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# The Impact of Information Processing Costs on Firm Disclosure Choice: Evidence from the XBRL Mandate

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ABSTRACT

This paper examines the effect of market participants' information processing costs on firms' disclosure choice. Using the recent eXtensible Business Reporting Language (XBRL) regulation, I find that firms increase their quantitative footnote disclosures upon implementation of XBRL detailed tagging requirements designed to reduce information users' processing costs. These results hold in a difference-in-difference design using matched nonadopting

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firms as controls, as well as two additional identification strategies. Examination of the disclosure increase by footnote type suggests that both regulatory and nonregulatory market participants play a role in monitoring firm disclosures. Overall, these findings suggest that the processing costs of market participants can be significant enough to impact firms' disclosure decisions.

**JEL codes:** D83; M41; M48; O33

**Keywords:** information processing costs; disclosure; XBRL

## *1. Introduction*

In this paper, I examine whether firms adjust their disclosure in response to changes in market participants' information processing costs. Firm disclosures play a critical role in a well-functioning capital market, and an important consideration in the market's use of firm disclosure is the cost of processing the disclosure. Numerous studies find that information processing costs can reduce or impair participants' processing of information (see section 2.1). Building on these findings, I hypothesize that these information processing costs can in turn affect firms' disclosure choice through their impact on disclosure outcomes. In particular, I predict that firms increase their disclosure when they expect a reduction in participants' information processing costs.

Models of firm disclosure portray disclosure choice as a cost–benefit tradeoff, with benefits that include reduction of information asymmetry and improved market liquidity (Diamond and Verrecchia [1991]), as well as avoidance of penalties for underdisclosure of information. These penalties can be imposed by investors in the form of price protection and market value adjustments (Grossman and Hart [1980]) and/or by regulators in the form of fines, regulatory burdens, and related repercussions (Becker [1968], Bushee and Leuz [2005]). For firms to receive these disclosure benefits or face penalties for underdisclosure, however, market participants must process the information disclosed. Thus, when processing costs prevent participants from fully responding to disclosure or the lack of disclosure, the extent of disclosure benefits could be muted and firm disclosure choices affected.

Although many studies examine the determinants of firm disclosure, the impact of participants' processing costs on firms' disclosure has not received much attention. This lack of attention is likely due to the difficulty of isolating the impact of participants' processing costs on firm disclosure choice from disclosure's effect on processing costs. To overcome this difficulty, I exploit a recent regulation that reduces information processing costs for market participants without changing firms' disclosure requirements. Specifically, the eXtensible Business Reporting Language (XBRL) mandate requires a subset of firms to "tag," or label, all quantitative disclosures in the financial statements and footnotes so the amounts are machine readable, but the mandate does not require additional disclosure.

The Securities and Exchange Commission (SEC) argues that XBRL reduces processing costs by eliminating the need for manual search and compilation of financial amounts, enabling easier comparison across time and firms, and highlighting contextual information about data items, calling it a "quantum leap over existing disclosure technology" (SEC [2006]). Therefore, I use a firm's mandatory adoption of XBRL as an exogenous reduction in expected market participant processing costs for that firm.

To measure firm disclosure, I focus on quantitative disclosures in the financial statement footnotes (i.e., disclosures subject to XBRL's "detailed tagging" requirements) because these details are valuable but costly to process. Footnotes provide a rich context for understanding the firm beyond that provided by summary statistics (De Franco, Wong, and Zhou [2011], Li, Ramesh, and Shen [2011]). For example, calculating a firm's leverage ratio gives a sense of the financial structure of the firm, but examining the detailed listing of notes payable, interest rates, and maturity dates paints a more nuanced picture of the firm's current and future health. Although footnotes are valuable, they also impose high processing costs on investors, regulators, and other market participants because they include many pieces of information in a wide variety of formats, often with text and numbers interspersed (Casey [1980], Hodge, Kennedy, and Maines [2004], Li, Ramesh, and Shen [2011]).

To the extent market participants do not fully process footnote information, firms have lower disclosure benefits (and lower costs of nondisclosure) and thus less incentive to provide the detailed information. As participants' information costs decrease, though, they can process more of the footnotes and increase their attention to detailed information. Anticipating increased processing and therefore more benefits to disclosure (and more costs of nondisclosure), firms have a stronger incentive to provide this detailed information.

As highlighted by the SEC, lower processing costs can increase attention from any market participant: investors, analysts, media, regulators, etc. (SEC [2009]). Each of these groups influences firms' disclosure choice in different ways. For example, investors can affect the bid–ask spread of a firm, increasing it when information is scarce and information asymmetry large, and decreasing the spread when firms provide more disclosure and thus reduce information asymmetry. Regulators, on the other hand, can impose fines or other regulatory burdens if firms do not provide enough disclosure. Analysts and media can influence firms by altering trading behavior through recommendations and articles. For any of these market participants, the amount of disclosure they process can have a significant impact on the firms that provide the information.

Accordingly, I predict that when firms comply with the detailed footnote tagging requirements of XBRL, they also increase the number of quantitative footnote disclosures in anticipation of increased market participant attention to these disclosures. For example, increased details of the deferred tax asset valuation allowance and various impacts on tax rates and

income, as shown in appendix A, example 1, are consistent with SEC discussion of tax-related disclosure issues prior to XBRL implementation. Similarly, further disaggregation of pension disclosures into U.S. and non-U.S. pension plans in appendix A, example 2, corresponds with investor discussions of pension disclosures as an area where XBRL would reduce information costs. However, if firms do not believe XBRL will significantly impact participants' processing costs and the related disclosure benefits or if they choose to delay adjusting disclosure until after participant attention increases, there would be no change in firm disclosure upon adoption of XBRL. Thus, this is an empirical question.

Using a difference-in-difference design with a sample of XBRL adopting firms and matched nonadopting firms (non-XBRL) in the first detailed implementation year, I find evidence supporting my prediction: XBRL firms increase their quantitative footnote disclosures relative to matched non-XBRL firms. The results are robust to controls for the qualitative information content of the filings, the presence of information intermediaries, firm characteristics, firm fixed effects, and year fixed effects, as well as count, logged, and scaled versions of the quantitative disclosure measure.

To interpret the difference-in-difference coefficient as the disclosure increase caused by XBRL, the parallel trends assumption is necessary; that is, that the treatment and control firms' disclosure would have changed similarly if XBRL had not been implemented. In support of this assumption, I find reasonably similar pretreatment disclosure trends, as discussed in section 4.1. In addition, I continue to find evidence of an impact on disclosure using two alternative identification approaches. First, I separate the initial treatment firms into two groups based on their fiscal year ends, and I identify those with later fiscal year ends (and thus somewhat later XBRL filings) as an alternative set of control firms. Using these new treatment and control firms, and calendar year fixed effects, I continue to see an increase in disclosure upon adoption for the first adopters. Second, I implement a parametric regression discontinuity (RD) design. The primary determinant of XBRL adoption is a firm's market float, and the RD approach allows me to exploit the discontinuity around the threshold, although it focuses more strongly on the impact of treatment at the cutoff. Again, I see an increase in disclosure upon XBRL adoption for firms above versus below the threshold. Combined, these tests provide robust evidence of an impact of XBRL on firms' disclosure in the first detailed implementation year.

To further characterize the disclosure changes, I disaggregate the quantitative disclosure increase of first-round XBRL adopters into 17 categories for the year before and after implementation, and I find significant increases in eight categories. I then compare the categories to SEC presentations and summaries of comment letters, finding that three of the eight categories that increased were highlighted in SEC communication and comment letters as focus areas for review. Overall, the results suggest that both regulatory and nonregulatory market participants play a role in monitoring firm disclosure.

The findings are subject to certain caveats. First, a primary assumption in my predictions is that firms' disclosure supply curve is fixed. If XBRL implementation prompts meaningful new fixed costs of firms' information collection (not due to changes in market participants' response to disclosure), this could shift firms' disclosure supply curve and at least partially explain the disclosure increase. This is unlikely in the XBRL setting because nearly all firms chose not to integrate XBRL into their internal systems, where the bulk of firms' information collection costs would occur, instead layering XBRL on top of the existing reporting process. Thus, the most likely path for an impact of XBRL on disclosure is through the effect on market participants' information processing. However, it is difficult to completely rule out a direct change in fixed information production costs as a potential driver of the disclosure increase.

Second, the difference-in-difference specification relies on the assumption of parallel trends in disclosure for treatment and matched control firms. I find evidence consistent with parallel trends in the pretreatment period, and I include year fixed effects, firm fixed effects, and numerous control variables to help control for potential deviations in posttreatment trends. In addition, two additional tests identify an impact of XBRL on disclosure in alternative ways. However, it is difficult to know definitively if all differences between treatment and control firms have been removed. Finally, a primary assumption throughout the paper is that the amount of quantitative disclosure is a meaningful measure of firms' disclosure, but I cannot provide definitive evidence of the informativeness of the disclosure increase for capital market participants. Instead, I confirm that the increase is not due solely to mandatory requirements or uninformative formatting adjustments that "fill in" disclosure tables with zeroes, and I examine types of disclosure increases both across the sample and anecdotally to characterize the nature of disclosure increases.

My paper makes several contributions. First, I find empirical evidence of an important incentive that impacts firms' disclosure choices. Several papers' findings suggest that managers adjust their disclosure style or channel because of information processing considerations (e.g., the complexity of annual reports (Li [2008]), the presentation of special items (Riedl and Srinivasan [2010]), and the use of non-10K disclosure (Guay, Samuels, and Taylor [2016]). I contribute by using an exogenous shock to processing costs to isolate the impact of processing costs on firms' choice of how much information to provide. Second, I contribute to the information processing costs literature by examining broader implications. Many studies examine the impact of information users' processing costs on their behavior in the markets (e.g., Casey [1980], Bloomfield [2002], Miller [2010]). I extend this literature by focusing on firm behavior, and my results suggest that firms increase disclosure when faced with anticipated reductions in participants' processing costs. Third, I contribute to the literature examining the SEC's XBRL mandate. Several studies examine the quality of XBRL filings, finding some errors and some appropriate and inappropriate use of

firm-customized extensions (e.g., Bartley, Chen, and Taylor [2010], Debreceny et al. [2010; 2011]). Other studies have begun to examine the capital market consequences of the XBRL mandate (e.g., Kim, Lim, and No [2012], Blankespoor, Miller, and White [2014], Bhattacharya, Cho, and Kim [2018]). My study focuses instead on the implications for firm disclosure choice, finding a potentially beneficial unintended consequence of the XBRL regulation.

## 2. *Motivation and Setting*

### 2.1 DISCLOSURE CHOICE AND INFORMATION PROCESSING COSTS

To model firms' disclosure choice, classic theories rely on the assumption of market participant response to disclosure and nondisclosure. In a simple disclosure model, a firm weighs the costs and benefits of disclosure when choosing the amount of information to provide. Firms' disclosure benefits include market outcomes like reduced information asymmetry and thus increased liquidity and decreased cost of capital (Diamond [1985], Diamond and Verrecchia [1991]). Firms' benefits also include a lower likelihood of regulatory fines and enforcement actions for insufficient disclosure.[1] These disclosure benefits arise, however, when market participants process and incorporate the information into their trading behaviors and regulatory enforcement decisions. GE spokesman David Frail describes the disclosure choice as a negotiation between management and investors, alluding to the importance of investors actually acquiring and using the information: "[Disclosure] is a process, and we'll be listening to everybody. But we have to measure the sheer volume of work against the value to investors of the information" (Silverman [2002b]).

Market participants' ability to acquire and process information is limited by the extent of processing costs they face, where processing costs can include both costs of "information acquisition" (the task of obtaining information) and costs of "information integration" (the task of assessing the informational implications and arriving at a valuation decision; Maines and McDaniel [2000]). Many papers highlight considerable information processing costs that impair users' ability to assimilate information in public disclosures (e.g., Casey [1980], Grossman and Stiglitz [1980],

[1] I do not distinguish between disclosure that is mandatory (i.e., required by regulatory bodies) or voluntary (i.e., not required by regulatory bodies) for several reasons. First, for both types, firms choose whether to provide the information. In either case, there are repercussions if firms choose not to disclose the information. For voluntary disclosure, penalties for not providing it come from investors, analysts, and media through market activity such as bid–ask spreads and/or the cost of capital. For mandatory disclosure, regulators (in addition to investors) can penalize firms for not providing it, assuming they choose to enforce the regulation (Becker [1968]). Second, the distinction between mandatory and voluntary information is not always clear, especially within the footnotes, where materiality and relevance of items varies across firms. Also see the discussion of footnote categories in section 5.1.

Verrecchia [1982], Merton [1987], Indjejikian [1991], Bloomfield [2002], Hirshleifer and Teoh [2003], Plumlee [2003]). More information complexity in the information environment impacts market behavior through reduced trading (Miller [2010]) and delayed impounding of information into price (You and Zhang [2009], Cohen and Lou [2012]). Similarly, when investors have extra information demands on them (e.g., busy earnings announcement days, important events for other firms), they do not completely process information (Hirshleifer, Lim, and Teoh [2009], deHaan, Shevlin, and Thornock [2015], Drake, Gee, and Thornock [2016], Kempf, Manconi, and Spalt [2017]). For regulators, information processing costs manifest in the costs of apprehending and convicting offenders and are an important component of the enforcement level chosen (Becker [1968]). Kedia and Rajgopal [2011] find evidence of a resource-constrained SEC focusing investigations more on firms that are geographically close, and recent articles highlight the importance of processing costs for the SEC.[2] Overall, market participants rationally weigh the benefits of obtaining firm information against the costs of processing that information; the higher the processing costs, the less processing of firms' disclosures.

Although costly to process, detailed financial information is valuable for decision making. Investors use information in financial statement footnotes to adjust their beliefs about firm value (De Franco, Wong, and Zhou [2011]), and footnote amounts are impounded into returns (Barth, Beaver, and Landsman [1992], Ely [1995]) Similarly, mosaic theory describes how the joint analysis of many individual items can provide valuable information (Pozen [2005]). Market participants with access to detailed information and appropriate tools use the information to make more informed decisions, as long as the processing costs do not outweigh the benefits. All else equal, if participants' costs of processing detailed information are reduced, they are more likely to process that detailed information.

The amount of processing impacts the response to disclosure, and thus affects firms' benefits of disclosure (and costs of nondisclosure), altering firms' disclosure incentives. Essentially, if processing costs are high, market participants will process less disclosure. With less information processing, market participants have a muted response to disclosure (Bloomfield [2002]) and are less able to identify nondisclosure. Effectively, market participants are less able to discipline firm disclosure choice when processing costs are high. Conversely, lower processing costs imply more attention to disclosure, and thus higher benefits of disclosure and costs of nondisclosure for firms (Hirshleifer, Lim, and Teoh [2004]). If the impact on disclosure benefit and nondisclosure cost is significant, firms would respond by increasing their disclosure.

*2.1.1. Increased Attention—Who and How.* This increased attention to disclosure (and pressure on firms) can come from any market participant—

[2] See https://nyti.ms/2n6ba6p and http://www.sec.gov/news/studies/2011/967study.pdf).

for example, investors, media, analysts, or regulators. Companies increase their annual report disclosures in response to investors calling for more transparency (Bulkeley [2002], Silverman [2002a]). Analysts and the media publicly report their evaluation and monitoring of firm disclosure (e.g., Lang and Lundholm [1993], Miller [2006]). Regulators examine firms' financial disclosure and impose fines and other penalties for poor compliance (Walsh [1999], Bushee and Leuz [2005]). In the SEC's case, it regularly scrutinizes disclosure and uses comment letters and speeches to encourage additional and more disaggregated information.[3] If firms anticipate increased scrutiny of their disclosures by any monitoring group, they are more likely to increase disclosure in order to avoid the costs of more visible disclosure deficiencies and to receive the increased benefits of disclosure.

Whoever the monitoring party, peer firm disclosure can help identify incomplete or unusual firm disclosure. In the Milgrom and Roberts [1986] model, investors make a fully informed decision by investigating competitors' disclosures and inferring the worst case scenario for any one firm's missing information. Comparison to peers is also a way to motivate firms to provide more information. For example, after GE increased the detail of its 10-K footnotes, analysts expressed appreciation and challenged other firms to follow suit: "GE has definitely raised the bar for all corporate reporting" (Silverman [2002b]). Peer firm disclosures are particularly relevant in the XBRL setting, where XBRL's standardization facilitates comparison across firms. If XBRL reduces the costs of comparing detailed disclosures across firms, investors are more likely to use peer firm disclosures to better understand the information firms could disclose. In this way, a reduction in processing costs would lead to more disciplining of firms and increased firm disclosure.

*2.1.2. Current Literature.* Many studies examine the effect of information processing costs on market behavior (as discussed above) or the effect of disclosure choice on information processing costs, whether the choice is the writing style of disclosures (You and Zhang [2009], Miller [2010]), the placement of disclosures within financial statements or footnotes (Hopkins [1996], Hirst and Hopkins [1998]), or the timing of disclosures (Hirshleifer, Lim, and Teoh [2009], deHaan, Shevlin, and Thornock [2015]). Some studies find evidence consistent with third parties attempting to reduce the effects of information costs for investors, further confirming their existence as frictions (e.g., Li, Ramesh, and Shen [2011], Rogers, Skinner, and Zechman [2016], Blankespoor, deHaan, and Zhu [2018], Blankespoor et al. [2019]). Other studies allude to the fact that firms can choose the disclosure complexity, presentation, or channel with

[3] As evidence that firms take the SEC monitoring seriously, public accounting firms draft annual summaries of the SEC's comment letter focus areas, with the explicit purpose of informing their clients as they prepare their financial statements.

information processing costs in mind. Li [2008] examines whether poorly performing firms have more complex 10-Ks, and Riedl and Srinivasan [2010] examine firms' decision of where to disclose special items (financial statements versus footnotes), citing both information processing costs and signaling of information relevance as potential drivers of firm disclosure behavior. Guay, Samuels, and Taylor [2016] find evidence of increased non-10k disclosure when the inherent complexity of a firm's 10-K is high.

The literature has not deeply examined the effect of market participants' information processing costs on the amount of that disclosure firms choose to provide, perhaps because it is difficult to disentangle whether information processing costs altered the amount of disclosure, or the amount of disclosure altered the information processing costs. To overcome this difficulty, I turn to the implementation of XBRL, which exogenously shocks information processing costs without changing the amount of required disclosure, providing the opportunity to identify the effect of anticipated market participant information processing costs on the amount of firm disclosure.

### 2.2 XBRL BACKGROUND

XBRL is a language that encodes financial information in a machine-readable format, enabling computer software to automatically acquire, classify, compare, and represent the information. Companies use XBRL to identify data items within a financial statement, provide information about each one (such as its name, relevant time period, and currency; e.g., Total Liabilities, 12/31/2010, USD), and highlight relations between items (e.g., Total Liabilities = Current Liabilities + Noncurrent Liabilities). Because each data item is "tagged" with this additional information, computer software can process XBRL filings with less human intervention. The information can then be organized in any format useful for analysis, such as across-time comparisons, across-firm comparisons, or detailed disaggregation of an account.

The SEC sees XBRL as a way to help market participants "capture and analyze [financial] information more quickly and at less cost" (SEC [2009]). In April 2009, the SEC mandated that all public companies subject to filing requirements in the United States provide XBRL versions of their quarterly and annual financial reports in addition to the standard text or html filing. The rule outlines a three-year implementation in phases. Large accelerated filers with a public common equity float over $5 billion (hereafter tier 1 filers, or XBRL1) begin the first phase of XBRL with filings for fiscal periods ending on or after June 15, 2009. In the second phase, all other large accelerated filers (i.e., public common equity float over $700 million, hereafter tier 2 filers, or XBRL2) begin providing XBRL filings for fiscal periods ending on or after June 15, 2010, and for the third phase, all remaining filers (hereafter tier 3 filers, or XBRL3) provide XBRL filings for fiscal periods ending on or after June 15, 2011. In addition to the size-based phase-in, the mandate allows firms two years to fully comply with the mandate once they

start filing XBRL documents. For a company's first year of XBRL filings, the rule only requires tags for quantitative items on the face of the financial statements and tags for each footnote in its entirety ("block tagging"). In the second and subsequent filing years, firms must individually tag all quantitative amounts in the footnotes as well ("detailed tagging").

### 2.3 XBRL AND INFORMATION PROCESSING COSTS

XBRL can help reduce processing costs for market participants by providing information in machine-readable format, facilitating comparison across firms and time, and highlighting contextual information and relations between data items.

First, with XBRL, less time, money, and effort are needed to acquire financial information to use in decisions. Without XBRL, market participants either hand-collect or pay others to collect information from the filings. Each incremental piece of information is costly to collect, and much of the footnote information is not available via data aggregators. With XBRL filings, the information is already in electronic format, ready for transfer into spreadsheets or valuation software. Once market participants understand XBRL and prepare their system for it, they receive more information at a lower cost, with the saved time and resources available for additional processing of the information. Second, XBRL facilitates comparison of data across time and across firms. Firms are strongly encouraged to use uniquely identified, standardized tags from within the U.S. GAAP XBRL taxonomy (or dictionary of tags) whenever possible, making it easier to compare financial information across time and firms.[4] Increased comparability decreases market participants' costs of acquiring the information as well as the costs of integrating the information to arrive at a final decision. Third, information within the tags, such as the item's organizational or mathematical relation to other data items, descriptions of the amount being captured, or references to relevant accounting standards, can provide market participants with contextual information that would have required additional studying of non-XBRL filings. This contextual information can lower the processing costs of evaluating financial information in depth. Overall, there are many ways XBRL might reduce processing costs for users willing to incorporate the tool into their process.

An important assumption of this study is that, as of implementation of the mandate, firms believed XBRL would reduce market participants' processing costs. Prior literature, SEC statements, and media coverage support this assumption. Hodge, Kennedy, and Maines [2004] find experimentally that users given an XBRL-enhanced search engine are better able to both acquire and integrate information if they choose to use it. Media

[4] Firms can create their own tags (called "extensions") when the standard tags are not appropriate. This allows flexibility for firm-specific information, but the need for and use of extensions results in a smaller reduction in information processing costs.

articles about early roundtables on XBRL described the potential for increased investor and analyst scrutiny or even broader analyst coverage after XBRL implementation (Johnson [2006], Leone [2006]). More recently, the founders of Thinknum, one of many new online XBRL tools, stated that "[a]utomating these tedious tasks affords analysts the opportunity to focus on making better judgments about the quality of the numbers reported and other economic factors that are critical to successful fundamental investing" (Selling [2014]). Turning to regulators, the SEC highlighted in the original mandate the cost savings its own staff would realize in reviewing disclosures (SEC [2009]). In a more recent interview, Susan Yount, then Associate Chief Accountant with the SEC Office of Interactive Data, said, "[W]ithout data that can be gathered and analyzed in a timely manner, it's harder for us to determine if our regulations are having the intended result. With XBRL, we do analyze each filing as it comes in the door. When we look at things like, for example, pension disclosures, collecting that data by hand is very time-consuming. To collect things like pension discount rates automatically – is an exercise that might have taken us months but now might take minutes" (Merrill Corporation [2012]).[5]

Another way to estimate management's expectation is the ex post realization of changes in market participants' costs. It is difficult to observe participants' information costs explicitly, but several studies examine the capital market response to the XBRL mandate and find evidence of at least some portion of investors benefitting. For example, Blankespoor, Miller, and White [2014] examine the market impact of XBRL adoption in the first year of basic tagging and find an increase in information asymmetry, suggesting there was the perception that some (but not all) investors were using and benefitting from XBRL. Other studies find more analyst coverage and better forecast accuracy after XBRL adoption (Liu, Wang, and Yao [2014]), a decrease in return volatility for XBRL adopters (Kim, Lim, and No [2012], and reduced post-earnings announcement drift for positive earnings surprises (Efendi, Park, and Smith [2014]). Bhattacharya, Cho, and Kim [2018] examine behavior within the set of sophisticated investors more likely to benefit from XBRL, and they find a greater increase in abnormal trading volume and profits for smaller, resource-constrained institutional investors relative to larger institutional investors, again suggesting that a subset of investors benefit. Finally, Harris and Morsfield [2012] conduct a formal survey of 26 institutional investors and analysts and informally interview others, and although they discuss numerous concerns with XBRL data quality and accessibility, they document that "most of the analysts and investors we spoke with are interested in and tried to use the footnote data that are XBRL-tagged."

[5] Also see http://raasconsulting.blogspot.com/2011/01/why-did-sec-mandate-xbrl.html for an article hypothesizing that the cost-savings for the SEC were a significant motivation for mandating XBRL.

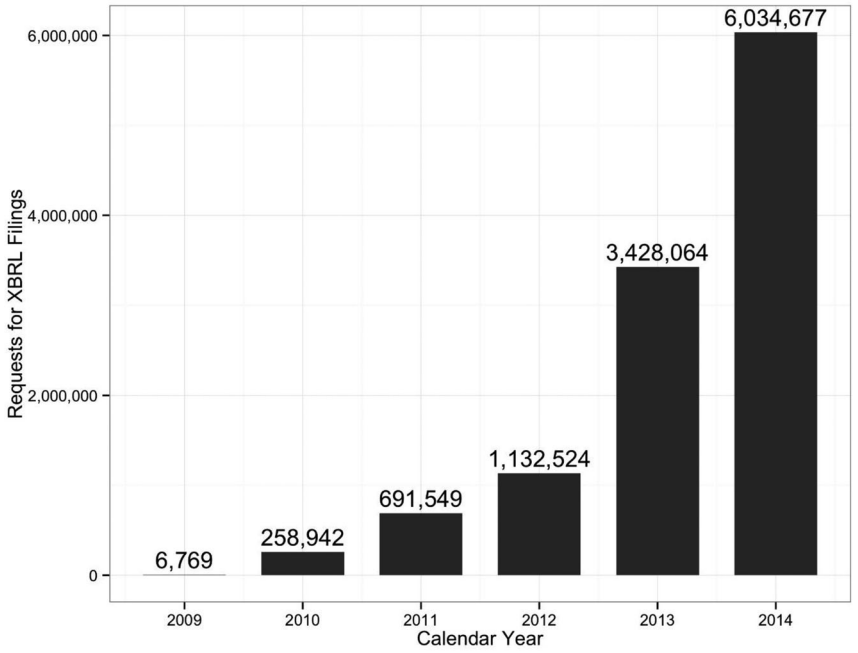


FIG. 1.—Total number of unique user-day-filing downloads of XBRL filings from Edgar by calendar year. This figure displays the total number of requests for my sample firms' 10-K XBRL filings from calendar year 2009 through 2014, where multiple requests from the same user IP address during the day are counted as one request. Thus, these are the total number of unique user-day-filing requests during the calendar year for all available XBRL filings (including current and prior year filings). See appendix B for more details.

Finally, as a third approach to assess management's expectation of demand for XBRL, I examine the ex post downloads of XBRL filings from the SEC EDGAR website.[6] As shown in figure 1, XBRL filings are downloaded consistently in each calendar year from 2009 through 2014. The downloads increase over time as (1) more firms provide XBRL files to the SEC each year, increasing the pool of XBRL files available for download (i.e., from 30 available filings in calendar year 2009 to 11,386 in calendar year 2014 for my sample firms); and (2) more stakeholders begin downloading XBRL filings. The mean (median) filing is downloaded between 220 (142) and 530 (488) times per year over the six years displayed, and every XBRL filing is downloaded at least once each year. Appendix B provides more details of how much increase is due to more filings available versus increased interest in all filings. Note that XBRL filing downloads are a noisy proxy for investor usage of XBRL filings because investors may download XBRL from a non-EDGAR location such as a third-party repository or

[6] See appendix B for details of the customization required to isolate XBRL filings from other SEC filings.

firms' websites (i.e., EDGAR downloads are a lower bound of interest in XBRL). In addition, users downloading XBRL filings may not be making investment decisions based on the information. Nevertheless, there is clear evidence of demand for XBRL filings across all years that is consistent with management expectation of XBRL influencing capital market participants. Thus, based on anecdotal evidence during my sample period and ex post empirical evidence of download activity and capital market behavior, I assume firms anticipate a reduction in market participants' processing costs because of XBRL.

### 2.4 XBRL AND DISCLOSURE CHOICE: PREDICTION

Based on the disclosure theory discussed earlier, I hypothesize that firms will increase disclosure when market participants' processing costs decrease. The corresponding prediction in my setting is that firms increase their quantitative footnote disclosures when they adopt XBRL's detailed tagging requirements.[7]

I focus on quantitative footnote disclosures and XBRL implementation of detailed tagging rather than basic tagging (fiscal year 2010 for tier 1 firms, 2011 for tier 2 firms, and 2012 for tier 3) for several reasons. First, although items in the footnotes are relevant for understanding firm performance, they impose high processing costs on market participants and thus receive less attention. For example, Li, Ramesh, and Shen [2011] find a market reaction to newswire filing alerts containing footnote excerpts, even though the SEC filings were already publicly available.

Second, the inherent benefits of XBRL—ease of obtaining multiple data items, standardization of data structure, and increased ability to compare across firms—are helpful in processing detailed footnote disclosures. When promoting XBRL, the SEC focused on the ease of pulling facts out of text (i.e., numbers out of footnotes). Per then-SEC Chairman Cox, "The result ... is that investors, using standard software, will be able immediately to pull up the information the way they want it, without having to slog through pages and pages of dry text" (SEC [2007]).

Finally, firms have more discretion when creating footnote disclosures than when creating financial statements. This flexibility exists to allow firms to tailor their communication to their investors. The SEC Advisory Committee on Improvements to Financial Reporting alluded to voluntary disclosure in footnotes by stating that "disclosure guidance generally establishes a 'floor' for communication between companies and investors, rather than a 'ceiling'" (SEC [2008]). A result of this flexibility, though, is potential

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[7] An alternative is that firms respond to the adoption of XBRL by *decreasing* their disclosure, because they want (1) to avoid the increased market participant attention or (2) to reduce the costs of tagging. However, for reason (1), it is not clear why these firms were voluntarily disclosing information they didn't want processed. For reason (2), the fixed costs of implementing XBRL tagging are larger than the variable costs of adding one more tag, making it unlikely that the costs of tagging would cause an average decrease in disclosure.

disclosure inconsistency across firms. Per the Investors Technical Advisory Committee (ITAC), current "disclosures are (unfortunately) inconsistent and incomplete" (ITAC [2007]). The combination of inherently higher information processing costs, footnote-specific benefits of XBRL, and more flexibility in footnote disclosure choices results in the "detailed tagging" of footnotes being a strong setting to examine the relation between information processing costs and firm disclosure choice.[8]

An important assumption is that XBRL does not affect firms' disclosure supply curve directly. If instead XBRL implementation prompts a meaningful change in firms' fixed costs of information collection, this could shift the supply curve and would be an alternative explanation for any empirical disclosure increase. It is difficult to confirm that there is no direct effect on firms' information collection costs, but it is unlikely in the initial XBRL implementation. XBRL does not ask for more disclosure or a change to existing human-readable filings. Any fixed cost of XBRL applies to the tagging of elements rather than firms' information collection and human-readable presentation. For XBRL implementation to affect information collection, firms would have to integrate XBRL in their internal financial reporting systems, and nearly all firms did not integrate XBRL (Wenger, Elam, and Williams [2011], Janvrin and No [2012, p. 175]). The more likely path for a disclosure effect is through changes in market participants' information processing. This could occur due to greater use of information and related benefits, and perhaps even secondary effects such as lower proprietary costs because peer firms have also increased their disclosure due to greater anticipated scrutiny. In any of these cases, disclosure increases because managers expect a change in processing costs to affect the response to disclosure.

## *3. Variable Definitions and Sample Selection*

### 3.1 VARIABLE DEFINITION

*3.1.1. Disclosure Measures.* To measure the amount of firm disclosure, I focus on quantitative footnote disclosures, or the numbers in the footnotes. The number of quantitative footnote disclosures is available post-XBRL as the number of footnote XBRL tags, but this is not available prior to XBRL implementation. Therefore, I estimate the number of quantitative disclosures, *TagsNotes*, for all filings using Perl to count the numbers in the footnotes.[9] I estimate *ScTagsNotes* by scaling *TagsNotes* for each firm-filing by

[8] The change in information processing costs could motivate firms to increase *all* their disclosure (e.g., press releases, earnings forecasts). However, the processing improvement is focused on quantitative information in financial statements and footnotes. Thus, the information knowledge and processing advantage is concentrated in these quantitative disclosures, and market participants are more likely to demand new information in the same format.

[9] See appendix C for details of the process of identifying the footnotes and counting the numbers.

the mean *TagsNotes* across all the firm's filings. *TagsNotes* allows for an intuitive interpretation of the disclosure increase as the number of additional pieces of information provided, while *ScTagsNotes* adjusts for the possibility that the increase is proportionally greater for firms with more disclosure before XBRL implementation. Finally, I construct *LnTagsNotes*, the natural log of *TagsNotes,* to mitigate potential skewness in the main variable (skew of *TagsNotes* is 1.95).

Like previous disclosure measures such as the number of press releases or the average number of words in press releases, *(Ln)(Sc)TagsNotes* captures disclosure quantity, which may or may not represent disclosure quality. Just as unnecessary words can obfuscate the meaning of disclosure, unnecessary numbers can increase the noise that market participants are required to sift through. In addition, this measure does not capture the importance of the additional information for market participants. Still, to the extent that each quantitative disclosure provides participants with another piece of information, *(Ln)(Sc)TagsNotes* captures an aspect of the depth and quality of a firm's disclosure.

*3.1.2 Control Variables.* As discussed below, I include several control variables, including the qualitative information content of the filing, firm performance, the presence of information intermediaries, and additional firm characteristics associated with the level of disclosure. See appendix D for detailed variable definitions.

Following Li [2008] and Miller [2010], I capture the log of the number of words in the footnotes (*LnWords_Notes*) and the footnotes' fog score (*Fog_Notes*) as measures of the qualitative information and disclosure readability, respectively.[10] In general, firms with longer reports are likely to have more information to provide and thus more quantitative disclosures as well. Because prior literature finds performance to be positively related to disclosure quantity (Lang and Lundholm [1993], Miller [2002]), I include the firm's return on assets for the fiscal period (*ROA*) and the market-adjusted return over the 12 months ending in the filing window (*PyAbnRet*). I include the log of one plus the number of analysts covering the firm (*LnAnalyst*), the percent of shares outstanding held by institutions (*InstHoldings*), and the log of the number of shareholders (*LnNumShareholders)* to control for the effect of information intermediaries and differences in shareholders' demands for disclosure quality on firms' disclosure choices (Bushee, Matsumoto, and Miller [2003], Lehavy, Li, and Merkley [2011]). Finally, I control for several firm characteristics that have historically been related

[10] I log control variables that are skewed or likely have a nonlinear relation with disclosure based on prior literature. As robustness, I rerun my results using quintile indicator variables for the number of words in the footnotes (instead of the log) and unlogged measures for analyst, number of shareholders, market value, number of segments, and prior year return volatility. Also, as an alternative control for firm size, I estimate my results using a fractional polynomial regression that flexibly incorporates firms' market float. In each case, *Post* XBRL1* remains positive and significant at the 5% level or better. See online appendix table IA1.

to disclosure. I use the log of the firm's market value (*LnMV*) and the log of the number of business segments (*LnSegments*) to control for firm size (Lang and Lundholm [1993], Li [2008]), and I include the firm's market-to-book equity ratio (*Mtb*) to control for the firm's investment opportunities and growth potential. I control for the volatility of firm operations using the standard deviation of the change in split-adjusted earnings per share over the previous five years (*EarnVol*) and the log of the standard deviation of the firm's daily stock returns over the 12 months ending in the filing window (*LnRetVol*) (Waymire [1985], Bushee and Noe [2000]). I winsorize all variables at 1% and 99% to reduce the effect of outliers. Also, for models that use *ScTagsNotes* as the dependent variable, I scale the control variables in a similar fashion to keep the relations consistent (i.e., divide by the firm average across time for the control variable.)

### 3.2 SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

To create the sample, I download all 10-K filings for fiscal years 2006 through 2014 (i.e., fiscal periods ending between June 16, 2006 and June 15, 2015), and I use Perl to extract the financial statement footnotes and count the numbers, or quantitative disclosures.[11] I remove closed-end investment funds, require firm-level CRSP and Compustat data, require valid output from the Perl parsing procedure, and remove filings for firms that do not adopt XBRL during the three-year implementation phase. Table 1, panel A, provides details of the sample selection. The final full sample is 25,683 10-K filings for 3,607 firms. Tier 1, or XBRL1, firms' first detailed XBRL filings began for fiscal periods ending on or after June 15, 2010 (adoption year 2010). Focusing on the XBRL1 firms and the first round of detailed adoption, I can obtain the necessary Compustat and Perl output for 386 filings of the original 424 detailed XBRL1 10-K reports filed. Panel B displays the pattern of XBRL adoption as each tier adopted over time.[12]

Table 2, panel A, provides descriptive statistics for the full 10-K filing sample. The mean number of quantitative disclosures in the footnotes is 1,154, as compared to the 356 mean items on the face of the financial statements. The footnotes contain 12,283 words on average and have a Fog score of

[11] The first fiscal year that non accelerated filers as well as accelerated filers were required to comply with Sarbanes-Oxley disclosure requirements (http://www.sec.gov/news/press/2005-25.htm) was 2006. Thus, I use 2006 through 2014 filings to maximize the number of observations available to model disclosure choice while maintaining comparability across filings.

[12] Note that I include both mandatory and voluntary detail XBRL filers (within the mandatory implementation period). Very few firms voluntarily adopted the detail tagging requirements, and most were "threshold crossers," or firms that dropped below the market float threshold after initial adoption of basic XBRL requirements but continued on to file detailed XBRL statements the next year, making them effectively mandatory. Nevertheless, I repeat my main analyses excluding these voluntary filers, and the coefficient on *Post* XBRL1* remains positive and significant at the 1% level or better. See online appendix table IA1.

**TABLE 1**
*Sample Selection*

**Panel A. Sample selection**

| | Filings | Firms |
|---|---|---|
| SEC filings for Compustat firms for fiscal years 2006 through 2014 | 56,711 | 10,806 |
| Less filings that do not have required Compustat and CRSP information | (22,959) | (4,887) |
| Less filings without quantitative footnote count from Perl output | (2,987) | (240) |
| Less filings of firms that enter (exit) the sample after (before) the initial three-year XBRL implementation period | (4,896) | (2,038) |
| Less filings of firms that do not adopt XBRL during the first three years | (186) | (34) |
| Total observations | 25,683 | 3,607 |

**Panel B. Distribution of sample filings over fiscal years, by detail adoption status for first 3 tiers**

| | Pretreatment | XBRL1 | XBRL2 | XBRL3 |
|---|---|---|---|---|
| 2006 | 2,405 | | | |
| 2007 | 2,568 | | | |
| 2008 | 2,757 | | | |
| 2009 | 2,859 | | | |
| 2010 | 2,647 | 386 | | |
| 2011 | 1,663 | 375 | 1,090 | |
| 2012 | | 351 | 1,028 | 1,765 |
| 2013 | | 345 | 999 | 1,627 |
| 2014 | | 345 | 940 | 1,533 |
| Total | 14,899 | 1,802 | 4,057 | 4,925 |

This table provides sample selection details. Panel A provides the sample selection, and Panel B the distribution of the sample over fiscal years by detail adoption status. Of the 34 "noncomplying" firms, 26 are not subject to the mandate requirements because they do not report under U.S. GAAP (11 trusts using modified cash basis and two foreign private issuers using IFRS) or because they are closed-end investment funds specifically exempted from the mandate. (Note that these specific firms were not removed in the first step of the sample selection because their share codes were mislabeled.) Six of the "noncomplying" firms have June/July fiscal year ends that provide an additional year for adoption on 10-K filings. The remaining two firms appear to be not complying with the mandate.

19.8, similar to Li [2008]. The mean (median) firm has market float (per the 10-K disclosure) of $3.6 billion ($574 million), assets of $5.9 billion ($790 million), analyst following of eight (six), and institutional holdings of 56% (65%).

## *4. Research Design and Results*

### 4.1 MARKET PARTICIPANT INFORMATION COSTS AND FIRM DISCLOSURE

*4.1.1. Main Research Design—First Implementation Group.* Using the staggered adoption of XBRL, I implement a difference-in-difference design using filings from 2006–2010. The treatment firms are XBRL1 firms that first adopt detailed requirements in 2010, and the control firms are a matched set of firms that do not adopt XBRL during 2010. These matched control firms (part of the second and third wave of XBRL adopters) allow

**TABLE 2**
*Descriptive Statistics*

**Panel A. Sample descriptive statistics**

| | Mean | P25 | Median | P75 | Std. Dev. | *N* |
|---|---|---|---|---|---|---|
| *TagsNotes* | 1,154 | 646 | 934 | 1,433 | 756 | 25,683 |
| *LnTagsNotes* | 6.87 | 6.47 | 6.84 | 7.27 | 0.59 | 25,683 |
| *ScTagsNotes* | 1.00 | 0.91 | 1.00 | 1.08 | 0.17 | 25,683 |
| *Tags_FS* | 356 | 291 | 338 | 392 | 124 | 25,683 |
| *Tag_Ratio_Notes* | 36% | 30% | 36% | 43% | 10% | 25,683 |
| *Tag_Ratio_FS* | 13% | 10% | 13% | 16% | 5% | 25,683 |
| *Words_Notes* | 12,283 | 8,075 | 11,048 | 14,949 | 6,099 | 25,683 |
| *Fog_Notes* | 19.8 | 18.7 | 19.8 | 20.8 | 1.5 | 25,683 |
| *Market Float* | 3,606 | 130 | 574 | 2,324 | 9,536 | 25,683 |
| *Market Value* | 4,138 | 180 | 742 | 2,818 | 10,665 | 25,683 |
| *Assets* | 5,938 | 176 | 790 | 3,367 | 17,675 | 25,683 |
| *Analyst* | 8.20 | 2.00 | 6.00 | 12.00 | 7.79 | 25,683 |
| *InstHoldings* | 0.56 | 0.29 | 0.65 | 0.84 | 0.33 | 25,683 |
| *NumShareholders* | 10.48 | 0.20 | 0.93 | 5.29 | 31.63 | 25,683 |
| *NumSegments* | 2.22 | 1.00 | 2.00 | 3.00 | 1.60 | 25,683 |
| *FootnoteCategories* | 12.73 | 11.00 | 13.00 | 14.00 | 2.12 | 25,514 |
| *ROA* | −0.01 | −0.02 | 0.03 | 0.08 | 0.21 | 25,683 |
| *PyAbnRet* | 0.03 | −0.23 | −0.02 | 0.19 | 0.46 | 25,683 |
| *EarnVol* | 2.36 | 0.32 | 0.74 | 1.82 | 6.10 | 25,683 |
| *RetVol* | 0.03 | 0.02 | 0.03 | 0.04 | 0.02 | 25,683 |
| *Mtb* | 2.93 | 1.16 | 1.94 | 3.40 | 4.78 | 25,683 |

**Panel B. Descriptive statistics by XBRL adoption group**

| | XBRL1 | XBRL2 | XBRL3 |
|---|---|---|---|
| *TagsNotes* | 1,869 | 1,363 | 835 |
| *LnTagsNotes* | 7.41 | 7.09 | 6.60 |
| *ScTagsNotes* | 1.00 | 1.00 | 1.00 |
| *Words_Notes* | 17,595 | 13,675 | 10,020 |
| *Market Float* | 20,340 | 2,354 | 322 |
| *Market Value* | 22,514 | 2,877 | 453 |
| *Analyst* | 19.81 | 10.64 | 3.66 |
| *InstHoldings* | 0.69 | 0.72 | 0.42 |
| *NumSegments* | 3.18 | 2.50 | 1.79 |
| *FootnoteCategories* | 14.13 | 13.41 | 11.92 |
| *No. of observations (N)* | 3,292 | 9,079 | 13,312 |

**Panel C. Descriptive statistics for XBRL1 and matched firms, 2006–2010**

| | XBRL1 | Matched Firms |
|---|---|---|
| *TagsNotes* | 1,788 | 1,316 |
| *LnTagsNotes* | 7.37 | 7.05 |
| *ScTagsNotes* | 0.96 | 0.95 |
| *Words_Notes* | 17,133 | 14,064 |
| *Market Float* | 18,171 | 1,616 |
| *Market Value* | 20,238 | 1,904 |
| *Analyst* | 18.40 | 8.30 |
| *InstHoldings* | 0.71 | 0.62 |

*(Continued)*

**TABLE 2**—*Continued*

**Panel C. Descriptive statistics for XBRL1 and matched firms, 2006–2010**

| | XBRL1 | Matched Firms |
|---|---|---|
| *NumSegments* | 3.18 | 2.53 |
| *FootnoteCategories* | 14.13 | 13.74 |
| *No. of observations (N)* | 1,782 | 1,676 |

Panel A provides descriptive statistics for the sample of 25,683 10-K filings from 2006 to 2014. Panel B compares mean values of key variables across XBRL1, XBRL2, and XBRL3 samples. Panel C compares mean values of key variables across XBRL1 and matched control firms during 2006 through 2010. The variables are as defined in appendix D, and all variables are winsorized at 1% and 99%.

me to control for any systematic changes other than XBRL that affect firms' disclosures during this period. I focus on the first adoption group and first year of detailed adoption for several reasons. First, with each passing year of the phased XBRL implementation, the set of nontreatment firms shrinks, reducing the pool of control firms. Using the first year of adoption as the treatment allows for the largest group of potential control firms with the closest match in pretreatment disclosure trends. Second, using the first adoption group avoids potential issues in later years, such as leakage of treatment through early adoption or reduced response due to changes in firms' expectations of the mandate's effect. Thus, I estimate the following OLS regression using all available firm-year observations for XBRL1 and matched control firms from 2006 through 2010:

$$(Ln)\,(Sc)\,Tags\,Notes_{i,t} = \beta_0 + \beta_1 Post \times XBRL1_{i,t} + \sum \beta_i\,(\mathrm{Sc})\,\mathrm{Control\,Variables_{i,t}} + \mathrm{Firm\,FE_i} + \mathrm{Year\,FE_{jt}} + \varepsilon, \quad (1)$$

where $i$ and $t$ index companies and years, respectively. *TagsNotes, LnTagsNotes, ScTagsNotes,* and the control variables are as defined in section 3. *Post* × *XBRL1* is the interaction of *Post* (an indicator variable for the first postadoption year, 2010) and *XBRL1* (an indicator variable for tier 1 firms that adopt XBRL detailed tagging requirements in 2010).[13] I control for fixed idiosyncratic firm disclosure choices by including firm fixed effects, time-related effects by including year fixed effects, and transitory

[13] Equation (1) does not include the main effects of *Post* and *XBRL1* because the year and firm fixed effects encompass the variation in *Post* and *XBRL1,* respectively, preventing estimation of their coefficients. Also, note that I do not cluster standard errors by time (to create two-way clustered standard errors) because there are five years in this regression, and to create consistent estimates of standard errors, at least 10–50 clusters (i.e., years, in this case) are recommended (Petersen [2009]; Gow, Ormazabal, and Taylor [2010]).

shocks that are correlated across time for a given firm by clustering standard errors by firm.[14] The coefficient on *Post* × *XBRL1* ($\beta_1$) captures the difference between the change in XBRL1 firms' disclosure and the change in matched Non-XBRL1 firms' disclosure before and after the XBRL1 implementation year, or the difference-in-difference impact of detailed tagging adoption on the amount of disclosure, controlling for other firm and time effects.

*4.1.2. Matched Sample and Parallel Trends Assumption.* The critical assumption in this difference-in-difference design is that the treatment and control firms have parallel trends of quantitative footnote disclosure. Because XBRL adoption groups are determined based on market float, many of the Non-XBRL1 firms are quite different from XBRL1 firms. Thus, to increase the reasonableness of the parallel trends assumption, I create a matched sample of control firms based on determinants of footnote disclosure. Specifically, I randomly prioritize the XBRL1 firms, and for each XBRL1 firm, I search within the same three-digit SIC code and select without replacement the non-XBRL1 firm with the smallest Mahalanobis distance from that firm, measured in the year of the disclosure choice (fiscal 2010) using three characteristics that are highly correlated with the amount of quantitative disclosure: number of segments (*LnSegments)*, amount of qualitative disclosure (*LnWords_Notes)*, and breadth of transaction types. To measure the breadth of transaction types, I count the number of footnote categories (as classified in section 5.1) in each filing for which the information is available (i.e., one year prior to detailed XBRL implementation and ongoing), and I use the maximum number of categories for each firm as the inherent breadth of their transactions.[15] I then gather all fiscal year observations for the matched XBRL1 and non-XBRL1 firms.

As shown in table 2, panels B and C, the matched non-XBRL1 sample is closer to the XBRL1 firms in the pretreatment years along the observable firm characteristics, especially the matching characteristics. More importantly, the parallel trends assumption is reasonably supported with the matched sample. As shown in figure 2, the XBRL1 and matched control firms have similar patterns of disclosure in the pretreatment period of 2006 through 2009. Table 3, panels A, B, and C show that the pretreatment year-over-year change in each of the disclosure variables is the same for both samples, except for 2006–2007 where XBRL1 firms' disclosure decreased while the control firms' increased.[16] The remaining question is whether

[14] In robustness tests, I include two-digit SIC industry-year fixed effects to control for industry-related effects, and the coefficient on *Post* × *XBRL1* remains positive and significant at the 1% level or better. See online appendix table IA1.

[15] This measure would be a natural control variable in the main analyses. However, by construction, the variable is non-time-varying, and thus the predictive ability is subsumed by the firm fixed effects.

[16] When I repeat my analyses using 2007 and forward only, the coefficient on *Post* × *XBRL1* remains positive and significant at the 1% level or better. See online appendix table IA1.

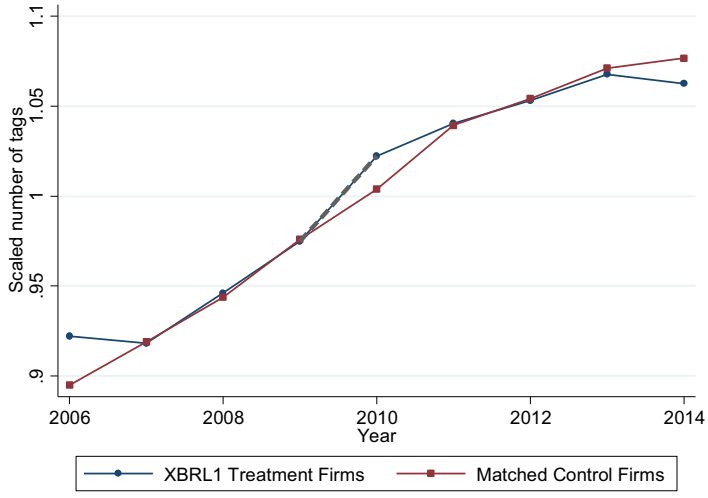


FIG. 2.—Quantitative footnote disclosures trends over time, XBRL1 and matched non-XBRL1. This figure displays the average scaled number of tags (i.e., *ScTagsNotes*, the number of quantitative footnote disclosures scaled by the firm's average number of quantitative footnote disclosures) for XBRL1 (i.e., the first group of XBRL adopters) and matched non-XBRL1 firms from 2006 to 2014. The gray dotted line indicates the change in disclosures in the first year of detailed adoption for XBRL1 firms. Years 2006–2009 are pretreatment years for both sets of firms. Years 2010 and forward are posttreatment for XBRL1, and 2011 or 2012 and forward are posttreatment for the matched control firms.

**TABLE 3**

*Parallel Trends Assumption: Pretreatment Trends in Disclosure*

**Panel A. Pretreatment disclosure trends, change in *TagsNotes***

| | Treatment Sample | Control Sample | Difference | *t*-Statistic |
|---|---|---|---|---|
| 2009–2008 | 70.01 | 63.12 | 6.894 | 0.36 |
| 2008–2007 | 58.22 | 28.95 | 29.261 | 1.27 |
| 2007–2006 | −0.19 | 43.84 | −44.025 | −1.83 |

**Panel B. Pretreatment disclosure trends, change in *LnTagsNotes***

| | Treatment Sample | Control Sample | Difference | *t*-Statistic |
|---|---|---|---|---|
| 2009–2008 | 0.033 | 0.047 | −0.014 | −1.15 |
| 2008–2007 | 0.037 | 0.032 | 0.004 | 0.30 |
| 2007–2006 | −0.001 | 0.039 | −0.040 | −2.49 |

**Panel C. Pretreatment disclosure trends, change in *ScTagsNotes***

| | Treatment Sample | Control Sample | Difference | *t*-Statistic |
|---|---|---|---|---|
| 2009–2008 | 0.033 | 0.034 | −0.002 | −0.17 |
| 2008–2007 | 0.030 | 0.026 | 0.004 | 0.40 |
| 2007–2006 | −0.004 | 0.031 | −0.034 | −2.78 |

Panels A, B, and C of this table provide the pretreatment changes in *TagsNotes*, *LnTagsNotes*, and *ScTagsNotes*, respectively, by year for the treatment sample and the matched control sample. The difference in disclosure trend between groups is tabulated, and the *t*-statistic is displayed for the test of whether the samples are significantly different in each pretreatment year. Variables are winsorized at 1% and 99%, and are as defined in appendix D.

the posttreatment disclosure trends would have continued to be the same in the absence of the XBRL mandate. Several components of my research design reduce the concern that posttreatment trends would have deviated even without the treatment. First, I include firm fixed effects, which controls for any time-invariate firm-level determinants of disclosure. Second, I include numerous controls for firm characteristics that could influence disclosure quantity and trends both pre- and post-XBRL adoption. Third, in robustness tests, I include industry-year fixed effects, which control for a dynamic time trend within each industry and thus eliminate industry-level disclosure trends.

*4.1.3. Main Results—First Implementation Group.* Table 4 provides the regression results for the effect of XBRL1 detailed tagging on the amount of quantitative disclosure in footnotes, using XBRL1 firms as the treatment sample and a matched set of non-XBRL1 firms as the control sample. Columns 1, 2, and 3 display a positive coefficient for *Post* × *XBRL1* significant at the 1% level or better, confirming that the increase in XBRL1 firms' disclosure is significantly greater than the change in matched control firm disclosure for all three disclosure measures. In addition, the magnitude of the effect appears to be economically significant; the coefficient for *Post* × *XBRL1* implies an average increase of 3.5% to 6.4% of the mean XBRL1 firm's quantitative footnote disclosures.

### 4.2 ALTERNATIVE IDENTIFICATION STRATEGIES

To provide further evidence that the increase in disclosure is related to the adoption of XBRL, I implement two additional tests that use alternative methods to identify the impact of XBRL: fiscal year cutoff and RD.

*4.2.1. Variation in Fiscal Year Ends.* The primary tests identify the year using fiscal year ends, where, for example, the year 2010 would include firms with fiscal year ends between June 15, 2010, and June 14, 2011. This approach follows the XBRL mandate's implementation timetable, and it assumes that other economic or regulatory events affecting firms follow this time frame as well. However, an alternative approach is to group firms with fiscal year ends within the same calendar year, under the assumption that economic events would affect firms similarly within a calendar year. In this case, a portion of XBRL1 firms (i.e., those with fiscal year ends from June through December) adopt in calendar year 2010 and a portion in calendar year 2011 (those with fiscal year ends from January through May). This variation allows the creation of a comparison sample within XBRL1 firms, avoiding concerns about appropriate matching to non-XBRL1 firms. I repeat my main analysis using just XBRL1 firms, identifying calendar year 2010 adopters as the treatment firms and calendar year 2011 adopters as control firms during the 2006 through 2010 time period. Specifically, I reestimate equation (1), using *CalYrPost* × *XBRL1_PreJanYE* and calendar year fixed effects, where *CalYrPost* is an indicator for calendar year 2010 and *XBRL1_PreJanYE* is an indicator for XBRL1 firms with fiscal year ends June

**TABLE 4**

*Impact of XBRL on the Number of Quantitative Footnote Disclosures, First Adoption Year*

| | Predicted Sign | *TagsNotes* (1) | *LnTagsNotes* (2) | *ScTagsNotes* (3) |
|---|---|---|---|---|
| *Post* × *XBRL1* | + | 113.82*** | 0.035*** | 0.040*** |
| | | (4.82) | (3.11) | (3.88) |
| *LnWords_Notes* | | 1,082.63*** | 0.728*** | 5.728*** |
| | | (16.32) | (17.11) | (27.89) |
| *Fog_Notes* | | −22.34** | −0.014** | −0.171* |
| | | (−2.11) | (−2.47) | (−1.88) |
| *LnAnalyst* | | −15.15 | −0.002 | −0.006 |
| | | (−1.06) | (−0.22) | (−0.72) |
| *InstHoldings* | | −26.04 | −0.020 | −0.010 |
| | | (−0.59) | (−0.72) | (−0.86) |
| *LnNumShareholders* | | 5.32 | 0.004 | −0.010* |
| | | (0.36) | (0.34) | (−1.65) |
| *LnMV* | | 19.62 | 0.007 | 0.042 |
| | | (1.26) | (0.82) | (1.08) |
| *LnSegments* | | 18.89 | 0.050** | 0.062*** |
| | | (0.47) | (2.50) | (3.19) |
| *ROA* | | 30.00 | 0.014 | 0.000 |
| | | (0.58) | (0.46) | (0.42) |
| *PyAbnRet* | | −9.28 | −0.005 | −0.000* |
| | | (−1.03) | (−1.05) | (−1.81) |
| *EarnVol* | | 2.92 | 0.000 | 0.001 |
| | | (1.27) | (0.26) | (0.16) |
| *LnRetVol* | | 44.17* | −0.003 | 0.020 |
| | | (1.90) | (−0.23) | (0.56) |
| *Mtb* | | −1.57* | −0.001* | −0.003 |
| | | (−1.78) | (−1.87) | (−1.19) |
| Firm Fixed Effects | | Yes | Yes | Yes |
| Year Fixed Effects | | Yes | Yes | Yes |
| *N* | | 3,458 | 3,458 | 3,458 |
| Adj. *R*-squared | | 0.4261 | 0.5335 | 0.4804 |

This table provides the results of regressing the number, log number, and scaled number of quantitative footnote disclosures (*TagsNotes*, *LnTagsNotes*, and *ScTagsNotes*, respectively) on the interaction term *Post** *XBRL1* (where *Post* is an indicator variable for post-XBRL1 filings (i.e., fiscal 2010) and *XBRL1* an indicator variable for firms that adopted XBRL's detailed tagging requirements in 2010), as well as control variables. (Note that coefficients for the individual *Post* and *XBRL* indicators are subsumed by the year and firm fixed effects, respectively.) Coefficients are provided with *t*-statistics in parentheses below. The sample consists of 3,458 XBRL1 and matched non-XBRL1 firm 10-K filings for fiscal 2006–2010. All models have firm-clustered, robust standard errors. Variables are as defined in appendix D and are winsorized at 1% and 99%. Column 3 uses *ScTagsNotes* as the dependent variable, which is a scaled version of *TagsNotes*, and thus for consistency, the control variables in that regression are scaled in a similar fashion to *ScTagsNotes*. The reported R-squared is from "within" estimation (i.e., does not include the effect of firm fixed effects). ***, **, * significantly different from zero at the 1%, 5%, and 10% (two-tailed) level or better, respectively.

through December. The remaining XBRL1 firms are then control firms similar to the treatment firms except for fiscal year end.

Eighty-seven percent of XBRL1 firms have June through December year ends, so the remaining 13% are the control observations. Despite the small size of the control sample, I continue to find a significantly positive relation between XBRL adoption and disclosure increase. As shown in table 5, panel A, the coefficient on *CalYrPost* × *XBRL1_PreJanYE* is positive and significant

**TABLE 5**
*Impact of XBRL on Disclosure, Alternative Specifications*

**Panel A. Impact of XBRL on disclosure, June through December year-end XBRL1 firms**

| | Predicted Sign | *TagsNotes* | *LnTagsNotes* | *ScTagsNotes* |
|---|---|---|---|---|
| *CalYrPost* × *XBRL1_PreJanYE* | + | 197.17*** | 0.078*** | 0.078*** |
| | | (6.02) | (3.81) | (4.21) |
| Control variables | | Yes | Yes | Yes |
| Firm fixed effects | | Yes | Yes | Yes |
| Calendar year fixed effects | | Yes | Yes | Yes |
| *N* | | 1,827 | 1,827 | 1,827 |
| Adj. *R*-squared | | 0.5071 | 0.5872 | 0.5352 |

**Panel B. Impact of XBRL on disclosure, January through May year-end XBRL1 firms**

| | Predicted Sign | *TagsNotes* | *LnTagsNotes* | *ScTagsNotes* |
|---|---|---|---|---|
| *CalYrPost* × *XBRL1_PostDecYE* | + | 24.08 | 0.020 | 0.014 |
| | | (0.92) | (1.37) | (0.95) |
| Control variables | | Yes | Yes | Yes |
| Firm fixed effects | | Yes | Yes | Yes |
| Calendar year fixed effects | | Yes | Yes | Yes |
| *N* | | 760 | 760 | 760 |
| Adj. *R*-squared | | 0.3672 | 0.3779 | 0.3708 |

**Panel C. Impact of XBRL on disclosure, regression discontinuity analysis**

| | Predicted Sign | *AbnTagsNotes* | *AbnLnTagsNotes* | *AbnScTagsNotes* |
|---|---|---|---|---|
| *XBRL1* | + | 82.46* | 0.057** | 0.055** |
| | | (1.90) | (2.28) | (2.52) |
| Market float polynomials | | Yes | Yes | Yes |
| Year | | 2010 | 2010 | 2010 |
| *N* | | 3,033 | 3,033 | 3,033 |
| Adj. *R*-squared | | 0.0084 | 0.0055 | 0.0064 |

This table provides the results of several alternative identification strategies. Panels A and B use just XBRL1 treatment firms and show the results of regressing the number, log number, and scaled number of quantitative footnote disclosures (*TagsNotes, LnTagsNotes,* and *ScTagsNotes,* respectively) on the interaction of *CalYrPost*, an indicator for filings that occurred during calendar year 2010, and *XBRL1_PreJanYE,* an indicator for XBRL1 firms with fiscal year ends June through December, or *XBRL1_PostDecYE,* an indicator for XBRL1 firms with fiscal year ends January through May, as well as control variables. Panel A uses XBRL1 firms' available filings in calendar year 2006 through 2010, and Panel B uses XBRL firms' filings in calendar 2010 and 2011. Panel C provides the results of the second stage of a parametric regression discontinuity design, as further described in the text. *Abn(Ln)(Sc)TagsNotes* are the firm-year-specific residuals from estimating Model (1) without market value. Market float polynomials include the firm's market float less the $5 billion cutoff value (separately for values above and below the cutoff), and the squares of those two differences. Coefficients are provided with *t*-statistics in parentheses below. Panels A and B have firm-clustered, robust standard errors and Panel C robust standard errors (because there is only one observation per firm). Variables are as defined in appendix D and are winsorized at 1% and 99%. The reported R-squared is from "within" estimation (i.e., does not include the effect of firm fixed effects). ***, **, * significantly different from zero at the 1%, 5%, and 10% (two-tailed) level or better, respectively.

at the 1% level for all three disclosure variables. Thus, this alternative analysis provides additional support for the impact of XBRL on firm disclosure.

Separating on fiscal year allows me to perform a similar test in the next year with flipped treatment and control groups. Specifically, if XBRL1 firms fully respond in the year of adoption, I would expect XBRL1 firms with January through May year ends to increase their disclosure more in calendar year 2011 than XBRL1 firms with June through December year ends.

However, firms may continue to adjust their disclosure over several years, in which case there would not be a differential disclosure increase for XBRL1 firms treated in calendar year 2011. As shown in table 5, panel B, there is no difference in the disclosure increase in calendar year 2011 between the two sets of XBRL1 firms. This could be evidence that firms continue to adjust their disclosure for several years after adoption, or it could be a weakly powered test due to the small number of XBRL1 firms with January through May fiscal year ends.

*4.2.2. RD Design.* Because XBRL adoption is determined primarily by whether a firm's market float lies above or below a cutoff, it is possible to use an RD design. The goal of an RD is to use the discontinuity in treatment to estimate the impact of treatment. This approach increases the internal validity, although it reduces the external validity or generalizability of the results because it focuses on the impact of treatment at the cutoff (Imbens and Lemieux [2008], Lee and Lemieux [2010], Roberts and Whited [2013]). In this setting, the probability of XBRL treatment increases at the cutoff but does not deterministically move from 0 to 1. Thus, following the advice of Roberts and Whited [2013], I implement a parametric fuzzy RD design using 2SLS for the first phase of XBRL adoption in 2010, with several factors that influence probability of treatment as exogenous instruments in the first stage. The primary instrument is an indicator for having a market float above the cutoff ($5 billion in 2010). I additionally include an indicator for having a fiscal year end in June, July, or August (because firms do not have to begin XBRL adoption with a 10-K filing and thus are able to delay for a year if the 10-K is the first filing after June 15), an indicator for not having any prior 10-K filings (because, again, firms do not have to start XBRL implementation with a 10-K filing and the 2010 10-K filing would then be the one that initiated their XBRL requirement for the next year), and interactions between the cutoff indicator and these two other indicators. As expected, the instruments are strongly predictive of XBRL adoption, with an (untabulated) first stage $R^2$ of 0.8939 and a Kleibergen–Paap $F$-statistic of 68.71. The coefficient on the cutoff indicator is positively correlated with adoption, and the interaction coefficients are negatively correlated, because firms that meet the cutoff but do not meet the filing date conditions are not required to implement XBRL.

For the second stage equation, I follow the suggestion in Lee and Lemieux [2010] and estimate the dependent variables *Abn(Ln)(Sc)TagsNotes* using the firm-year-specific residuals from equation (1) excluding market value, to absorb the time-series correlation and predictable variation. Following Roberts and Whited [2013], I then regress *Abn(Ln)(Sc)TagsNotes* on polynomials of market float (the forcing variable), estimating unique coefficients for the difference and squared difference between firms' market float and the treatment cutoff value, both above and below the cutoff. This technique models the relation between the forcing variable and the dependent variable, focusing entirely on the discontinuity to estimate the causal

impact of the treatment.[17] As shown in table 5, panel C, I continue to find a positive relation between XBRL adoption and detailed disclosure in the first year of adoption at the 10% level or better, although the results are slightly weaker than those in table 4.

Overall, there are several potential reasons for the slightly weaker results. By focusing on the discontinuity alone, RD generally lowers the power of the test. Complexity in this specific setting exacerbates the problem, with the inclusion of factors such as complex assignment to treatment and a dependent variable with significant time series correlation. In addition, the forcing variable (i.e., market float) is captured using textual analysis techniques from firms' 10-K filings, and because of the nature of the data and collection process, there is likely more noise in this measure than in market value (the control variable used in the primary regressions). Finally, the low density of observations at the cutoff point in the first year further reduces the strength of the RD design. Nevertheless, using an RD approach adjusted for some of these concerns yields results consistent with the main difference-in-difference findings, increasing the internal validity claims.

## 5. *Additional Tests—Type of Disclosures*

I perform several additional tests to better understand the quantitative disclosure measure and to confirm that the results are not driven by nondiscretionary or noninformative disclosures.

### 5.1 FOOTNOTE DISCLOSURES BY CATEGORY

The analyses thus far have used the number of quantitative disclosures in the entire footnotes because it is difficult to obtain specific footnote information for a large sample prior to XBRL adoption. However, XBRL does require firms to start with basic tagging one year prior to detail tagging, and this basic tagging includes a "block tag" of each footnote in its entirety (i.e., debt, taxes, pension, etc.). I estimate a disaggregation of *TagsNotes* starting one year prior to detailed XBRL implementation by counting quantitative disclosures in each block-tagged footnote. As shown in table 6, panel A, the sum of the disclosures in block-tagged footnotes (*FC_Total)* has a mean of 1,215 items per filing, which is similar to this sample's mean of 1,256 *TagsNotes*. The two measures have a Pearson correlation of 0.93, providing additional comfort of their accuracy.

The mean number of footnotes per firm is 18.5, ranging from 15 to 21 for the 25th to 75th percentile. However, firms have discretion in organizing their footnotes, resulting in different groupings across firms. Therefore, I

[17] A key assumption of RD is that firms cannot precisely manipulate the forcing variable. In this case, precise manipulation of market float is difficult because it is a function of market forces on a given day. In addition, when I examine the observations' density, there is no evidence of a shift in observations downward to just below the cutoff to avoid regulatory requirements, and a McCrary [2008] test of the density confirms there is no discontinuity.

**TABLE 6**

*Levels of and Changes in Quantitative Footnote Disclosure Categories*

**Panel A. Quantitative footnote disclosures by category**

| | *N* | Mean | Percent of Total |
|---|---|---|---|
| *Tags_Notes* | 10,480 | 1,255.8 | |
| *FC_Total* | 10,480 | 1,215.3 | |
| *Taxes* | 10,480 | 104.4 | 10.9% |
| *Compensation* | 10,480 | 103.6 | 11.0% |
| *Pension* | 10,480 | 96.3 | 6.5% |
| *Segments* | 10,480 | 92.1 | 7.3% |
| *Borrowings* | 10,480 | 79.9 | 6.6% |
| *Shareholder's Equity and Related* | 10,480 | 63.1 | 6.3% |
| *PPE & Inventory* | 10,480 | 62.7 | 4.3% |
| *Quarterly Financial Information* | 10,480 | 60.3 | 6.0% |
| *Significant Accounting Policies* | 10,480 | 60.3 | 6.6% |
| *Securities & Investments* | 10,480 | 48.6 | 3.2% |
| *Fair Value* | 10,480 | 44.4 | 3.1% |
| *M&A* | 10,480 | 38.0 | 3.2% |
| *Commitments & Contingencies* | 10,480 | 37.4 | 3.5% |
| *Goodwill & Intangible* | 10,480 | 35.1 | 3.2% |
| *Derivatives* | 10,480 | 25.6 | 1.6% |
| *Receivables* | 10,480 | 14.5 | 1.0% |
| *Other* | 10,480 | 210.0 | 14.7% |

**Panel B. XBRL1 adoption year change in quantitative footnote disclosure by category**

| | *N* | Difference | Scaled Difference |
|---|---|---|---|
| *Tags_Notes* | 316 | 128.26*** | 0.0659*** |
| *FC_Total* | 316 | 115.18*** | 0.0607*** |
| *Taxes* | 316 | 2.21*** | 0.0019*** |
| *Compensation* | 316 | −0.63 | −0.0008 |
| *Pension* | 316 | 28.18*** | 0.0153*** |
| *Segments* | 316 | −1.89 | −0.0013 |
| *Borrowings* | 316 | 2.58 | 0.0017 |
| *Shareholder's Equity and Related* | 316 | 0.76 | 0.0014 |
| *PPE & Inventory* | 316 | 1.02 | 0.0009 |
| *Quarterly Financial Information* | 316 | −0.63 | 0.0010 |
| *Significant Accounting Policies* | 316 | −3.28 | −0.0019 |
| *Securities & Investments* | 316 | 5.92*** | 0.0029** |
| *Fair Value* | 316 | 21.02*** | 0.0112*** |
| *M&A* | 316 | 2.94 | 0.0033** |
| *Commitments & Contingencies* | 316 | 3.45*** | 0.0020*** |
| *Goodwill & Intangible* | 316 | 1.98** | 0.0013** |
| *Derivatives* | 316 | 11.40*** | 0.0053*** |
| *Receivables* | 316 | 8.41*** | 0.0046*** |
| *Other* | 316 | 11.04 | 0.0078 |

Panel A of this table provides descriptive statistics about the disaggregation of quantitative footnote disclosures into categories for the full sample of available data, beginning in 2009 for tier 1 XBRL (XBRL1) adopters and continuing through 2013. Panel B provides the XBRL adoption year change (2009–2010) in disclosure by category for XBRL1 firms. The scaled difference is the category change scaled by the total quantitative footnote disclosure in the preadoption year. ***, **, * significantly different from zero at the 1%, 5%, and 10% (two-tailed) level or better, respectively.

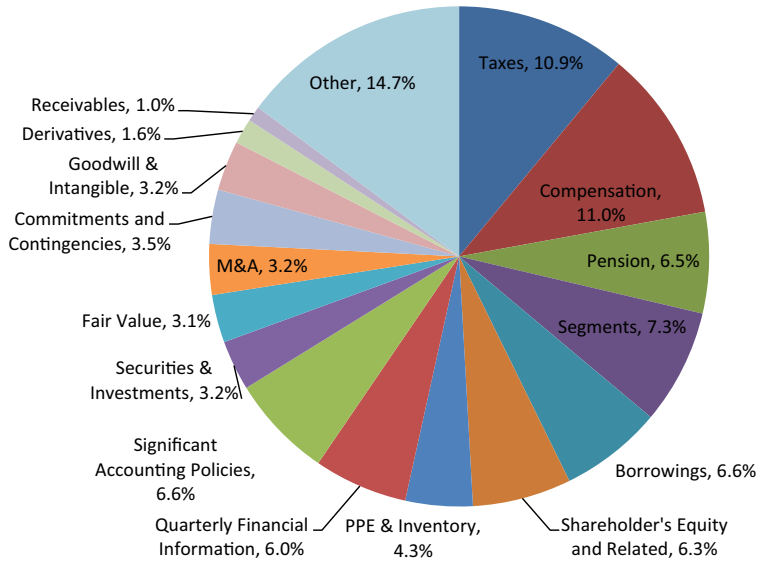


FIG. 3.—Footnote composition. This figure displays the average percent of quantitative footnote disclosures in each footnote category for XBRL1, XBRL2, and XBRL3 firms with available block tagged footnote information from 2009 through 2013.

examine the block-tagged footnotes and identify 16 specific categories and one miscellaneous category. See appendix E for details of the primary components of each category and figure 3 for a pictorial representation of the average filing's footnote composition. Taxes and Compensation footnotes include the most quantitative disclosures, with Pension, Segments, and Borrowings as the next major footnotes.

This detailed information is only available for XBRL firms one year preadoption, so I cannot compare XBRL firms with control firms in the treatment year. However, I can examine the difference in pre- and postadoption disclosures by category for the XBRL firms to better understand the types of disclosure that were adjusted. In addition, examining by category allows me to identify changes potentially driven by the expectation of regulator scrutiny versus analyst, investor, and media scrutiny. Specifically, I examine (1) the SEC speeches given at the 2008–2010 AICPA National Conferences on Current SEC & PCAOB Developments and (2) Ernst & Young's and Deloitte Touche's 2008–2010 executive summaries of SEC comment letter focus areas to proxy for firms' expectation of where SEC scrutiny was likely to occur.[18] I map the comments in these

[18] The annual slide presentations of the "Current Developments in the Division of Corporate Finance" are available online on the SEC speeches page: http://www.sec.gov/News/Page/List/Page/1356125649549. The audit firm executive summaries of SEC comment letters are publicly available at each firm's website.

documents to the 16 financial statement categories in table 6, focusing on quantitative disclosure scrutiny, and I identify the five most common categories in these documents as high-SEC-scrutiny categories: taxes, segments, goodwill & intangible, PPE & inventory (impairments), and securities & investments.

Table 6, panel B, provides the change in disclosure across categories for XBRL1 firms, as well as the scaled difference (change scaled by the preadoption year total number of disclosures *FC_Total*). Consistent with the regression results, disclosure increased in the adoption year, both in terms of disclosure count and percent, and there are several categories with significant increases. Of these, the taxes, securities & investment, and goodwill & intangible categories are SEC-identified areas of higher scrutiny, suggesting that part of the increase could be due to higher expected regulator scrutiny. The first example in appendix A provides anecdotal evidence of the potential influence of higher regulator scrutiny, with changes made to the tax footnote by an XBRL1 firm from pre-XBRL to the first adoption year (2009–2010). The firm increased disaggregation of the valuation allowance across expiration periods and included new details of the income recognized due to the reversal of accrued interest and penalties. These changes are in line with the SEC's comments during the December 2008 National Conference on Current SEC and PCAOB Developments that encouraged companies to provide ample disclosure around the valuation allowance and impact of changes on the effective tax rate and net income. Similarly, appendix A example 3 shows evidence of an adjustment in the goodwill & intangible category, with a postadoption firm disaggregating accumulated amortization for each intangible asset, rather than providing a summary amount for all intangible assets.[19]

Due to the diversity of sources for analyst, investor, and media scrutiny, it is more difficult to identify categories associated with nonregulator market participants. However, there are XBRL-specific references made by analysts and investor groups that identify XBRL as being helpful in examining pension, debt, compensation, and lease footnotes.[20] Thus, the large increases in pension and commitments & contingencies (which includes leases) suggest that nonregulator market participants played a role in motivating the disclosure change. The second example in appendix A provides anecdotal evidence of an XBRL1 firm increasing disclosure from pre- to postadoption

[19] These examples of XBRL firms' disclosure pre- and postadoption are provided to characterize the potential disclosure adjustments. However, the focus of the draft remains on the large sample empirical tests because it is difficult to know with certainty what motivated each firm's decision to begin disclosing a given item.

[20] See a presentation made by Elmer Huh of Morgan Stanley at the 2005 XBRL International Conference (http://www2.xbrl.org/nmpxbrl.aspx?id=122) and a 2010 article that references Eric Linder, founder of SavaNet, a financial analysis software company using XBRL (http://www.irmagazine.com/articles/earnings-calls-financial-reporting/15891/what-every-company-should-know-about-xbrl/).

(2009–2010) years by disaggregating numerous pension disclosures across U.S. and non-U.S. pension plans.

The final set of categories of interest are those that align with specific mandatory disclosure requirements. If the categories accurately capture firms' disclosure, I would expect changes in footnote categories affected by mandatory disclosure changes during my period. The three most significant quantitative disclosure changes during my period are to financial instruments, derivatives, and variable interest entities. SFAS 157 requires additional disclosure of financial instruments' fair values, and it went into effect for fiscal 2008. SFAS 161 requires additional disclosure for derivatives and hedges, starting in fiscal 2009. SFAS 166 and 167 increase the amount of disclosure related to variable interest entities, special purpose entities, and securitizations, starting in fiscal 2010. Consistent with firms responding to mandatory changes, fair value and derivatives quantitative disclosures increase. In addition, some of the change in pension disclosures may be a result of fair value disclosures for pension assets. Disclosure on variable interest entities is harder to isolate, as firms are less consistent in their choice of where to locate these disclosures. Some are included in the fair value, derivatives, borrowings, or other categories, while others are in the securities & investments category (which also significantly increases during this time period).

It is important to remember that firms still have discretion to voluntarily provide more information than new standards require, and they also have discretion in how fully to comply with the new mandatory requirements. (Evidence of firms' continued discretion is the existence of Securities & Investments as a focus area of the SEC during this period.) This discretion makes it difficult to remove the effect of new regulatory requirements; excluding disclosure changes in these areas removes mandatory and discretionary changes, biasing against finding an XBRL-related disclosure increase.

Overall, disaggregating the count of quantitative footnote disclosures into categories provides more information about the types of disclosures that increased, and the categories affected suggest that the disclosure increase was potentially related to both regulator and nonregulator scrutiny. However, there are several caveats to the results in this section. First, the identification of participant focus areas is inherently noisy and is complicated because the SEC may respond to lower review costs by broadening its focus areas rather than deepening its reviews. Second, the SEC's mandate is to protect investors, so if its focus areas coincide with investors' focus, it can be difficult to separate expectations of investor scrutiny from regulator attention. Third, given the data constraints, I cannot compare XBRL firms to control firms and thus am not able to conclude that these category-level changes are greater than they would have been absent the treatment.

### 5.2 FINANCIAL INSTRUMENTS, FAIR VALUES, DERIVATIVES, AND VARIABLE INTEREST ENTITIES

In the footnote category analysis, I discuss the potential impact of mandatory disclosure requirements on disclosure changes. To control for changes in disclosure requirements in the main analyses, I include year fixed effects (and industry-year fixed effects in robustness tests). However, this assumes that the altered disclosure requirement affects all firms within an industry equally. If a change in disclosure requirements systematically affects XBRL firms differently from non-XBRL firms, it could affect the difference-in-difference coefficient. Although the footnote disaggregation provides some evidence that the disclosure increase was not limited to areas with simultaneous mandatory changes, I perform several additional analyses using alternative measures of firms' exposure to mandatory disclosure changes. First, I use qualitative footnotes to estimate the extent of quantitative disclosure related to fair value/financial instruments, derivatives, and variable interest entities by counting the number of times derivations of the words fair value, financial instrument, derivative, and variable interest entity appear in the footnotes, respectively. The four word counts are positively correlated (ranging between 0.50 and 0.77) with the tag counts of the related footnote category, providing evidence that these word counts capture some aspect of the related quantitative disclosure. I repeat my main analyses, including controls for these word counts, and I continue to find a positive coefficient on *Post* × *XBRL1*, significant at the 5% level or better. Second, I use the percent of firm's assets that are measured at fair value as an alternative measure of firms' exposure to mandatory disclosure changes.[21] Specifically, I calculate each firm's maximum fair value ratio, and I identify the top quintile of firms as *HighFVRatio* firms. I then rerun my main analyses with *Post* × *XBRL1* × *HighFVRatio* (and related interactions). I continue to find a positive coefficient on *Post* × *XBRL1* (significant at the 1% level or better), with no significant difference between *HighFVRatio* firms and other firms.[22] Finally, I repeat analyses using instead the actual fair value ratio or the decile rank of the ratio for firm-years, and interactions between the ratio and the years of the standards changes (2008, 2009, 2010), finding a positive *Post* × *XBRL1* coefficient again, significant at the 5% level or better. See online appendix table IA2. Overall, the results provide further evidence that the disclosure increase is not driven by changes in disclosure requirements.

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[21] The fair value ratio is Compustat *tfva/at*. *Tfva* (total fair value of assets) exists for fiscal 2008 and forward, with some missing values. For firm-year estimates that are missing prior to 2008, I backfill using the 2008 fair value ratio. For 2008 and forward, I leave missing values unadjusted.

[22] The *Post* × *XBRL1* coefficient is positive and significant (5% level or better) using firms with above median fair value ratios as *HighFVRatio* firms, too.

### 5.3 NONZERO QUANTITATIVE FILINGS

Firms adopting XBRL may restructure the formatting of their footnotes to reduce the cost of tagging going forward. Specifically, organizing quantitative disclosures into tables and ensuring that every year has a value—even if that value is zero—can make it easier to automatically roll forward tags in subsequent years. My primary measure of disclosure—*(Ln)(Sc)TagsNotes*—counts all numbers provided in the footnotes, including zeroes, because disclosures of the absence of a financial item can be informative for market participants. However, if the zero is simply a result of firms adjusting their formatting and "filling in" empty blanks, it would be less informative. To ensure that an increase in zeroes is not driving my results, I rerun my main analyses using nonzero quantitative footnote disclosures (unscaled, logged, and scaled) as the dependent variable, and I continue to find a positive coefficient on *Post* × *XBRL1,* significant at the 5% level or better.

Finally, for completeness, I repeat my main analyses adjusting for both nonzero quantitative filings and firms' exposure to mandatory disclosure requirement changes during the period. Because these robustness tests exclude potentially informative voluntary disclosures, they provide more conservative estimates of the treatment effect. I continue to find a positive coefficient on *Post* × *XBRL1,* significant at the 10% level or better. The coefficient estimates are slightly smaller than in primary analyses, implying a disclosure increase of 2.2% to 5.9% for the mean XBRL1 firm. See online appendix table IA2.

## 6. *Subsequent Years of XBRL Adoption*

I turn next to the full sample of XBRL-adopting firms from 2006 to 2014 to examine the second and third implementation phases. If these second- and third-wave firms have the same incentives as the first-wave firms, I would expect similar increases in disclosure upon XBRL adoption, or perhaps even greater. As less visible firms, they could expect a greater increase in scrutiny, and more time to adoption would give more time to understand the implications of reductions in processing costs. However, if market conditions changed during the time period, it is possible that the relation between XBRL adoption and disclosure may be different. The critical assumption underlying the prediction of increased disclosure is that management expects a change in information processing cost and market scrutiny. For the first round of XBRL adoption, there were statements and articles emphasizing the importance of XBRL for examining firms' disclosure more closely. In later years of the XBRL mandate, however, there were open discussions of whether XBRL was helpful in scrutinizing firms' disclosures (given concerns about data quality and accessibility), and these discussions could have influenced management's perception of the attention that would be paid to XBRL filings. In addition, XBRL3 firms may have

had an expectation that the mandate would be postponed or revoked for them soon and thus any change in processing costs would be short-lived.[23]

There are also several research design weaknesses in using the full sample with all three XBRL treatment groups. A difference-in-difference design with multiple treatment groups and treatment periods includes in the control group any firms not currently receiving the treatment, even if they previously received the treatment (Bertrand and Mullainathan [2003]). This design assumes that the treatment effect is never delayed and never extends beyond the initial treatment year. In the main matched sample analyses that end after the first treatment year, this is a reasonable assumption. However, in the full sample, multiyear XBRL setting, this assumption might not hold true for several reasons. First, because of the additional time between the SEC's announcement of XBRL and the second and third round adopters' implementation date, there is more potential for leakage of part of the disclosure response into earlier periods. Second, given firms' uncertainty around how market participants might use the information and the natural iterative process for firms to learn the disclosure demanded, adopters might continue to react to the treatment for several years after treatment. Leakage of treatment into nontreatment periods can result in no treatment difference between groups or even a negative treatment effect. In addition, the critical parallel trends assumption of a difference-in-difference is that the treatment groups would have parallel disclosure trends absent treatment. Unlike the main matched sample that has very similar pretreatment disclosure patterns, the full set of adopters have more disparate disclosure patterns prior to treatment, making it difficult to draw causal conclusions in this full sample setting. In short, it is not clear what the amount and timing of disclosure response to XBRL would be for later adopters, and the full XBRL adoption setting is not as clean of a research setting to examine the relation between disclosure and processing costs.

Nevertheless, for completeness, I implement models similar to the main analyses, with adjustments for the *Post* variable. First, instead of *Post*, I use *PostXBRL_ALL*, an indicator variable equal to one for any post-XBRL firm-filing (i.e., 2010 or later for XBRL1 firm-filings, 2011 or later for XBRL2 firm-filings, and 2012 or later for XBRL3 firm-filings). I include control variables and firm and year fixed effects, and cluster standard errors by firm, like the main specification. In addition, I run a second model that also includes a time trend for each adoption group to attempt to control for differences in disclosure trends across adoption groups (Angrist and Pischke 2015). As shown in table 7, panel A, the coefficient on *PostXBRL_ALL*

[23] In support of this explanation, bills that propose postponing or repealing the XBRL filing requirement for a subset of tier 3 firms were introduced into Congress in March 2014, February 2016, and February 2018. For example, http://www.complianceweek.com/house-panel-recommends-partial-xbrl-exemption/article/338555/, https://fcw.com/articles/2016/02/04/sec-congress-data.aspx, and https://www.congress.gov/bill/115th-congress/house-bill/5054.

**TABLE 7**

*Impact of XBRL on the Number of Quantitative Footnote Disclosures, All Adoption Years*

**Panel A. Impact of XBRL on disclosure, all adoption years**

| | Predicted Sign | *TagsNotes* | | *LnTagsNotes* | | *ScTagsNotes* | |
|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) |
| *PostXBRL_ALL* | + | 51.81*** | 35.75*** | 0.026*** | 0.018*** | 0.027*** | 0.018*** |
| | | (7.12) | (5.10) | (6.23) | (4.38) | (7.20) | (4.86) |
| Control variables | | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| XBRLGroup-Time Trend | | No | Yes | No | Yes | No | Yes |
| *N* | | 25,683 | 25,683 | 25,683 | 25,683 | 25,683 | 25,683 |
| Adj. *R*-squared | | 0.3483 | 0.3612 | 0.5007 | 0.5069 | 0.4761 | 0.4865 |

**Panel B. Impact of XBRL on disclosure, disaggregated by adoption year**

| | Predicted Sign | *TagsNotes* | | *LnTagsNotes* | | *ScTagsNotes* | |
|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) |
| *PostXBRL1* | + | 138.82*** | 85.51*** | 0.061*** | 0.030*** | 0.071*** | 0.038*** |
| | | (7.90) | (4.76) | (7.30) | (3.40) | (8.86) | (4.67) |
| *PostXBRL2* | + | 66.55*** | 2.70 | 0.037*** | −0.008 | 0.039*** | −0.007 |
| | | (6.07) | (0.26) | (5.58) | (−1.18) | (6.54) | (−1.19) |
| *PostXBRL3* | + | −26.19*** | 34.01*** | −0.011** | 0.028*** | −0.016*** | 0.025*** |
| | | (−2.95) | (3.48) | (−2.05) | (4.44) | (−3.24) | (4.17) |
| Control Variables | | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| XBRLGroup-Time Trend | | No | Yes | No | Yes | No | Yes |
| *N* | | 25,683 | 25,683 | 25,683 | 25,683 | 25,683 | 25,683 |
| Adj. *R*-squared | | 0.3585 | 0.3616 | 0.5047 | 0.5073 | 0.4835 | 0.487 |

Panel A of this table provides the results of regressing the number, log number, and scaled number (*TagsNotes, LnTagsNotes,* and *ScTagsNotes)* of quantitative footnote disclosures on an indicator variable for post-XBRL adoption filings (*PostXBRL_ALL*) and control variables, using 25,683 XBRL firm 10-K filings for fiscal 2006–2014. Panel B disaggregates the post-XBRL indicator into the three adoption groups—tier 1 in 2010 (*PostXBRL1*), tier 2 in 2011 (*PostXBRL2*), and tier 3 in 2012 (*PostXBRL3*). Coefficients are provided with *t*-statistics in parentheses below. All models have firm-clustered, robust standard errors. Variables are as defined in appendix D and are winsorized at 1% and 99%. The reported R-squared is from "within" estimation (i.e., does not include the effect of firm fixed effects). ***, **, * significantly different from zero at the 1%, 5%, and 10% (two-tailed) level or better, respectively.

is positive and significant at the 1% level for all three disclosure measures, consistent with the XBRL1 sample findings. The coefficient magnitude is smaller than the XBRL1 analyses, however, indicating there may be differences in the implementation effect across groups.

Thus, I disaggregate *PostXBRL_ALL* into the three implementation groups (*PostXBRL1, PostXBRL2,* and *PostXBRL3*), and regress each of *(Ln)(Sc)TagsNotes* on the three postadoption indicators in table 7, panel B. Consistent with the earlier findings, there is a positive coefficient on *PostXBRL1* throughout, significant at the 1% level or better. For *PostXBRL2*

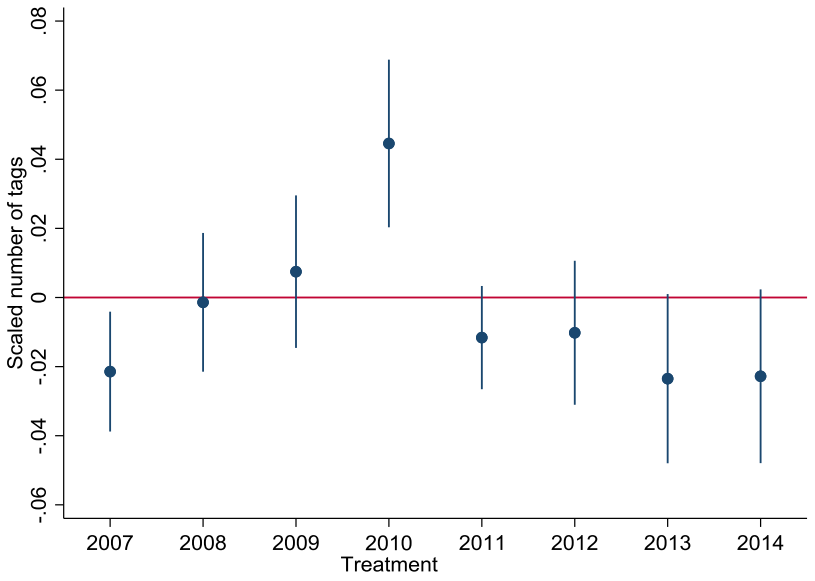


FIG. 4.—Impact of XBRL on disclosure, matched treatment and control firms going forward. This figure portrays the difference-in-difference estimates for XBRL1 firms and matched control firms after controlling for firm characteristics and fixed effects. In this figure, the x-axis represents the year (e.g., 2010 includes fiscal year ends from June 15, 2009, through June 14, 2010), and the y-axis represents the scaled number of tags (i.e., *ScTagsNotes,* the number of quantitative footnote disclosures scaled by the firm's average number of quantitative footnote disclosures). The figure displays the results of estimating Model 1 for XBRL1 and matched control firms for the extended period 2006 through 2014. It plots the two-tailed 90% confidence interval around each point estimate of the disclosure difference between first-period XBRL adopters (XBRL1 firms) and matched control firms, year-by-year. Note that because the estimation period extends beyond 2010 in this chart, the matched control firms also receive treatment in later years.

and *PostXBRL3,* results are less consistent. Six of the 12 coefficients are positive and significant at the 1% level or better, suggesting that each adoption group responded to the expected market scrutiny by increasing their disclosures. However, the magnitude of the effect for XBRL2 and XBRL3 firms is smaller (often between 40% and 66% of XBRL1 firms' effect magnitude), perhaps due to management's reduced expectation of scrutiny, the expectation of potential postponement or revocation of the mandate for smaller firms, or treatment leakage into prior or future periods, as noted above. In addition, three coefficients are negative and significant, and the sign of coefficients can change when the adoption group time trend is included. This confirms the earlier concern that differences across adoption groups, as well as potential treatment leakage into prior or future periods, reduces the interpretability of the results.

An alternative way to examine the effect of XBRL in subsequent years is to extend forward the main analysis with XBRL1 and matched control firms. If the treatment effect occurs solely in the year of treatment, I might

expect a negative difference-in-difference in the year or two after XBRL1 treatment, and then no difference after that time. Figure 4 provides the treatment effect year-by-year for these firms, showing that the treatment effect for XBRL1 firms is concentrated in their initial treatment year, 2010. In subsequent years, the difference-in-difference is negative but insignificant. When I repeat the main analyses using calendar year instead of XBRL year as the time period, I find strong support for a disclosure increase in the first group of adopters, and some weak evidence of a relative increase in disclosure for the second group of adopters (see online appendix section IA3). One explanation for these findings is that the second group of adopters increase their disclosure upon treatment, but the first group of adopters have treatment leakage into subsequent years as well, resulting in no or little statistically significant difference in the treatment effect in subsequent years for the groups. However, it is difficult to disentangle potential treatment leakage from firms' differing incentives. Overall, I suggest caution in drawing conclusions about the treatment effect for subsequent adopters in subsequent years.

## 7. *Conclusion*

I examine the impact of market participants' information processing costs on firms' disclosure choice. Using the adoption of XBRL detailed tagging requirements as an exogenous shock to anticipated participant information processing costs, I implement a difference-in-difference design with matched control firms, finding that firms increase their quantitative footnote disclosures upon adoption of XBRL detailed tagging requirements. I continue to find a positive impact using two alternative identification strategies, that is, a parametric RD design and a matched sample exploiting differences in XBRL1 firms' fiscal calendar year end. The disclosure increase for XBRL1 firms occurs in a variety of footnote categories, suggesting an expectation of increased scrutiny from both regulatory and nonregulatory market participants. Together, these results provide evidence of firms increasing their detailed, quantitative disclosure in response to anticipated reductions in market participants' information processing costs.

This study makes three main contributions to the literature. First, it contributes to the disclosure literature by providing evidence of managers disclosing more because of an anticipated decrease in market participants' processing costs. Second, it contributes to the information processing costs literature by showing how market participant information processing costs can impact firms' disclosure choice. Third, it provides evidence for regulators of an unintended consequence of cost-decreasing regulation that is potentially positive if the additional disclosure is informative for market participants.

## APPENDIX A

### *Examples of Increases in Quantitative Footnote Disclosures*

This appendix provides three examples of quantitative footnote disclosure increases in XBRL1 firms' first detailed XBRL filing, as compared with the prior year's disclosure. Because these firms are in the first wave of XBRL adoption, the comparison is typically from fiscal 2009 to fiscal 2010. Note that it is difficult to know with certainty what prompts firms to voluntarily adjust portions of their footnote disclosures, and thus the focus of the draft is on large sample empirical tests that control for common determinants of disclosure. However, these examples help characterize what the increases in disclosure may include. Within each example, portions of the relevant footnote from the year prior to detailed XBRL adoption and the year of detailed XBRL adoption are included, and the red boxes highlight the areas of change across the years.

**Example 1 - Increased Disaggregation of Deferred Tax Asset Valuation Allowance, and additional information related to tax rate and income effects of unrecognized tax benefits**

Pre-XBRL Disclosure (2009)

**T. Income Taxes**

Of the total deferred tax assets associated with the tax loss carryforwards, $480 expires over the next 10 years (of which $346 has been reserved for through the valuation allowance), $702 over the next 20 years, and $495 is unlimited. Generally, the valuation allowance relates to tax loss carryforwards because the ability to generate sufficient future income in some jurisdictions is uncertain. Of the tax credit carryforwards, $361 expires over the next 10 years (most of this amount relates to foreign tax credits that do not begin to expire until 2015), $34 expires over the next 15 to 20 years, and $70 is unlimited.

For all periods presented, a portion of the balance at end of year pertains to state tax liabilities, which are presented before any offset for federal tax benefits. The effect of unrecognized tax benefits, if recorded, that would impact the 2009 annual effective tax rate would be approximately 1% of pretax book income. Alcoa does not anticipate that changes in its unrecognized tax benefits will have a material impact on the Statement of Consolidated Operations during 2010.

It is Alcoa's policy to recognize interest and penalties related to income taxes as a component of the Provision for income taxes on the accompanying Statement of Consolidated Operations. In 2009, 2008, and 2007, Alcoa recognized $5, $1, and $2, respectively, in interest and penalties. As of December 31, 2009 and 2008, the amount accrued for the payment of interest and penalties was $16 and $9, respectively.

Post-XBRL Disclosure (2010)

**T. Income Taxes**

| December 31, 2010 | Expires within 10 years | Expires within 11-20 years | No expiration* | Other* | Total |
|---|---|---|---|---|---|
| Tax loss carryforwards | $ 419 | $ 557 | $ 758 | $ - | $1,734 |
| Tax credit carryforwards | 385 | 35 | 63 | - | 483 |
| Other | - | - | 392 | 2,625 | 3,017 |
| Valuation allowance | (294) | (389) | (36) | (142) | (861) |
| | $ 510 | $ 203 | $ 1,177 | $ 2,483 | $4,373 |

The total deferred tax asset (net of valuation allowance) is supported by taxable temporary differences that reverse within the carryforward period (approximately 25%), tax planning strategies (approximately 10%), and projections of future taxable income exclusive of reversing temporary differences (approximately 65%).

For all periods presented, a portion of the balance at end of year pertains to state tax liabilities, which are presented before any offset for federal tax benefits. The effect of unrecognized tax benefits, if recorded, that would impact the annual effective tax rate for 2010, 2009, and 2008 would be approximately 4%, 1%, and 2%, respectively, of pretax book income. Alcoa does not anticipate that changes in its unrecognized tax benefits will have a material impact on the Statement of Consolidated Operations during 2011.

It is Alcoa's policy to recognize interest and penalties related to income taxes as a component of the Provision for income taxes on the accompanying Statement of Consolidated Operations. In 2010, 2009, and 2008, Alcoa recognized $1, $6, and $4, respectively, in interest and penalties. Due to the expiration of the statute of limitations and settlements with tax authorities, Alcoa also recognized income of $4, $1, and $3 in 2010, 2009, and 2008, respectively, related to previously accrued interest and penalties. As of December 31, 2010 and 2009, the amount accrued for the payment of interest and penalties was $13 and $16, respectively.

**Example 2 – Disaggregation of Pension Disclosure into U.S... and Non-U.S. Pension plans (representative excerpt of additional pension disclosure)**

Pre-XBRL Disclosure (2009)

***RETIREMENT BENEFITS PLANS***

| | Pension liabilities | | Other postretirement liabilities | |
|---|---|---|---|---|
| | 2009 | 2008 | 2009 | 2008 |
| Changes in benefit obligation | | | | |
| Beginning balance | $(3,288) | $(3,092) | $ (779) | $ (859) |
| Service cost | (110) | (137) | (15) | (15) |
| Interest cost | (203) | (190) | (49) | (49) |
| Actuarial (loss) gain | (198) | 67 | (70) | 58 |
| Benefits paid | 318 | 287 | 96 | 87 |
| Foreign currency translation | (98) | 239 | (3) | 4 |
| Business acquisitions | | (419) | | |
| Other | (31) | (43) | (10) | (5) |
| Ending balance | (3,610) | (3,288) | (830) | (779) |

Post-XBRL Disclosure (2010)

**Note 6. RETIREMENT BENEFITS PLANS**

| | United States pension liabilities | | Non-United States pension liabilities | | Other postretirement liabilities | |
|---|---|---|---|---|---|---|
| | 2010 | 2009 | 2010 | 2009 | 2010 | 2009 |
| Balance at January 1 | $2,244 | $2,145 | $1,366 | $1,143 | $ 830 | $ 779 |
| Service cost | 80 | 76 | 39 | 34 | 16 | 15 |
| Interest cost | 131 | 133 | 69 | 70 | 46 | 49 |
| Actuarial loss | 133 | 98 | 94 | 100 | 15 | 70 |
| Gross benefits paid | (122) | (229) | (76) | (89) | (88) | (96) |
| Foreign currency translation | — | — | (53) | 98 | 1 | 3 |
| Other | (8) | 21 | 21 | 10 | 6 | 10 |
| Balance at December 31 | $2,458 | $2,244 | $1,460 | $1,366 | $ 826 | $ 830 |

**Example 3 - Increased Disaggregation of Intangible Asset Accumulated Amortization**

Pre-XBRL Disclosure (2009)

**3. GOODWILL AND OTHER INTANGIBLE ASSETS**

The Company's other intangible assets subject to amortization consist of the following as of December 31, (in thousands):

| | Estimated Useful Lives (years) | 2009 | 2008 |
|---|---|---|---|
| Acquired network location (1) | 20 | $ 1,101,232 | $ 1,055,313 |
| Acquired customer base | 15-20 | 756,928 | 737,108 |
| Acquired customer relationships | 20 | 883,491 | 775,000 |
| Acquired licenses and other intangibles | 5-15 | 21,574 | 21,574 |
| Economic Rights, TV Azteca | 70 | 30,292 | 30,292 |
| Total | | 2,793,517 | 2,619,287 |
| Less accumulated amortization | | (1,238,579) | (1,103,521) |
| Intangible assets, net | | 1,554,938 | 1,515,766 |

Post-XBRL Disclosure (2010)

**3. GOODWILL AND OTHER INTANGIBLE ASSETS**

The Company's other intangible assets subject to amortization consist of the following:

| | | As of December 31, 2010 | | | As of December 31, 2009 (3) | | |
|---|---|---|---|---|---|---|---|
| | Estimated Useful Lives (years) | Gross Carrying Value | Accumulated Amortization | Net Book Value | Gross Carrying Value | Accumulated Amortization | Net Book Value |
| | | | | (in thousands) | | | |
| Acquired network location (1) | 20 | $1,301,208 | $ (603,578) | $ 697,630 | $1,105,397 | $ (551,746) | $ 553,651 |
| Acquired customer base | 15-20 | 750,104 | (513,223) | 236,881 | 756,928 | (479,937) | 276,991 |
| Acquired customer relationship | 20 | 1,209,292 | (223,628) | 985,664 | 875,318 | (173,747) | 701,571 |
| Acquired licenses and other intangibles | 5-15 | 21,601 | (19,984) | 1,617 | 21,574 | (19,936) | 1,638 |
| Economic Rights, TV Azteca | 70 | 30,292 | (13,646) | 16,646 | 30,292 | (13,213) | 17,079 |
| Total | | 3,312,497 | (1,374,059) | 1,938,438 | 2,789,509 | (1,238,579) | 1,550,930 |

## APPENDIX B

### *Identifying XBRL Filing Downloads from EDGAR Download Logs*

Many papers have used access of EDGAR filings as a proxy for investor search for financial information (e.g., Drake, Roulstone, and Thornock [2015]; Lee, Ma, and Wang [2015]). Similarly, I examine online access of XBRL filings as evidence of market participant interest in XBRL. I download the EDGAR access logs for the 10-K XBRL filings in my sample and

time period from https://www.sec.gov/data/edgar-log-file-data-set, and I exclude downloads from servers that self-identify as webcrawlers in the SEC database, under the assumption that these downloads are unrelated to capital market participants. To capture search traffic related to XBRL filings, it is important to understand the typical access patterns in this setting. Specifically, XBRL files are available for download either one-by-one as .XML files (where each 10-K filing has multiple .XML files to download to obtain the full set of XBRL information), or as one pull per SEC filing via XBRL.ZIP files. These two primary methods of downloading are distinct from typical human or computer access of filings, which would involve accessing .HTML files or .TXT files, the focus of prior studies.[24]

I estimate XBRL usage by capturing the number of unique user-day-firm downloads, where user is defined by the IP address and day by the access day. This way, users that access XBRL by downloading multiple .XML files are still only counted as one access of the filing. The number of unique user-day-firm downloads per calendar year is provided in figure 1, with 30 filings available for download in 2009 and 11,386 cumulative filings available by 2014. If these downloads are broken down by filing year, the pattern of usage shows many downloads in the year of the filing and often a slight decline in downloads in the second and third year after the filing is posted. However, filings from each year continue to be downloaded in large numbers in all years, with dramatic increases in the number of downloads for all filings in 2013 and 2014. See figure B1. This increase in demand for XBRL filings in later years is consistent with more software providers and greater awareness of and interest in XBRL as the technology is better understood and data quality improves.

Finally, another consideration in prior papers has been the separation of EDGAR access into "robot" and "nonrobot" access. These earlier papers examine individuals' usage of filings, so it is important for them to remove bulk downloading of filings by computer scripts. In the XBRL setting, however, one of the most efficient ways to use XBRL is to perform bulk downloads of filings and create an offline database for later evaluation. Thus, eliminating robot access would likely remove the demand of the most sophisticated users. However, examining the split between robot and nonrobot access of XBRL files could be informative of the type of demand that is occurring, as well as changes over time. Thus, following the procedure of Lee, Ma, and Wang (2015), I examine the cdf of the number of firms downloaded per user, and I identify users with more than the 95th percentile of downloads (21 firms per day) as robots. I find that both robot

[24] A third potential way to access XBRL filings is to extract the XBRL tags from exhibits near the end of the .TXT file. However, this option is not an efficient or straightforward way of getting the information, and thus is less likely to be a channel used by investors. In addition, because the .TXT files contain all non-XBRL and XBRL information, downloads of these files cannot be tied directly to XBRL usage. Thus, I focus on the most likely and separately identifiable methods of accessing XBRL filings.

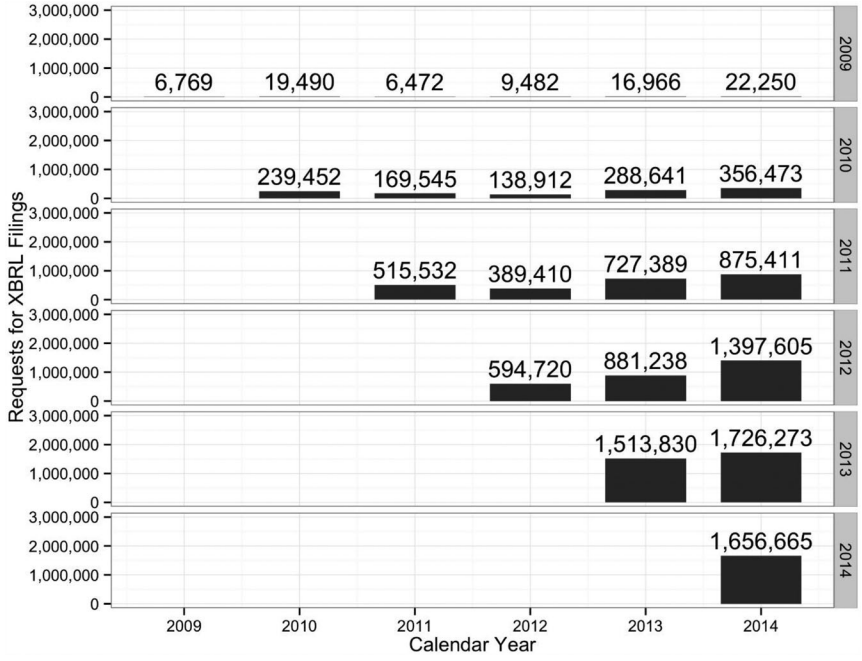


FIG. B1.—Requests for XBRL filings, by filing year and calendar (access) year. This figure displays total number of unique user-day-filing requests for the XBRL filings of the firms in my sample from calendar year 2009 through 2014, where multiple requests for a firm from the same user IP address during the day are counted as one request. These requests are shown by filing year (right-hand vertical axis) and accession year (x axis), both in calendar year. For example, the XBRL 10-Ks filed by my sample firms in calendar year 2011 were downloaded 515,532 during calendar year 2011 and 389,410 times in 2012.

and nonrobot access increases over time, with robot access increasing at a faster rate and making up 87% of XBRL requests during 2014. 27% (73%) of the unique user-day-firm downloads are of XBRL.ZIP (.XML) files. Consistent with the greater efficiency of downloading one XBRL.ZIP file versus multiple .XML files per filing, robot downloads comprise 95% of XBRL.ZIP files and 84% of .XML files.

Using EDGAR downloads to approximate XBRL usage is a noisy estimate of the extent of investor usage of these filings. On one hand, this could overestimate the usage because there is no way to know whether the XBRL filings downloaded were used to make investment decisions or scrutinize disclosures. On the other hand, this number could greatly underestimate the usage because XBRL is most powerful when downloaded and formed into a database that can be repeatedly queried by multiple users. In that case, one download of an XBRL filing could represent many users scrutinizing the disclosures. In either case, though, there is evidence of downloading of XBRL filings that would support management's assumption of interest in XBRL.

## APPENDIX C

### *PERL Parsing of SEC Filings and Counting of Numbers*

This appendix explains the details of obtaining the SEC filings, cleaning the file, extracting the various sections of the report, and counting the number of "numbers" within each section. I begin by downloading the 10-K reports from SEC's EDGAR website and performing cleaning techniques like those in Li [2008]. In particular, I remove the heading information found between <SEC-HEADER> and </SEC-HEADER>, eliminate any file portions that are not html or text (i.e., images, etc.), exclude <TYPE>XML sections (which contain the embedded XBRL information), and remove html tags and codes.[25] I then identify and extract the financial statements and the footnotes (separately) using regular expressions that include variations of the relevant section titles for each and make use of the typical ordering of the sections. For example, to find the footnotes within 10-Ks, I first look for the financial statements using various versions of financial statement titles such as "Item 8 Index to Consolidated Financial Statements" or "Consolidated Balance Sheet," and I then look for variations of "Notes Accompanying the Consolidated Financial Statements" once the financial statement section has been found. I identify the end of the footnotes using either variants of the next section titles (item 9 or 10) or the start of the report's exhibits. Note that there are still some filings that cannot be separated into their components using the Perl script because they include nonstandard headings or firm-specific information within the section titles. As a result, I am not able to include these observations in my final sample, as shown in table 1.

I then use regular expressions in Perl to identify and count numbers. Because numbers can vary in format, I use several rules to identify "true" numbers. First, I exclude years or dates by not counting 4-digit numbers without a comma (e.g., 2009) and not counting numbers in a date format (e.g., 1/1/08, January 1, 2008). I allow numbers to include decimals or commas (before appropriate 3-digit groupings), and I count fractions or ratios as one number. I exclude numbers that are references to notes or sections (e.g., note 7, item 9, section 2, notes 5 and 6, 10-K) and numbers that are part of descriptions (e.g., under 1 year, from 1 to 3 years, over 12 months, level 1/2/3). I eliminate numbered lists or footnote labeling in the formats of 1), (1), or 1. However, there is still some noise in the number measurement. For example, there is no effective way to remove page numbers, which often appear as individual numbers just like numbers in tables. For the remaining measurement error, it is likely that the error is random

[25] I perform additional cleaning procedures before estimating the number of words or the fog score of the sections. Specifically, I follow Li [2008] in removing paragraphs with more than 50% nonalpha characters and those with fewer than 80 characters, as well as removing standard sentences at the beginning of the filing.

or has a firm-fixed component which is eliminated by the firm fixed effects and difference-in-difference test design. I use *TagsNotes* for the main tests because the number of quantitative XBRL tags is only available for filings of XBRL firms after adoption, eliminating the ability to compare postadoption disclosure to preadoption disclosure or to non-XBRL firm disclosure. However, I can use the number of XBRL tags where available to test the validity of *TagsNotes*. Specifically, I examine the correlation between my measure (*TagsNotes*) and a count of the quantitative XBRL tags for the subset of detailed XBRL filings, and I find a Pearson (Spearman) correlation of 0.884 (0.937), supporting the reasonableness of *TagsNotes*. In addition, I examine the correlation between my measure (*TagsNotes*) and the outcome of running a Perl script on the XBRL block tags of footnotes (*FC_Total*, from table 6) which is available postadoption and one year preadoption, and I find a Pearson (Spearman) correlation of 0.925 (0.960), providing further comfort that *TagsNotes* captures the amount of quantitative disclosure in the footnotes. Finally, I randomly choose 10 filings using a stratified approach to include both XBRL1 and non-XBRL1 firms before, during, and after 2010, and I manually count the number of quantitative disclosures for which tagging was likely required. I find a Pearson (Spearman) correlation of 0.998 (1), consistent with *TagsNotes* accurately capturing firms' quantitative disclosure.

## APPENDIX D

*Variable Definitions*

| | |
|---|---|
| *Analyst, LnAnalyst* | Number of analysts following the firm (or Log(1 + number of analysts)), measured as the maximum number of analysts providing a forecast in I/B/E/S for the firm over the fiscal year |
| *Assets* | Total assets as of the fiscal period end, in millions, from Compustat |
| *EarnVol* | Standard deviation of the change in split-adjusted earnings per share over the five prior fiscal years, including the current one |
| *Fog_Notes* | Fog score for the words in the footnote section of the financial statements, using the Fathom package in Perl |
| *FootnoteCategories* | The maximum number of footnote categories in the firm's filings. Categories are identified using XBRL block footnote tags, which are available beginning one year prior to XBRL detailed implementation. The XBRL block tags are manually classified into one of the overarching categories detailed in figure 4, table 6, and appendix E. |
| *InstHoldings* | Percent of share value held by institutions as of the end of the fiscal year, as measured by Thomson Reuter's Institutional Holdings database |
| *Market Float* | Market float for the firm as of the end of the second quarter of the fiscal year, as provided in the 10-K Filing, in millions |
| *Market Value, LnMV* | Value of shares outstanding (or Log of share value) as of the fiscal year end, per Compustat, in millions |
| *Mtb* | Market-to-book value, or market value of shares outstanding scaled by the book value of equity, as of the fiscal year end, per Compustat |

(*Continued*)

**APPENDIX D**—*Continued*

| | |
|---|---|
| *NumSegments, LnSegments* | Number of business or operating segments (or Log of number of segments) reported for the fiscal year, per Compustat Segments file. Firms with no segments are assigned a value of one |
| *NumShareholders, LnNumShareholders* | Number of shareholders (or Log of the number of shareholders) as of the fiscal year end, per Compustat, in thousands. |
| *Post* | Indicator variable equal to one for the first XBRL detailed tagging postadoption year of XBRL1 firms (fiscal 2010, i.e., fiscal period ends June 15, 2010 through June 14, 2011) and zero otherwise |
| *PostALL* | Indicator variable equal to one for any postadoption year of XBRL and zero otherwise (i.e., fiscal period ends June 15, 2010 or later for XBRL1 firms, June 15, 2011 or later for XBRL2, and June 15, 2012 or later for XBRL3) |
| *PostXBRL1(2)[3]* | Indicator variables equal to one for postadoption XBRL firm-years – fiscal 2010 for XBRL1, 2011 for XBRL2, and 2012 for XBRL3 and zero otherwise |
| *PyAbnRet* | Firm's market-adjusted return over the calendar year ending in the filing window |
| *RetVol, LnRetVol* | Standard deviation of daily returns (or the Log of the standard deviation of daily returns) for the firm over the calendar year ending in the filing window |
| *ROA* | Net income before extraordinary items scaled by average assets |
| *ScTagsNotes* | Number of "numbers" in the footnotes within the SEC annual filing, captured as described in appendix C, scaled by the firm's average *TagsNotes* across all years |
| *Tags_FS* | Number of "numbers" in the financial statements within the SEC annual filing, captured as described in appendix C. |
| *TagsNotes, LnTagsNotes* | Number of "numbers" (or Log of number of numbers) in the footnotes within the SEC annual filing, captured as described in appendix C. |
| *Tags_Ratio_FS* | Number of "numbers" in the financial statements scaled by the total number of "numbers" in the entire filing |
| *Tags_Ratio_Notes* | Number of "numbers" in the footnotes scaled by the total number of "numbers" in the entire filing |
| *Words_Notes, LnWords_Notes* | Number of words in the footnotes within the SEC annual filing (or Log of the number of words) |
| *XBRL1(2)[3]* | Indicator variables equal to one for firms that adopted XBRL detailed tagging requirements during the first (second) [third] implementation phase, or Tier1(2)(3) firms |

**APPENDIX E**

*Footnote Categories and Their Most Common Components*

| Footnote Category | Most Common Components |
|---|---|
| Borrowings | Debt, Notes Payable, Capital Leases, Deposit Liabilities, Accounts Payable, Accrued and other Liabilities, Deferred Revenue, Securitizations and Variable Interest Entities |
| Commitments & Contingencies | Commitments & Contingencies, Operating Leases, Allowance for Loan Loss, Guarantees |
| Compensation | Share-based payments, Compensation and Employee Benefit Plans (when combined) |

(*Continued*)

**APPENDIX E**—*Continued*

| Footnote Category | Most Common Components |
|---|---|
| Derivatives | Derivative Instruments and Hedging Activities, Derivatives and Fair Value |
| Fair Value | Fair Value Disclosures and Measurement Inputs |
| Goodwill & Intangible | Goodwill, Intangible Assets |
| M&A | Business Combination, Mergers, Acquisitions, Dispositions/Divestitures |
| Other | Parent Only Financial Statements, Valuation and Qualifying Accounts, Restructuring, Subsequent Events, Additional Financial Information, Related Party Transactions, Supplemental Cash Flow and Balance Sheet Disclosures, Other Income and Expense, Industry-specific (e.g., Regulatory Capital Requirements, Oil and Gas Exploration, Public Utilities, etc.) |
| Pension | Pension, Other Postretirement Benefits, Employee Benefit Plans |
| PPE & Inventory | Property Plant and Equipment, Real Estate and Accumulated Depreciation, Asset Impairment, Inventory |
| Quarterly Fin Info | Quarterly Financial Information |
| Receivables | Receivables (Accounts, Notes, Trade, Loans, Financing, and Other) |
| Securities & Investments | Securities (Debt and Equity, Trading, AFS, HTM), Equity Method Investments, Financial Instruments, Investments |
| Segments | Segment Reporting |
| Shareholder's Equity and Related | Shareholder's Equity (Common, Preferred, Treasury, Warrants, Rights), Earnings per Share, (Accumulated) Comprehensive Income |
| Sig Acct Policies | Significant Accounting Policies, Basis of Presentation |
| Taxes | Taxes (Income, Sales, General) |

## REFERENCES


ANGRIST, J. D., AND J. PISCHKE. *Mastering 'Metrics: The Path from Cause to Effect*. Princeton, NJ: Princeton University Press, 2015.

BARTH, M. E.; W. H. BEAVER; AND W. R. LANDSMAN. "The Market Valuation Implications of Net Periodic Pension Cost Components." *Journal of Accounting and Economics* 15 (1992): 27–62.

BARTLEY, J.; Y. S. A. CHEN; AND E. TAYLOR. "Avoiding Common Errors in XBRL Implementation." *Journal of Accountancy* 209 (2010): 46–51.

BECKER, G. S. "Crime and Punishment: An Economic Approach." *The Journal of Political Economy* 76 (1968): 169–217.

BERTRAND, M., AND S. MULLAINATHAN. "Enjoying the Quiet Life? Corporate Governance and Managerial Preferences." *Journal of Political Economy* 111 (2003): 1043–75.

BHATTACHARYA, N.; Y. J. CHO; AND J. B. KIM. "Leveling the Playing Field Between Large and Small Institutions: Evidence from the SEC's XBRL Mandate." *The Accounting Review* 93 (2018): 51–71.

BLANKESPOOR, E.; E. DEHAAN; J. WERTZ; AND C. ZHU. "Why Do Individual Investors Disregard Accounting Information? The Roles of Information Awareness and Acquisition Costs." *Journal of Accounting Research* 57 (2019): 53–84.

BLANKESPOOR, E.; E. DEHAAN; AND C. ZHU. "Capital Market Effects of Media Synthesis and Dissemination: Evidence from Robo-Journalism." *Review of Accounting Studies* 23 (2018): 1–36.

BLANKESPOOR, E.; B. P. MILLER; AND H. D. WHITE. "Initial Evidence on the Market Impact of the XBRL Mandate." *Review of Accounting Studies* 19 (2014): 1468–1503.

BLOOMFIELD, R. J. "The 'Incomplete Revelation Hypothesis' and Financial Reporting." *Accounting Horizons* 16 (2002): 233–43.

BULKELEY, W. M. "IBM Plans to Increase Disclosure of Items that Boost Bottom Line." *Wall Street Journal* (Eastern Edition) March 5, 2002: B6.

BUSHEE, B. J., AND C. LEUZ. "Economic Consequences of SEC Disclosure Regulation: Evidence from the OTC Bulletin Board." *Journal of Accounting and Economics* 39 (2005): 233–64.

BUSHEE, B. J.; D. A. MATSUMOTO; AND G. S. MILLER. "Open Versus Closed Conference Calls: The Determinants and Effects of Broadening Access to Disclosure." *Journal of Accounting and Economics* 34 (2003): 149–80.

BUSHEE, B. J., AND C. F. NOE. "Corporate Disclosure Practices, Institutional Investors, and Stock Return Volatility." *Journal of Accounting Research* 38 (2000): 171–202.

CASEY, C. J. "Variation in Accounting Information Load: The Effect on Loan Officers' Predictions of Bankruptcy." *The Accounting Review* 55 (1980): 36–49.

COHEN, L., AND D. LOU. "Complicated Firms." *Journal of Financial Economics* 104 (2012): 383–400.

DE FRANCO, G.; M. H. F. WONG; AND Y. ZHOU. "Accounting Adjustments and the Valuation of Financial Statement Note Information in 10-K Filings." *The Accounting Review* 86 (2011): 1577–1604.

DEBRECENY, R. S.; S. M. FAREWELL; M. PIECHOCKI; C. FELDEN; A. GRANING; AND A. D'ERI. "Flex or Break? Extensions in XBRL Disclosures to the SEC." *Accounting Horizons* 25 (2011): 631–57.

DEBRECENY, R. S.; S. M. FAREWELL; M. PIECHOCKI; C. FELDEN; AND A. GRANING. "Does It Add Up? Early Evidence on the Data Quality of XBRL Filings to the SEC." *Journal of Accounting and Public Policy* 29 (2010): 296–306.

DEHAAN, E.; T. SHEVLIN; AND J. THORNOCK "Market (In)Attention and the Strategic Scheduling and Timing of Earnings Announcements." *Journal of Accounting and Economics* 60 (2015): 36–55.

DIAMOND, D. W. "Optimal Release of Information by Firms." *The Journal of Finance* 40 (1985): 1071–94.

DIAMOND, D. W., AND R. E. VERRECCHIA. "Disclosure, Liquidity, and the Cost of Capital." *The Journal of Finance* 46 (1991): 1325–59.

DRAKE, M. S.; K. GEE; AND J. R. THORNOCK. "March Market Madness: The Impact of Value-Irrelevant Events on the Market Pricing of Earnings News." *Contemporary Accounting Research* 33 (2016): 172–203.

DRAKE, M. S.; D. T. ROULSTONE; AND J. R. THORNOCK. "The Determinants and Consequences of Information Acquisition via EDGAR." *Contemporary Accounting Research* 32 (2015): 1128–61.

EFENDI, J.; J. D. PARK; AND L. M. SMITH. "Do XBRL Filings Enhance Information Efficiency? Early Evidence from Post-Earnings Announcement Drift." *Journal of Business Research* 67 (2014): 1099–1105.

ELY, K. M. "Operating Lease Accounting and the Market's Assessment of Equity Risk." *Journal of Accounting Research* 33 (1995): 397–415.

GOW, I. D.; G. ORMAZABAL; AND D. J. TAYLOR. "Correcting for Cross-Sectional and Time-Series Dependence in Accounting Research." *The Accounting Review* 85 (2010): 483–512.

GROSSMAN, S. J., AND O. D. HART. "Disclosure Laws and Takeover Bids." *The Journal of Finance* 35 (1980): 323–34.

GROSSMAN, S. J., AND J. E. STIGLITZ. "On the Impossibility of Informationally Efficient Markets." *The American Economic Review* 70 (1980): 393–408.

GUAY, W.; D. SAMUELS; AND D. TAYLOR. "Guiding Through the Fog: Financial Statement Complexity and Voluntary Disclosure." *Journal of Accounting and Economics* 62 (2016): 234–69.

HARRIS, T., AND S. MORSFIELD. "An Evaluation of the Current State and Future of XBRL and Interactive Data for Investors and Analysts." White paper, Columbia Business School, Center for Excellence in Accounting and Security Analysis, 2012.

HIRSHLEIFER, D.; S. S. LIM; AND S. H. TEOH. "Disclosure to an Audience with Limited Attention." Working paper, University of California, Irvine and DePaul University, 2004. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=604142.

HIRSHLEIFER, D.; S. S. LIM; AND S. H. TEOH. "Driven to Distraction: Extraneous Events and Underreaction to Earnings News." *The Journal of Finance* 64 (2009): 2289–2325.

HIRSHLEIFER, D., AND S. H. TEOH. "Limited Attention, Information Disclosure, and Financial Reporting." *Journal of Accounting and Economics* 36 (2003): 337–86.

HIRST, D. E., AND P. E. HOPKINS. "Comprehensive Reporting and Analysts' Valuation Judgments." *Journal of Accounting Research* 36 (1998): 47–75.

HODGE, F. D.; J. J. KENNEDY; AND L. A. MAINES. "Does Search-Facilitating Technology Improve the Transparency of Financial Reporting?" *The Accounting Review* 79 (2004): 687–703.

HOPKINS, P. E. "The Effect of Financial Statement Classification of Hybrid Financial Instruments on Financial Analysts' Stock Price Judgments." *Journal of Accounting Research* 34 (1996): 33–50.

IMBENS, G. W., AND LEMIEUX, T. "Regression Discontinuity Designs: A Guide to Practice." *Journal of Econometrics* 142 (2008): 615–635.

INDJEJIKIAN, R. J. "The Impact of Costly Information Interpretation on Firm Disclosure Decisions." *Journal of Accounting Research* 29 (1991): 277–301.

INVESTORS TECHNICAL ADVISORY COMMITTEE (ITAC). "Comment Letter to Mr. Robert Herz, Chairman of the Financial Accounting Standards Board, December 11, 2007." Available at http://www.fasb.org/jsp/FASB/Page/ITACDisclosureProposal.pdf.

JANVRIN, D. J., AND W. G. NO. "XBRL Implementation: A Field Investigation to Identify Research Opportunities" *Journal of Information Systems* 26 (2012): 169–97.

JOHNSON, S. "XBRL Will Keep Investors Wanting More." CFO.com. September 29, 2006.

KEDIA, S., AND S. RAJGOPAL. "Do the SEC's Enforcement Preferences Affect Corporate Misconduct?" *Journal of Accounting and Economics* 51 (2011): 259–78.

KEMPF, E.; MANCONI, A.; AND SPALT, O. "Distracted Shareholders and Corporate Actions." *The Review of Financial Studies* 30 (2017): 1660–95.

KIM, J. W.; J. H. LIM; AND W. G. NO. "The Effect of First Wave Mandatory XBRL Reporting Across the Financial Information Environment." *Journal of Information Systems* 26 (2012): 127–53.

LANG, M., AND R. LUNDHOLM. "Cross-Sectional Determinants of Analyst Ratings of Corporate Disclosures." *Journal of Accounting Research* 31 (1993): 246–71.

LEE, C. M. C.; P. MA; AND C. C. Y. WANG. "Search-Based Peer Firms: Aggregating Investor Perceptions Through Internet Co-Searches." *Journal of Financial Economics* 116 (2015): 410–31.

LEE, D. S., AND LEMIEUX, T. "Regression Discontinuity Designs in Economics." *Journal of Economic Literature* 48 (2010): 281–355.

LEHAVY, R.; F. LI; AND K. MERKLEY. "The Effect of Annual Report Readability on Analyst Following and the Properties of Their Earnings Forecasts." *The Accounting Review* 86 (2011): 1087–115.

LEONE, M. "Will XBRL Improve Analyst Coverage?" CFO.com. June 13, 2006.

LI, E. X.; K. RAMESH; AND M. SHEN. "The Role of Newswires in Screening and Disseminating Value-Relevant Information in Periodic SEC Reports." *The Accounting Review* 86 (2011): 669–701.

LI, F. "Annual Report Readability, Current Earnings, and Earnings Persistence." *Journal of Accounting and Economics* 45 (2008): 221–47.

LIU, C.; T. WANG; AND L. J. YAO. "XBRL's Impact on Analyst Forecast Behavior: An Empirical Study." *Journal of Accounting and Public Policy* 33 (2014): 69–82.

MAINES, L. A., AND L. S. MCDANIEL. "Effects of Comprehensive-Income Characteristics on Nonprofessional Investors' Judgments: The Role of Financial Statement Presentation Format." *The Accounting Review* 75 (2000): 179–207.

MCCRARY, J. "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test." *Journal of Econometrics* 142 (2008): 698–714.

MERRILL CORPORATION. "Q&A With an Expert: View from the SEC Office of Interactive Data." *Dimensions: The Compliance Authority*. October 2012. Available at http://merrillcompliancesolutions.wordpress.com/2012/10/16/qa-with-an-expert-view-from-the-sec-office-of-interactive-data/?goback=.gde_980987_member_175689500

MERTON, R. C. "A Simple Model of Capital Market Equilibrium with Incomplete Information." *The Journal of Finance* 42 (1987): 483–510.

MILGROM, P. R., AND J. ROBERTS. "Relying on the Information of Interested Parties." *The RAND Journal of Economics* 17 (1986): 18–32.

MILLER, B. P. "The Effects of Reporting Complexity on Small and Large Investor Trading." *The Accounting Review* 85 (2010): 2107–43.

MILLER, G. S. "Earnings Performance and Discretionary Disclosure." *Journal of Accounting Research* 40 (2002): 173–204.

MILLER, G. S. "The Press as a Watchdog for Accounting Fraud." *Journal of Accounting Research* 44 (2006): 1001–33.

PETERSEN, M. A. "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches." *Review of Financial Studies* 22 (2009): 435–80.

PLUMLEE, M. A. "The Effect of Informational Complexity on Analysts' Use of that Information." *The Accounting Review* 78 (2003): 275–96.

POZEN, D. E. "The Mosaic Theory, National Security, and the Freedom of Information Act." *The Yale Law Journal* 115 (2005): 628–79.

RIEDL, E. J., AND S. SRINIVASAN. "Signaling Firm Performance Through Financial Statement Presentation: An Analysis Using Special Items." *Contemporary Accounting Research* 27 (2010): 289–332.

ROBERTS, M. R., AND T. M. WHITED. "Endogeneity in Empirical Corporate Finance." *Handbook of the Economics of Finance* 2 (2013): 493–572.

ROGERS, J. L.; D. J. SKINNER; AND S. L. C. ZECHMAN. "The Role of the Media in Disseminating Insider-Trading News." *Review of Accounting Studies* 21 (2016): 711–39.

SECURITIES AND EXCHANGE COMMISSION. "SEC to Rebuild Public Disclosure System to Make it 'Interactive'." 2006. Available at http://www.sec.gov/news/press/2006/2006-158.htm.

SECURITIES AND EXCHANGE COMMISSION. "Roundtable on Interactive Data." 2007. Available at http://www.sec.gov/spotlight/xbrl/xbrltranscript031907.pdf

SECURITIES AND EXCHANGE COMMISSION. "Final Report of the Advisory Committee on Improvements to Financial Reporting to the United States Securities and Exchange Commission." 2008. Available at http://www.sec.gov/about/offices/oca/acifr/acifr-finalreport.pdf.

SECURITIES AND EXCHANGE COMMISSION. "Interactive Data to Improve Financial Reporting." 2009. Available at http://www.sec.gov/rules/final/2009/33-9002.pdf

SELLING, T. "Is XBRL the Future of Financial Reporting? (YES!)" *The Accounting Onion*. February 19, 2014. Available at http://accountingonion.com/2014/02/xbrl_the_future_of_financial_analysis.html.

SILVERMAN, R. E. "GE to Change Its Practices of Disclosure." *Wall Street Journal* (Eastern Edition) February 20, 2002a: p. A3.

SILVERMAN, R. E. "GE's Annual Report Bulges with Data in Bid to Address Post-Enron Concerns." *Wall Street Journal* (Eastern Edition) March 11, 2002b: p. A3.

VERRECCHIA, R. E. "Information Acquisition in a Noisy Rational Expectations Economy." *Econometrica* 50 (1982): 1415–30.

WALSH, J. H. "Regulatory Supervision by the Securities and Exchange Commission: Examinations in a Disclosure-Enforcement Agency." *Administrative Law Review* 51 (1999): 1229–48.

WAYMIRE, G. "Earnings Volatility and Voluntary Management Forecast Disclosure." *Journal of Accounting Research* 23 (1985): 268–95.

WENGER, M. R.; R. ELAM; AND K. WILLIAMS. "Global Ledger: The Next Step for XBRL." *CPA Journal* 81 (2011): 64–71.

YOU, H., AND X. ZHANG. "Financial Reporting Complexity and Investor Underreaction to 10-K Information." *Review of Accounting Studies* 14 (2009): 559–86.