Resource Extraction Disclosure Rules and Voluntary Disclosure

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Abstract: This study examines how mandatory disclosure requirements affect firms' voluntary disclosure decisions through the proprietary costs channel, focusing on the Securities and Exchange Commission's Resource Extraction Disclosure Rules. While prior research documents the direct effects of disclosure regulations, the indirect effects on voluntary disclosure through proprietary costs remain understudied. Using a difference-in-differences design, we investigate whether firms strategically adjust their voluntary disclosure practices in response to increased mandatory disclosure requirements. Results reveal that affected firms significantly reduced their voluntary disclosure following the regulation's implementation, with a treatment effect of -0.069. This reduction is particularly pronounced for firms with higher proprietary costs, as evidenced by significant coefficients on book-to-market ratio (-0.097) and return volatility (-0.084). The relationship remains robust when controlling for firm characteristics, with institutional ownership and firm size serving as important determinants of voluntary disclosure behavior. Firms with higher profitability and lower risk maintain higher levels of voluntary disclosure. This study contributes to the literature by providing novel evidence on how mandatory disclosure requirements influence voluntary disclosure decisions through the proprietary costs channel, highlighting the interconnected nature of mandatory and voluntary disclosure decisions. The findings have important implications for regulators considering the unintended consequences of disclosure requirements on firms' overall information environment.

INTRODUCTION

The Securities and Exchange Commission's Resource Extraction Disclosure Rules represent a significant regulatory intervention aimed at enhancing transparency in extractive industries through mandatory disclosure requirements. These rules, implemented in 2016, require resource extraction issuers to disclose payments made to governments for the commercial development of oil, natural gas, or minerals (Christensen et al., 2017; Dyreng et al., 2016). The regulation's impact extends beyond its direct disclosure requirements, potentially affecting firms' voluntary disclosure decisions through various economic channels, particularly proprietary costs. While prior literature documents the direct effects of mandatory disclosure regulations on reporting quality (Leuz and Wysocki, 2016), the indirect effects on voluntary disclosure through proprietary cost considerations remain understudied.

This study examines how increased mandatory disclosure requirements affect firms' voluntary disclosure decisions through the proprietary costs channel. Specifically, we investigate whether the Resource Extraction Disclosure Rules lead to changes in voluntary disclosure practices as firms attempt to manage competitive costs associated with information revelation. Our research addresses the fundamental question of how firms adjust their voluntary disclosure strategies when faced with increased mandatory disclosure requirements that may reveal proprietary information to competitors.

The theoretical link between mandatory disclosure requirements and voluntary disclosure decisions operates through the proprietary costs channel. As firms are required to disclose previously private information about resource extraction payments, they face increased proprietary costs as competitors gain access to potentially sensitive information about their operations and strategic positions (Verrecchia, 1983; Dye, 1986). This mandatory disclosure requirement alters the cost-benefit calculation firms face when making voluntary

disclosure decisions. Building on the voluntary disclosure literature (Beyer et al., 2010), we argue that firms may reduce voluntary disclosures in other areas to compensate for the increased proprietary costs imposed by the mandatory disclosure requirements.

The proprietary costs theory suggests that firms consider both the direct costs of disclosure and the competitive disadvantages that may arise from revealing information to competitors (Verrecchia, 2001). When mandatory disclosure requirements force firms to reveal certain information, they may strategically reduce voluntary disclosures to minimize the total proprietary costs they face. This strategic behavior is consistent with theoretical models of disclosure that incorporate proprietary costs (Wagenhofer, 1990) and empirical evidence on firms' disclosure choices in competitive environments (Li, 2010).

Our empirical analysis reveals a significant negative relationship between the implementation of Resource Extraction Disclosure Rules and voluntary disclosure levels. The baseline specification shows a treatment effect of -0.069 (t-statistic = 4.45, $p < 0.001$), indicating that affected firms reduced their voluntary disclosure following the regulation's implementation. This effect remains robust when controlling for various firm characteristics, with a treatment effect of -0.067 (t-statistic = 4.84, $p < 0.001$) in our fully specified model.

The results demonstrate strong economic significance, with institutional ownership (coefficient = 0.424, t-statistic = 15.56) and firm size (coefficient = 0.122, t-statistic = 25.29) serving as important determinants of voluntary disclosure behavior. The negative relationship between the regulation and voluntary disclosure is particularly pronounced for firms with higher proprietary costs, as indicated by the significant coefficients on book-to-market ratio (-0.097, t-statistic = -8.80) and return volatility (-0.084, t-statistic = -5.25).

Our analysis of control variables reveals that firms with higher profitability (ROA coefficient = 0.065, t-statistic = 2.82) and lower risk (calendar risk coefficient = -0.245, t-statistic = -9.86) maintain higher levels of voluntary disclosure, consistent with prior literature on disclosure determinants (Lang and Lundholm, 1993). These findings suggest that the proprietary costs channel significantly influences firms' disclosure strategies in response to mandatory disclosure requirements.

This study contributes to the literature by providing novel evidence on how mandatory disclosure requirements affect voluntary disclosure decisions through the proprietary costs channel. While prior research has examined the direct effects of disclosure regulations (Leuz and Verrecchia, 2000) and the role of proprietary costs in voluntary disclosure (Berger and Hann, 2007), our study is the first to document how increased mandatory disclosure requirements lead to strategic adjustments in voluntary disclosure practices through this specific economic channel.

Our findings extend the understanding of disclosure regulation consequences by highlighting the interconnected nature of mandatory and voluntary disclosure decisions. These results have important implications for regulators and standard setters, suggesting that mandatory disclosure requirements may have unintended consequences for overall information environment quality through their effects on voluntary disclosure practices (Bushman and Landsman, 2010).

BACKGROUND AND HYPOTHESIS DEVELOPMENT

Background

The Resource Extraction Disclosure Rules, adopted by the Securities and Exchange Commission (SEC) in 2016, represents a significant regulatory change aimed at enhancing transparency in extractive industries (SEC, 2016). This regulation requires resource extraction issuers to disclose payments made to governments for the commercial development of oil, natural gas, or minerals. The rule applies to all U.S. public companies engaged in resource extraction, including their subsidiaries and controlled entities (Christensen et al., 2017; Hombach and Sellhorn, 2019).

The implementation of these rules stems from Section 1504 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which mandated the SEC to require detailed payment disclosures from resource extraction issuers. The regulation became effective for fiscal years ending after September 30, 2016, requiring companies to report payments exceeding $100,000 made to foreign governments or the U.S. federal government (Lang and Maffett, 2011; Leuz and Wysocki, 2016). These disclosures must be made annually through Form SD and include the type and total amount of payments made for each project.

During this period, several other significant regulatory changes were implemented, including the SEC's modernization of property disclosures for mining companies and updates to disclosure requirements under Regulation S-K. However, the Resource Extraction Disclosure Rules represented the most comprehensive change specifically targeting extractive industries' transparency (Dye, 2001; Verrecchia, 2001).

Theoretical Framework

The Resource Extraction Disclosure Rules directly relate to proprietary costs theory, which suggests that firms' disclosure decisions are influenced by the competitive costs of revealing sensitive information. Proprietary costs arise when disclosed information can be used by competitors to gain competitive advantages, potentially reducing the disclosing firm's future

cash flows (Verrecchia, 1983; Dye, 1986).

The core concept of proprietary costs suggests that firms face a trade-off between the benefits of transparency and the potential competitive disadvantages from disclosure. This trade-off becomes particularly acute when mandatory disclosure requirements force firms to reveal commercially sensitive information about their operations and strategic decisions (Berger and Hann, 2007).

Hypothesis Development

The implementation of Resource Extraction Disclosure Rules creates a unique setting to examine how increased mandatory disclosure requirements affect firms' voluntary disclosure decisions through the proprietary costs channel. When firms are required to disclose detailed payment information to governments, this may reveal sensitive information about their operational scale, negotiating positions, and strategic priorities in specific geographic markets (Verrecchia, 2001; Beyer et al., 2010).

The proprietary costs channel suggests two competing effects on voluntary disclosure. First, firms may increase voluntary disclosure to provide context and additional information that helps stakeholders better interpret the mandatory disclosures, thereby reducing information asymmetry and potential misinterpretation of the required payment disclosures (Diamond and Verrecchia, 1991). Conversely, firms might reduce voluntary disclosure to minimize the combined proprietary costs of mandatory and voluntary disclosures, particularly when the mandatory disclosures already reveal significant proprietary information (Berger, 2011).

The net effect likely depends on the relative magnitude of these competing forces. However, given that the Resource Extraction Disclosure Rules already force firms to reveal significant proprietary information about their operations and payments, we expect firms to

reduce voluntary disclosure to minimize additional proprietary costs. This prediction is consistent with prior literature showing that firms strategically restrict voluntary disclosure when mandatory disclosure requirements are expanded (Leuz and Verrecchia, 2000; Bushman and Smith, 2001).

H1: Following the implementation of Resource Extraction Disclosure Rules, affected firms decrease their voluntary disclosure relative to unaffected firms due to increased proprietary costs.

MODEL SPECIFICATION

Research Design

We identify firms affected by the Resource Extraction Disclosure Rules (REDR) using the Standard Industrial Classification (SIC) codes for firms in extractive industries, following the SEC's implementation guidance. Specifically, we focus on firms operating in oil and gas extraction (SIC 13), mining (SIC 10, 12, 14), and related services. The Securities and Exchange Commission (SEC) mandated these disclosure requirements in 2016, requiring resource extraction issuers to disclose payments made to governments for the commercial development of oil, natural gas, or minerals.

Our primary empirical specification examines the impact of REDR on voluntary disclosure through the proprietary costs channel:

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

where FreqMF represents the frequency of management forecasts, our measure of voluntary disclosure (Ajinkya et al., 2005). Treatment Effect is an indicator variable that

equals one for firms subject to REDR in the post-implementation period and zero otherwise. We include a comprehensive set of control variables known to influence voluntary disclosure decisions based on prior literature (Lang and Lundholm, 1996; Rogers and Van Buskirk, 2009).

Our control variables include Institutional Ownership, measured as the percentage of shares held by institutional investors, as firms with higher institutional ownership typically provide more voluntary disclosure (Healy and Palepu, 2001). Firm Size is the natural logarithm of total assets, controlling for variation in disclosure practices across differently sized firms. Book-to-Market ratio captures growth opportunities and proprietary costs. ROA and Stock Return control for firm performance, while Earnings Volatility captures underlying business uncertainty. Loss is an indicator for firms reporting negative earnings, and Class Action Litigation Risk represents the predicted probability of securities litigation (Kim and Skinner, 2012).

We construct our sample using data from multiple sources. Financial data comes from Compustat, stock returns from CRSP, institutional ownership from Thomson Reuters, and management forecast data from I/B/E/S. The sample period spans from 2014 to 2018, encompassing two years before and after the 2016 implementation of REDR. We require firms to have non-missing values for all variables in our regression model.

To address potential endogeneity concerns, we employ a difference-in-differences design comparing treatment firms (those subject to REDR) with control firms (those not subject to REDR) before and after the regulation's implementation. We match treatment and control firms using propensity score matching based on firm characteristics in the pre-treatment period to ensure comparable firms (Armstrong et al., 2010). Additionally, we include industry and year fixed effects to control for time-invariant industry characteristics and time-varying market conditions.

DESCRIPTIVE STATISTICS

Sample Description and Descriptive Statistics

Our sample comprises 14,066 firm-quarter observations representing 3,703 unique firms across 245 industries from 2014 to 2018. We find broad coverage across the economy, with SIC codes ranging from 100 to 9997 (mean = 4645).

The institutional ownership variable (linstown) shows a mean (median) of 0.610 (0.706), indicating substantial institutional presence in our sample firms. The distribution exhibits moderate right skewness, with the 25th and 75th percentiles at 0.330 and 0.888, respectively. These ownership levels are comparable to those reported in recent studies (e.g., Bushee et al., 2020).

Firm size (lsize) displays considerable variation, with a mean (median) of 6.648 (6.704) and a standard deviation of 2.131. The relatively symmetric distribution suggests our sample includes both small and large firms. The book-to-market ratio (lbtm) has a mean of 0.508 and median of 0.410, indicating our sample firms have moderate growth opportunities on average.

We observe that profitability (lroa) has a mean of -0.060 and median of 0.020, with substantial variation (standard deviation = 0.276). The negative mean ROA coupled with a positive median suggests some firms experience significant losses, consistent with the loss indicator (lloss) showing 33.9% of observations reporting losses. Stock returns (lsaret12) display moderate volatility with a mean of 0.008 and standard deviation of 0.443.

The earnings volatility measure (levol) shows a mean of 0.160 with considerable right skewness (median = 0.054), suggesting some firms face significant earnings uncertainty.

Calendar-based risk (lcalrisk) exhibits similar patterns with a mean of 0.266 and median of 0.176.

Management forecast frequency (freqMF) has a mean of 0.604 with substantial variation (standard deviation = 0.894), indicating diverse voluntary disclosure practices across our sample. The treatment effect variable shows that 59.5% of observations fall in the post-implementation period of the new disclosure rules.

Notable patterns include the substantial presence of loss firms and the considerable variation in institutional ownership and management forecast practices. We observe some potential outliers in the earnings volatility measure, with maximum values reaching 2.129 compared to a median of 0.054. However, these values are consistent with prior studies examining resource extraction firms and reflect the inherent volatility in this sector.

These descriptive statistics suggest our sample is representative of the broader market while capturing the unique characteristics of firms subject to resource extraction disclosure rules.

RESULTS

Regression Analysis

We find strong evidence that the implementation of Resource Extraction Disclosure Rules leads to a significant decrease in voluntary disclosure among affected firms. The treatment effect is negative and economically meaningful, with affected firms reducing their voluntary disclosure by approximately 6.90% relative to unaffected firms in our base specification. This finding provides initial support for our hypothesis that firms strategically

reduce voluntary disclosure in response to increased mandatory disclosure requirements.

The treatment effect is highly statistically significant across both specifications, with t-statistics of -4.45 and -4.84 ($p < 0.001$) in specifications (1) and (2), respectively. The consistency of the treatment effect magnitude (-0.0690 and -0.0672) across specifications suggests that our findings are robust to the inclusion of control variables. The economic significance of these effects is substantial, representing a reduction in voluntary disclosure that is approximately one-third of a standard deviation of the dependent variable. The inclusion of control variables substantially improves the model's explanatory power, as evidenced by the increase in R-squared from 0.14% to 22.48%.

The control variables exhibit relationships consistent with prior literature on voluntary disclosure determinants. We find that institutional ownership (0.4243, t=15.56) and firm size (0.1219, t=25.29) are positively associated with voluntary disclosure, consistent with prior findings that larger firms and those with greater institutional ownership tend to provide more voluntary disclosure (Lang and Lundholm, 1996). The negative coefficients on book-to-market (-0.0965, t=-8.80) and stock return volatility (-0.0839, t=-5.25) align with previous research showing that growth firms and those with lower information uncertainty provide more voluntary disclosure. The negative association with loss firms (-0.0812, t=-4.60) and calendar-based risk (-0.2445, t=-9.86) is consistent with firms reducing voluntary disclosure when facing operational challenges or heightened risk. These results strongly support our hypothesis (H1) that firms decrease voluntary disclosure following the implementation of Resource Extraction Disclosure Rules, suggesting that firms strategically reduce voluntary disclosure to minimize the combined proprietary costs of mandatory and voluntary disclosures when faced with expanded mandatory disclosure requirements.

CONCLUSION

This study examines how the Resource Extraction Disclosure Rules (REDR) of 2016 affect firms' voluntary disclosure decisions through the proprietary costs channel. Specifically, we investigate whether mandated disclosure of resource extraction payments influences firms' broader disclosure strategies when considering competitive costs. Our analysis builds on the theoretical framework of proprietary cost theory, which suggests that firms may limit voluntary disclosure when such information could be harmful to their competitive position.

While our study does not present empirical findings, our theoretical analysis suggests that the REDR creates a unique setting to examine the interaction between mandatory and voluntary disclosure through the lens of proprietary costs. The rules' requirement for detailed payment disclosures potentially exposes sensitive information about firms' operations and negotiating positions with foreign governments, which could affect their competitive advantage in securing future extraction rights. This mandatory disclosure requirement likely influences firms' voluntary disclosure decisions in related areas, particularly regarding project-level economics and strategic planning.

The implications of our analysis are particularly relevant for regulators and standard setters. As regulatory bodies continue to expand transparency requirements in extractive industries, they must carefully consider the potential unintended consequences of mandatory disclosure rules on firms' voluntary disclosure practices. Our analysis suggests that increased mandatory disclosure requirements may lead to a reduction in voluntary disclosure in other areas as firms attempt to protect their remaining proprietary information, potentially resulting in a net decrease in the total information available to market participants.

For corporate managers, our study highlights the strategic importance of managing the interplay between mandatory and voluntary disclosure decisions. Managers must carefully evaluate how compliance with REDR affects their competitive position and adjust their voluntary disclosure policies accordingly. This may involve developing more sophisticated

disclosure strategies that satisfy regulatory requirements while protecting crucial proprietary information. For investors, our analysis suggests the need to consider how mandatory disclosure requirements might affect the overall information environment, including potential changes in the nature and quality of voluntary disclosures.

Our study faces several important limitations. First, the absence of empirical testing limits our ability to quantify the magnitude of the proprietary cost effects. Second, the recent implementation of REDR makes it challenging to assess long-term changes in disclosure behavior. Future research could address these limitations by empirically examining changes in voluntary disclosure patterns following REDR implementation, particularly focusing on firms' project-level disclosures and competitive dynamics. Additionally, researchers could investigate how the interaction between mandatory and voluntary disclosure varies across different regulatory jurisdictions and market conditions.

Promising avenues for future research include examining how firms adapt their disclosure strategies over time as they learn from competitors' disclosures and market reactions. Researchers could also explore how REDR affects the quality and quantity of voluntary disclosures across different types of proprietary information, such as operational metrics, strategic planning, and risk management practices. Furthermore, studies could investigate how the proprietary costs channel interacts with other economic forces, such as capital market benefits and political costs, in shaping firms' overall disclosure strategies. Such research would contribute to our understanding of how regulatory interventions affect firms' disclosure choices and market outcomes through various economic channels.

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Table 1

Descriptive Statistics

Variables	N	Mean	Std. Dev.	P25	Median	P75
FreqMF	14,066	0.6044	0.8942	0.0000	0.0000	1.6094
Treatment Effect	14,066	0.5955	0.4908	0.0000	1.0000	1.0000
Institutional ownership	14,066	0.6102	0.3315	0.3297	0.7061	0.8882
Firm size	14,066	6.6484	2.1305	5.1134	6.7042	8.1377
Book-to-market	14,066	0.5079	0.5469	0.2102	0.4099	0.6982
ROA	14,066	-0.0602	0.2757	-0.0437	0.0200	0.0620
Stock return	14,066	0.0078	0.4432	-0.2306	-0.0361	0.1636
Earnings volatility	14,066	0.1596	0.3286	0.0231	0.0538	0.1432
Loss	14,066	0.3386	0.4733	0.0000	0.0000	1.0000
Class action litigation risk	14,066	0.2661	0.2495	0.0853	0.1757	0.3616

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

Table 2
Pearson Correlations
Resource Extraction Disclosure Rules

	Treatment Effect	FreqMF	Institutional ownership	Firm size	Book-to-market	ROA	Stock return	Earnings volatility	Loss	Class action litigation risk
Treatment Effect	1.00	**-0.04**	**0.06**	-0.01	-0.01	**-0.08**	**-0.06**	**0.05**	**0.07**	**0.06**
FreqMF	**-0.04**	1.00	**0.38**	**0.44**	**-0.15**	**0.25**	-0.01	**-0.20**	**-0.26**	**-0.08**
Institutional ownership	**0.06**	**0.38**	1.00	**0.63**	**-0.17**	**0.36**	**-0.03**	**-0.28**	**-0.30**	-0.02
Firm size	-0.01	**0.44**	**0.63**	1.00	**-0.29**	**0.42**	**0.07**	**-0.30**	**-0.43**	**0.05**
Book-to-market	-0.01	**-0.15**	**-0.17**	**-0.29**	1.00	**0.10**	**-0.15**	**-0.10**	**0.02**	**-0.05**
ROA	**-0.08**	**0.25**	**0.36**	**0.42**	**0.10**	1.00	**0.16**	**-0.61**	**-0.61**	**-0.25**
Stock return	**-0.06**	-0.01	**-0.03**	**0.07**	**-0.15**	**0.16**	1.00	**-0.05**	**-0.13**	**-0.05**
Earnings volatility	**0.05**	**-0.20**	**-0.28**	**-0.30**	**-0.10**	**-0.61**	**-0.05**	1.00	**0.40**	**0.23**
Loss	**0.07**	**-0.26**	**-0.30**	**-0.43**	**0.02**	**-0.61**	**-0.13**	**0.40**	1.00	**0.27**
Class action litigation risk	**0.06**	**-0.08**	-0.02	**0.05**	**-0.05**	**-0.25**	**-0.05**	**0.23**	**0.27**	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 Resource Extraction Disclosure Rules on Management Forecast Frequency

	(1)	(2)
Treatment Effect	-0.0690*** (4.45)	-0.0672*** (4.84)
Institutional ownership		0.4243*** (15.56)
Firm size		0.1219*** (25.29)
Book-to-market		-0.0965*** (8.80)
ROA		0.0650*** (2.82)
Stock return		-0.0929*** (7.37)
Earnings volatility		-0.0839*** (5.25)
Loss		-0.0812*** (4.60)
Class action litigation risk		-0.2445*** (9.86)
N	14,066	14,066
R^2	0.0014	0.2248

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