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Internal control and internal capital allocation: evidence from internal capital markets of multi-segment firms

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Abstract We investigate the impact of internal control over financial reporting on management decisions in directing corporate resources to alternative investment projects in multi-segment firms. Results from cross-sectional and inter-temporal analyses indicate that internal control weaknesses (ICWs) are associated with distortionary internal capital allocations. The adverse impact on internal capital markets is more pronounced for firms with company-level ICWs. Our analyses also show that firms with weak existing governance mechanisms benefit more from maintaining effective internal control. We further document that the negative impact of ICWs on firms' internal capital transfers manifests in a lower excess value of diversification.

Keywords Internal control over financial reporting · Internal capital allocation · Internal capital market · Diversification

JEL Classifications M41 · M48 · G32

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1 Introduction

As an important aspect of corporate governance reforms, the Sarbanes-Oxley Act of 2002 (SOX) requires that U.S. public corporations develop and disclose their internal controls. Former SEC Chairman William H. Donaldson, in addressing the impact of SOX, stressed that the internal control requirements should improve the quality of information to shareholders, along with the quality of information on which management relies to make decisions, and help to protect against misdirection of corporate resources.[1] In this study, we explore the role of internal control over financial reporting (ICFR) in firms' internal capital allocations—an important investment decision concerning how to direct corporate resources to various projects in a multi-segment firm. We also investigate how internal control interacts with existing governance mechanisms to affect firms' resource distributions. For completeness, we further examine whether the impact of ICFR on internal capital market efficiency manifests in firm value.

Operating internal capital markets is one of the fundamental attributes of the conglomerate form of enterprise. Diversified firms are documented to actively reallocate capital across business segments via internal capital markets (Lamont 1997). Unfortunately, the reallocations are found to be inefficient, as conglomerates seem to divert funds from segments with valuable investment opportunities to less productive ones. The inefficiencies in internal capital markets are attributed to the intensified agency problem and information asymmetry associated with complex organizational structures. Multi-segment firms face rent-seeking activities not only from top management, but also on the part of divisional managers (Scharfstein and Stein 2000). The agency problems are further exacerbated by information aggregation issues in conglomerates, which cause substantial information asymmetries between top management and divisional managers (Habib et al. 1997) and between firm insiders and outside investors (Gilson et al. 2001). These distortionary reallocations lead to significant value losses, typically referred to as diversification discount in the finance literature (Rajan et al. 2000; Billett and Mauer 2003).

Despite well-documented evidence on the dark side of internal capital markets and diversification discount, little is known about what can mitigate the inefficiency and value loss from diversification. Prior studies find that existing governance effects, which are mostly exerted top-down or from outside, can partially explain the extent of diversification and value differentials between single- and multi-segment firms; however, they fail to establish a reliable relation between governance controls and internal capital market efficiency once firms choose to diversify (Denis et al. 1997). Acharya et al. (2011) argue that external governance is "crude and uninformed," and that while it can provide some discipline, it is relatively ineffective in firms with complex organizational structures, such as conglomerates where monitoring and control of management performance is difficult. They conjecture that complex firms that score more strongly on internal governance factors should do relatively better.

We posit that ICFR, with its emphasis on process, policies, procedures, and checks and balances coupled with the production of timely and accurate information, can help ease the

[1] See "Testimony: Concerning the Impact of the Sarbanes-Oxley Act. House Committee on Financial Services." *Washington, D.C.: Goverment Printing Office.*

agency problem and information asymmetry associated with multi-segment firms. At the division level, precise and timely internal information helps top management pick value-enhancing projects and better monitor the performance of divisional investments. Formal policies and procedures improve communication within the organization, which can reduce coordination costs and divisional managers' propensity to lobby. At the headquarters level, high-quality accounting information allows boards and outside shareholders to better track and monitor top management's investment decisions. The prevention and detection mechanisms can constrain top management's ability to expropriate corporate resources via investing in pet projects. Thus, multi-segment firms with effective ICFR are expected to have more efficient internal capital markets and higher excess value of diversification than firms that are deficient in internal control.

Using a sample of diversified U.S. public companies filing SOX Section 404 or Section 302 reports over the period 2004–2009, we find that firms with internal control weaknesses (ICWs)—that is, ineffective ICFR—display lower efficiency in internal capital transfers relative to firms without ICWs. The negative association between ICWs and internal capital market efficiency is primarily driven by multi-segment firms with internal control problems related to the control environment and overall financial reporting process, consistent with the notion that company-level ICWs, as opposed to account-level ICWs, matter more for management decisions. The inter-temporal tests further show that firms remediating their ICWs exhibit an improvement in internal capital allocations, while those experiencing ICFR deterioration demonstrate decreased internal capital transfer efficiency. The overall evidence indicates that weak internal controls lead managers to make distortionary internal capital reallocations.

The provisions of SOX deal directly and indirectly with some of the deficiencies of U.S. corporate governance (Holmstrom and Kaplan 2003). To assess whether the new internal control requirements mitigate unresolved agency problems and serve a unique governance role in disciplining management to direct corporate resources to value-enhancing projects, we control for the effect of existing governance mechanisms. The documented negative relation continues to hold, suggesting an incremental effect of ICFR on corporate capital allocations. We further show that the perverse impact of ICWs on internal capital transfers is only significant for firms with weak governance controls, suggesting that these firms benefit more from maintaining effective ICFR than well-governed conglomerates do.

Since prior studies document that inefficient internal capital markets are a major source of the value loss from diversification, we proceed to explore whether ICWs have implications for conglomerates' relative firm valuation. Our cross-sectional analysis shows a negative association between ICWs and the excess value of diversification. Further, an inter-temporal change analysis indicates that ICW remediation reduces value loss from diversification, while ICFR deterioration exacerbates diversification discount. The overall evidence suggests that the negative impact of ICWs on firms' internal capital transfers manifests in a lower excess value of diversification.

Our study makes three contributions to the accounting and finance literature. First, we extend the line of research on the economic consequences of maintaining effective ICFR. While prior studies primarily focus on the impact of ICFR on accounting quality and information risk, two recent studies examine its impact on firms' real decisions such as inventory management (Feng et al. 2015) and investment levels (Cheng et al. 2013). Our study

differs from these studies, especially Cheng et al. (2013), in several important ways. We emphasize the role of ICFR in internal capital reallocation decisions given the overall investment level. As argued by Rajan et al. (2000), firm-level investment efficiency is not reflective of internal reallocation efficiency. For example, it is possible that the overall firm-level investment is appropriate but the reallocation decisions among segments are not optimal; that is firms subsidize poorly performing divisions using resources from those with valuable investment opportunities (Lamont 1997; Shin and Stulz 1998). Alternatively, even though a firm exhibits over- or under-investment at the firm level, this does not necessarily indicate that the firm overinvests in poorly performing segments or underinvests in segments with profitable projects; that is the firm may properly pool resources to invest in strong divisions. In addition to documenting a role of ICFR in disciplining management to deploy corporate resources to the best use *within* a firm, we are the first to provide evidence that the effects of internal control depend on firms' existing governance mechanisms. We further document a valuation benefit of maintaining effective ICFR, and this market-based benefit is largely underperceived by regulators and the business community (Alexander et al. 2013) and not adequately researched in academic studies.

Second, this study contributes to the finance literature on internal capital markets and diversification discount by examining which governance control is effective in diversified firms. While Hoechle et al. (2012) find that various governance controls partially explain the value differences between single- and multi-segment firms, there is limited evidence that governance controls mitigate internal capital market inefficiency that is unique to multi-segment firms, possibly because those controls are mostly exercised top-down or imposed externally, which confines their beneficial effects in settings with greater information asymmetry and more severe agency conflicts. We document a significant and unique governance role of ICFR in the functioning of internal capital markets in conglomerates, supporting the conjecture of Acharya et al. (2011) that internal governance mechanisms benefit complex, multi-segment firms more than external governance factors do.

Finally, our study adds to the research on SOX-initiated governance reforms. SOX is intended to remedy the inefficiencies in U.S. corporate governance, but how the governance reforms interact with existing governance mechanisms remains largely unanswered. While Holmstrom and Kaplan (2003) expect that firms with strong governance instruments benefit less, empirical research provides conflicting evidence. Hochberg et al. (2009) document that firms characterized by severe agency problems experience greater abnormal returns (benefit more) around the events leading to the passage of SOX, but Jain and Rezaee (2006) find that SOX is more beneficial to companies with stronger governance. The conflicting results may be attributable to empirical difficulties inherent in event studies. We focus on a narrower and more powerful setting by examining how internal control provisions in SOX interact with existing governance mechanisms to influence firms' capital reallocations, and document that poorly governed firms benefit more from maintaining effective internal control.

The remainder of the paper is organized in the following manner. In the next section, we discuss related literature and develop hypotheses. In Section 3, we present our data and sample selection. The empirical analyses and results are reported in Section 4, and Section 5 concludes.

2 Literature background and hypotheses

2.1 Literature on internal capital market and diversification discount

One of the fundamental characteristics of the conglomerate form of enterprise is the operation of internal capital markets, which channel limited resources to different uses inside a company (Williamson 1975). Although some researchers argue that internal capital markets are value-enhancing because they afford headquarters valuable flexibility to shift funds from less desirable projects to more promising ones and can relax credit constraints during periods of economic shocks (Stein 1997; Khanna and Tice 2001), the prevailing evidence indicates that the reallocations of resources are generally not efficient (Rajan et al. 2000). The inefficiencies of internal capital markets are manifested through a form of socialism in internal capital reallocations in which weaker divisions are subsidized by stronger ones. Shin and Stulz (1998) and Billett and Mauer (2003) find that the sensitivity of a segment's investment to cash flows of the other divisions does not depend on the quality of the segment's growth options, and that the average value of internal transfers in conglomerates is negative. Analyzing the change in investment policies in the case of breakups of conglomerates confirms the inefficient transfers conclusion (Gertner et al. 2002; Dittmar and Shivdasani 2003), indicating that biases arising from unobserved differences between segments of diversified firms and single-segment firms are not the explanation (Whited 2001).

Financial economists have put forth various explanations for the pervasive inefficiencies in internal capital markets. Most are based on agency problems ascribed to firms operating in diverse lines of business. While some studies suggest that divisional managers cause disruption in the capital reallocation process (Meyer et al. 1992; Rajan et al. 2000; Duchin and Sosyura 2013), others argue that agency conflicts at the firm level also contribute to distortionary capital budget decisions (Scharfstein 1998; Shin and Stulz 1998). Scharfstein and Stein (2000) develop a two-tiered agency model which captures rent-seeking behavior of divisional managers and the agency role of top management. The agency problems in conglomerates are further exacerbated by greater information asymmetry (Bushman et al. 2004). Firms competing in multiple industries may suppress activities of financial analysts, thus intensifying information asymmetry between firm insiders and outsiders (Gilson et al. 2001). Combining diverse operations also creates information aggregation problems that can give rise to substantial information asymmetry within the firm (Habib et al. 1997).

Another related line of literature examines the effect of diversification strategies on firm value and finds that diversified firms are valued significantly lower than matching portfolios of comparable single-segment firms (Berger and Ofek 1995; Hoechle et al. 2012). The primary explanation for diversification discount is capital misallocations among segments (e.g., Rajan et al. 2000; Billett and Mauer 2003). Other explanations include management incompetency in managing large organizations (Lamont and Polk 2002) and high administrative costs (Baker 1992). Still, several studies challenge the notion that the diversifying strategy per se causes diversification discount (Campa and Kedia 2002; Graham et al. 2002; Lamont and Polk 2001).

2.2 In relation to existing internal control literature

The primary purposes of SOX are to enhance U.S. corporate governance and increase financial reporting quality. The SEC (2003) defines ICFR as a process including policies and procedures to provide reasonable assurance regarding the reliability of financial reporting and the safeguarding of assets. Although internal controls are historically associated with accounting function, the SEC (2003) stresses that the scope of ICFR extends to policies, plans, procedures, processes, systems, activities, functions, projects, initiatives, and endeavors of all types at all levels of a company. The SEC position indicates that while the primary purpose of ICFR is for financial reporting quality, effective ICFR should improve firms' overall internal governance structures and thus has significant implications for firms' real decisions.

In support of the SEC's position on the financial reporting consequence of maintaining effective ICFR, Doyle et al. (2007b) and Ashbaugh-Skaife et al. (2008) find that effective ICFR reduces unintentional errors and intentional manipulations, leading to higher external reporting quality; Feng et al. (2009) document that ICWs affect the accuracy and timeliness of internal management reports. Building on the argument that ICWs reduce accounting quality and increase information risk, several studies find that ineffective internal controls result in higher cost of capital (e.g., Kim et al. 2011; Ashbaugh-Skaife et al. 2009).

Three recent studies investigate the impact of ICFR on firms' real decisions. Gao and Jia (2016) study how internal control safeguards corporate cash resources. Feng et al. (2015) examine how ICWs affect firms' operation by focusing on inventory-related material weaknesses, and find that firms with this type of ICWs have lower inventory turnover ratios and are more likely to report inventory impairments. Cheng et al. (2013) investigate how ineffective ICFR affects firms' investment efficiency, and report that ICW firms underinvest when facing financial constraints and overinvest when rich resources are available. They further find that this investment inefficiency is mitigated after the disclosure of ICWs.

While Cheng et al. (2013) examine the impact of ICFR on amounts of investment at the firm level, we focus on management's decisions in directing corporate resources to alternative investment projects in multi-segment firms. Although both the choice of projects and the level of investment are critical for economic productivity and the wellbeing of shareholders (Harris and Raviv 1996), internal capital misallocations are more of a concern than overall investment levels in multi-segment firms (Lamont 1997). In particular, the total amount of investment in multi-segment firms is less likely to be affected by capital rationing, as these firms can rely on internal capital markets for funding instead of on external capital markets exclusively. More importantly, the findings on investment levels offer little insight into the choice of projects. For example, when firms overinvest (underinvest), it is unclear whether they overinvest (underinvest) in all projects, or only in certain projects by reallocating funds among projects.

Prior studies find that firms operating in multiple lines of business are more likely to suffer from internal control deficiencies (Doyle et al. 2007a),[2] suggesting that conglomerates should benefit more from maintaining effective

[2] Using a larger sample spanning from 2004 to 2009, we also document that multi-segment firms have a higher probability of reporting ICWs, especially company-level ICWs.

ICFR (Alexander et al. 2013). Thus, multi-segment firms provide a strong setting for assessing the governance role of ICFR in mitigating capital resource misallocations and the resulting valuation implications, and how internal control interacts with conventional governance mechanisms in influencing firms' real decisions. These issues are largely ignored in prior studies.

2.3 Hypotheses development

As indicated by the literature on internal capital markets, the failings of internal capital markets are attributed to greater agency problems and more severe information asymmetry in conglomerates. Accounting systems collect and summarize financial effects of firms' investing, operating, and financing activities and thus facilitate tracking, evaluating, and monitoring of investment decisions and performance. ICFR reflects the quality of a firm's entire information production system, including its corporate accounting and external reporting systems. In addition, policies, procedures, and checks and balances contained in ICFR can constrain managers' ability to appropriate corporate assets. Thus, ICFR is expected to play a significant role in reducing agency problems at both the headquarters and division levels and in ameliorating the information asymmetry between insiders and outside investors as well as between headquarters and divisions.

At the division level, more precise information generated from effective ICFR enables headquarters to better judge the relative performance of different divisions, which will assist in making more value-enhancing resource allocation decisions. In contrast, under weak ICFR, headquarters may not be able to discern winners and losers as accurately and thus are more likely to make sub-optimal capital transfer decisions. Also, the formal policies and procedures contained in IFCR can make it easier for headquarters to better monitor divisional managers, reducing their rent-seeking behavior and propensity to lobby.

At the headquarters level, effective ICFR can constrain managerial opportunism. Managers may find it difficult to overstate the value of their pet projects by manipulating the numbers or window-dressing the reports. In addition, higher quality information generated by effective internal control systems can facilitate more effective contracting between top management and shareholders and lead to better interest alignment (Lambert 2001), which may incentivize top management to compensate divisional managers appropriately rather than reward them with distortionary capital budgets. Finally, high quality and timely accounting information facilitates monitoring by shareholders and boards of directors, which is all the more important for conglomerates with information-aggregation problems and complex informational environments.

Based on the aforementioned arguments, we hypothesize that the efficiency of internal capital markets in firms with ICWs is lower than that in firms with effective ICFR. Given that inefficient allocation of resources across segments is the primary explanation for diversification discount, we also expect that the adverse impact of ICWs on internal capital markets will manifest in a relatively lower value in these firms.

3 Sample and variable

3.1 Sample selection

Our initial sample consists of all firms listed in Audit Analytics that issue Section 302 or Section 404 reports for the fiscal years 2004–2009. We extract financial data for these firms from Compustat Annual Files and exclude financials firms (SIC codes 6000–6999) and utilities (SIC codes 4900–4949). We obtain segment data from Compustat Industry Segments Files. Because our study focuses on internal capital markets of multi-segment firms, we eliminate firms that have less than two business segments. Similar to Berger and Ofek (1995) and Billett and Mauer (2003), we exclude firm-year observations if (1) a firm reports segments in financial or utility sectors, (2) a firm's total revenue is less than $20 million that year, and (3) the difference between the sum of segment sales (assets) and firm-level total sales (total assets) is more than 1 % (25 %). For firms where the difference is less than the minimum, we allocate the difference in assets, sales, capital expenditures, operating income, and depreciation to different segments on an item-weighted basis. After merging these two datasets and requiring information on internal capital transfer, internal control quality, and control variables, we have 1,917 firm-year observations from 691 multi-segment firms, of which 179 firm-years, or 9.34 %, report ICWs.[3] The number of observations in subsequent analyses may vary depending on the availability of certain variables.

3.2 Measures of internal capital market efficiency

We use two measures to capture internal capital market efficiency. The measure devised by Rajan et al. (2000) classifies internal transfers as efficient when a segment with above average growth opportunities has greater-than-average investment or a segment with below average growth opportunities has lower-than-average investment, and as inefficient otherwise. A segment's investment opportunities are assumed to be identical to those of standalone firms in the same industry (imputed Q), and its relative investment is estimated as the difference between its actual investment and that of comparable single-segment firms. The difference between the segment's relative investment and the average of all segments' investment in the firms is weighted by the difference between the segment's imputed Q and the average imputed Q of all segments, and this weighted ratio is then summed across all segments in the firm. In essence, Rajan et al.'s measure captures the sensitivity of segment investment to segment Q and reflects the aggregate results of efficient and inefficient transfers. We refer to this measure as *ICM_Invst*, and a negative (positive) value represents inefficient (efficient) internal capital transfers. The advantage of this measure is its consistency with basic investment theories—firms with better investment opportunities should invest more. However, given that firms choosing to diversify differ systematically from those choosing to remain standalone, this approach may induce measurement errors by using standalone firms as benchmark (Campa and Kedia 2002).

[3] The sample distribution for each year (2004–2009) is as follows: 348 (50 firms, or 14.37 %, reporting ICWs) in 2004, 327 (34, or 10.40 %) in 2005, 336 (32, or 9.52 %) in 2006, 319 (27, or 8.46 %) in 2007, 303 (22, or 7.26 %) in 2008, and 284 (14, or 4.93 %) in 2009.

To overcome the potential bias, Billett and Mauer (2003) develop an alternative approach to measuring internal transfer efficiency by computing internal transfer as the difference between a segment's capital expenditure and its own after-tax cash flow and comparing the segment's profitability with that of the remaining segments to estimate relative efficiency of cross-transfer. A transfer out of a segment occurs if the segment's capital expenditure is lower than its after-tax cash flow, and this transfer is classified as inefficient (efficient) if the segment's accounting performance (ROA) is superior (inferior) to that of the remaining segments. A segment is deemed to receive a subsidy if its capital expenditure exceeds its after-tax cash flow, and this subsidy is efficient (inefficient) if the segment has a larger (smaller) ROA than the average of all other segments. To obtain firm-level overall internal transfer efficiency (referred to as *ICM_ROA*), we sum efficient transfers and subsidies and subtract inefficient transfers and subsidies over all segments in the firm. The variable *ICM_ROA* is higher for firms with more efficient internal capital markets.[4] The advantage of this approach is that internal transfer is observable; its drawback is that accounting profitability is a flow-based measure, which does not directly capitalize the value of a transfer.

3.3 Measures of diversification discount

We use multiple measures to capture diversification discount. Following Berger and Ofek (1995), we measure the excess value of diversification as the natural logarithm of the ratio of a firm's actual value, defined as market value of equity plus book value of debt, to its imputed value. A firm's imputed value is the sum of imputed values of its segments, where each segment's imputed value is its assets (sales) multiplied by the median multiple of firm value to assets (sales) across all single-segment firms in the same industry. The excess value based on asset (sales) multiple is referred to as *ExValA* (*ExValS*). Following Hoechle et al. (2012), we construct a third measure of excess value that is based on both assets and sales multiples. Specifically, we estimate the imputed value for each segment based on both assets and sales multiples, and then choose the one for which the industry standard deviation is lower. We refer to this hybrid measure of excess value as *ExValM*.

3.4 Measure of internal control quality

We code a firm-year observation as having ICWs if its Section 302 reports identify a material weakness in any quarter of the year or its Section 404 report reveals material weaknesses for that year. All other firm-years are classified as non-ICW observations. We do not differentiate between assessments under Section 302 and Section 404 because many companies integrate the two processes and reach similar assessments under the two procedures (Doyle et al. 2007a; Ashbaugh-Skaife et al. 2008). All

[4] We subtract a segment's interest and tax expenses from earnings before interest and taxes to obtain its after-tax cash flow. There are three ways to calculate a segment's interest and tax expenses. The first is to impute interest expense and tax rate using same-industry single-segment firms; the second is to prorate a firm's interest and tax expenses based on each segment's asset size; and the third is to prorate expenses based on each segment's sales. Our measure (*ICM_ROA*) uses the third approach. We obtain similar results if the other two approaches are used.

variable definitions are presented in the appendix, and all continuous variables are winsorized at the 1st and 99th percentiles.

4 Empirical tests and results

4.1 Descriptive statistics and univariate analysis

Table 1 presents descriptive statistics of primary variables (Panel A) and a comparison between ICW and non-ICW samples (Panel B). For internal capital market efficiency, the mean value of *ICM_Invst* and *ICM_ROA* is −0.0006 and −0.0279, respectively, consistent with the evidence that internal capital markets are generally inefficient in multi-segment firms (Rajan et al. 2000; Billett and Mauer 2003). Both measures have a median value of zero; 38.54 (34.74) percent of firm-years have positive (negative) *ICM_Invst*; and 6.37 (45.91) percent have positive (negative) *ICM_ROA*. The distribution of *ICM_Invst* is relatively symmetric, while *ICM_ROA* exhibits a highly left-skewed distribution.[5] As for the degree of diversity, the average number of segments (*NSegment*), diversity of growth opportunities across segments (*SegDiversity*), and coefficient of variation of segment growth opportunities (*SegVariation*) are 2.8367, 0.3089, and 0.3260, respectively, in line with Rajan et al. (2000).

More importantly, we find that *ICM_ROA* is significantly lower for firms with ineffective ICFR than for firms with effective ICFR, which provides preliminary support for our hypothesis. With respect to other attributes, we find that firms with ICWs are different from their non-ICW counterparts in terms of firm size, profitability, leverage, volatility of sales and investment, financial constraints, extreme sales growth, presence of foreign operations, age, and auditor. There is no evidence that the two types of firms differ significantly in investment level, growth opportunities, or restructuring activities. For the degree of diversity, we find that only the difference in the coefficient of variation of segment growth opportunities is significant.

We estimate the Pearson correlations of the variables used in our internal capital market analysis. The untabulated results indicate that *ICW* is marginally correlated with *ICM_Invst* (significant at the 10 % level) but highly correlated with *ICM_ROA*. The correlations between control variables are generally below 0.50 except for firm size and auditor quality, suggesting that multicollinearity is of limited concern.

4.2 Internal control weaknesses and internal capital market efficiency

Our major hypothesis is that effective internal controls ameliorate agency problems and information asymmetry in multi-segment firms and thus firms with effective ICFR have

[5] Billett and Mauer (2003) report a lower mean value of *ICM_ROA*. The difference is probably a result of the different sample periods of the two studies. Their sample period spans from 1990 to 1998, which is before the new segment reporting standard [Statement of Financial Accounting Standards (SFAS) 131] took effect. As noted by Hoechle et al. (2012), Compustat segment files changed substantially under the new reporting framework and segment data before and after 1997 might not be directly comparable.

Table 1 Descriptive statistics and comparison between ICW firms and non-ICW firms

Panel A: Descriptive statistics

Variable	Mean	Standard Deviation	5th Percentile	25th Percentile	Median	75th Percentile
ICM_Invst_t	-0.0006	0.0106	-0.0106	-0.0002	0.0000	0.0003
ICM_ROA_t	-0.0279	0.1588	-0.0598	-0.0024	0.0000	0.0000
$Size_t$	6.6964	1.7755	3.4298	5.5791	6.7706	7.8763
$Earnings_t$	0.0744	0.1062	-0.1028	0.0409	0.0845	0.1285
$CapitalExp_t$	0.0471	0.0429	0.0077	0.0196	0.0343	0.0576
$Leverage_t$	0.2509	0.1835	0.0002	0.1108	0.2286	0.3518
MTB_t	1.5501	0.6230	0.8366	1.1378	1.3906	1.7914
$Std(Sale)_t$	0.3602	0.7816	0.0516	0.1104	0.1861	0.3072
$Std(CapitalExp)_t$	0.0303	0.0293	0.0049	0.0120	0.0202	0.0375
$Dividend_t$	0.5493	0.4977	0.0000	0.0000	1.0000	1.0000
$BondRating_t$	0.5050	0.5001	0.0000	0.0000	1.0000	1.0000
$SAIndex_t$	-3.7675	0.6343	-4.6369	-4.4221	-3.6791	-3.3239
$ZScore_t$	30.4374	159.1656	0.0000	2.4006	3.8050	6.9397
$NSegment_t$	2.8367	1.0298	2.0000	2.0000	3.0000	3.0000
$SegDiversity_t$	0.3089	0.2063	0.0571	0.1511	0.2574	0.4307
$SegVariation_t$	0.3260	0.2437	0.0117	0.1290	0.2832	0.4781
$ExtrSales_t$	0.2081	0.4061	0.0000	0.0000	0.0000	0.0000
$Restructure_t$	0.3448	0.4754	0.0000	0.0000	0.0000	1.0000
$Loss_t$	0.1899	0.3923	0.0000	0.0000	0.0000	0.0000
$Foreign_t$	0.3542	0.4784	0.0000	0.0000	0.0000	1.0000
Age_t	25.3719	16.6940	5.0000	11.0000	20.0000	41.0000
$Big4_t$	0.7955	0.4034	0.0000	1.0000	1.0000	1.0000
$M\&A_t$	0.0772	0.2670	0.0000	0.0000	0.0000	0.0000

Panel B: Comparison between ICW and non-ICW firms

Variable	Means			Medians		
	ICW (N = 179)	Non-ICW (N = 1738)	Diff. t-stat.	ICW (N = 179)	Non-ICW (N = 1738)	Diff. z-stat.
ICM_Invst_t	-0.0019	-0.0005	-1.61	0.0000	0.0000	0.04
ICM_ROA_t	-0.0728	-0.0233	-2.44	-0.0007	0.0000	-3.98
$Size_t$	6.0489	6.7631	-5.16	5.9930	6.8177	-4.95
$Earnings_t$	0.0463	0.0773	-3.03	0.0632	0.0864	-3.92
$CapitalExp_t$	0.0477	0.0470	0.21	0.0321	0.0346	-0.37
$Leverage_t$	0.2937	0.2465	2.77	0.2790	0.2255	2.41
MTB_t	1.6264	1.5422	1.50	1.4092	1.3885	0.85
$Std(Sale)_t$	0.5657	0.3391	3.26	0.2727	0.1778	6.38
$Std(CapitalExp)_t$	0.0370	0.0297	2.88	0.0287	0.0198	3.56
$Dividend_t$	0.4078	0.5639	-4.01	0.0000	1.0000	-3.99
$BondRating_t$	0.3520	0.4614	-2.81	0.0000	0.0000	-2.80
$SAIndex_t$	-3.4904	-3.7961	6.20	-3.4090	-3.7211	6.42

Table 1 (continued)

$ZScore_t$	33.0783	30.1654	0.20	3.3552	3.8665	-2.77
$NSegment_t$	2.7430	2.8464	-1.50	3.0000	3.0000	-0.65
$SegDiversity_t$	0.3024	0.3095	-0.48	0.2689	0.2549	0.26
$SegVariation_t$	0.3617	0.3223	1.87	0.2916	0.2816	1.56
$ExtrSales_t$	0.2626	0.2025	1.88	0.0000	0.0000	1.88
$Restructure_t$	0.2961	0.3498	-1.44	0.0000	0.0000	-1.44
$Loss_t$	0.3408	0.1743	4,54	0.0000	0.0000	5.40
$Foreign_t$	0.4134	0.3481	1.74	0.0000	0.0000	1.74
Age_t	20.4637	25.8774	-4.55	14.0000	21.0000	-4.39
$Big4_t$	0.6313	0.8124	-4.85	1.0000	1.0000	-5.71
$M\&A_t$	0.0894	0.0759	0.64	0.0000	0.0000	0.64

This table presents descriptive statistics for a sample of multi-segment firms with Section 404 or Section 302 disclosures from 2004 to 2009 (Panel A) and a comparison between ICW firms and non-ICW firms (Panel B). Differences between ICW and non-ICW firms in means (medians) are tested using a t-test (Wilcoxon rank sum test). Variable definitions are in the appendix

more efficient internal capital markets than ICW firms. We test the hypothesis by estimating the following baseline regression model:

$$\begin{aligned} ICM_{i,t} = {} & \beta_0 + \beta_1 * ICW_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * Earnings_{i,t} + \beta_4 * CapitalExp_{i,t} + \beta_5 * Leverage_{i,t} \\ & + \beta_6 * MTB_{i,t} + \beta_7 * Std(Sale)_{i,t} + \beta_8 * Std(CapitalExp)_{i,t} + \beta_9 * Dividend_{i,t} \\ & + \beta_{10} * BondRating_{i,t} + \beta_{11} * SAIndex_{i,t} + \beta_{12} * ZScore_{i,t} + \beta_{13} * NSegment_{i,t} \\ & + \beta_{14} * SegDiversity_{i,t} + \beta_{15} * SegVariation_{i,t} + \beta_{16} * ExtrSales_{i,t} + \beta_{17} * Restructure_{i,t} \\ & + \beta_{18} * Loss_{i,t} + \beta_{19} * Foreign_{i,t} + \beta_{20} * Age_{i,t} + \beta_{21} * Big4_{i,t} + \beta_{22} * M\&A_{i,t} \\ & + Industryfixedeffects + Yearfixedeffects + \varepsilon_{i,t}, \end{aligned} \quad (1)$$

where dependent variable *ICM* is one of the two measures of internal capital market efficiency (*ICM_Invst* and *ICM_ROA*). *ICW* takes a value of one if a firm-year is classified as having ICWs, and zero otherwise. If a firm's internal control quality is associated with capital allocations across segments as hypothesized, the coefficient on *ICW* should be a negative ($\beta_1 < 0$).

To isolate the effect of ICWs on internal capital market efficiency, we include an array of control variables in our regression analyses. We first control for firm attributes that are identified by prior studies as affecting firm-level investment and internal capital market efficiency (Rajan et al. 2000; Cheng et al. 2013; Hovakimian 2011; Bens and Monahan 2004). These control variables include firm size (*Size*), profitability (*Earnings*), capital expenditure (*CapitalExp*), leverage (*Leverage*), growth opportunities (*MTB*), volatility of sales (*Std(Sale)*) and capital expenditure (*Std(CapitalExp)*), and financial constraints (*Dividend, BondRating, SAIndex,* and *ZScore*). We also include number of segments (*NSegment*), diversity of segment Q (*SegDiversity*), and coefficient of variation of segment Q (*SegVariation*) to capture the degree of diversity of multi-segment firms. In addition, we control for the determinants of ICWs that include extreme sales growth (*ExtrSales*), organizational change (*Restructure*), presence of aggregate loss (*Loss*), foreign operations (*Foreign*), firm age (*Age*), auditor quality (*Big4*), and merger and acquisitions (*M&A*). A failure to control for firm attributes leading to lower internal control quality would make it possible that the inefficient resource allocations associated with ineffective internal controls do in fact reflect these underlying factors. We further include year and industry fixed

effects to account for variations in the value of internal transfers stemming from macroeconomic and industry factors.[6] To account for serial correlations, all statistics in regression analyses are based on standard errors that are clustered at firm level.

We begin with a univariate regression of internal capital market efficiency on *ICW* with year and industry fixed effects, followed by a full regression of Eq. (1), and present the results in Table 2. For the univariate regression (columns 1 and 3), the coefficient on *ICW* is negative and significant at the conventional levels for both *ICM_Invst* and *ICM_ROA*. After including the control variables (columns 2 and 4), the model explanatory power improves substantially and, more importantly, the coefficient on *ICW* remains negative and significant. As to the magnitude of impact, the coefficients on *ICW* suggest that the value of internal capital transfers in ICW firms is 0.0017 (0.0423) lower than in their counterparts with effective ICFR when the measure is *ICM_Invst* (*ICM_ROA*), accounting for 16.04 % (26.76 %) of the standard deviation of the corresponding variable. These results support our hypothesis that firms with ineffective ICFR exhibit lower efficiency in internal capital transfers.[7]

Turning to the coefficients on control variables, we find some evidence that the degree of diversity among segments is negatively associated with internal capital market efficiency, consistent with prior studies (e.g., Billett and Mauer 2003; Rajan et al. 2000). Similar to Hovakimian (2011), we find that proxies for financial constraints are positively associated with the Rajan et al. (2000) measure (*ICM_Invst*) but not with the Billett and Mauer (2003) measure (*ICM_ROA*). Given the documented positive relation between financial constraints and *ICM_Invst*, we further investigate whether the impact of ICWs on *ICM_Invst* depends on financial constraints. Untabulated results show that the coefficient on *ICW* is negative and significant for financially non-constrained firms but insignificant for firms with financial constraints, implying that ICW firms are more likely to misallocate resources via internal capital markets when resources are abundant.

4.3 Controlling for self-selection bias

Prior studies suggest that ICW firms are likely to be systematically different from non-ICW firms and that firms choose their internal control systems by weighing the costs and benefits based on their innate firm characteristics (Doyle et al. 2007a). The behavior of self-selecting internal control quality could result in potential bias in our observed sample that includes both Section 302 and Section 404 disclosures.

[6] Industry is defined at the firm level based on the Fama and French (1997) 48-industry classification. However, our results remain largely unchanged if we define industry at the segment level, which means more than one industry indicator can equal one if the segments in a firm are from different industries.

[7] The internal capital market measures used in the current literature capture underinvestment by good segments and overinvestment by bad segments without considering that firms may invest more than is optimal in high Q segments. To account for potential overinvestment in good segments, we modify the measure of Rajan et al. (2000) by treating overinvestment in high Q segments as inefficient transfers. Overinvesting in a high Q segment is assumed to occur if the segment has above average Q and has capital expenditure more than one standard deviation of capital expenditure of same-industry single-segment firms. The mean (median) value of this alternative measure is −0.0012 (−0.0002). The coefficient on *ICW* is −0.0013 (*p*-value =0.066) when this measure is used as dependent variable to estimate Eq. (1). A drawback with this alternative measure is that overinvesting in a high Q segment is deemed worse than overinvestment in another good but lower Q segment. The reason is this measure is weighted by the difference between a segment's Q and the average of segment Q in the firm. As such, this alternative measure only serves to suggest that overinvestment in high Q segments does not drive our main inferences.

Table 2 Internal control weaknesses and internal capital market

Variable	Expected Sign	ICM_Invst_t		ICM_ROA_t	
		(1)	(2)	(3)	(4)
Intercept	?	0.0017**	0.0069	-0.0204	0.0645
		(0.026)	(0.144)	(0.165)	(0.220)
ICW_t	-	**-0.0016***	**-0.0017***	**-0.0595*****	**-0.0423****
		(0.063)	**(0.053)**	**(0.003)**	**(0.021)**
$Size_t$	?		0.0003		0.0074
			(0.224)		(0.112)
$Earnings_t$	?		-0.0060**		0.1904***
			(0.046)		(0.001)
$CapitalExp_t$	?		-0.0073		-0.0617
			(0.558)		(0.526)
$Leverage_t$	?		0.0007		0.0352
			(0.698)		(0.232)
MTB_t	?		0.0003		-0.0070
			(0.414)		(0.238)
$Std(Sale)_t$	?		-0.0008*		-0.0001
			(0.055)		(0.987)
$Std(CapitalExp)_t$	?		0.0114		0.0983
			(0.238)		(0.561)
$Dividend_t$	?		-0.0013**		0.0319***
			(0.045)		(0.000)
$BondRating_t$	?		-0.0014**		-0.0092
			(0.026)		(0.393)
$SAIndex_t$	?		0.0018		0.0322
			(0.369)		(0.161)
$ZScore_t$	?		0.0000		0.0000
			(0.226)		(0.889)
$NSegment_t$	-		-0.0011*		-0.0042
			(0.080)		(0.304)
$SegDiversity_t$	-		-0.0005		-0.0301
			(0.317)		(0.121)
$SegVariation_t$	-		-0.0009		-0.1148***
			(0.154)		(0.000)
$ExtrSales_t$	?		-0.0011		-0.0037
			(0.102)		(0.698)
$Restructure_t$	?		-0.0007*		-0.0026
			(0.097)		(0.782)
$Loss_t$	?		-0.0004		-0.0164
			(0.651)		(0.355)
$Foreign_t$	?		-0.0004		0.0213**
			(0.437)		(0.010)

Table 2 (continued)

	Expected	ICM_Invst_t		ICM_ROA_t	
Variable	Sign	(1)	(2)	(3)	(4)
Age_t	?		0.0001		0.0005
			(0.496)		(0.502)
$Big4_t$	?		0.0006		0.0086
			(0.492)		(0.549)
$M\&A_t$	?		-0.0013		-0.0070
			(0.189)		(0.642)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
R^2		3.25 %	5.11 %	5.28 %	12.12 %
N		1917	1917	1917	1917

The table lists coefficients (p-value) from OLS regressions of internal capital market efficiency (*ICM_Invst* and *ICM_ROA*) on an indicator variable of internal control weaknesses (*ICW*), the determinants of internal control weaknesses, and a set of firm characteristics for a sample of multi-segment firms with Section 404 or Section 302 disclosures from 2004 to 2009. *P*-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Industry fixed effects are based on the Fama and French (1997) 48 industry classification. Variable of interest is in boldface. Variables are as defined in the appendix

We control for this possible self-selection bias using the propensity-score matching method. First, we estimate a probit regression of *ICW* on its determinants as selected in Doyle et al. (2007b) for the sample firms.[8] Based on the predicted probabilities from the first-stage probit regression, for each ICW firm we find a matching non-ICW conglomerate that has the closest propensity score in the same year. Using this approach, we find matches for 179 firm-year observations, resulting in a combined sample of 358 observations.[9] We re-estimate Eq. (1) for this sample and find the coefficient on *ICW* continues to be significantly negative for both internal capital market measures (Table 3), indicating that our results are not sensitive to the control for self-selection bias.

4.4 Type of internal control weaknesses and internal capital market efficiency

Moody's (2004) argues that ICWs related to account-balance or transaction-level processes (i.e., account-level ICWs) are less severe in their impact as they are more easily auditable. In contrast, company-level ICWs related to the control environment and overall financial reporting process are hard to audit and therefore have a persistent impact and more adverse

[8] The regression result is as follows: ICW = −0.966 (0.017) – 0.186 (0.007) * Size + 0.269 (0.203) * Restructure + 0.589 (0.003) * Loss + 0.351 (0.059) * Foreign + 0.328 (0.296) * M&A + 0.528 (0.013) * ExtrSales - 0.009 (0.151) * Age – 0.522 (0.024) * Big4. Variable definitions are in the Appendix and *P*-values in parenthesis.

[9] To test the effectiveness of the matching, we conduct a covariate balance test and find that the differences in the determinants of ICWs between ICW firms and non-ICW matching firms are not statistically significant except for *Loss* and *Big4*, which are marginally significant.

Table 3 Internal control weaknesses and internal capital market: propensity-score matching

		ICM_Invst_t		ICM_ROA_t	
Variable		(1)	(2)	(3)	(4)
Intercept	?	0.0039	-0.0002	-0.0081	0.1399
		(0.214)	(0.976)	(0.891)	(0.134)
ICW_t	-	**-0.0018***	**-0.0018***	**-0.0560****	**-0.0469****
		(0.090)	(0.082)	(0.014)	(0.031)
$Size_t$	?		-0.0001		0.0065
			(0.896)		(0.602)
$Earnings_t$	?		-0.0023		0.3097***
			(0.727)		(0.006)
$CapitalExp_t$	?		-0.0225		-0.3385
			(0.216)		(0.191)
$Leverage_t$	?		0.0063*		0.0043
			(0.093)		(0.935)
MTB_t	?		0.0002		-0.0069
			(0.832)		(0.667)
$Std(Sale)_t$	?		-0.0007		0.0201
			(0.491)		(0.104)
$Std(CapitalExp)_t$	?		0.0060		0.0781
			(0.798)		(0.859)
$Dividend_t$	?		-0.0031**		0.0614**
			(0.047)		(0.029)
$BondRating_t$	?		-0.0006		-0.0421
			(0.706)		(0.245)
$SAIndex_t$	?		-0.0014		0.0284
			(0.379)		(0.287)
$ZScore_t$	?		0.0000		0.0000
			(0.538)		(0.814)
$NSegment_t$	-		-0.0054**		-0.0376
			(0.032)		(0.134)
$SegDiversity_t$	-		-0.0003		-0.0653
			(0.465)		(0.173)
$SegVariation_t$	-		0.0002		-0.1286***
			(0.468)		(0.006)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
R^2		1.47 %	6.49 %	4.42 %	20.01 %
N		358	358	358	358

The table lists coefficients (*p*-value) from OLS regressions of internal capital market efficiency (*ICM_Invst* and *ICM_ROA*) on an indicator variable of internal control weaknesses (*ICW*), the determinants of internal control weaknesses, and a set of firm characteristics for a sample of ICW multi-segment firms and non-ICW control firms obtained from propensity-score matching. *P*-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Industry fixed effects are based on the Fama and French (1997) 48 industry classification. Variable of interest is in boldface. Variables are as defined in the appendix

implications. Empirical studies find that company-level ICWs have greater effects on accounting quality (Doyle et al. 2007b) and investment efficiency (Cheng et al. 2013).

We investigate whether the inefficiency of internal capital transfers associated with ICWs depends on the nature of ICWs and, in particular, whether the impact of company-level ICWs is greater by creating two indicator variables, *CompanyICW* and *AccountICW*, to proxy company-level ICWs and account-level ICWs.[10] We re-estimate Eq. (1) by replacing *ICW* with *AccountICW* and *CompanyICW* and present the results in Table 4. Several interesting points emerge from this analysis. First, the coefficient is negative and significant for company-level ICWs but insignificant for account-level ICWs irrespective of the regression specification. Second, while the inclusion of control variables improves the model's explanatory power substantially, the impact on the coefficient of company-level ICWs is marginal. Third, the economic impact of company-level ICWs on internal capital market efficiency is substantial. In particular, the coefficients on *CompanyICW* imply that the value of internal capital transfers for firms with company-level ICWs is 0.0027 (0.0532) lower than the value for firms without ICWs when the measure is *ICM_Invst* (*ICM_ROA*). These findings suggest that the documented negative effect of ICWs on internal control market is mostly concentrated in firms with company-level ICWs.

4.5 Corporate governance, ICWs, and internal capital market efficiency

As stated earlier, there is limited evidence on the role of corporate governance in the workings of internal capital markets. On one hand, it may be problematic if we do not control for the existing governance apparatus given the possible interdependencies among various control mechanisms (Cremers and Nair 2005). In particular, the correlation between ICWs and the value of internal transfers could be spurious if alternative corporate control mechanisms are not chosen independently. On the other hand, the quality of governance is potentially a function of ICWs, so controlling for governance variables could possibly over-control for ICW effects. In this section, we explore whether ICFR has a distinct role in the workings of internal capital market beyond that of traditional governance mechanisms and whether its impact depends on the strength of existing governance controls.

Prior studies find that outside directors, institutional shareholders, and financial analysts play important roles in monitoring management investment decisions (Rosenstein and Wyatt 1990; Agrawal and Mandelker 1990; Chen et al. 2007). We use the percentage of outside directors (*OutDirPtg*), institutional ownership (*InstitutionSharePtg*), and the number of analysts following a firm (*Analyst*) to capture their monitoring roles. We further control for managerial entrenchment resulting from antitakeover provisions by using the corporate governance index of Bebchuk et al. (2009) (*EIndex*), as prior studies find that antitakeover provisions affect firms' investment behavior and are value relevant (Bebchuk et al. 2009).[11]

[10] *CompanyICW* is set to one if a firm reports internal control problems related to a lack of segregation of duties, inadequate disclosure controls, an ineffective or understaffed audit committee, a lack of senior management competency and tone, ineffective internal audit functions, and ineffective personnel, and 0 otherwise. *AccountICW* equals one for firms reporting any weaknesses other than *CompanyICW*, and 0 otherwise.

[11] The E-Index is composed of six of the provisions of the G-Index that Bebchuk et al. (2009) find to drive corporate governance. E-Index is available every other year; for years when the index is not available, we follow previous studies and use the index of the most recent years. Our measure (*EIndex*) is a linear transformation of E-Index and is defined as 6 – E-Index. Therefore, a higher (lower) value of *EIndex* indicates a greater (smaller) takeover exposure and better (worse) governance.

Table 4 Nature of internal control weaknesses and internal capital market

	Expected	ICM_Invst_t		ICM_ROA_t	
Variable	Sign	(1)	(2)	(3)	(4)
Intercept	?	0.0016**	0.0069	-0.0206	0.0637
		(0.028)	(0.147)	(0.159)	(0.223)
$CompanyICW_t$	-	**-0.0024***	**-0.0027****	**-0.0686*****	**-0.0532****
		(0.037)	**(0.025)**	**(0.006)**	**(0.018)**
$AccountICW_t$	-	**0.0007**	**0.0009**	**-0.0347**	**-0.0128**
		(0.237)	**(0.192)**	**(0.113)**	**(0.331)**
$Size_t$	?		0.0003		0.0075
			(0.212)		(0.109)
$Earnings_t$	?		-0.0061**		0.1892***
			(0.042)		(0.001)
$CapitalExp_t$	?		-0.0073		-0.0615
			(0.558)		(0.529)
$Leverage_t$	?		0.0008		0.0365
			(0.653)		(0.219)
MTB_t	?		0.0004		-0.0062
			(0.317)		(0.284)
$Std(Sale)_t$	?		-0.0008**		-0.0003
			(0.049)		(0.968)
$Std(CapitalExp)_t$	?		0.0112		0.0959
			(0.246)		(0.569)
$Dividend_t$	?		-0.0013**		0.0315***
			(0.040)		(0.000)
$BondRating_t$	?		-0.0014**		-0.0090
			(0.028)		(0.399)
$SAIndex_t$	?		0.0019		0.0325
			(0.362)		(0.159)
$ZScore_t$	?		0.0000		0.0000
			(0.217)		(0.871)
$NSegment_t$	-		-0.0012*		-0.0052
			(0.067)		(0.272)
$SegDiversity_t$	-		-0.0004		-0.0289
			(0.352)		(0.129)
$SegVariation_t$	-		-0.0009		-0.1154***
			(0.139)		(0.000)
$ExtrSales_t$	?		-0.0012*		-0.0041
			(0.093)		(0.669)
$Restructure_t$	?		-0.0008*		-0.0031
			(0.076)		(0.736)
$Loss_t$	?		-0.0004		-0.0169
			(0.616)		(0.342)

Table 4 (continued)

	Expected	ICM_Invst_t		ICM_ROA_t	
Variable	Sign	(1)	(2)	(3)	(4)
$Foreign_t$	?		-0.0003		0.0218***
			(0.488)		(0.010)
Age_t	?		0.0001		0.0005
			(0.489)		(0.495)
$Big4_t$	?		0.0005		0.0077
			(0.551)		(0.583)
$M\&A_t$	?		-0.0013		-0.0069
			(0.190)		(0.645)
Industry Indicators		Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes
R^2		3.40 %	5.30 %	5.36 %	12.23 %
N		1917	1917	1917	1917
No. of CompanyICW		133	133	133	133
No. of AccountICW		46	46	46	46

The table lists coefficients (*p*-value) from OLS regressions of internal capital market efficiency (*ICM_Invst* and *ICM_ROA*) on two indicator variables indicating company-level and account-level internal control weaknesses (*CompanyICW* and *AccountICW*), the determinants of internal control weaknesses, and a set of firm characteristics for a sample of multi-segment firms with Section 404 and Section 302 disclosures from 2004 to 2009. *P*-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Industry fixed effects are based on the Fama and French (1997) 48 industry classification. Variables of interest are in boldface. Variables are as defined in the appendix

Executive compensation is another element of corporate governance systems, and executive equity incentives are found to motivate managers to invest efficiently to maximize firm value (Broussard et al. 2004). We add CEO option *delta* to the regression to control for the effect of equity incentives. If any of the governance variables are missing, we follow Biddle et al. (2009) and set its value to zero to avoid a significant reduction in sample size, and denote this with an indicator variable (*OutDirMis*, *InstitutionMis*, *EIndexMis*, and *DeltaMis*).

The estimated results in Table 5 show little evidence that outside directors, institutional shareholders, analysts, the takeover market, and executive equity incentives are significantly related to internal capital market efficiency. However, the coefficient on *ICW* remains negative and significant, indicating a unique role of internal control in the workings of internal capital markets. This finding suggests that internal control serves as an important internal corporate governance mechanism beyond the traditional governance devices in curbing rent-seeking activities and mitigating unresolved agency problems in conglomerates.

To investigate whether the benefits of effective internal control depend on the strength of firms' existing governance mechanisms, we create five governance indicator variables based on the median value of each variable and then construct a composite governance index by summing individual governance dummies. This governance index captures different aspects

Table 5 Corporate governance, internal control weaknesses and internal capital market

	Expected	Controlling for Governance		ICM_Invst$_t$		ICM-ROA$_t$	
Variable	Sign	ICM_Invst$_t$	ICM_ROA$_t$	StrongGov	WeakGov	StrongGov	WeakGov
ICW$_t$	-	**-0.0017***	**-0.0420****	**-0.0008**	**-0.0023****	**-0.0378**	**-0.0475****
		(0.058)	(0.018)	(0.188)	(0.049)	(0.228)	(0.030)
Analyst$_t$	+	0.0003	0.0027				
		(0.501)	(0.716)				
OutDirPtg$_t$	+	0.0015	-0.0719*				
		(0.641)	(0.079)				
InstitutionSharePtg$_t$	+	0.0015	-0.0061				
		(0.258)	(0.700)				
OptionDelta$_t$	+	-0.0000	0.0034				
		(0.953)	(0.284)				
Eindex$_t$	+	-0.0002	-0.0033				
		(0.326)	(0.414)				
OutDirMis$_t$	?	0.0022	-0.0451				
		(0.397)	(0.171)				
InstitutionMis$_t$	?	0.0008	-0.0134				
		(0.430)	(0.275)				
DeltaMis$_t$	?	-0.0007	-0.0045				
		(0.279)	(0.775)				
EIndexMis$_t$	?	-0.0014	-0.0002				
		(0.219)	(0.993)				
Control Variables		Yes	Yes	Yes	Yes	Yes	Yes
Industry Indicators		Yes	Yes	Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes	Yes	Yes
R^2		5.41 %	12.49 %	12.14 %	7.13 %	22.69 %	15.25 %
N		1917	1917	781	1136	781	1136

The first two columns of this table report estimated results from regressions examining the relation between ICWs and internal capital market efficiency after controlling for effects of existing governance mechanisms. The coefficients on control variables are not reported for brevity. The last four columns present the results estimated for strongly governed and poorly governed firms separately. Strongly governed firms are those with the sum of five governance indicator variables being greater than 2 (median value), and poorly governed firms are those with the sum of five governance indicator variables equal to or less than 2. Five governance indicator variables are created based on the median value of each governance variable. P-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Industry fixed effects are based on the Fama and French (1997) 48 industry classification. Variable of interest is in boldface. Variables are as defined in the appendix

of governance mechanisms. We partition our sample into two subgroups based on the median value of the governance index and estimate Eq. (1) for the two subsamples separately. The coefficient on *ICW* is negative and significant for the weak governance group but insignificant for the strong governance group. This suggests that multi-segment firms benefit significantly from maintaining

sound internal controls when existing governance is weak. Our finding is consistent with the perception that the new governance reforms bring greater benefits to poorly governed firms.

4.6 Changes in internal control status and changes in internal capital market efficiency

Some unobservable factors may affect both internal control quality and internal capital markets, causing a mechanical relation between ICWs and internal capital allocations. To rule out the possibility that time-invariant omitted variables drive our results, we perform an inter-temporal analysis by taking advantage of the fact that some firms rectify their ICWs and some experience ICFR deterioration during the sample period. Specifically, we examine how changes in ICFR relate to changes in internal capital transfer efficiency. If ICWs drive internal resource misallocations, then internal capital market efficiency should increase (decrease) as the quality of ICFR improves (deteriorates). To ensure that a firm serves as its own control, we focus on firms that have a status change in ICFR during the sample period. That is, a firm is included in our sub-sample for change analysis as long as it has an incidence of ICFR remediation or deterioration. We find that 54 firms remediate their ICFR problems, and 35 firms experience ICFR deterioration. After requiring the availability of at least two-year data to compute changes, we are left with 232 firm-year observations to use in conducting change analysis.

Given the time and effort involved in implementing changes in internal control systems (Bedard et al. 2012), we measure changes in internal capital market efficiency from year t-1 to t + 2, while year t is the year of remediation or deterioration. We present the changes in internal capital market efficiency based on the status changes in ICFR in Panel A of Table 6. The results show that firms experience a positive change in internal capital market efficiency upon remediating their ICWs and a decrease in the value of internal transfers upon deteriorating their ICFR. As changes in internal capital market efficiency may arise from changes in factors other than the status changes in ICFR, we conduct multivariate change analysis to control for the effects of changing firm characteristics. Specifically, we estimate the following regression model:

$$\begin{aligned}
\Delta ICM_{t-1,t+2} &= \beta_0 + \beta_1 * NICW_ICW_{t-1,t} + \beta_2 * ICW_NICW_{t-1,t} + \beta_3 * \Delta Size_{t-1,t+2} \\
&+ \beta_4 * \Delta Earnings_{t-1,t+2} + \beta_5 * \Delta CapitalExp_{t-1,t+2} + \beta_6 * \Delta Leverage_{t-1,t+2} \\
&+ \beta_7 * \Delta MTB_{t-1,t+2} + \beta_8 * \Delta Std(Sale)_{t-1,t+2} + \beta_9 * \Delta Std(CapitalExp)_{t-1,t+2} \\
&+ \beta_{10} * \Delta Dividend_{t-1,t+2} + \beta_{11} * \Delta BondRating_{t-1,t+2} + \beta_{12} * \Delta SAIndex_{t-1,t+2} \\
&+ \beta_{13} * \Delta ZScore_{t-1,t+2} + \beta_{14} * \Delta NSegment_{t-1,t+2} + \beta_{15} * \Delta SegDiversity_{t-1,t+2} \\
&+ \beta_{16} * \Delta SegVariation_{t-1,t+2} + \beta_{17} * \Delta ExtrSales_{t-1,t+2} + \beta_{18} * \Delta Restructure_{t-1,t+2} \\
&+ \beta_{19} * \Delta Loss_{t-1,t+2} + \beta_{20} * \Delta Foreign_{t-1,t+2} + \beta_{21} * \Delta Age_{t-1,t+2} + \beta_{22} * \Delta Big4_{t-1,t+2} \\
&+ \beta_{23} * \Delta M\&A_{t-1,t+2} + Yearfixedeffects + \varepsilon,
\end{aligned} \tag{2}$$

where *NICW_ICW* (*ICW_NICW*) is an indicator variable taking a value of one if a firm has effective (ineffective) ICFR in year t-1 and ineffective (effective) ICFR in year t. If changes in ICFR lead to corresponding changes in internal capital allocations as

Table 6 Internal control weaknesses and internal capital market: change analysis

Panel A: Univariate analysis

	Improvement (1)	Deterioration (2)	No Change (3)	Dif. t-Stat. (1) - (3)	Dif. t-Stat. (2) - (3)
$\Delta ICM\_Invst_{t-1,\ t+2}$	0.0010	-0.0037	-0.0002	1.49	-2.65
$\Delta ICM\_ROA_{t-1,\ t+2}$	0.0048	-0.0277	-0.0062	1.83	-1.54

Panel B: Regression analysis

Variable	Expected Sign	$\Delta ICM\_Invst_{t-1,\ t+2}$ (1)	(2)	$\Delta ICM\_ROA_{t-1,\ t+2}$ (3)	(4)
Intercept	?	0.0011	0.0006	0.0072	-0.0111
		(0.257)	(0.808)	(0.219)	(0.182)
$NICW\_ICW_{t-1,t}$	-	**-0.0033***	**-0.0031****	**-0.0202***	**-0.0239***
		(0.076)	**(0.041)**	**(0.091)**	**(0.058)**
$ICW\_NICW_{t-1,t}$	+	**0.0010***	**0.0009***	**0.0103***	**0.0102***
		(0.061)	**(0.056)**	**(0.051)**	**(0.066)**
$\Delta size_{t-1,t+2}$	?		0.0000		-0.0262*
			(0.986)		(0.093)
$\Delta earnings_{t-1,t+2}$	?		-0.0049*		0.1045**
			(0.054)		(0.049)
$\Delta CapitalExp_{t-1,t+2}$	?		0.0554		-0.5993**
			(0.128)		(0.026)
$\Delta leverage_{t-1,t+2}$	?		-0.0028		-0.0466*
			(0.437)		(0.091)
$\Delta MTB_{t-1,t+2}$	?		-0.0005		0.0014
			(0.545)		(0.794)
$\Delta Std(Sale)_{t-1,t+2}$	?		-0.0004*		0.0005
			(0.069)		(0.825)
$\Delta Std(CapitalExp)_{t-1,t+2}$	?		0.0677*		-0.8488
			(0.091)		(0.166)
$\Delta dividend_{t-1,t+2}$	?		0.0006		0.0012
			(0.596)		(0.886)
$\Delta BondRating_{t-1,t+2}$	?		-0.0013		-0.0373
			(0.383)		(0.157)
$\Delta SAIndex_{t-1,t+2}$	?		0.0062		0.0378
			(0.205)		(0.569)
$\Delta ZScore_{t-1,t+2}$	?		0.0000		-0.0001*
			(0.144)		(0.035)
$\Delta NSegment_{t-1,t+2}$	-		-0.0018***		0.0239**
			(0.002)		(0.012)
$\Delta SegDiversity_{t-1,t+2}$	-		0.0016		-0.0120
			(0.360)		(0.203)
$\Delta SegVariation_{t-1,t+2}$	-		-0.0031		-0.0075
			(0.259)		(0.752)

Table 6 (continued)

$\Delta ExtrSales_{t-1,t+2}$	?		0.0008		0.0141
			(0.652)		(0.314)
$\Delta restructure_{t-1,t+2}$	?		0.0013		0.0075
			(0.405)		(0.235)
$\Delta loss_{t-1,t+2}$	?		-0.0004		-0.0175*
			(0.689)		(0.056)
$\Delta foreign_{t-1,t+2}$	?		-0.0005		-0.0012
			(0.731)		(0.942)
$\Delta age_{t-1,t+2}$	?		0.0006		0.0061
			(0.529)		(0.374)
$\Delta Big4_{t-1,t+2}$	?		0.0003		0.0277
			(0.738)		(0.190)
$\Delta M\&A_{t-1,t+2}$			0.0014		0.0053
			(0.133)		(0.668)
Year Indicators		Yes		Yes	
R^2		9.00 %	21.36 %	8.73 %	39.72 %
N		232	232	232	232

Panel A of the table reports changes in internal capital market efficiency (ΔICM_Invst and ΔICM_ROA) sorted by status changes in ICFR. Panel B lists coefficients (*p*-value) from OLS regressions of changes in internal capital market efficiency on changes in ICFR status (*NICW_ICW* and *ICW_NICW*), changes in the determinants of internal control weaknesses, and changes in a set of firm characteristics for a sample of multi-segment firms. Change in ICFR status is calculated between year t-1 and year t, while changes in other variables are calculated as the differences between year t + 2 and year t-1. P-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Variables of interest are in boldface. Variables are as defined in the appendix

hypothesized, we expect a negative coefficient on *NICW_ICW* ($\beta_1 < 0$) and a positive coefficient on *ICW_NICW* ($\beta_2 > 0$).

The estimated results of Eq. (2), reported in Panel B of Table 6, show the coefficient on *NICW_ICW* is negative and that on *ICW_NICW* is positive for both univariate and multivariate regressions, irrespective of the measure of internal capital market efficiency.[12] As indicated by R^2, changes in firm attributes explain a significant portion of changes in internal capital allocations; however, they do not subsume the effect of firm ICFR status changes. The overall results suggest that firms' internal capital allocation efficiency improves if their ICWs are remediated and worsens if their ICFR deteriorates.

4.7 Internal control weaknesses and diversification discount

In this section, we inquire whether ICWs are associated with the value loss attributed to diversification strategies. Since firm value reflects investors' perception of firms' future

[12] In this regression, firm-years without status change in ICFR serve as benchmark. For robustness check, we also conduct a change analysis for firm-years with ICFR status change. This analysis directly contrasts the impact of deterioration in ICFR with improvement. When we use *ICW_NICW* (improvement) as default, the coefficient on *NICW_ICW* (deterioration) is −0.0035 ($t = -3.25$) for ΔICM_Invst and −0.0267 ($t = -1.81$) for ΔICM_ROA, confirming our original conclusions. We thank the referee for this suggestion.

prospects, we look at excess value of diversification in the year following the year of ICW disclosure to avoid forward-looking bias. Our sample for diversification discount tests includes all firms with available information on *ICW* in year t (2004–2009) and available information on control variables and three measures of diversification discount (*ExValA, ExValS,* and *ExValM*) in year t + 1 (2005–2010).[13]

We report descriptive statistics on the three measures of diversification discount and a comparison in diversification discount between ICW and non-ICW firms in Panel A of Table 7. For the full sample, the mean (median) excess value for conglomerates based on asset multiples (*ExValA*), sales multiples (*ExValS*), and both asset and sales multiples (*ExValM*) is −0.098 (−0.105), −0.276 (−0.252), and −0.098 (−0.108), respectively, suggesting a value loss associated with diversification, which is consistent with the findings of prior studies.[14] Our untabulated results show that 41.68 (58.36) percent of firms have positive (negative) value of *ExValA*, 36.79 (63.21) percent of firms have positive (negative) *ExValS*, and 41.48 (58.50) percent of firms have positive (negative) *ExValM*. For the comparison between ICW and non-ICW firms, we find the differences are significant for all three measures, suggesting that the value loss associated with diversification is significantly larger for firms with ICWs than for firms with effective ICFR.

To put the diversification discount analysis in a multivariate framework, we estimate a regression model similar to Eq. (1) except that (1) dependent variable is diversification discount (*ExValA*, *ExValS*, and *ExValM*), (2) dependent variable and control variables are measured at year t + 1, and (3) variable *MTB* is excluded as market-to-book also proxies firm value. If investors perceive a role of ICWs in the value loss of diversification, we expect a negative coefficient on *ICW*.

In Panel B of Table 7, we report the estimated results from both univariate and full regressions. Across all six specifications, the coefficient on *ICW* is significantly negative. The coefficient estimates from full regressions indicate that the incremental value loss from diversification for conglomerates with ICWs ranges from 7.02 to 9.65 %. Given that the mean value of diversification discount for our sample firms ranges from 9.76 to 27.63 %, this incremental value loss stemming from deficiencies in ICFR is economically significant. We find some evidence that the diversity among segments has a negative influence on excess value, consistent with Rajan et al. (2000). The estimated results in Panel C of Table 7 demonstrate that the value loss is more pronounced for firms with company-level ICWs.[15]

As stated earlier, time-invariant omitted variables may bias the results from the cross-sectional analysis. We thus undertake a change analysis by focusing on firms with status

[13] We do not impose the sample restriction that firms to be included in diversification discount tests have to be present in the sample for internal capital market analyses because this restriction requires firms to have two consecutive years' data to compute *ICM_Invst* and *ICM_ROA* at year t and *ExValA*, *ExValS*, and *ExValM* at year t + 1. This restriction excludes a large number of valid observations and reduces the sample size substantially.

[14] Berger and Ofek (1995) find that, on average, diversified firms are valued less than matching portfolios of specialized firms by 13 to 15 %. Ammann et al. (2012) report a significant diversification discount of between 5 and 21 % for US nonfinancial firms between 1998 and 2005.

[15] As Hoechle et al. (2012) document that a substantial portion of the diversification discount can be explained away by governance variables, we control for the effects of outside directors, institutional shareholders, analysts, the takeover market, and executive equity incentives. The results (untabulated) indicate that the coefficient on *ICW* remains significant for *ExValA* and *ExValM* but with a smaller magnitude, and negative but insignificant for *ExValS*.

Table 7 Internal control weaknesses and diversification discount for multi-segment firms

Panel A: Univariate analysis

	Means				Medians			
	Full	**ICW**	**Non-ICW**	**t-Stat.**	**Full**	**ICW**	**Non-ICW**	**z-Stat.**
$ExValA_{t+1}$	-0.0979	-0.2203	-0.0845	-3.29	-0.1051	-0.2103	-0.0964	-3.18
$ExValS_{t+1}$	-0.2763	-0.3873	-0.2641	-2.11	-0.2520	-0.3792	-0.2426	-2.44
$ExValM_{t+1}$	-0.0976	-0.2133	-0.0849	-2.82	-0.1082	-0.1869	-0.1027	-2.51

Panel B: Regression analysis

Variable	**Expected**	$ExValA_{t+1}$			$ExValS_{t+1}$		$ExValM_{t+1}$
	Sign	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept	?	-0.0521 (0.183)	-0.3149** (0.013)	-0.2341*** (0.000)	-1.4309*** (0.000)	-0.0562 (0.195)	-0.5003*** (0.001)
ICW_t	**-**	**-0.1425*** (0.001)**	**-0.0965*** (0.007)**	**-0.1353** (0.011)**	**-0.0702* (0.074)**	**-0.1403*** (0.001)**	**-0.0949** (0.015)**
$Size_{t+1}$	?		-0.0362*** (0.001)		0.0413** (0.012)		-0.0315*** (0.009)
$Earnings_{t+1}$	?		0.5846*** (0.001)		0.4612*** (0.000)		0.4981*** (0.005)
$CapitalExp_{t+1}$	?		0.3103*** (0.000)		0.5095*** (0.000)		0.3605*** (0.000)
$Leverage_{t+1}$	?		1.2348*** (0.000)		1.0286*** (0.000)		1.1336*** (0.000)
$Std(Sale)_{t+1}$	?		-0.0001 (0.335)		-0.0006* (0.084)		-0.0001 (0.287)
$Std(CapitalExp)_{t+1}$	?		-0.0654 (0.785)		0.6647** (0.034)		-0.0184 (0.953)
$Dividend_{t+1}$	?		0.0897*** (0.000)		-0.0399 (0.236)		0.0760*** (0.003)
$BondRating_{t+1}$	?		0.0067 (0.809)		-0.0447 (0.268)		0.0294 (0.333)
$SAIndex_{t+1}$	?		-0.0971** (0.048)		-0.2717*** (0.000)		-0.1590*** (0.004)
$ZScore_{t+1}$	?		0.0000*** (0.000)		0.0000*** (0.000)		0.0000*** (0.000)
$NSegment_{t+1}$	-		-0.0172 (0.328)		-0.0199 (0.371)		-0.0132 (0.369)
$SegDiversity_{t+1}$	-		0.0503 (0.163)		0.1865*** (0.004)		0.0644 (0.126)
$SegVariation_{t+1}$	-		-0.1012** (0.011)		-0.1470*** (0.007)		-0.1019** (0.021)

Table 7 (continued)

$ExtrSales_{t+1}$	?	0.1343*** (0.000)		0.1909*** (0.000)		0.1504*** (0.000)
$Restructure_{t+1}$	?	-0.1033*** (0.000)		-0.1854*** (0.000)		-0.1213*** (0.000)
$Loss_{t+1}$	?	-0.1484*** (0.000)		-0.1669*** (0.000)		-0.1638*** (0.000)
$Foreign_{t+1}$	?	-0.0151 (0.504)		0.0029 (0.928)		-0.0050 (0.847)
Age_{t+1}	?	-0.0032** (0.024)		-0.0109*** (0.000)		-0.0057*** (0.001)
$Big4_{t+1}$	?	0.0790** (0.013)		0.0487 (0.261)		0.0447 (0.189)
$M\&A_{t+1}$	?	-0.0042 (0.886)		0.0583 (0.221)		0.0137 (0.681)
Industry Indicators		Yes	Yes	Yes	Yes	Yes	Yes
Year Indicators		Yes	Yes	Yes	Yes	Yes	Yes
R^2		7.93 %	19.69 %	9.64 %	19.30 %	8.23 %	18.05 %
N		2922	2922	2922	2922	2922	2922

Panel C: Nature of internal control weaknesses

Variable	**Expected**	**ExValA$_{t+1}$**		**ExValS$_{t+1}$**		**ExValM$_{t+1}$**	
	Sign	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept	?	-0.0517 (0.187)	-0.3141** (0.013)	-0.2325*** (0.000)	-1.4270*** (0.000)	-0.0556 (0.199)	-0.4989*** (0.001)
$CompanyICW_t$	-	**-0.1505*** (0.002)**	**-0.1006** (0.019)**	**-0.1682*** (0.009)**	**-0.0895* (0.093)**	**-0.1511*** (0.005)**	**-0.1018** (0.032)**
$AccountICW_t$	-	**-0.1242** (0.029)**	**-0.0874* (0.078)**	**-0.0601 (0.258)**	**-0.0276 (0.382)**	**-0.1156** (0.048)**	**-0.0795 (0.116)**
$Size_{t+1}$	?		-0.0362*** (0.001)		0.0414*** (0.007)		-0.0314*** (0.010)
$Earnings_{t+1}$	?		0.5848*** (0.001)		0.4623*** (0.004)		0.4985*** (0.005)
$CapitalExp_{t+1}$	?		0.3105*** (0.000)		0.5107*** (0.000)		0.3609*** (0.000)
$Leverage_{t+1}$	?		1.2356*** (0.000)		1.0326*** (0.001)		1.1351*** (0.000)
$Std(Sale)_{t+1}$	?		-0.0001 (0.336)		-0.0006*** (0.000)		-0.0001 (0.288)
$Std(CapitalExp)_{t+1}$	?		-0.0683 (0.776)		0.6508 (0.149)		-0.0234 (0.940)
$Dividend_{t+1}$	?		0.0897*** (0.000)		-0.0400 (0.227)		0.0759*** (0.003)
$BondRating_{t+1}$	?		0.0067 (0.809)		-0.0448 (0.252)		0.0294 (0.333)

Table 7 (continued)

$SAIndex_{t+1}$	?	-0.0968** (0.048)		-0.2706*** (0.000)		-0.1586*** (0.004)
$ZScore_{t+1}$	?	0.0000*** (0.000)		0.0000*** (0.000)		0.0000*** (0.000)
$NSegment_{t+1}$	-	-0.0174 (0.326)		-0.0210 (0.322)		-0.0136 (0.365)
$SegDiversity_{t-1}$	-	0.0506 (0.162)		0.1877*** (0.006)		0.0649 (0.124)
$SegVariation_{t+1}$	-	-0.1011** (0.011)		-0.1465***(0.009)		-0.1017** (0.021)
$ExtrSales_{t+1}$	?	0.1342*** (0.000)		0.1902*** (0.000)		0.1502*** (0.000)
$Restructure_{t+1}$	?	-0.1033*** (0.000)		-0.1854*** (0.000)		-0.1212*** (0.000)
$Loss_{t+1}$	?	-0.1484*** (0.000)		-0.1668*** (0.000)		-0.1637*** (0.000)
$Foreign_{t+1}$	?	-0.0150 (0.508)		0.0035 (0.914)		-0.0048 (0.854)
Age_{t+1}	?	-0.0032** (0.024)		-0.0109*** (0.000)		-0.0057*** (0.001)
$Big4_{t+1}$	?	0.0786** (0.014)		0.0470 (0.292)		0.0440 (0.196)
$M\&A_{t+1}$	?	-0.0043 (0.885)		0.0580 (0.204)		0.0136 (0.683)
Industry Indicators	Yes	Yes	Yes	Yes	Yes	Yes
Year Indicators	Yes	Yes	Yes	Yes	Yes	Yes
R^2	7.94 %	19.69 %	9.67 %	21.19 %	8.24 %	18.05 %
N	2922	2922	2922	2922	2922	2922

Panel A of the table reports the univariate comparison of the excess value of diversification between ICW and non-ICW multi-segment firms. Panel B lists coefficients (*p*-value) from OLS regressions of diversification discount (*ExValA, ExValS,* and *ExValM*) on an indicator variable of internal control weaknesses (*ICW*), the determinants of internal control weaknesses, and a set of firm characteristics for a sample of multi-segment firms. Panel C lists coefficients (*p*-value) from OLS regressions of diversification discount on two indicator variables indicating company-level and account-level internal control weaknesses (*CompanyICW* and *AccountICW*), the determinants of internal control weaknesses, and a set of firm characteristics for a sample of multi-segment firms. *P*-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Industry fixed effects are based on the Fama and French (1997) 48 industry classification. Variables of interest are in boldface. Variables are as defined in the appendix

Table 8 Internal control weaknesses and diversification discount for multi-segment firms: change analysis

Panel A: Univariate analysis

	Improvement	**Deterioration**	**No Change**	**Dif. t-Stat.**	**Dif. t-Stat.**
	(1)	(2)	(3)	(1) - (3)	(2) - (3)
$\Delta ExValA_{t,t+1}$	0.0858	-0.0763	-0.0212	1.73	-1.71
$\Delta ExValS_{t,t+1}$	0.0307	-0.1215	-0.0550	2.43	-1.49
$\Delta ExValM_{t,t+1}$	0.0591	-0.1164	-0.0376	1.96	-1.79

Panel B: Regression analysis

Variable	**Expected**	**$\Delta ExValA_{t,t+1}$**		**$\Delta ExValS_{t,t+1}$**		**$\Delta ExValM_{t,t+1}$**	
	Sign	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept	?	-0.1790*	-0.2835***	-0.3026**	-0.4083***	-0.2023	-0.2753*
		(0.081)	(0.009)	(0.030)	(0.005)	(0.176)	(0.055)
$NICW\_ICW_{t-1,t}$	-	**-0.0707***	**-0.0874****	**-0.0759***	**-0.0838***	**-0.0913***	**-0.1012****
		(0.073)	**(0.029)**	**(0.092)**	**(0.066)**	**(0.063)**	**(0.040)**
$ICW\_NICW_{t-1,t}$	+	**0.1046*****	**0.0812****	**0.1002****	**0.0773***	**0.1044****	**0.0726***
		(0.008)	**(0.032)**	**(0.028)**	**(0.071)**	**(0.022)**	**(0.083)**
$\Delta size_{t,t+1}$	?		-0.3824***		0.2026		-0.3283*
			(0.003)		(0.212)		(0.059)
$\Delta earnings_{t,t+1}$	?		0.3085*		0.3783*		0.4199**
			(0.069)		(0.061)		(0.044)
$\Delta CapitalExp_{t,t+1}$	?		-0.0716		0.0344		-0.1077
			(0.764)		(0.910)		(0.724)
$\Delta leverage_{t,t+1}$	?		1.0869		0.7166		1.0035
			(0.114)		(0.436)		(0.249)
$\Delta Std(Sale)_{t,t+1}$	?		0.1326		0.0844		0.1355

Table 8 (continued)

		(0.215)	(0.442)	(0.261)
$\Delta Std(CapitalExp)_{t,t+1}$	?	-0.5352	-2.0807	-0.5241
		(0.706)	(0.316)	(0.781)
$\Delta dividend_{t,t+1}$	?	-0.0355	0.1390	0.1608
		(0.725)	(0.280)	(0.263)
$\Delta BondRating_{t,t+1}$	?	-0.0327	-0.0187	0.0240
		(0.658)	(0.849)	(0.780)
$\Delta SAIndex_{t,t+1}$	?	-0.6316	0.0254	-0.0946
		(0.141)	(0.964)	(0.889)
$\Delta ZScore_{t,t+1}$	?	-0.0001	-0.0000	-0.0000
		(0.288)	(0.733)	(0.956)
$\Delta NSegment_{t,t+1}$	-	0.0871*	0.1069*	0.0261
		(0.082)	(0.081)	(0.391)
$\Delta SegDiversity_{t,t+1}$	-	0.1227	0.2491**	-0.0386
		(0.118)	(0.042)	(0.384)
$\Delta SegVariation_{t,t+1}$	-	-0.0843	-0.1863**	-0.1853**
		(0.110)	(0.028)	(0.018)
$\Delta ExtrSales_{t,t+1}$	?	0.1141***	0.0554	0.1309**
		(0.003)	(0.302)	(0.011)
$\Delta restructure_{t,t+1}$	?	-0.0464	-0.0406	-0.0047
		(0.323)	(0.452)	(0.928)
$\Delta loss_{t,t+1}$	?	0.0188	0.0380	0.0593
		(0.677)	(0.463)	(0.275)
$\Delta foreign_{t,t+1}$	?	-0.0712	-0.1379	0.0103
		(0.382)	(0.241)	(0.915)
$\Delta age_{t,t+1}$	?	0.0728**	0.0734**	0.0600

Table 8 (continued)

			(0.014)		(0.039)		(0.104)
$\Delta Big4_{t,t+1}$	?		0.0110		0.0500		0.0495
			(0.909)		(0.613)		(0.568)
$\Delta M\&A_{t,t+1}$	?		-0.0483		-0.0671		-0.0710
			(0.221)		(0.205)		(0.192)
Year Indicators		Yes	Yes	Yes	Yes	Yes	Yes
R^2		4.75 %	13.36 %	4.90 %	12.05 %	4.24 %	11.44 %
N		578	578	578	578	578	578

Panel A of the table reports the changes in diversification discount (*ΔExValA, ΔExValS*, and *ΔExValM*) sorted by status changes in ICFR. Panel B lists coefficients (*p*-value) from OLS regressions of changes in diversification discount on changes in ICFR status (*NICW_ICW* and *ICW_NICW*), changes in the determinants of internal control weaknesses, and changes in a set of firm characteristics for a sample of multi-segment firms with status changes in ICFR during the sample period. Change in ICFR status is calculated between year t-1 and year t, while changes in other variables are calculated as the differences between year t and year t + 1. *P*-values are calculated based on standard errors that are clustered at firm level. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively (one-tailed if there is a sign prediction, two-tailed otherwise). Variables of interest are in boldface. Variables are as defined in the appendix

changes in ICFR during our sample period. As firm value reflects investors' perceptions and investors may adjust their perceptions immediately after observing changes in ICFR, we measure changes in diversification discount from year t to t + 1, with year t being the year of remediation or deterioration. We first report changes in diversification discount sorted by changes in ICFR in Panel A of Table 8 and find that the value loss from diversification is reversed when firms remediate their ICWs and the value loss is aggravated when firms' ICFR deteriorates. To abstract from the effects of other changing firm characteristics, we further conduct a multivariate analysis by estimating a regression model similar to Eq. (2) except that (1) the dependent variable is change in diversification discount (*ΔExValA, ΔExValS,* and *ΔExValM*), (2) changes in dependent variable and control variables are measured from year t to year t + 1, and (3) change in *MTB* is excluded from the regression.

As indicated in Panel B of Table 8, across all six specifications including three univariate regressions and three full regressions, the coefficient on *NICW_ICW* is negative and significant and that on *ICW_NICW* is positive and significant, suggesting that remediation of ICWs leads to increases in excess value of diversification while deterioration in ICFR causes decreases in firm value.[16] This evidence coupled with our earlier findings supports the idea that investors perceive an association between weak internal controls and inefficient internal resource allocations, which causes them to discount the value of conglomerates with ICWs.

While we document a significant impact of ICWs on multi-segment firm value, an ensuing, interesting question is whether this effect is unique to conglomerates or if it is shared by single-segment firms where cross-subsidizations are non-existent. To address this question, we estimate a cross-sectional regression of excess value for all single-segment firms over the same period.[17] In untabulated results, we find a negative and significant coefficient on *ICW.* However, when we conduct change analysis, the coefficients on *NICW_ICW* and *ICW_NICW* are not significant, suggesting that the results from the cross-sectional analysis may be driven by some time-invariant unobservable factors. The overall evidence seems to suggest that the valuation implication of ICFR for single-segment firms is not as unambiguous as for multi-segment firms.

5 Concluding remarks

This study investigates the impact of internal control quality on management decisions in directing corporate resources to various projects within multi-segment firms. We document a negative association between ICWs and the value of internal capital transfer from the cross-sectional analyses. The inter-temporal tests indicate that firms remediating ICWs experience an improvement in internal capital market efficiency, while firms whose ICFR deteriorates

[16] In this regression, firm-years without status change in ICFR serve as benchmark. For robustness check, we also conduct a change analysis for firm-years with ICFR status change. This analysis directly contrasts the impact of deterioration in ICFR with improvement. When we use *ICW_NICW* (improvement) as default, the coefficient on *NICW_ICW* (deterioration) is −0.1820 (t = −3.55) for *ΔExValA*, −0.1742 (t = −2.83) for *ΔExValS,* and −0.1832 (t = −2.85) for *ΔExValM.*

[17] As with multi-segment firms, excess value for single-segment firms is the natural logarithm of the ratio of a firm's actual value to its imputed value estimated as its assets (sales) multiplied by the median multiple of firm value to assets (sales) across all single-segment firms in the same industry. In essence, this measure reflects industry-adjusted firm value.

experience just the opposite, supporting the inferences that ICWs lead to distortionary internal capital reallocations. The adverse impact of ICWs on internal capital transfers mostly concentrates on firms with internal control problems related to the control environment and overall financial reporting process. We further find that the governance role of ICFR in mitigating inefficient internal capital transfers varies with the strength of existing governance controls—that is, poorly governed firms benefit more from maintaining effective internal controls than well-governed firms. Finally, we find that investors perceive the perverse impact of ICWs on internal capital reallocations and discount the value of conglomerates with ICWs. The overall results highlight an important governance role of internal controls in disciplining management as regards directing corporate resources to the best use within the firm.

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Appendix

Table 9 Variable definitions

Variable	Definition
Measures of Internal Capital Market	
ICM_Invst	We follow Rajan et al. (2000) to capture internal transfer efficiency by using the asset-weighted sensitivity of segment investment to segment Q for each firm. We first compute the industry- and firm-adjusted investment for each segment as $\frac{\text{CAPXSeg}_j}{AT_j} - \frac{\text{CAPXSeg}_i^{AA}}{AT_j^{AA}} - \sum_{j-1}^{n} W_j \left(\frac{\text{CAPXSeg}_i}{AT_j} - \frac{\text{CAPXSeg}_i^{AA}}{AT_j^{AA}} \right)$ (3) where CAPXSeg_j is capital expenditure for segment j, AT_j is total assets of segment j, $\frac{\text{CAPXSeg}_j^{AA}}{AT_j^{AA}}$ is the asset-weighted average capital expenditure to assets ratio for single-segment same-industry firms, n is the number of segments in a firm, and W_j is segment j assets divided by firm total assets. We weight this ratio by the difference between the segment's imputed Q and the average imputed Q of all segments in the firm and then we compute the firm-level internal capital transfer efficiency by summing the asset-weighted ratios across all of the firm's segments: $\frac{\sum_{j=1}^{n} AT_j \left(Q_j - Q_a\right) \left(\frac{\text{CAPXSeg}_j}{AT_j} - \frac{\text{CAPXSeg}_j^{AA}}{AT_j^{AA}} - \sum_{j=1}^{n} W_j \left(\frac{\text{CAPXSeg}_j}{AT_j} - \frac{\text{CAPXSeg}_j^{AA}}{AT_j^{AA}} \right) \right)}{AT}$, (4) where Q_j is the segment imputed Q, which is the asset-weighted average Q of same-industry single-segment firms (single-segment Q is estimated as total assets plus market value of equity less book value of equity divided by total assets), and Q_a is the asset-weighted average of segment imputed Qs for the firm. The efficient transfer occurs when high Q segments invest more than average and low Q segments invest less than the average segment in the firm.
ICM_ROA	We follow Billett and Mauer (2003) to capture the efficiency of internal transfers as follows: We first compute the exchange of resources within a multi-segment firm based on the difference between a segment's cash flow and its capital expenditure. A segment i is assumed to have received a subsidy, *SUBSIDY*$_i$, defined as Max [CAPXSeg_i - CFSeg_i, 0], if there is a positive difference between the segment's

Table 9 (continued)

Variable	Definition
	capital expenditure ($CAPXSeg_i$) and its own cash flow ($CFSeg_i$). Alternatively, a segment i is assumed to have potential funds available for transfer-out, $PTRANSFER_i$, computed as Max [$CFSeg_i - CAPXSeg_i$, 0], if its cash flow exceeds its capital expenditure. The segment's cash flow is calculated as $CFSeg_i = EBIT_i - Int_i - Tax_i + Dep_i$. Earnings before interest and tax ($EBIT_i$) and deprecation (Dep_i) are obtained directly from the CIS file. Interest and tax expenses for segments are not directly available in the CIS file, and we allocate to the segments a share of the firm's actual interest and tax expenses based on segment sales. Since the actual funds transfer out of segment i cannot exceed the total funds available to transfer and the total amount of subsidies received, we define segment i's transfer, $TRANSFER_i$, as the minimum of its potential transfer and its weighted share of total internal capital market subsidies and compute it as $$\text{TRANSFERi} = \text{Min}\left[\text{PTRANSFER}_i, \text{PTRANSFER}_i \times \frac{\sum_{i=1}^{n} \text{SUBSIDY}_i}{\sum_{i=1}^{n} \text{PTRANSFER}_i}\right]., \quad (5)$$ where n is the number of segments in a firm. We then separate the transfers and subsidies into inefficient and efficient transfers and subsidies by comparing the segment return on assets (ROA is the ratio of earnings before interest, taxes, and depreciation to total assets) with the asset-weighted average ROA of the remaining segments in the firm. A transfer out of a segment i is deemed inefficient (efficient) if the segment ROAi is greater (less) than the asset-weighted average ROA of the remaining segments, RAvgROAi, while a subsidy is considered inefficient (efficient) if the segment receiving the subsidy has lower (higher) ROA than RAvgROAi. The value of inefficient (efficient) transfer and subsidy is the relative efficiency-weighted transfer and subsidy and is stated mathematically as follows: $$ITRANSFER_i = (ROA_i - RAvgROA_i) * TRANSFER_i * INEFFICIENT_i, \quad (6)$$ $$ETRANSFER_i = (RAvgROA_i - ROA_i) * TRANSFER_i * EFFICIENT_i, \quad (7)$$ $$ISUBSIDY_i = (RAvgROA_i - ROA_i) * SUBSIDY_i * INEFFICIENT_i, \quad (8)$$ $$ESUBSIDY_i = (ROA_i - RAvgROA_i) * SUBSIDY_i * EFFICIENT_i, \quad (9)$$ where $INEFFICIENT_i$ ($EFFICIENT_i$) is an indicator variable that equals 1 if the transfer or subsidy is deemed inefficient (efficient) and 0 otherwise. The final step is the construction of the firm-level value of internal capital transfers. The value of firm-level inefficient transfers (*ITRANSFER*), efficient transfers (*ETRANSFER*), inefficient subsidy (*ISUBSIDY*), and efficient subsidy (*ESUBSIDY*) is estimated as the sum of the value of all segments' inefficient and efficient transfers and subsidies in the firm scaled by total assets. The difference between the sum of efficient transfers and subsidies and the sum of inefficient transfers and subsidies is the value of internal capital transfers.
Measures of Excess Value of Diversification	
ExValA	Excess value estimated as the natural logarithm of the ratio of a firm's actual value to its implied value. Actual firm value (MV) equals the sum of the market value of equity (Data25 * Data199) and the book value of debt (Data9 + Data34). The imputed value for each segment is calculated by multiplying the segment's assets by the median ratio of market value to assets (asset multiplier) for single-segment firms in the same industry. The industry median ratios are based on the narrowest NAICS grouping

Table 9 (continued)

Variable	Definition
	that includes at least five single-segment firms with total sales of at least $20 million. Imputed values are summed across segments for an estimate of implied firm value.
ExValS	Excess value calculated using sales multiplier. The procedure is the same as in *ExValA*.
ExValM	Excess value calculated using both sales and asset multiplier. Imputed values for each segment are calculated based on both sales and asset multiplier, and the one with the lower industry standard deviation is chosen. The procedure is the same as in *ExValA*.
Measures of Internal Control Quality	
ICW	An indicator variable equal to 1 if the firm discloses material weaknesses under Section 404 or Section 302 in year t, and 0 otherwise.
CompanyICW	An indicator variable equal to 1 if the firm discloses company-level ICWs, and 0 otherwise.
AccountICW	An indicator variable equal to 1 if the firms discloses ICWs other than company-level ICWs, and 0 otherwise.
NICW_ICW	An indicator variable equal to 1 if the firm discloses effective ICFR in year t-1 and ineffective ICFR in year t, and 0 otherwise.
ICW_NICW	An indicator variable equal to 1 if the firm discloses ineffective ICFR in year t-1 and effective ICFR in year t, and 0 otherwise.
Determinants of Internal Control Weaknesses	
ExtrSales	An indicator variable equal to 1 if the firm industry-adjusted sales growth (Data12) falls into the top quintile, and 0 otherwise.
Restructure	An indicator variable equal to 1 if the firm has a non-zero restructuring charge (Data376) in year t, and 0 otherwise.
Loss	An indicator variable equal to 1 if the sum of net income before extraordinary items (Data123) for years t and t-1 is less than 0, and 0 otherwise.
Foreign	An indicator variable equal to 1 if the firm has a non-zero foreign currency translation (Data150) in year t, and 0 otherwise.
Age	Number of years since the firm appears in Compustat database.
Big4	An indicator variable equal to 1 if the firm engages one of the Big Four accounting firms as auditor, and 0 otherwise.
M&A	An indicator variable equal to 1 if the firm has merger and acquisitions in year t, and 0 otherwise.
Control Variables	
NSegment	The number of segments.
SegDiversity	The standard deviation of a firm's asset-weighted fitted Q divided by the equally weighted average fitted Q. To calculate fitted Q, for each segment, we take all single-segment same-industry firms and estimate the following regression each year: $Q_{jt} = \beta_0 + \beta_1 SIZE_{jt} + \beta_2 CFA_{jt} + \beta_3 TO_{jt} + \varepsilon_{jt}$, where Q_{jt} is the market-to-book ratio of single-segment firm j in the same industry in year t; $SIZE_{jt}$ is the logarithm of total assets; CFA_{jt} is the ratio of earnings before interest, taxes, and depreciation to total assets; and TO_{jt} is the ratio of sales to total assets. We then apply the estimated regression parameters to the segment's SIZE, CFA, and TO to fit a Q for each segment.
SegVariation	Coefficient of variation of segment Q, estimated as the standard deviation of segment fitted Q divided by the mean of segment fitted Q.

Table 9 (continued)

Variable	Definition
SizeAT	The natural logarithm of total assets (Data6).
Earnings	EBIT estimated as earnings before extraordinary items (Data18) plus interests (Data15) plus item taxes (Data16) scaled by sales (Data12).
CapitalExp	Capital expenditure (Data128) scaled by sales (Data12).
Leverage	Total debt (Data9 + Data34) scaled by total assets (Data6).
MTB	Market-to-book ratio estimated as total assets (Data6) less book value of equity (Data60) plus market value of equity (Data25 * Data199) divided by total assets (Data6).
Std(Sale)	The standard deviation of sales (Data12) for the past five years.
Std(CapitalExp)	The standard deviation of capital expenditure for the past five years.
Dividend	An indicator variable equal to 1 for dividend payers, and 0 for non-dividend payers.
BondRating	An indicator variable equal to 0 if a firm has no bond rating but reports a positive amount of debt, and 1 otherwise.
SAIndex	Hadlock and Pierce (2010) financial constraint index estimated as −0.737 * ln(total assets) + 0.043 * (ln(total asset))^2–0.040 * age.
ZScore	Altman (1968) Z-Score estimated as 1.2 * (working capital/total assets) + 1.4 * (retained earnings/total assets) + 3.3 * (EBIT/total assets) + 0.6 * (market value of equity/total liabilities) + 0.99 * (sales/total assets).
Governance variables	
OutDirPtg	The percentage of outside directors on boards.
InstitutionSharePtg	The percentage of institutional shareholdings.
Analyst	The number of analysts following a firm in year t.
EIndex	Antitakeover index estimated as 6 less Bebchuk et al. (2009) six-provision index.
OptionDelta	Option *delta* measured as the dollar change in the value of an executive's options that would come from a one-percentage-point increase in the company stock price, e.g., 0.01 * share price * options delta * number of options.
OutDirMis	An indicator variable equal to 1 if the variable of OutDirPtg is missing, and 0 otherwise.
InstitutionMis	An indicator variable equal to 1 if the variable of InstitutionSharePtg is missing, and 0 otherwise.
EIndexMis	An indicator variable equal to 1 if the variable of EIndex is missing, and 0 otherwise.
DeltaMis	An indicator variable equal to 1 if the variable OptionDelta is missing, and 0 otherwise.

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