts is weak and economically limited. This aligns with Zang (2012), who argues that firms view accrual-based and real-activity methods as substitutes and that complex groups prefer accrual-based tools, which can be applied within less visible affiliates, rather than altering operating policies in ways that could harm long-term performance. Graham et al. (2005) report that managers are willing to adjust real activities to hit earnings targets; our evidence suggests that this motive does not systematically increase with depth or breadth in our setting.

Panel B introduces two moderating forces: audit quality (Big 4) and the 2018 reporting and monitoring environment, and allows both Depth and Breadth to interact with these forces. For the audit-quality channel, the Depth $\times$ Big 4 interaction is small and not statistically different from zero, and the Breadth $\times$ Big 4 interaction is also small and insignificant. This indicates that obtaining a Big 4 auditor does not correspond to a detectable shift toward real-activity manipulation. Combined with Table 8, this supports Hypothesis 5: high-quality external assurance constrains accrual-based flexibility in deep groups, but we do not see evidence that firms respond by substituting systematic cuts in discretionary spending.

For the post-2018 channel, the Depth coefficient is negative and significant, whereas Depth $\times$ Post-2018 is positive and of a similar magnitude. Taken together, this implies that before 2018, deeper groups exhibited a slightly more negative abnormal discretionary expense residual (that is, somewhat more spending cuts). Still, the magnitudes are small – on the order of a few thousandths

of assets over an interquartile change in Depth. After 2018, the positive $\text{Depth} \times \text{Post-2018}$ term largely offsets this baseline slope, so that the depth-real management relation flattens out and becomes economically negligible in the later regime. Breadth behaves similarly, with its overall effects remaining modest. The main Breadth coefficient is close to zero and not statistically significant, while the $\text{Breadth} \times \text{Post-2018}$ interaction is small and positive. Although this interaction is statistically significant in some specifications, its magnitude is small and not robust. It indicates that any tendency for endpoint-heavy groups to adjust discretionary spending is not meaningfully stronger in the post-2018 period.

Overall, Table 9 supports Hypothesis 3. The primary channel for complexity is not real-activity manipulation. The economic effect of Depth on discretionary spending is small even before 2018 and becomes weaker – and essentially flat – in the post-2018 environment. Consistent with Hypothesis 6, the 2018 information regime does not produce a stronger link between structural complexity and real operating cuts. Instead, the changes after 2018 concern the baseline environment: firms, on average, report lower discretionary expense residuals in the post-2018 period, but this shift is not concentrated among deeper or broader groups.

4.5. Earnings of subsidiaries and their effect on the parent company

Naturally, the structure's complexity will be inversely related to the effectiveness with which assets are moved through the internal capital market. A pure subsidiary structure, in which all subsidiaries are directly owned by the parent company, entails the lowest information asymmetry and the easiest path for capital transfers. More complex structures yield additional benefits: the parent can push high-risk or reputation-sensitive projects to distant affiliates, thereby gaining plausible deniability; however, the chain becomes more fragile if an intermediate node fails. Moreover,

shareholders may demand higher premiums due to the opacity of complex networks.

In Table 10, we examine how complexity affects the upward flow of subsidiary earnings, measured by Equity in Net Loss/Earnings from unconsolidated subsidiaries.

[Table 10]

In Panel A, both Depth and Breadth load negatively, and Breadth is statistically significant throughout columns 3–6. This means that when groups are more vertically layered (high Depth) or more endpoint-heavy (high Breadth), a smaller share of affiliate results is recorded at the parent in the current period. This is consistent with Hypothesis 4: more complex structures retain earnings at lower tiers rather than immediately recognizing them at the parent.

Panel B introduces two additional moderators: the Big 4 audit tier and the post-2018 information environment. For Depth, the main effect is strongly negative and statistically significant, indicating that, before 2018, deeper groups report less equity-method income at the parent level. In other words, in the weak-monitoring baseline, additional layers are associated with more income remaining in lower-tier entities rather than flowing through to the listed firm. The $\text{Depth} \times 2018+$ interaction is large, positive, and highly significant, implying that this retention pattern weakens and effectively reverses in the later regime: after 2018, increases in Depth are associated with more, rather than less, equity-method income being recognized at the parent. By contrast, the $\text{Depth} \times \text{Big 4}$ interaction is negative but not statistically different from zero, suggesting that for Depth, the main shift in where affiliate results appear is driven by the post-2018 disclosure environment, with audit tier playing at most a secondary role.

Breadth exhibits a broadly analogous, but even more pronounced, pattern when monitoring is strengthened. The main Breadth coefficient is negative and not statistically significant, consistent with little reliable association between breadth and parent-level equity-method income in the pre-

2018, non-Big 4 baseline. The Breadth $\times$ 2018+ interaction, however, is positive and significant, indicating that after 2018, broader groups pass somewhat more affiliate results through to the parent. The Breadth $\times$ Big 4 term is substantial, positive, and precisely estimated, and remains so in full specification. This suggests that, under high-assurance audits, particularly in the post-2018 environment, endpoint-heavy groups are markedly more likely to recognize equity-method income at the parent rather than defer it to lower tiers.

Taken together, Table 10 supports H4 and ties together H5 and H6. Before 2018, complex groups, particularly those with greater hierarchical depth, were more likely to contain earnings within affiliates rather than passing them through, consistent with opacity at lower levels of the group. After 2018, and especially when combined with stronger audit environments, that containment is less effective: more of the performance of influenced subsidiaries becomes visible in parent-reported income. This pattern aligns with the cost-of-capital evidence, in which investors reward depth when they can verify credible ring-fencing of downside risk, and with the broader interpretation that enhanced monitoring and disclosure shift subsidiary results toward greater visibility at the parent rather than systematic retention in lower tiers.

5. Conclusion

We demonstrate that the internal structure of U.S. business groups influences how markets value firms and how firms report their financial information. Using a new dataset that links U.S. public parents to both direct and indirect subsidiaries, including private affiliates that are usually invisible in standard filings, we find that investors distinguish sharply between two forms of organizational complexity. Groups that are broad and flat, meaning a high share of directly held endpoints, face a higher implied cost of capital. By contrast, groups with deeper ownership chains,

meaning longer ownership chains, are assigned a lower required return once depth is combined with credible external monitoring, especially when the financial statements are signed by a Big 4 auditor or observed in the post-2018 information environment. In other words, equity markets appear to treat depth as a credible risk containment and breadth as visible exposure.

We then validate this interpretation in two ways. First, civil lawsuits show that deeper groups redirect legal risk away from the public parent. As depth increases, a smaller share of cases names the parent, the probability that the parent is sued in a given quarter falls, and the announcement-window penalty to the parent's stock is less severe when the defendant sits several tiers below the parent. This is direct evidence of risk ring fencing, which is precisely what investors seem to reward in pricing. Second, we study reporting behavior inside the group. Deeper structures are associated with more accrual-based earnings management, but not with systematic cuts to real operating activity, consistent with the idea that accounting discretion is transmitted through lower-tier affiliates in a way that operating changes cannot. We also find that in weakly monitored settings, and particularly for depth, complex groups recognize less equity-method income from influenced affiliates at the parent level, consistent with income remaining in lower tiers. After 2018, and especially under Big 4 assurance, more of that affiliate performance becomes visible to parent investors, and the market response to organizational shape becomes sharper.

Our results extend classic work on pyramids and business groups by demonstrating that, even in a high-disclosure U.S. setting, subsidiary networks matter. Depth and breadth encode different economic functions. Depth helps mitigate legal and reputational risks when paired with credible monitoring and is priced as a form of protection. In weaker monitoring environments, breadth leaves the parent directly exposed and is priced as risk. Future work can build on this by examining whether creditors and rating agencies respond to group shape in the same way equity

holders do, and whether the board actively redesigns internal ownership structures to manage financing costs, litigation spillover, and the visibility of subsidiary performance.

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Figure 1. Examples of Business-group Structure and its Complexity

Example (1) illustrates the pure subsidiary structure where no firm other than the ultimate owner owns any other firm. All firms are equally distant from the owner and appear to be of equivalent importance. Example 2 introduces a business group with multiple levels and member firms that own and control other member firms.

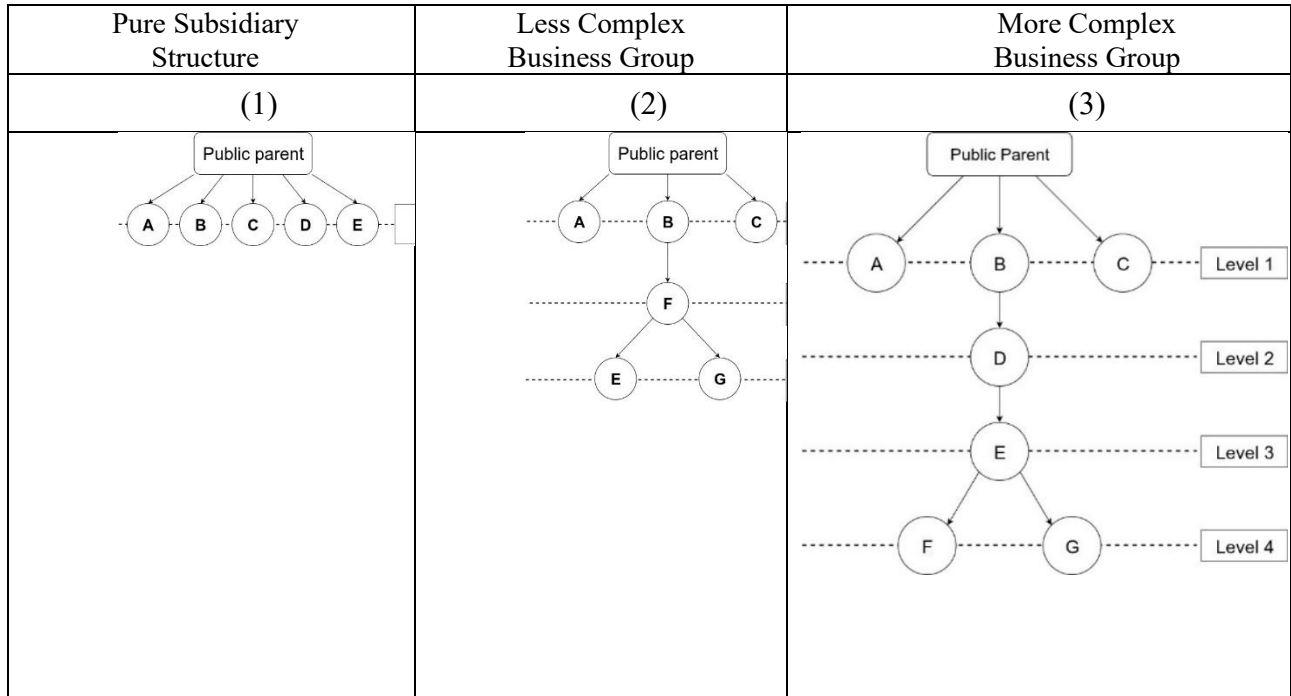


Table 1. Sample descriptive statistics and sample distribution*Panel A. Descriptive statistics*

Panel A provides the descriptive statistics for the dependent and independent variables used in the regression analysis. Used abbreviations for statistics: SD denotes standard deviation, and p25 (p75) stands for the 25th (75th) percentile, etc. The appendix contains detailed definitions of the variables.

Variable	N	Mean	SD	p5	p25	p50	p75	p95
Equity in Net Loss/Earnings, unconsol. subsidiaries	154,516	-0.498	50.08	-1.1	0	0	0	0.614
Abs Accruals/Total assets	157,433	0.079	0.167	0.003	0.018	0.051	0.098	0.239
Abnormal real management	157,437	-0.054	2.298	-0.582	-0.074	-0.01	0.008	0.244
Analyst forecast error	128,842	0.117	5.342	-1.139	0	0.078	0.25	1.333
Analyst dispersion	115,861	0.045	1.586	-0.5	0.012	0.045	0.113	0.524
Implied cost of capital (monthly)	422,614	1.736	3.147	0	0.4	1.6	2.4	4.6
Size (Log of total assets)	157,437	6.875	1.963	3.581	5.594	6.904	8.136	10.132
Book/Market	157,437	0.787	16.689	0.091	0.292	0.542	0.888	1.804
Return on Assets	157,437	0.063	2.837	-0.185	0.021	0.09	0.151	0.27
Total liabilities/Total assets	157,437	0.561	0.274	0.143	0.364	0.557	0.782	0.92
Log the number of analysts covering the stock	157,437	1.632	1.007	0	0.693	1.792	2.398	3.091
Depth of the BG - (50 %+) controlled	157,437	3.158	2.108	1	2	3	4	7
Breadth of the BG - (50 %+) controlled	157,437	0.84	0.261	0	0.75	1	1	1
sN - (N of 50% controlled subsidiaries)	157,437	203.6	520.1	3	11	37	147	1,005
TMH - Tendency to make a hub	157,437	29.225	104.764	1	1.754	3.807	15.794	121.517
BIG 4 (Auditors quality dummy, monthly)	422,614	0.513	0.5	0	0	1	1	1
Lawsuits: incidence within the BG	184,423	0.04	0.195	0	0	0	0	0
Lawsuits: ratio parent/total	8,888	0.762	0.409	0	0.636	1	1	1

Panel B. Sample distribution

1) Fiscal year distribution

year	Frequency	Percent	Cumulative
2007	10,785	6.85	6.85
2008	10,591	6.73	13.58
2009	10,274	6.53	20.1
2010	10,074	6.4	26.5
2011	10,311	6.55	33.05
2012	10,230	6.5	39.55
2013	10,053	6.39	45.93
2014	10,078	6.4	52.34
2015	10,028	6.37	58.71
2016	9,603	6.1	64.8
2017	9,346	5.94	70.74
2018	9,275	5.89	76.63
2019	9,162	5.82	82.45
2020	9,019	5.73	88.18
2021	9,137	5.8	93.98
2022	9,471	6.02	100
Total	157,437	100	

2) Distribution of business group complexity (depth).

In this table, we present the distribution of clustered business group depth, inspired by the concept of a possible invisibility horizon. We cluster the business groups into three categories: those with an easily accessible subsidiary structure ($BG_depth = 1$), those on the horizon of visibility ($BG_depth = 2$), and those with an undetectable structure ($BG_depth \geq 3$). In each distance, direct control should be at a majority level (i.e., 50% control).

	50% control	
$BG_depth=1$	25,730	16.34
$BG_depth=2$	51,818	32.91
$BG_depth \geq 3$	79,889	50.74
Total	157,437	100

Table 2. Correlation matrix of the BG complexity measures

This table presents the correlation matrix ($n = 157,437$) for the measures of BG complexity used in the analysis. *BG_depth* denotes the depth of the BG (the maximum number of organizational levels) based on 50% subsidiary control links. *BG_breadth* refers to the breadth of the BG, defined as the ratio of the number of endpoints to the total number of subsidiaries, based on 50% subsidiary control links. Similarly, *sN* refer to the total number of subsidiaries in majority (50%+) control. Finally, the variable *TMH* corresponds to a complexity measure called Tendency to Make a Hub. A graphical illustration is provided in Figure 1, and the Appendix includes detailed definitions of the variables.

	(1)	(2)	(3)	(4)
(1) <i>BG_depth</i> , maximum level	1			
(2) <i>BG_breadth</i> , #endpoints/ <i>sN</i>	-0.2807	1		
(3) <i>sN</i> , total number of subsidiaries	0.4626	-0.0193	1	
(4) <i>TMH</i> , tendency to make a hub	0.2127	-0.0356	0.5424	1

Table 3. Implied Cost of Capital and the BG complexity

The table presents the results of the impact of the complexity of BG on the Implied Cost of Capital, which we computed using the methodology of Hou et al. (2012). For the full methodological details, see Lee et al. (2021) and Pastor et al. (2022). The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A – All firms, no control for auditors or exogenous shocks

	Implied Cost of Capital					
	(1)	(2)	(3)	(4)	(5)	(6)
Depth of the BG (50 %+) controlled	-0.0291*** (0.0029)	-0.0347*** (0.0028)			-0.0177*** (0.0031)	-0.0249*** (0.0030)
Breadth of the BG (50 %+) controlled			0.2885*** (0.0192)	0.2828*** (0.0192)	0.2545*** (0.0201)	0.2354*** (0.0200)
sN (N of controlled subsidiaries)	-0.0001*** (0.0000)		-0.0001*** (0.0000)		-0.0001*** (0.0000)	
TMH-degree tendency making hub	0.0003*** (0.0001)		0.0004*** (0.0001)		0.0004*** (0.0001)	
Size (Log of total assets)	0.0146 (0.0142)	0.0324** (0.0138)	0.0106 (0.0141)	0.0319** (0.0138)	0.0186 (0.0142)	0.0379*** (0.0138)
Size^2	0.0071*** (0.0009)	0.0055*** (0.0009)	0.0066*** (0.0009)	0.0042*** (0.0009)	0.0067*** (0.0009)	0.0049*** (0.0009)
Book/Market	0.0017*** (0.0003)	0.0017*** (0.0003)	0.0018*** (0.0003)	0.0018*** (0.0003)	0.0017*** (0.0003)	0.0017*** (0.0003)
Return on Assets	-0.3487*** (0.0180)	-0.3496*** (0.0180)	-0.3455*** (0.0180)	-0.3468*** (0.0180)	-0.3458*** (0.0180)	-0.3469*** (0.0180)
Total liabilities/Total assets	-0.0962*** (0.0277)	-0.0940*** (0.0277)	-0.1195*** (0.0276)	-0.1224*** (0.0276)	-0.1065*** (0.0277)	-0.1031*** (0.0277)
Log the number of analysts covering the stock	-0.2724*** (0.0075)	-0.2710*** (0.0075)	-0.2785*** (0.0075)	-0.2749*** (0.0075)	-0.2804*** (0.0075)	-0.2781*** (0.0075)
Constant	1.5664*** (0.0621)	1.5291*** (0.0617)	1.3164*** (0.0646)	1.2719*** (0.0642)	1.3380*** (0.0647)	1.3142*** (0.0644)
Industry (48), year, quarter FE	yes	yes	yes	yes	yes	yes
Adjusted R-square	0.0218	0.0216	0.0221	0.0218	0.0222	0.0220
N (observations)	422,614	422,614	422,614	422,614	422,614	422,614

Table 3. Implied Cost of Capital and the BG complexity (cont.)*Panel B – Big 4 indicator and 2018 shock interacting with BG complexity*

	Implied Cost of Capital			
	(1)	(2)	(3)	(4)
Big 4 dummy	-0.0266 (0.0204)	-0.0226 (0.0203)	-0.0789*** (0.0127)	-0.0780*** (0.0127)
Depth of the BG	0.0191*** (0.0052)	0.0191*** (0.0052)		
Depth of the BG*2018+ dummy	-0.0248*** (0.0050)	-0.0268*** (0.0049)		
Depth of the BG*Big 4 dummy	-0.0349*** (0.0057)	-0.0362*** (0.0057)		
Breadth of the BG			0.2659*** (0.0193)	0.2609*** (0.0193)
Breadth of the BG*2018+ dummy			-0.0145*** (0.0045)	-0.0182*** (0.0044)
Breadth of the BG*Big 4 dummy			-0.2357*** (0.0238)	-0.2386*** (0.0238)
sN (N of controlled subsidiaries)	-0.0000*** (0.0000)		-0.0001*** (0.0000)	
TMH-degree tendency making hub	0.0001*** (0.0001)		0.0002*** (0.0001)	
Size (Log of total assets)	0.0286* (0.0146)	0.0334** (0.0143)	0.0566*** (0.0143)	0.0632*** (0.0139)
Size^2	0.0068*** (0.0009)	0.0063*** (0.0009)	0.0049*** (0.0009)	0.0042*** (0.0009)
Book/Market	0.0016*** (0.0003)	0.0016*** (0.0003)	0.0016*** (0.0003)	0.0016*** (0.0003)
Return on Assets	-0.3760*** (0.0180)	-0.3768*** (0.0180)	-0.3724*** (0.0180)	-0.3734*** (0.0180)
Total liabilities/Total assets	-0.1192*** (0.0276)	-0.1178*** (0.0276)	-0.1262*** (0.0275)	-0.1251*** (0.0275)
Log the number of analysts covering the stock	-0.2693*** (0.0075)	-0.2688*** (0.0075)	-0.2760*** (0.0075)	-0.2750*** (0.0075)
Constant	1.1511*** (0.0646)	1.1412*** (0.0642)	0.8712*** (0.0669)	0.8622*** (0.0665)
Industry, year, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.0283	0.0283	0.0289	0.0288
N (observations)	422,614	422,614	422,614	422,614

Table 4. Implied Cost of Capital, tax jurisdiction effect, and the BG complexity

Panel A – Big 4 indicator and Tax Heaven subsidiary interacting with BG complexity

	Implied Cost of Capital					
	(1)	(2)	(3)	(4)	(5)	(6)
A subsidiary in Tax heavens	-0.0345* (0.0208)	-0.0534** (0.0215)	-0.0651*** (0.0217)	0.0515 (0.0343)	0.0500 (0.0342)	0.0224 (0.0343)
Big 4 dummy		-0.0439** (0.0208)	-0.0846*** (0.0222)		-0.1081*** (0.0122)	-0.0251* (0.0146)
Depth of the BG	-0.0021 (0.0055)	0.0095 (0.0062)	-0.0108 (0.0073)			
Depth of the BG* TaxH dummy	-0.0200*** (0.0060)	-0.0108* (0.0063)	0.0148* (0.0079)			
Depth of the BG*Big 4 dummy		-0.0382*** (0.0059)	-0.0053 (0.0085)			
Depth of the BG* Post2018 dummy	-0.0245*** (0.0027)					
Depth of the BG* TaxH*BIG 4			-0.0364*** (0.0068)			
Breadth of the BG				0.3378*** (0.0257)	0.3512*** (0.0257)	0.3482*** (0.0257)
Breadth of the BG*TaxH dummy				-0.1808*** (0.0383)	-0.1815*** (0.0382)	-0.0121 (0.0416)
Breadth of the BG*Big 4 dummy					-0.1966*** (0.0147)	-0.1938*** (0.0147)
Breath of the BG* 2018 dummy				-0.0288*** (0.0025)		
Breadth of the BG*TaxH*BIG 4						-0.2411*** (0.0233)
Industry, year, quarter FE, Firm controls as in Table 3 ²⁰	yes	yes	yes	yes	yes	yes
Adjusted R-square	0.0220	0.0223	0.0224	0.0223	0.0229	0.0232
N (observations)	422,614	422,614	422,614	422,614	422,614	422,614

²⁰ For brevity, firm-level controls are not presented here; they are available in the Appendix.

Table 4. Implied Cost of Capital, tax jurisdiction effect, and the BG complexity

Panel B – Big 4 indicator and Grey Tax Jurisdiction subsidiary interacting with BG complexity

	Implied Cost of Capital					
	(1)	(2)	(3)	(4)	(5)	(6)
A subsidiary in a grey tax jurisdiction (TaxG)	0.0955*** (0.0349)	0.0851** (0.0353)	0.0897** (0.0363)	0.3258*** (0.0508)	0.2999*** (0.0508)	0.2918*** (0.0508)
Big 4 dummy		-0.0553*** (0.0206)	-0.0529** (0.0211)		-0.1112*** (0.0122)	-0.0984*** (0.0125)
Depth of the BG	-0.0172*** (0.0035)	-0.0012 (0.0051)	-0.0001 (0.0054)			
Depth of the BG*TaxG dummy	-0.0222*** (0.0059)	-0.0182*** (0.0061)	-0.0228** (0.0102)			
Depth of the BG*Big 4 dummy		-0.0353*** (0.0058)	-0.0367*** (0.0063)			
Depth of the BG* Post2018 dummy	-0.0232*** (0.0027)					
Depth of the BG* TaxG*BIG 4			0.0047 (0.0084)			
Breadth of the BG				0.3184*** (0.0205)	0.3297*** (0.0204)	0.3296*** (0.0204)
Breadth of the BG*TaxG dummy				-0.4513*** (0.0584)	-0.4349*** (0.0584)	-0.2517*** (0.0684)
Breadth of the BG*Big 4 dummy					-0.1937*** (0.0147)	-0.1920*** (0.0147)
Breath of the BG* 2018 dummy				-0.0293*** (0.0025)		
Breadth of the BG*TaxG*BIG 4						-0.2283*** (0.0442)
Industry, year, quarter FE, Firm controls as in Panel A(B) ²¹	yes	yes	yes	yes		
Adjusted R-square	0.0220	0.0223	0.0224	0.0223	0.0229	0.0232
N (observations)	422,614	422,614	422,614	422,614	422,614	422,614

²¹ For brevity, firm-level controls are not presented here; they are available in the Appendix.

Table 5. BG Complexity and ratio of lawsuits against the parent company

The table presents the results of the impact of BG complexity on the ratio of lawsuits against the parent company (the head of the BG) to total lawsuits, scaled by the total. The sub-sample used contains data on BG heads who have experienced at least one lawsuit against any part of BG. Base category (omitted dummy) is for level 1 (pure subsidiary structure). The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
BG depth=2	-0.0901*** (0.0090)	-0.0921*** (0.0089)	-0.0920*** (0.0089)	-0.0920*** (0.0089)
BG depth=3	-0.1621*** (0.0120)	-0.1644*** (0.0119)	-0.1640*** (0.0119)	-0.1646*** (0.0119)
BG depth>=4	-0.2765*** (0.0121)	-0.2803*** (0.0117)	-0.2786*** (0.0117)	-0.2837*** (0.0117)
BG breath	0.0344 (0.0298)			
# controlled subsidiaries	0.0112 (0.0119)	0.0058 (0.0111)	-0.0257*** (0.0038)	
# controlled subsidiaries (squared)	-0.0020*** (0.0005)	-0.0019*** (0.0005)		
Log of total assets	0.0006 (0.0035)	0.0007 (0.0035)	0.0008 (0.0035)	-0.0030 (0.0035)
Book/Market	0.0039 (0.0080)	0.0039 (0.0080)	0.0038 (0.0080)	0.0051 (0.0079)
Return on Assets	-0.1276*** (0.0438)	-0.1237*** (0.0436)	-0.1254*** (0.0435)	-0.1131*** (0.0438)
Total liabilities/Total assets	-0.0202 (0.0273)	-0.0183 (0.0272)	-0.0194 (0.0272)	-0.0097 (0.0272)
Log the number of analysts covering the stock	0.0362*** (0.0078)	0.0364*** (0.0078)	0.0371*** (0.0078)	0.0446*** (0.0079)
	1.0326*** (0.0619)	1.0821*** (0.0455)	1.1709*** (0.0343)	1.0652*** (0.0307)
Constant				
Industry (12) FE, year FE, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.1576	0.1576	0.1568	0.1529
N (observations)	8,888	8,888	8,888	8,888

Table 6. BG Complexity and the likelihood of a lawsuit against the parent company

The table presents the results of the impact of the complexity of BG on the probability of lawsuits against the parent company (the head of BG). For simplicity, the model is estimated by a linear probability model. Base category (omitted dummy) is for level 1 (pure subsidiary structure). The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
BG depth=2	-0.0016 (0.0011)	-0.0077*** (0.0010)	-0.0076*** (0.0010)	-0.0077*** (0.0010)
BG depth=3	-0.0120*** (0.0015)	-0.0210*** (0.0014)	-0.0208*** (0.0014)	-0.0211*** (0.0014)
BG depth>=4	-0.0015 (0.0017)	-0.0127*** (0.0015)	-0.0126*** (0.0015)	-0.0135*** (0.0015)
BG breath	0.0344*** (0.0014)			
# controlled subsidiaries	0.0053*** (0.0013)	0.0019 (0.0013)	-0.0024*** (0.0004)	
# controlled subsidiaries (squared)	-0.0003*** (0.0001)	-0.0002*** (0.0001)		
Log of total assets	0.0244*** (0.0005)	0.0253*** (0.0005)	0.0254*** (0.0005)	0.0253*** (0.0005)
Book/Market	-0.0000* (0.0000)	-0.0000** (0.0000)	-0.0000** (0.0000)	-0.0000* (0.0000)
Return on Assets	-0.0000 (0.0001)	-0.0000 (0.0001)	-0.0000 (0.0001)	-0.0000 (0.0001)
Total liabilities/Total assets	-0.0037* (0.0019)	-0.0024 (0.0018)	-0.0025 (0.0018)	-0.0020 (0.0017)
Log the number of analysts covering the stock	0.0028*** (0.0006)	0.0034*** (0.0006)	0.0034*** (0.0006)	0.0036*** (0.0006)
Constant	-0.1600*** (0.0057)	-0.1213*** (0.0057)	-0.1083*** (0.0038)	-0.1176*** (0.0035)
Industry (12) FE, year FE, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.0698	0.0682	0.0682	0.0680
N (observations)	175,444	175,444	175,444	175,444

Table 7. Lawsuits at a different level of the BG and the company CAR

The table presents the results of an event study measuring the impact of a lawsuit started within BG. For each lawsuit, we know the exact time of filing the case; we compute CAR over symmetric intervals (-14,14), (-7,7), (-5,5), and (-3,3) days. We also identify the level, i.e., the distance from the top (parent company), and cluster them into simple categories: distance=1, 2, and more than 3, while distance=0 represents the lawsuit against the mother company (which forms the base/omitted category). We also control whether the analyzed period does not contain QE announcements, and for a battery of last returns. The appendix contains detailed definitions of the control variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) CAR(-14, 14)	(2) CAR(-7, 7)	(3) CAR(-5, 5)	(4) CAR(-3, 3)
Distance=1 (level 1)	0.2124*** (0.0260)	0.0376 (0.0272)	0.0628** (0.0273)	0.0522* (0.0278)
Distance=2 (level 2)	0.1732*** (0.0533)	0.0511 (0.0570)	0.0357 (0.0561)	0.0449 (0.0548)
Distance=3 (level 3)	0.2565*** (0.0491)	0.4456*** (0.0484)	0.4340*** (0.0508)	0.1833*** (0.0523)
QE dummy	1.1721*** (0.0150)	0.5022*** (0.0227)	0.2438*** (0.0285)	0.3313*** (0.0363)
# controlled subsidiaries	-0.0001*** (0.0000)	-0.0000*** (0.0000)	0.0000* (0.0000)	0.0000** (0.0000)
Log of total assets	0.0907*** (0.0085)	0.0630*** (0.0084)	0.0179** (0.0086)	0.0257*** (0.0089)
Book/Market	0.9352*** (0.0751)	0.3627*** (0.0508)	0.1745*** (0.0466)	0.2318*** (0.0460)
Return on Assets	-0.8377*** (0.2084)	-0.7041*** (0.1763)	-0.6113*** (0.1825)	-0.3187* (0.1802)
Total liabilities/Total assets	0.0813 (0.0764)	-0.1803** (0.0836)	-0.1588* (0.0813)	-0.0291 (0.0798)
Log the number of analysts covering the stock	0.0255 (0.0224)	-0.0739*** (0.0255)	-0.0489** (0.0248)	-0.1006*** (0.0247)
fiscal_4th_qtr	-0.0129 (0.0143)	0.1692*** (0.0182)	0.1540*** (0.0169)	0.2023*** (0.0161)
Constant	-14.9644*** (0.7384)	0.7356 (0.7243)	0.6499 (0.6891)	1.6014** (0.7525)
Industry (48) FE, year FE	Yes	Yes	Yes	Yes
Returns M(-1), M(-2-3), M(-4-6), M(-7,-12)	Yes	Yes	Yes	Yes
Adjusted R-square	0.0777	0.0428	0.0574	0.0672
N (observations)	1,417,048	743,293	523,575	344,902

Table 8. Abs Accruals/Average Assets and the BG complexity

The table presents the results of the impact of BG complexity on Abs Accruals/Average Assets, sourced from Compustat. The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A – All firms, no control for auditors or exogenous shocks

	Abs Accruals/Average Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Depth of the BG (50 %+) controlled	0.0079*** (0.0011)	0.0070*** (0.0011)			0.0070*** (0.0012)	0.0061*** (0.0011)
Breadth of the BG (50 %+) controlled			-0.0328*** (0.0071)	-0.0321*** (0.0071)	-0.0189** (0.0075)	-0.0199*** (0.0075)
sN (N of controlled subsidiaries)	-0.0000*** (0.0000)		-0.0000 (0.0000)		-0.0000*** (0.0000)	
TMH-degree tendency making hub	-0.0000 (0.0000)		-0.0000 (0.0000)		-0.0000 (0.0000)	
Size (Log of total assets)	-0.1715*** (0.0050)	-0.1678*** (0.0049)	-0.1691*** (0.0050)	-0.1672*** (0.0049)	-0.1719*** (0.0050)	-0.1683*** (0.0049)
Size^2	0.0086*** (0.0003)	0.0082*** (0.0003)	0.0087*** (0.0003)	0.0085*** (0.0003)	0.0086*** (0.0003)	0.0083*** (0.0003)
Book/Market	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
Return on Assets	-0.0049*** (0.0007)	-0.0049*** (0.0007)	-0.0049*** (0.0007)	-0.0049*** (0.0007)	-0.0049*** (0.0007)	-0.0049*** (0.0007)
Total liabilities/Total assets	0.0729*** (0.0086)	0.0730*** (0.0086)	0.0770*** (0.0086)	0.0767*** (0.0086)	0.0734*** (0.0086)	0.0735*** (0.0086)
Log the number of analysts covering the stock	0.0542*** (0.0029)	0.0541*** (0.0029)	0.0538*** (0.0029)	0.0538*** (0.0029)	0.0547*** (0.0029)	0.0547*** (0.0029)
Constant	0.6605*** 0.0079***	0.6523*** 0.0070***	0.6884***	0.6832***	0.6777*** 0.0070***	0.6707*** 0.0061***
Industry (48), year, quarter FE	yes	yes	yes	yes	yes	yes
Adjusted R-square	0.0113	0.0113	0.0112	0.0112	0.0114	0.0113
N (observations)	184,285	184,285	184,285	184,285	184,285	184,285

Table 8. Abs Accruals/Average Assets and the BG complexity (cont.)*Panel B – Big 4 indicator and 2018 shock interacting with BG complexity*

	Abs Accruals/Average Assets			
	(1)	(2)	(3)	(4)
Big 4 dummy	0.0442*** (0.0077)	0.0447*** (0.0077)	0.0136*** (0.0051)	0.0134*** (0.0051)
Depth of the BG	0.0149*** (0.0018)	0.0144*** (0.0018)		
Depth of the BG*2018+ dummy	-0.0010 (0.0019)	-0.0017 (0.0019)		
Depth of the BG*Big 4 dummy	-0.0115*** (0.0020)	-0.0117*** (0.0020)		
Breadth of the BG			-0.0310*** (0.0072)	-0.0310*** (0.0072)
Breadth of the BG*2018+ dummy			0.0029* (0.0016)	0.0019 (0.0016)
Breadth of the BG*Big 4 dummy			-0.0140 (0.0086)	-0.0139 (0.0086)
sN (N of controlled subsidiaries)	-0.0000*** (0.0000)		-0.0000** (0.0000)	
TMH-degree tendency making hub	-0.0000 (0.0000)		-0.0000 (0.0000)	
Size (Log of total assets)	-0.1795*** (0.0051)	-0.1756*** (0.0050)	-0.1720*** (0.0050)	-0.1688*** (0.0049)
Size^2	0.0090*** (0.0003)	0.0087*** (0.0003)	0.0087*** (0.0003)	0.0084*** (0.0003)
Book/Market	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
Return on Assets	-0.0049*** (0.0007)	-0.0049*** (0.0007)	-0.0048*** (0.0007)	-0.0049*** (0.0007)
Total liabilities/Total assets	0.0729*** (0.0087)	0.0731*** (0.0087)	0.0754*** (0.0086)	0.0753*** (0.0086)
Log the number of analysts covering the stock	0.0544*** (0.0029)	0.0544*** (0.0029)	0.0550*** (0.0029)	0.0549*** (0.0029)
Constant	0.6618*** (0.0241)	0.6533*** (0.0239)	0.6846*** (0.0249)	0.6772*** (0.0248)
Industry, year, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.0118	0.0118	0.0116	0.0115
N (observations)	184,285	184,285	184,285	184,285

Table 9. Real Earnings Management and the BG complexity

The table presents the results of the impact of BG complexity on Real Earnings Management, using a regression approach following Roychowdhury (2006). The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A – All firms, no control for auditors or exogenous shocks

	Real Earnings Management					
	(1)	(2)	(3)	(4)	(5)	(6)
Depth of the BG (50 %+) controlled	-0.0037** (0.0018)	-0.0032* (0.0017)			-0.0038** (0.0019)	-0.0033* (0.0018)
Breadth of the BG (50 %+) controlled			0.0051 (0.0113)	0.0038 (0.0113)	-0.0022 (0.0119)	-0.0026 (0.0118)
sN (N of controlled subsidiaries)	0.0000 (0.0000)		0.0000 (0.0000)		0.0000 (0.0000)	
TMH-degree tendency making hub	0.0000 (0.0000)		0.0001 (0.0000)		0.0000 (0.0000)	
Size (Log of total assets)	0.0513*** (0.0082)	0.0477*** (0.0080)	0.0496*** (0.0082)	0.0468*** (0.0080)	0.0513*** (0.0082)	0.0476*** (0.0080)
Size^2	-0.0033*** (0.0006)	-0.0030*** (0.0005)	-0.0033*** (0.0006)	-0.0030*** (0.0005)	-0.0033*** (0.0006)	-0.0029*** (0.0005)
Book/Market	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)
Return on Assets	-0.7004*** (0.0010)	-0.7004*** (0.0010)	-0.7004*** (0.0010)	-0.7004*** (0.0010)	-0.7004*** (0.0010)	-0.7004*** (0.0010)
Total liabilities/Total assets	-0.0741*** (0.0135)	-0.0739*** (0.0135)	-0.0763*** (0.0134)	-0.0759*** (0.0134)	-0.0741*** (0.0135)	-0.0738*** (0.0135)
Log the number of analysts covering the stock	-0.0033 (0.0045)	-0.0032 (0.0045)	-0.0026 (0.0045)	-0.0025 (0.0045)	-0.0033 (0.0045)	-0.0031 (0.0045)
Constant	-0.2749*** (0.0356)	-0.2666*** (0.0354)	-0.2778*** (0.0371)	-0.2700*** (0.0369)	-0.2729*** (0.0372)	-0.2642*** (0.0370)
Industry (48), year, quarter FE	yes	yes	yes	yes	yes	yes
Adjusted R-square	0.7497	0.7497	0.7497	0.7497	0.7497	0.7497
N (observations)	157,437	157,437	157,437	157,437	157,437	157,437

Table 9. Real Earnings Management and the BG complexity (cont.)*Panel B – Big 4 indicator and 2018 shock interacting with BG complexity*

	Real Earnings Management			
	(1)	(2)	(3)	(4)
Big 4 dummy	-0.0078 (0.0122)	-0.0077 (0.0122)	0.0075 (0.0080)	0.0078 (0.0080)
Depth of the BG	-0.0058** (0.0028)	-0.0053* (0.0028)		
Depth of the BG*2018+ dummy	0.0055* (0.0030)	0.0059** (0.0029)		
Depth of the BG*Big 4 dummy	0.0045 (0.0032)	0.0045 (0.0032)		
Breadth of the BG			0.0067 (0.0114)	0.0062 (0.0113)
Breadth of the BG*2018+ dummy			0.0043* (0.0026)	0.0051** (0.0025)
Breadth of the BG*Big 4 dummy			-0.0048 (0.0135)	-0.0052 (0.0135)
sN (N of controlled subsidiaries)	0.0000 (0.0000)		0.0000 (0.0000)	
TMH-degree tendency making hub	0.0000 (0.0000)		0.0000 (0.0000)	
Size (Log of total assets)	0.0523*** (0.0084)	0.0480*** (0.0082)	0.0490*** (0.0082)	0.0450*** (0.0080)
Size^2	-0.0035*** (0.0006)	-0.0031*** (0.0005)	-0.0034*** (0.0006)	-0.0030*** (0.0005)
Book/Market	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)
Return on Assets	-0.7004*** (0.0010)	-0.7004*** (0.0010)	-0.7005*** (0.0010)	-0.7005*** (0.0010)
Total liabilities/Total assets	-0.0687*** (0.0135)	-0.0685*** (0.0135)	-0.0697*** (0.0134)	-0.0693*** (0.0134)
Log the number of analysts covering the stock	-0.0015 (0.0045)	-0.0015 (0.0045)	-0.0014 (0.0045)	-0.0014 (0.0045)
Constant	-0.1972*** (0.0372)	-0.1876*** (0.0370)	-0.2012*** (0.0386)	-0.1917*** (0.0384)
Industry, year, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.7507	0.7507	0.7507	0.7507
N (observations)	157,437	157,437	157,437	157,437

Table 10. Unconsolidated subsidiary Net Loss/Earnings and the BG complexity

The table presents the results of the impact of BG complexity on Equity in Net Loss/Earnings (C/F), which refers to the earnings generated by unconsolidated subsidiaries that are subject to the “significant influence” of the parent, under the Cash Flow (CF) approach. The appendix contains detailed definitions of the variables. Robust standard errors are in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A – All firms, no control for auditors or exogenous shocks

	Equity in Net Loss/Earnings (C/F)					
	(1)	(2)	(3)	(4)	(5)	(6)
Depth of the BG (50 %+) controlled	-0.1111 (0.0958)	-0.0881 (0.0930)			-0.1849* (0.1017)	-0.1602 (0.0986)
Breadth of the BG (50 %+) controlled			-0.9405* (0.5687)	-1.0015* (0.5677)	-1.3083** (0.6036)	-1.3264** (0.6019)
sN (N of controlled subsidiaries)	0.0002 (0.0004)		0.0001 (0.0004)		0.0003 (0.0004)	
TMH-degree tendency making hub	0.0033 (0.0021)		0.0033 (0.0021)		0.0030 (0.0021)	
Size (Log of total assets)	3.2546*** (0.4072)	3.1018*** (0.3952)	3.1542*** (0.4055)	3.0361*** (0.3951)	3.2255*** (0.4074)	3.0653*** (0.3955)
Size^2	-0.2942*** (0.0288)	-0.2793*** (0.0272)	-0.2920*** (0.0289)	-0.2797*** (0.0271)	-0.2904*** (0.0289)	-0.2748*** (0.0273)
Book/Market	0.0028 (0.0088)	0.0028 (0.0088)	0.0028 (0.0088)	0.0028 (0.0088)	0.0028 (0.0088)	0.0028 (0.0088)
Return on Assets	-0.0092 (0.0514)	-0.0091 (0.0514)	-0.0095 (0.0514)	-0.0094 (0.0514)	-0.0094 (0.0514)	-0.0094 (0.0514)
Total liabilities/Total assets	2.4563*** (0.6624)	2.4578*** (0.6623)	2.4020*** (0.6609)	2.4133*** (0.6609)	2.4879*** (0.6626)	2.4879*** (0.6625)
Log the number of analysts covering the stock	0.1755 (0.2257)	0.1880 (0.2255)	0.2385 (0.2259)	0.2502 (0.2255)	0.2125 (0.2263)	0.2240 (0.2260)
Constant	-14.8794*** (1.8247)	-14.5451*** (1.8119)	-13.9351*** (1.9064)	-13.6118*** (1.8910)	-13.6278*** (1.9139)	-13.2607*** (1.9033)
Industry (48), year, quarter FE	yes	yes	yes	yes	yes	yes
Adjusted R-square	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
N (observations)	154,516	154,516	154,516	154,516	154,516	154,516

Table 10. Unconsolidated subsidiary Net Loss/Earnings and the BG complexity (cont.)*Panel B – Big 4 indicator and 2018 shock interacting with BG complexity*

	Equity in Net Loss/Earnings (C/F)			
	(1)	(2)	(3)	(4)
Big 4 dummy	0.4595 (0.6144)	0.5622 (0.6132)	-1.6496*** (0.4079)	-1.6204*** (0.4078)
Depth of the BG	-0.6134*** (0.1425)	-0.6010*** (0.1419)		
Depth of the BG*2018+ dummy	1.4786*** (0.1634)	1.4542*** (0.1623)		
Depth of the BG*Big 4 dummy	-0.2437 (0.1685)	-0.2760 (0.1680)		
Breadth of the BG			-0.5741 (0.5739)	-0.6543 (0.5731)
Breadth of the BG*2018+ dummy			0.6499*** (0.1405)	0.5892*** (0.1374)
Breadth of the BG*Big 4 dummy			4.5835*** (0.6781)	4.5032*** (0.6776)
sN (N of controlled subsidiaries)	-0.0006 (0.0004)		-0.0011** (0.0004)	
TMH-degree tendency making hub	0.0056*** (0.0021)		0.0062*** (0.0021)	
Size (Log of total assets)	3.0491*** (0.4160)	3.0286*** (0.4044)	2.8584*** (0.4078)	2.9307*** (0.3965)
Size^2	-0.2783*** (0.0294)	-0.2766*** (0.0278)	-0.2833*** (0.0289)	-0.2910*** (0.0272)
Book/Market	0.0022 (0.0088)	0.0023 (0.0088)	0.0026 (0.0088)	0.0026 (0.0088)
Return on Assets	-0.0059 (0.0514)	-0.0061 (0.0514)	-0.0064 (0.0514)	-0.0067 (0.0514)
Total liabilities/Total assets	2.1384*** (0.6631)	2.1691*** (0.6630)	1.8677*** (0.6623)	1.9060*** (0.6622)
Log the number of analysts covering the stock	0.3500 (0.2271)	0.3704 (0.2270)	0.4487** (0.2275)	0.4785** (0.2273)
Constant	-14.7736*** (1.9087)	-14.7316*** (1.8963)	-13.9569*** (1.9855)	-14.0526*** (1.9716)
Industry, year, quarter FE	yes	yes	yes	yes
Adjusted R-square	0.0048	0.0047	0.0048	0.0047
N (observations)	154,516	154,516	154,516	154,516

Appendix: Variable Definitions

Variable	Definition
Dependent variables	
Esubsy	Equity in Net Loss/Earnings (C/F) refers to the earnings generated by unconsolidated subsidiaries that are subject to the “significant influence” of the parent, as per the Cash Flow (CF) approach, in millions USD. Data sources: Compustat.
Abs accruals	Abs Accruals/Average Assets. Data sources: Compustat.
Abnormal discretionary expenses	The abnormal discretionary expenses (XSGA), we follow the Roychowdhury (2006) and run the following cross-sectional model for each industry and quarter: $\frac{XSGA_{it}}{Assets_{i,t-4}} = \beta_1 * \frac{1}{Assets_{i,t-4}} + \beta_2 * \frac{Sales_{i,t-4}}{Assets_{i,t-4}} + \epsilon_{it}$ where $XSGA_{it}$ denotes SG&A costs, including marketing and R&D for firm i in quarter t. The model is estimated for every quarter and the Fama-French 48 industries separately. We follow Hou et al. (2012) methodology, using ten years of industry data to project each firm’s earnings for three years, then assume the firm’s return on equity converges to the industry average from years four through twelve, culminating in a perpetual horizon beyond year twelve. They also maintain a constant dividend payout ratio throughout the entire period. The discount rate required to equate these projected cash flows with the current stock price is determined by iterating through a combination of bisection and Newton-Raphson algorithms. If those two methods yield conflicting discount rates, the authors discard the observation. For full methodological details, see Lee et al. (2021) and Pastor et al. (2022)
Implied cost of capital	
Analyst forecast error	Earnings forecast error in percent. Data source: I/B/E/S.
Analyst dispersion	The standard deviation of analysts’ forecasts was scaled by the consensus for quarterly earnings per share as of the quarter-end date. Data source: I/B/E/S.
Explanatory variables: Business-group characteristics	
BG depth	Business group depth – The maximum number of levels (ownership layers) in the business group.
Complex	Qualitative variable on complexity (number of levels within the business group). =1 for the business group with just one level =2 if $1 < \text{business group depth} \leq 3$ =3 if business group depth > 4
sN	The number of subsidiaries with 50% control.

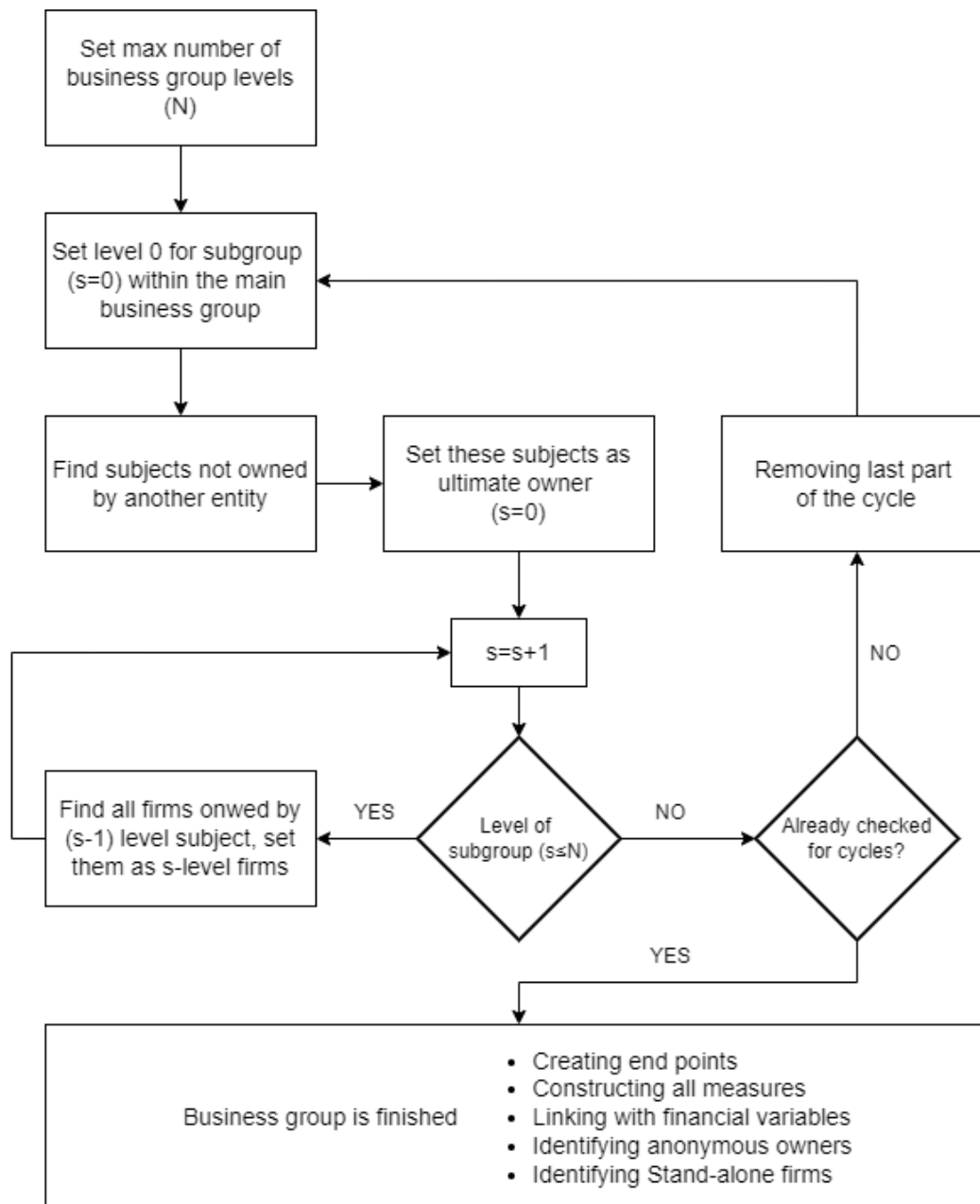
TMH	Tendency to Make a Hub: $TMH = \frac{\sum_{i=1}^{ V } deg(v)^2}{\sum_{i=1}^{ V } deg(v)}$ Where $deg(v)$ denotes the centrality degree of a particular subsidiary, i.e., the sum of in-degree and out-degree, the sum of ownership connections of node v (subsidiary) within the BG.
BG Breadth	Business-group breadth is the ratio of the number of endpoints (firms that do not own any other firms) divided by the total number of subsidiaries within the business group. $BGC_idx = \frac{Number\ of\ endpoints}{Number\ of\ firms}$

Control variables: Firm-level variables

Firm size, firm size ²	Firm size is the natural logarithm of the market value of equity. Data sources: CRSP and Compustat.
Book-to-market ratio	The book-to-market ratio is defined as book equity divided by market equity. Data sources: CRSP and Compustat.
ROA	Return on assets. Data sources: Compustat.
leverage	Total liabilities/Total assets
Number of analysts covering a stock	The natural logarithm of one plus the number of analysts forecasting the quarterly earnings per share in the latest I/B/E/S consensus, as of the quarter-end date. Data source: I/B/E/S.
Industry, year, and quarter FE	We use FF 48 industries, annual coverage 2007-2022, and indicators for each quarter, 1 st is the base.

Technical Appendix: Algorithm for Business Group Creation, Top-down Approach

Figure A.1: Algorithm describing the annual construction of business group membership



Notes: The figure illustrates the primary steps in the pyramidal construction algorithm after filtering out anonymous owners or owners with a unique ID but a generic name. Since we consider the direct control of 10% (i.e., less than 50 percent), we must include control for inner cycles (A → B, B → C, C → D, D → A, etc.) to prevent infinite loops in the algorithm.