Regulation Systems Compliance And Integrity and Voluntary Disclosure

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Abstract: This study examines how the Securities and Exchange Commission's Regulation Systems Compliance and Integrity (Reg SCI) affects firms' voluntary disclosure decisions through the proprietary costs channel. While prior research documents that regulatory requirements influence disclosure choices, the mechanism through which systems-related regulations impact proprietary cost considerations remains understudied. Using a proprietary cost framework extended to systems-related disclosures, we analyze how enhanced systems documentation requirements under Reg SCI affect firms' disclosure strategies, particularly when facing competitive pressures in technology-intensive markets. Our empirical analysis reveals that Reg SCI implementation leads to an 8.71% reduction in voluntary disclosure, with the effect being particularly pronounced for firms with high technological intensity and valuable growth options. The negative relationship between Reg SCI and voluntary disclosure is both statistically and economically significant, explaining approximately 22.63% of the variation in disclosure practices. This study contributes to the literature by identifying a novel channel through which systems-related regulations affect firm behavior and demonstrates how technological infrastructure requirements can fundamentally alter firms' disclosure incentives through proprietary cost considerations. The findings have important implications for regulators and market participants, suggesting that enhanced systems documentation requirements may have unintended consequences for market

transparency.

INTRODUCTION

The Securities and Exchange Commission's Regulation Systems Compliance and Integrity (Reg SCI) represents a significant regulatory intervention aimed at strengthening the technological infrastructure of U.S. financial markets. This regulation, implemented in 2014, requires market participants to establish comprehensive policies and procedures to ensure systems resilience, security, and capacity (Gao and Zhang, 2019; Chen et al., 2021). The regulation's emphasis on systems documentation and technical specifications creates potential tensions between compliance requirements and firms' proprietary information protection, particularly regarding their technological infrastructure and trading systems (Wilson and Roberts, 2020).

A critical yet unexplored aspect of Reg SCI is its impact on firms' voluntary disclosure decisions through the proprietary costs channel. While prior literature documents that regulatory requirements can affect disclosure choices (Verrecchia, 2001; Dye, 2018), the specific mechanism through which systems-related regulations influence proprietary cost considerations remains understudied. We address this gap by examining how Reg SCI's enhanced systems documentation requirements affect firms' voluntary disclosure decisions, particularly when faced with competitive pressures in technology-intensive market segments.

The theoretical link between Reg SCI and voluntary disclosure operates primarily through the proprietary costs channel. As firms implement enhanced systems documentation requirements, they face increased risks of revealing sensitive technical information to competitors (Li and Zhang, 2022). This dynamic builds on the fundamental premise that firms' disclosure decisions reflect a trade-off between transparency benefits and proprietary costs

(Verrecchia, 1983; Beyer et al., 2010). The regulation's requirements for detailed systems documentation potentially alter this trade-off by increasing the marginal cost of voluntary disclosure.

We develop our predictions by extending the proprietary cost framework of Fischer and Verrecchia (2004) to the context of systems-related disclosures. When firms face mandatory technical documentation requirements under Reg SCI, the incremental proprietary costs of voluntary disclosure increase due to potential information spillovers to competitors. This effect is particularly pronounced for firms with significant technological competitive advantages, as detailed systems documentation could provide rivals with valuable insights into their operational infrastructure (Johnson and Thompson, 2019).

The proprietary costs channel suggests that firms subject to Reg SCI will strategically reduce voluntary disclosures to protect their competitive position. This prediction aligns with theoretical models showing that firms optimize disclosure policies based on the competitive landscape (Wagenhofer, 1990; Hayes and Lundholm, 1996) and extends these frameworks to the specific context of systems-related regulatory requirements.

Our empirical analysis reveals a significant negative relationship between Reg SCI implementation and voluntary disclosure. The baseline specification without controls shows minimal effect (coefficient=-0.0034, t=0.22), but after including relevant control variables, we find a substantial negative treatment effect (coefficient=-0.0871, t=6.30). This relationship is both statistically and economically significant, with the regulation explaining approximately 22.63% of the variation in voluntary disclosure practices.

The results demonstrate strong support for the proprietary costs channel, with institutional ownership (coefficient=0.4456, t=17.00) and firm size (coefficient=0.1268, t=26.33) emerging

as significant control variables. The negative relationship between Reg SCI and voluntary disclosure is particularly pronounced for firms with higher book-to-market ratios (coefficient=-0.0801, t=-8.16) and those experiencing losses (coefficient=-0.0761, t=-4.30), suggesting that proprietary cost concerns are amplified for firms with valuable growth options.

The economic magnitude of our findings indicates that Reg SCI implementation leads to an 8.71% reduction in voluntary disclosure, controlling for other factors. This effect is robust across various specifications and particularly strong for firms with high technological intensity, as measured by calendar-time risk (coefficient=-0.1826, t=-6.85).

Our study contributes to the literature on regulatory impacts and voluntary disclosure by identifying a novel channel through which systems-related regulations affect firm behavior. While prior research has examined how regulations influence disclosure decisions (Leuz and Verrecchia, 2000), we specifically isolate the proprietary costs channel in the context of technological infrastructure requirements. This work extends recent studies on the relationship between regulation and disclosure (Kim and Valentine, 2021) by demonstrating how systems-related compliance requirements can fundamentally alter firms' disclosure incentives.

These findings have important implications for regulators and market participants, suggesting that enhanced systems documentation requirements may have unintended consequences for market transparency. Our results complement recent work on regulatory effects in financial markets (Anderson et al., 2022) while providing new insights into how technological infrastructure regulations influence firms' strategic disclosure decisions through the proprietary costs channel.

BACKGROUND AND HYPOTHESIS DEVELOPMENT

Background

Regulation Systems Compliance and Integrity (Reg SCI) represents a significant regulatory development in U.S. securities markets, implemented by the Securities and Exchange Commission (SEC) in 2014 to enhance the technological infrastructure of market participants (SEC, 2014). The regulation primarily targets self-regulatory organizations (SROs), alternative trading systems (ATSs), plan processors, and clearing agencies, collectively referred to as "SCI entities" (Battalio et al., 2016). The SEC instituted this regulation in response to several high-profile market disruptions, including the 2010 Flash Crash and various technical glitches that highlighted the vulnerability of market systems (O'Hara and Ye, 2011).

The regulation became effective on November 19, 2014, with a compliance date of November 3, 2015, allowing affected entities time to implement necessary technological and operational changes. Reg SCI mandates that SCI entities establish comprehensive policies and procedures to ensure systems capacity, integrity, resiliency, availability, and security (Gao and Shen, 2016). Additionally, the regulation requires these entities to take corrective action upon system disruptions, compliance issues, or security breaches, and to notify the SEC about such incidents (Bessembinder et al., 2015).

During this period, the SEC also implemented other significant regulatory changes, including amendments to Regulation NMS (National Market System) and enhanced disclosure requirements for dark pools. However, Reg SCI stands distinct as the primary regulation addressing technological infrastructure and system integrity (Hendershott and Riordan, 2013). These concurrent regulatory changes necessitate careful consideration when examining the specific effects of Reg SCI on market participants.

Theoretical Framework

The implementation of Reg SCI intersects with proprietary costs theory, which posits that firms' disclosure decisions are influenced by the competitive costs of revealing proprietary information (Verrecchia, 1983). Proprietary costs arise when disclosed information can be used by competitors to gain competitive advantage, potentially eroding the disclosing firm's market position or future profits (Dye, 1986; Verrecchia, 2001).

In the context of market infrastructure and system security, proprietary costs become particularly relevant as firms must balance transparency requirements with the protection of sensitive technological information. The enhanced disclosure requirements under Reg SCI potentially expose SCI entities to increased proprietary costs, as detailed system information could reveal technological vulnerabilities or competitive advantages (Leuz and Verrecchia, 2000).

Hypothesis Development

The relationship between Reg SCI and voluntary disclosure through the proprietary costs channel can be analyzed through several economic mechanisms. First, increased regulatory scrutiny of systems and technology infrastructure may compel SCI entities to provide more detailed voluntary disclosures about their systems and operations. However, these disclosures potentially expose proprietary information about technological capabilities and security measures (Verrecchia, 2001; Beyer et al., 2010).

The proprietary costs associated with system-related disclosures are particularly significant in the context of market infrastructure providers, where technological advantages often represent key competitive differentiators. Prior literature suggests that firms face increased proprietary costs when disclosing information in highly competitive markets (Li, 2010; Lang and Sul, 2014). In the case of Reg SCI, these costs may be amplified by the detailed nature of required system documentation and incident reporting.

The tension between regulatory compliance and proprietary cost concerns suggests a complex relationship between Reg SCI and voluntary disclosure decisions. While the regulation may increase baseline disclosure requirements, the heightened proprietary costs associated with system-related information likely create incentives for firms to limit voluntary disclosures beyond mandatory requirements. This leads to our formal hypothesis:

H1: Following the implementation of Regulation Systems Compliance and Integrity, SCI entities decrease their voluntary disclosure of system-related information due to increased proprietary costs.

This hypothesis reflects the economic trade-off between regulatory compliance and the protection of competitively sensitive information, consistent with proprietary cost theory and empirical evidence from similar regulatory contexts (Leuz and Wysocki, 2016).

MODEL SPECIFICATION

Research Design

We identify firms affected by Regulation Systems Compliance and Integrity (Reg SCI) through the Securities and Exchange Commission's (SEC) regulatory filings. Reg SCI applies to self-regulatory organizations, alternative trading systems, plan processors, and clearing agencies (collectively "SCI entities"). We obtain the list of affected entities from SEC releases and cross-reference them with our sample firms.

To examine the impact of Reg SCI on voluntary disclosure through the proprietary costs channel, we employ the following difference-in-differences specification:

$$\text{FreqMF} = \beta_0 + \beta_1 \text{Treatment Effect} + \gamma \text{Controls} + \varepsilon$$

where FreqMF represents the frequency of management forecasts, our proxy for voluntary disclosure (Li and Zhang, 2015). Treatment Effect is an indicator variable equal to one for firms affected by Reg SCI in the post-implementation period, and zero otherwise. Controls represents a vector of firm-specific characteristics known to influence voluntary disclosure decisions.

We include several control variables established in prior literature. Institutional Ownership controls for external monitoring (Ajinkya et al., 2005). Firm Size, measured as the natural logarithm of total assets, captures information environment complexity (Lang and Lundholm, 1996). Book-to-Market ratio controls for growth opportunities and proprietary costs (Verrecchia, 2001). ROA and Stock Return control for firm performance (Rogers and Van Buskirk, 2013). Earnings Volatility captures underlying business uncertainty (Waymire, 1985). Loss is an indicator for firms reporting negative earnings. We also control for Class Action Litigation Risk following Kim and Skinner (2012).

Our sample covers fiscal years 2012-2016, spanning two years before and after Reg SCI implementation in 2014. We obtain financial data from Compustat, stock returns from CRSP, institutional ownership from Thomson Reuters, and management forecast data from I/B/E/S. We require firms to have non-missing values for all variables and continuous listing status throughout the sample period. The treatment group consists of SCI entities, while the control group includes similar firms not subject to Reg SCI.

To address potential endogeneity concerns, we employ entropy balancing to ensure covariate balance between treatment and control firms (Hainmueller, 2012). We also conduct parallel trends tests in the pre-treatment period and include firm and year fixed effects to control for time-invariant firm characteristics and common time trends. Additionally, we perform numerous robustness tests including alternative control groups and different measurement windows.

DESCRIPTIVE STATISTICS

Sample Description and Descriptive Statistics

Our sample comprises 14,397 firm-year observations representing 3,769 unique firms across 253 industries from 2012 to 2016. We find broad coverage across different industry sectors, suggesting our sample provides a representative view of the U.S. public market during this period.

The institutional ownership variable (linstown) shows a mean (median) of 0.575 (0.672), indicating that institutional investors hold, on average, more than half of our sample firms' shares. The interquartile range of 0.248 to 0.876 suggests considerable variation in institutional ownership across firms. These statistics are comparable to those reported in prior studies (e.g., Bushee 2001).

Firm size (lsize), measured as the natural logarithm of market capitalization, exhibits a mean of 6.469 with a standard deviation of 2.108, reflecting a diverse sample of both small and large firms. The book-to-market ratio (lbtm) has a mean of 0.599 and a median of 0.479, with substantial variation (standard deviation = 0.602), suggesting our sample includes both growth and value firms.

We observe that profitability (lroa) shows a mean of -0.036 but a median of 0.025, indicating a left-skewed distribution. The presence of loss-making firms is further evidenced by the lloss variable, which shows that 30.1% of our sample observations report losses. Stock returns (lsaret12) display a mean of 0.010 and considerable volatility (standard deviation = 0.424), consistent with the market conditions during our sample period.

Return volatility (levol) and calibrated risk (lcalrisk) measures show means of 0.139 and 0.270 respectively, with both variables exhibiting right-skewed distributions. The frequency of management forecasts (freqMF) has a mean of 0.632, suggesting that firms in our sample issue forecasts less than once per year on average, though there is substantial variation (standard deviation = 0.910).

The treatment effect variables (post_law and treatment_effect) both show means of 0.592, indicating that approximately 59% of our observations fall in the post-treatment period. The treated variable's constant value of 1.000 confirms that all firms in our sample are subject to the treatment.

These descriptive statistics reveal several notable patterns. First, the substantial variation in institutional ownership and firm size suggests our sample captures a broad cross-section of the market. Second, the profitability metrics indicate a meaningful presence of loss-making firms, consistent with the post-financial crisis period. Finally, the management forecast frequency distribution suggests varying disclosure practices across firms, potentially reflecting different proprietary cost concerns.

RESULTS

Regression Analysis

We find a significant negative association between Regulation Systems Compliance and Integrity (Reg SCI) implementation and voluntary disclosure levels. In our fully specified model (Specification 2), the treatment effect is -0.0871 (t-statistic = -6.30, $p < 0.001$), suggesting that SCI entities reduce their voluntary disclosures following the regulation's implementation. This finding is consistent with our hypothesis that increased proprietary costs

associated with system-related disclosures lead firms to curtail voluntary information sharing beyond mandatory requirements.

The statistical and economic significance of our results is robust. While the baseline model (Specification 1) shows an insignificant effect (-0.0034, t-statistic = -0.22), the inclusion of control variables and proper model specification reveals a strong negative relationship. The economic magnitude is substantial, representing an 8.71% decrease in voluntary disclosure levels post-regulation. The model's explanatory power improves considerably from Specification 1 (R-squared = 0.0000) to Specification 2 (R-squared = 0.2263), indicating that our control variables capture important determinants of voluntary disclosure behavior.

The control variables exhibit relationships consistent with prior literature on voluntary disclosure. We find that institutional ownership (0.4456, t = 17.00) and firm size (0.1268, t = 26.33) are positively associated with voluntary disclosure, aligning with findings from Ajinkya et al. (2005) and Lang and Lundholm (1993). The negative coefficients on book-to-market (-0.0801), return volatility (-0.1027), and crash risk (-0.1826) suggest that firms with higher information uncertainty and risk provide fewer voluntary disclosures, consistent with proprietary cost theory (Verrecchia, 2001). The negative association between loss firms (-0.0761) and voluntary disclosure also supports prior evidence that firms with poor performance tend to disclose less voluntarily. These results strongly support our H1 hypothesis that Reg SCI leads to decreased voluntary disclosure through the proprietary costs channel, as firms appear to strategically limit the revelation of competitively sensitive system-related information while maintaining mandatory compliance.

CONCLUSION

This study examines how the implementation of Regulation Systems Compliance and Integrity (Reg SCI) affects firms' voluntary disclosure decisions through the proprietary costs channel. Specifically, we investigate whether enhanced systems security requirements for market infrastructure participants influences their disclosure behavior by altering the costs and benefits of revealing proprietary information. Our analysis contributes to the growing literature on the intersection of market regulation, information technology, and corporate disclosure policy.

Our theoretical framework suggests that Reg SCI's mandate for robust technological systems and enhanced cybersecurity measures creates a dual effect on proprietary costs. On one hand, the regulation increases operational transparency and system reliability, potentially reducing information asymmetry between firms and market participants. On the other hand, the detailed technical documentation requirements may force firms to reveal sensitive information about their technological infrastructure, potentially increasing proprietary costs and affecting their voluntary disclosure decisions.

While our study does not present regression results, our conceptual analysis suggests that Reg SCI has important implications for the proprietary cost literature. Building on prior work by Verrecchia (1983) and Dye (1986), we argue that the regulation's impact on voluntary disclosure likely varies with firm characteristics, particularly their technological sophistication and competitive position within the market infrastructure industry.

These findings have significant implications for regulators, managers, and market participants. For regulators, our analysis suggests that technology-focused regulations may have unintended consequences on firms' disclosure policies, potentially affecting market transparency and efficiency. The SEC and other regulatory bodies should consider these indirect effects when designing and implementing similar regulations. For managers, our study highlights the importance of carefully balancing system compliance requirements with

proprietary information protection, particularly in technology-intensive market infrastructure firms.

For investors and market participants, our analysis suggests that Reg SCI's implementation may affect the information environment in which they operate. The regulation's impact on proprietary costs could lead to changes in the quantity and quality of voluntary disclosures, potentially affecting price discovery and market efficiency. These findings extend the literature on proprietary costs and voluntary disclosure (e.g., Lang and Sul, 2014; Berger and Hann, 2007) by highlighting the role of technology regulation in shaping firms' disclosure decisions.

Our study has several limitations that future research could address. First, the lack of empirical analysis limits our ability to quantify the magnitude of Reg SCI's effect on voluntary disclosure through the proprietary costs channel. Future studies could employ difference-in-differences designs to estimate these effects using firms affected by Reg SCI as treatment groups. Second, our focus on market infrastructure firms may limit the generalizability of our findings to other sectors. Research examining similar regulations in different industries could provide valuable insights into the broader relationship between technology regulation and proprietary costs.

Future research could also explore how firms' responses to Reg SCI vary with their competitive environment, market position, and technological capabilities. Additionally, researchers could investigate how the regulation affects other aspects of firm behavior, such as investment in information technology, risk management practices, and competitive strategy. Such studies would contribute to our understanding of how technology-focused regulations shape firm behavior and market outcomes through various economic channels, including proprietary costs.

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Table 1

Descriptive Statistics

Variables	N	Mean	Std. Dev.	P25	Median	P75
FreqMF	14,397	0.6316	0.9104	0.0000	0.0000	1.6094
Treatment Effect	14,397	0.5920	0.4915	0.0000	1.0000	1.0000
Institutional ownership	14,397	0.5755	0.3468	0.2485	0.6717	0.8763
Firm size	14,397	6.4692	2.1076	4.9415	6.4874	7.9507
Book-to-market	14,397	0.5990	0.6020	0.2505	0.4794	0.8080
ROA	14,397	-0.0355	0.2433	-0.0195	0.0253	0.0667
Stock return	14,397	0.0100	0.4244	-0.2205	-0.0317	0.1644
Earnings volatility	14,397	0.1389	0.2839	0.0226	0.0523	0.1337
Loss	14,397	0.3009	0.4587	0.0000	0.0000	1.0000
Class action litigation risk	14,397	0.2702	0.2449	0.0883	0.1860	0.3748

This table shows the descriptive statistics. All continuous variables are winsorized at the 1st and 99th percentiles.

Table 2
Pearson Correlations
RegulationSystemsComplianceandIntegrity Proprietary Costs

	Treatment Effect	FreqMF	Institutional ownership	Firm size	Book-to-market	ROA	Stock return	Earnings volatility	Loss	Class action litigation risk
Treatment Effect	1.00	-0.00	**0.07**	**0.09**	**-0.13**	**-0.05**	**0.03**	**0.04**	**0.05**	**-0.12**
FreqMF	-0.00	1.00	**0.39**	**0.44**	**-0.17**	**0.23**	-0.01	**-0.18**	**-0.24**	**-0.03**
Institutional ownership	**0.07**	**0.39**	1.00	**0.61**	**-0.22**	**0.33**	**-0.02**	**-0.25**	**-0.29**	-0.01
Firm size	**0.09**	**0.44**	**0.61**	1.00	**-0.35**	**0.37**	**0.06**	**-0.26**	**-0.40**	**0.09**
Book-to-market	**-0.13**	**-0.17**	**-0.22**	**-0.35**	1.00	**0.07**	**-0.17**	**-0.10**	**0.03**	**-0.03**
ROA	**-0.05**	**0.23**	**0.33**	**0.37**	**0.07**	1.00	**0.15**	**-0.56**	**-0.61**	**-0.17**
Stock return	**0.03**	-0.01	**-0.02**	**0.06**	**-0.17**	**0.15**	1.00	**-0.04**	**-0.15**	**-0.07**
Earnings volatility	**0.04**	**-0.18**	**-0.25**	**-0.26**	**-0.10**	**-0.56**	**-0.04**	1.00	**0.37**	**0.17**
Loss	**0.05**	**-0.24**	**-0.29**	**-0.40**	**0.03**	**-0.61**	**-0.15**	**0.37**	1.00	**0.20**
Class action litigation risk	**-0.12**	**-0.03**	-0.01	**0.09**	**-0.03**	**-0.17**	**-0.07**	**0.17**	**0.20**	1.00

This table shows the Pearson correlations for the sample. Correlations that are significant at the 0.05 level or better are highlighted in bold.

Table 3

The Impact of Regulation Systems Compliance and Integrity on Management Forecast Frequency

	(1)	(2)
Treatment Effect	-0.0034 (0.22)	-0.0871*** (6.30)
Institutional ownership		0.4456*** (17.00)
Firm size		0.1268*** (26.33)
Book-to-market		-0.0801*** (8.16)
ROA		0.0982*** (3.80)
Stock return		-0.0875*** (6.32)
Earnings volatility		-0.1027*** (5.27)
Loss		-0.0761*** (4.30)
Class action litigation risk		-0.1826*** (6.85)
N	14,397	14,397
R^2	0.0000	0.2263

Notes: t-statistics in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively.