

Contents lists available at [ScienceDirect](#)

J. Account. Public Policy

journal homepage: www.elsevier.com/locate/jaccpubpol

Do stock prices reflect undisclosed financial statement information? Evidence from the OTCBB

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ARTICLE INFO

Article history:

Available online xxxx

ABSTRACT

I exploit a regulatory change that mandated that Over-the-Counter Bulletin Board (OTCBB) firms must comply with the reporting requirements of the 1934 Securities Exchange Act. I use this change to examine the association between equity values and financial statement data in voluntary and mandatory disclosure environments. Before the change, disclosure of financial statement information was voluntary for most of these firms. I study firms that initiate SEC filing after the change and classify them as disclosing and nondisclosing based on whether they voluntarily disclosed financial statement information *before* the regulatory change. In these firms' initial SEC filings after the eligibility rule, they retroactively disclose financial statement information for the year prior to compliance with the rule. Thus I can observe previously withheld financial data. I find that the choice to voluntarily disclose is negatively associated with firm characteristics related to proprietary costs and with situations in which accounting information plays a less important role in resolving information asymmetry. For nondisclosing firms, I find evidence that equity values reflect financial statement data, even though this information was not publicly available, and that compliance with mandatory SEC disclosure requirements strengthens this association. For disclosing firms, I find evidence that suggests investors viewed their voluntary disclosure of financial statement data as credible and fail to find evidence that compliance with mandatory reporting requirements enhances this association.

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1. Introduction

Companies in the United States with securities listed on the national exchanges, including the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ, must meet the requirements of the Securities Exchange Act of 1934 (1934 Act) and publicly disclose their quarterly and annual financial statements with the U.S. Securities and Exchange Commission (SEC). However, before 1999, most firms trading on the OTCBB were exempt from these requirements. As a result, some OTCBB firms voluntarily chose to disclose financial statement information, while others did not.² When the SEC approved the “eligibility rule,” firms were required to comply with the reporting requirements of the 1934 Act to remain trading on the OTCBB. In their initial filing with the SEC, firms disclosed their financial statements for their most recent year *and* at least

¹ I thank Marco Trombetta (editor) and two anonymous reviewers for constructive comments. I also thank the members of my dissertation committee: Hui Chen, Alan Jagolinzer, Bjorn Jorgensen (chair), Nathalie Moyen and Steve Rock. I also thank Katherine Gunny, Tom Lys, Greg Martin, Jeremy Michels, Brian Miller, Linda Myers, Marlene Plumlee, Naomi Soderstrom and workshop participants at North Carolina State University, Northwestern University, University of Arkansas, University of Colorado at Boulder, University of Houston, and University of Utah for helpful comments.

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² Firms trading on the OTCBB before the eligibility rule voluntarily disclosed financial statement information three primary ways: press releases, Standard & Poor's Corp., and Moody's (now Mergent's) Annual Corporate Manual.

one year before the most recent year. To illustrate, E'Prime Aerospace Corporation did not voluntarily disclose financial statement information for the fiscal year that ended September 30, 1997. However, in its initial filing with the SEC on March 9, 1999, E'Prime provided its financial statements for the years that ended September 30, 1998 and 1997. Thus it became possible to observe financial statements that were not previously disclosed. In this paper, I use the introduction of the eligibility rule to study the extent to which stock prices incorporate financial statement information, even when it was not publicly available to investors.

On January 4, 1999, the SEC approved the eligibility rule, due concerns that stock prices, absent the disclosure of current financial statements, did not adequately reflect firm fundamentals. I exploit this setting to provide direct evidence about the SEC's primary concern. The literature examines the economic consequences of the imposition of SEC securities regulations, but to my knowledge, no studies examine the association between stock prices and financial statement data before and after the regulations.³

In unregulated markets, voluntary disclosure can help resolve information asymmetry between firms and investors. Theoretical work by Grossman (1981) and Milgrom (1981) predicts that all but the worst firms voluntarily disclose when firms' disclosures are costless and truthful. If investors hold skeptical priors and interpret nondisclosure as negatively as possible, "full disclosure" arises voluntarily and resolves information asymmetry between firms and investors. Since firms have strong incentives to disclose, the fact that a number of them still elect not to suggests that OTCBB firms faced substantial impediments to disclosure, such as disclosure costs (e.g., Verrecchia, 1983; Vives, 1984; Dye, 1985). While information asymmetry is fully resolved for the voluntarily disclosing firms in these models, some asymmetry remains for nondisclosing firms. This is because investors no longer can interpret nondisclosure as negatively and must consider the possibility that a firm is withholding information for strategic reasons. Investors infer the nondisclosed information, on average, which implies prices will not fully reveal firm-specific information for nondisclosing firms.

In the absence of disclosure, alternative information channels may further reduce information asymmetry. Nondisclosure creates incentives for individual investors to acquire private information (e.g., Hirshleifer, 1971; Grossman and Stiglitz, 1980). Information correlated with financial information may be accessible to local investors (e.g., Coval and Moskowitz, 1999), in particular more observable information, such as sales and size. This suggests that, absent disclosure, OTCBB investors likely resolved some of the information asymmetry through private information acquisition. Insiders may also reveal private information through informed trading. Regulatory enforcement of the OTCBB was minimal, and insider trading was thus easier to execute than for exchange-listed companies in the United States. Collectively, these arguments suggest nondisclosed financial statement information is at least partially reflected in stock prices, but mandatory disclosure regulation may allow stock prices to better reflect this information.

The absence of full disclosure raises the possibility that mandatory disclosure can help resolve information asymmetry in capital markets (Beyer et al., 2010). A potential problem with voluntary disclosure is that, because managers have incentives to be self-serving, their disclosures may not be seen by investors as credible. Analytical research demonstrates that a credible commitment to higher disclosure can reduce information asymmetry between managers and investors as well as among investors (e.g., Diamond and Verrecchia, 1991; Baiman and Verrecchia, 1996; Verrecchia, 1999). Rock (2002) argues that, while theoretically firms can contractually commit to voluntary disclosure, practical difficulties make this arrangement less robust than SEC mandates. Such difficulties were particularly relevant for firms trading on the OTCBB, since no contractual commitments for financial disclosure were required of them. And even if firms do voluntarily commit to disclosure, opportunism may lead them to deviate from their commitments. Mandatory disclosure can reduce this opportunism.⁴ With a more credible commitment to disclosure, the association between equity values and financial statement data may be strengthened, even for firms that voluntarily disclosed information before the eligibility rule.

I first classify firms as disclosing if they voluntarily disclose at least earnings within six months of their fiscal year-end for the year before compliance with the eligibility rule and nondisclosing otherwise.⁵ For the restricted sample of firms that comply and have the required data, I document that 30% of them voluntarily disclosed financial statement information. I next examine the firm characteristics associated with disclosure choices. I find firms' likelihood of disclosure relates negatively to research and development activities and ownership concentration. These results are consistent with firms guarding proprietary information and not disclosing when financial statements play less of a role in resolving information asymmetry, due to more concentrated ownership. I also find that firms' likelihood of disclosure is positively associated with size, which is consistent with a fixed cost component of disclosure, greater returns to information acquisition, increased litigation risk, or a combination of these.

To examine the nature and strength of the associations between equity values and financial statement data, I estimate log-linear regression models, following Hand (2005) and other research on the valuation of young, growth-oriented firms.⁶ The strength of the association is measured as the adjusted R^2 from the regressions. The financial statement data are the major components of the balance sheet and income statement: assets; liabilities; sales; cost of goods sold (COGS); selling, general, and administrative expense (SG&A); and research and development expense (R&D). Disaggregating book value and net income data

³ See Leuz and Wysocki (2016) for a review of this literature. In general, the empirical studies of the 1933, 1934 and 1964 Acts find mixed results on the costs and benefits of mandatory disclosure.

⁴ For example, Hope and Thomas (2008) provide evidence that the elimination of the disclosure of geographic segment earnings enabled managers to engage in more empire building.

⁵ While I classify firms' disclosure choices in a binary way, disclosure can vary substantially in terms of quantity and quality.

⁶ See also Lerner (1994), Gompers and Lerner (1999, 2000a, 2000b), and Heughebaert and Manigart (2012).

into its major components avoids distortions in the relationship with market values, due to accounting conservatism, that can arise for young, intangible-intensive firms (Zhang, 2001; Hand, 2004). I also control for selection bias in firms' decision to disclose, using a variant of Heckman's (1979) two-stage technique.

In the year before the eligibility rule for nondisclosing firms, I find an association between equity values and financial statement data, even though this data was not publicly available at that time. This association is relatively strong, with an adjusted R^2 of 14%.⁷ Depending on the specification, assets, COGS, SG&A, and R&D are all positively associated with equity values.⁸ Even absent disclosure, a significant portion of the nondisclosed financial information finds its way into stock prices.

I find the SEC's mandatory disclosure requirements strengthened the association between equity values and financial statement data for nondisclosing firms. The adjusted R^2 for these firms more than doubles from 14% in the year before compliance with the eligibility rule to 29% in the year after compliance (and is statistically significantly different). This suggests that only part of the financial statement data was incorporated into prices for nondisclosing firms beforehand. This lends support for the SEC's concerns that, absent disclosure, prices did not fully reflect firm fundamentals.

For firms that voluntarily disclosed financial statement data, I find a strong association between equity values and financial statement data for the year prior to compliance with the eligibility rule. The adjusted R^2 from the regression of equity values on financial statement data is 25%, which suggests that investors viewed the voluntary disclosures of financial statement data by these firms as credible. Liabilities are negatively associated with equity values, while COGS, SG&A, and R&D are positively associated, depending on the specification. I fail to reject the null that the SEC's mandatory disclosure requirements strengthened the association between equity values and financial statement data for voluntarily disclosing firms. This finding suggests that voluntary disclosure by these firms before the eligibility rule was viewed as credible.

This paper's primary contribution is to examine the strength and the nature of the association between equity values and financial statement data when disclosure is voluntary and whether mandatory disclosure enhances that association. Research on OTC markets primarily focuses on market microstructure.⁹ Other work examines settings in which earnings must be disclosed but where firms have substantial discretion in accounting method choice and how that flexibility affects the credibility of accounting information.¹⁰ In contrast, my study provides direct evidence of the *relationship* between equity values and accounting information for OTCBB firms before and after the eligibility rule. By examining this association, my paper complements the work of Bushee and Leuz (2005), who document that firms complying with the rule experience an increase in liquidity. For the restricted sample of firms that comply with the rule, I show that a significant portion financial statement information finds its way into stock prices, even in the absence of public disclosure, but that mandatory disclosure results in stock prices that better reflect financial statement data. My study also highlights that not all firms benefit equally from mandatory disclosure requirements; I fail to find that the association between equity values and financial statement data is strengthened by mandatory SEC disclosure requirements. These results should be of interest to the SEC as it continues to evaluate its approach to regulating OTC markets due to concerns about the quotation of issuers that make no or limited disclosures. The eligibility rule imposed SEC disclosures requirements only on OTCBB firms, not on firms trading on the Pink Sheets. SEC (2019) proposes that issuers must make current information publicly available (but not file with the SEC) to be quoted on the Pink Sheets. The results from my study suggest that, if passed, the SEC's proposal is likely to result in stock prices that better reflect financial statement information for firms that were not previously disclosing it.

The empirical literature finds mixed evidence on the proprietary cost hypothesis and generally faces challenges with measurement of propriety costs and separating mandatory disclosure from voluntary disclosure (Beyer et al., 2010). This paper provides additional empirical evidence that higher proprietary costs lead to less disclosure in a voluntary disclosure setting with significant economic variation in the disclosure.

The paper proceeds as follows. Section 2 provides the historical background of U.S. securities regulation and the institutional details of the OTCBB. Section 3 offers a literature review. I discuss hypotheses development and research design in Section 4. Section 5 describes the data collection. Section 6 reports on the association between equity values and financial statement data. Section 7 concludes.

2. History of US securities regulation and institutional setting of OTCBB

2.1. History of US securities regulation

Federal regulation of US securities began with the passage of the Securities Act of 1933 (1933 Act).¹¹ State-level securities laws were largely superseded by federal regulation. The 1933 Act and the 1934 Act aimed to remedy the lack of reliable

⁷ In comparison, Hand (2005) reports an adjusted R^2 of 13% unique to financial statement data for the venture capital valuations of biotech firms that have similar economic characteristics to the firms in my sample.

⁸ While a positive association between equity values and COGS and SG&A might seem counterintuitive, this is consistent with research in the entrepreneurial finance literature examining young, growing firms (e.g., Armstrong et al., 2006).

⁹ For market micro-structure research on OTC markets, see Luft, Levine, and Larson (2001); Luft and Levine (2004); Bollen and Chrisite (2009); Ang, Shtauber, and Tetlock (2013); and Bruggeman, Kaul, Leuz, and Werner (2018).

¹⁰ For research on how flexibility in accounting choice impacts the credibility of accounting information, see Sivakumar and Waymire (1993); Ely and Waymire (1999); and Barton and Waymire (2004).

¹¹ Interstate railroads and public utilities had been subject to federal regulation prior to the 1933 Act and the 1934 Act.

information about securities, perceived to be the primary cause of the stock market crash of 1929. Congress and the president premised the acts based on the principle of “full and fair” disclosure. Together, the acts required exchange-listed companies to disclose audited financial statements and details about a listed company’s business. Additionally, the acts significantly increased civil liability for fraud.

The acts pertained to exchange-listed firms, which left most firms in the OTC market free from federal regulation.¹² Two subsequent regulatory changes expanded the periodic reporting requirements of the 1934 Act to a significant number of OTC firms. The first change was passed in 1964, in response to concerns about fraud and the growth of the OTC market. Congress passed the 1964 Securities Amendments Acts, which subjected OTC firms above a size and shareholder threshold (\$1 million in assets and 500 shareholders, respectively) to the same disclosure requirements as exchange-listed firms. This resulted in a substantial change in the scope of firms required to provide mandatory disclosures. The second change was also adopted in response to concerns about fraud in the OTC market. On January 4, 1999, the SEC approved the eligibility rule, requiring firms on the OTCBB to become reporting companies, regardless of size or number of shareholders.

Disclosure requirements and their enforcement are defining features of US securities markets. Many researchers question the necessity of mandatory disclosure to achieve well-functioning markets (e.g., Stigler, 1964; Benston, 1973). Others argue mandatory disclosure is essential to maintain efficient markets (e.g., Coffee, 1984). For scholars interested in understanding the impact of US federal securities regulation, the 1933 Act, the 1934 Act, the 1964 Acts, and the eligibility rule represent fertile research ground.

2.2. Institutional setting

To describe the OTCBB setting, I follow Bushee and Leuz’s (2005) discussion of the salient features of the OTCBB market before and after the eligibility rule. In 1998, the OTCBB represented a sizable market segment, with over 6000 domestic issues, an average daily trading volume over \$200 million, and an estimated market capitalization of over \$50 billion. Formed in response to the mandate of the Penny Stock Reform Act of 1990, the OTCBB was an electronic quotation medium that collected and disseminated real-time quotes, transaction prices, and volume data for small-cap OTC securities.¹³

A key distinction between the OTCBB and the national exchanges was the absence of quantitative financial listing requirements (e.g., minimum net worth or market capitalization) for quoted firms. Firms needed only find a broker/dealer willing to make a market in their stock to begin quotation, and, in contrast to the national exchanges, they did not have a formal relationship with the OTCBB. The National Association of Securities Dealers (NASD, which is now part of the Financial Industry Regulatory Authority) was entrusted with operating and regulating the OTCBB. During the period of this study, the NASD delegated the actual execution of operating and regulating this market to its subsidiary, NASDAQ. The OTCBB differed from the Pink Sheets, which is another OTC market segment. The Pink Sheets were characterized by less price transparency during the period of this study, because this market started electronic quotations in 1999 and a supporting web portal in 2000.

Before January 1999, approximately 3500 firms on the OTCBB were not required to file periodic financial reports with the SEC. These firms were exempt from SEC regulation, because they (1) never issued securities under the 1933 Act and (2) were below the size or “owners of record” thresholds stated in Section 12(g) of the 1934 Act. Issuers registering an offering under the 1933 Act trigger periodic reporting requirements in accordance with Section 15(d) of the 1934 Act. Firms frequently avoided registering under the 1933 Act by qualifying for an exemption. For example, Regulation D Rule 504 exempts offering up to \$1 million in a 12-month period. Section 12(g) details the size and shareholder thresholds of the 1934 Act as firms exceeding \$10 million in assets and with a class of securities held by more than 500 owners of record on the last day of the fiscal year register their securities under the 1934 Act. The actual number of individual shareholders often exceeded the owners of record because all shares held in “street name” by each brokerage firm or clearinghouse count as only one owner.

While exempt from the 1934 Act reporting requirements, these 3500 firms were required to provide financial statement information *once*, upon initial quotation on the OTCBB. Specifically, SEC Rule 15c2-11 required the initial broker/dealer making a market in these securities to obtain current financial statement information (with no audit requirement) from issuers.¹⁴ The market maker did not need to subsequently obtain updated information. Further, after 30 days, the “piggyback” exemption permitted other market makers to issue quotes without obtaining updated financial information.¹⁵ As a result, financial statement information was generally not publicly available for these firms.¹⁶

These lax requirements created some challenges in the OTCBB market. An article published by *The Wall Street Journal* on September 4, 1997 documented a surge of fraud and a lack of financial information on the OTCBB that marked the first of several events that would lead to the eligibility rule. Shortly thereafter, on September 22, 1997, the US Senate held a

¹² In 1936, Congress passed an amendment to the 1934 Act that required OTC firms to register with the SEC and begin filing periodic reports if the firms issued more than \$2 million of securities in an offering.

¹³ In general, an OTC security is any security that is not listed or traded on a national exchange or NASDAQ.

¹⁴ Paragraph (g)(1) of Rule 15c2-11 defines “current” as six months. If the balance sheet provided is more than six months old at the initial quotation, then the firm must provide an income statement and retained earnings statement with a more current date.

¹⁵ In Release No. 34-87115, *Publication or Submission of Quotations Without Specified Information*, issued on September 25, 2019, the SEC is proposing to eliminate the piggyback rule.

¹⁶ Bushee and Leuz (2005) confirmed this in interviews with officials from NASDAQ, the SEC and several OTCBB market makers. I also conducted interviews with OTCBB market makers who confirmed that financial statement information was not generally available during this time.

committee meeting on fraud in OTC markets. SEC Chairman, Arthur Levitt Jr., testified before the committee that fraud was a problem in the OTC markets (S. Hrg. 105–226, Sept. 22, 1997). The NASD also expressed concern about the OTCBB. Both the SEC and the NASD expressed concern that electronic quotation of real-time data provided on the OTCBB gave investors a misleading impression about the reliability of firms traded there. Additionally, the NASD was concerned about damage to the reputation of NASDAQ, as the OTCBB was often linked to NASDAQ.¹⁷

Ultimately, the NASD and SEC increased the disclosure requirements of the OTCBB. On December 9, 1997, the NASD Board of Governors indicated it was considering requiring firms to file with the SEC to remain on the OTCBB. On February 13, 1998, the NASD Board of Governors proposed limiting the OTCBB to firms that filed period reports with the SEC. After a brief period for public comment, the NASD approved this restriction by passing the eligibility rule in May 1998 as amendments to NASD rules 6530 and 6540. The SEC announced the rule's approval on January 4, 1999.

The rule required OTCBB firms to file the periodic reports specified in Sections 13 and 15(d) of the 1934 Act with the SEC, except banks and insurance companies, which were allowed to file with their appropriate regulators, rather than the SEC. The rule required firms to file a registration statement, Form 10, under the 1934 Act or a 10-K with equivalent information. The financial statements also had to be audited. Each company's initial filing provided the current year's financial statement and at least one year of prior information for small business filers and up to two years for nonsmall business filers. For firms that had not disclosed financial statement information for the year preceding the eligibility rule, it now became possible to observe what they had elected not to disclose. After the initial filing, the rule required firms to file current reports, 10-Qs, and 8-Ks as well as annual reports, 10-Ks, to maintain their quotation on the OTCBB. Investors could easily access the filings on SEC EDGAR. For most firms, this dramatically increased the amount of publicly available financial information. The amount of public and private enforcement also increased following firms' registration with the SEC. Firms were now under the scrutiny of the agency, while Section 18 of the 1934 Act significantly increased firms' civil liability, making private enforcement easier for investors.

The eligibility rule was phased in on a monthly basis, starting in July 1999 and ending June 2000, based on firms' ticker symbols on January 4, 1999. This gave firms from six to 18 months to prepare their SEC filings. Each month, the OTCBB reviewed approximately 100–300 firms for compliance with the eligibility rule. The phase-in schedule provided the OTCBB with time to review compliance. One month prior to each phase-in date, the OTCBB reviewed firms' compliance and appended an 'E' to noncompliant firms' ticker symbols. When firms subsequently complied, the 'E' was removed. Otherwise, the firms were deleted from the OTCBB at the phase-in date.

The OTCBB reviewed 5402 firms for compliance. The eligibility rule did not affect 1899 firms because they had already registered and were filing with the SEC when the rule was passed (Already Compliant firms).¹⁸ Of the 3503 firms affected by the rule, approximately three-quarters did not comply and were forced off the OTCBB (Noncompliant firms). Most of these firms moved to the Pink Sheets (Bushee and Leuz, 2005). The remaining firms complied with the eligibility rule and continued quotation on the OTCBB (Newly Compliant firms).

3. Literature review

3.1. Voluntary and mandatory disclosure

The necessity of mandatory disclosure requirements is much debated, and the empirical evidence is mixed (Leuz and Wysocki, 2016). Analytical models demonstrate that, if managers can costlessly make truthful disclosures about the firm, then information asymmetry poses no problems between firms and investors, since voluntary disclosure by firms will eliminate the information asymmetry (i.e., Grossman, 1981; Milgrom, 1981). Faced with skeptical investors, all but firms with the worst profitability have incentives to disclose their operating performance. Assuming truthful, costless disclosure, all but the worst thus voluntarily disclose. But rarely is such "full disclosure" observed in the real world, which suggests that voluntary disclosure likely entails costs, may not be credible, or both.¹⁹

In addition to the worst firms withholding their information (agency costs), the literature argues that proprietary costs (i.e., Verrecchia, 1983; Dye, 1985) lead some firms to withhold information. Investors can then no longer assume the worst about a firm, and some information asymmetry remains between managers and investors of nondisclosing firms. Investors infer the nondisclosed information, on average, which implies prices will not fully reveal firm-specific information for nondisclosing firms.

Public disclosure, however, is not the only way information asymmetry can be resolved in capital markets. Nondisclosure creates incentives for investors to earn returns by acquiring private information. Grossman and Stiglitz (1980) propose a model in which some investors become informed and convey some, but not all, of their information to the uninformed through their trades. Specifically, when the informed investors observe information that the return to a security is going to be high (low), they bid the price up (down). Thus prices reveal the private information of the informed traders but not

¹⁷ For example, Bedford Holdings, Inc. disclosed the following, "The Company's Common Stock is quoted under the symbol 'BFHI' on the NASDAQ Electronic Bulletin Board." This could confuse investors and blurs the line between NASDAQ and the OTCBB.

¹⁸ To facilitate comparison with Bushee and Leuz (2005), I use their labels.

¹⁹ For a comprehensive review of voluntary disclosure, see Beyer et al. (2010). Dye (2017) describes the recent history and evolution of the theory of financial and accounting disclosures.

perfectly (or the equilibrium would not exist). Insider trading is an additional channel through which managers incorporate their private information into stock prices (Manne, 1966). In Kyle's (1985) model of insider trading without a public information signal, insiders reveal a portion of their private information. Bhattacharya et al. (2000) study an emerging market, the Bolsa Mexicana de Valores, where unrestricted insider trading causes prices to fully incorporate the information from corporate news announcements before their public release. Lastly, disclosure by competitors may allow investors to infer firm-specific information about a nondisclosing firm. Jorgensen and Kirschenheiter (2012) show that investors infer nondisclosed information from voluntary disclosures by comparable firms. A fundamental question in capital markets without mandatory disclosure requirements of financial statement information is how much information is reflected in stock prices.

The lack of full disclosure opens the possibility that mandatory disclosure can reduce information asymmetry better than voluntary disclosure, leading to higher market quality (i.e., better access to capital, higher liquidity, lower costs of capital, or both). The literature posits two main justifications for mandatory disclosure regulation (Beyer et al., 2010). First, misalignment between managers' and investors' incentives can inhibit managers' credible conveyance of information. (A core assumption of Grossman, 1981; Milgrom, 1981 is the ability to credibly convey information.) Analytical research demonstrates that a credible commitment to higher disclosure standards can reduce information asymmetry between managers and investors as well as among investors (e.g., Diamond and Verrecchia, 1991; Baiman and Verrecchia, 1996; Verrecchia, 1999).

Even if firms attempt to "commit" to voluntary disclosure, the potential benefits of opportunism may result in their not adhering to their commitment. For example, Hope and Thomas (2008) show that the elimination of geographic-segment earnings disclosure enabled managers to engage in more empire building. Many argue that the mandatory SEC disclosure regulation provides a credible commitment to disclosure that is unavailable in voluntary disclosure regimes. For example, Rock (2002) argues the SEC provides issuers with a credible commitment to high quality, comprehensive disclosure for an indefinite period in the future. A key feature of the SEC system that enhances the *permanence* of the commitment is that, while entry is relatively easy, exiting is difficult. Rock (2002) argues that theoretically firms could make private contractual commitments to high disclosure but that practical difficulties in enforcing these commitments make such a system less robust than the combination of private and public enforcement and civil and criminal penalties system in place with the SEC. Consistent with these arguments, Cheng, Liao, and Zhang (2013) find that a regulatory change that stopped mandating disclosure of 10 nonfinancial items for smaller reporting companies resulted in an increase in market illiquidity for the affected firms, even those that kept voluntarily disclosing the nonfinancial items.

The second justification the literature proposes for mandatory disclosure regulation is that disclosure is a public good that creates free-rider problems and firms do not provide the socially optimal level of disclosure (Beyer et al., 2010). In the absence of disclosures, investors have incentives to acquire private information, which Hirshleifer (1971) argues is socially wasteful. Positive externalities may arise from mandatory disclosure, such as information transfers and liquidity spillovers (e.g., Dye, 1990; Admati and Pfleiderer, 2000). However, negative externalities may also arise from mandatory disclosure if disclosure can attract investors away from other firms (e.g., Fishman and Hagerty, 1989).

The empirical evidence on whether mandatory SEC disclosure requirements provides net benefits is mixed.²⁰ Early work studying the 1933 and 1934 Acts generally fails to find evidence of benefits and is generally skeptical of disclosure regulation.²¹ For example, Mahoney and Mei (2006) argue that the contractual-based disclosure system of the NYSE already provided investors with equivalent information to the mandatory disclosure requirements of the 1934 Act. Their conclusion is that, in the context of a strong legal system, securities regulation may not yield substantial benefits above voluntary and contractual disclosure. A challenge, however, with studies of the acts is the tumultuous markets of that period.

The two other significant opportunities to study the imposition of the SEC disclosure requirements on firms in the United States are the Securities Act Amendments of 1964 and the eligibility rule in 1999, both of which expanded disclosure requirements to OTC firms. The benefits of these settings are that markets were more stable during both of these periods and natural control groups from unaffected OTC firms. Greenstone, Oyer, and Vissing-Jorgensen (2006) find a positive market reaction for affected firms, while Ferrell (2007) finds a reduction in the volatility of OTC stock returns. Greenstone et al. (2006) suggest that mandatory disclosure causes managers to better focus on maximizing shareholder value. Later work by Battaolio et al. (2011) takes a different approach to measuring the benefits the 1964 Acts and fails to find improvements from mandatory disclosure. Of particular importance, Battaolio et al. (2011) were able to find financial information from various sources for most firms. Their critique of the 1964 Acts resembles Mahoney and Mei's (2006) critique of the 1934 Act—similar information was available before and after the SEC disclosure requirement.

Lastly, Bushee and Leuz (2005) study the eligibility rule, which imposed SEC disclosure requirements on OTC firms that wanted to remain trading on the OTCBB. They document significant costs and benefits associated with mandatory disclosure regulation. First, as discussed in Section 2, they document that approximately three-quarters of the 3503 affected firms (those not previously filing with the SEC) are forced into a less regulated market at a significant cost in terms of market value and liquidity. Second, stock returns suggest that the regulatory change was costly for the firms that chose to comply with the mandatory disclosure obligations. These firms, however, did experience an increase in liquidity upon compliance, consistent with mandatory disclosure providing a more credible commitment to disclosure than voluntary disclosure. Finally, Bushee

²⁰ For a comprehensive review and discussion of this literature, see Leuz and Wysocki (2016).

²¹ See Stigler (1964), Benston (1973), Jarrell (1981), Chow (1983), Simon (1989), Mahoney and Mei (2006), and Daines and Jones (2012).

and Leuz (2005) find evidence of positive externalities that are likely due to liquidity spillovers or an enhanced reputation of the OTCBB. They are able to measure externalities by examining OTCBB firms already filing with the SEC that presumably should be unaffected by the eligibility rule, except for potential externalities. Their setting is particularly useful because disclosure of financial statements was genuinely voluntary (i.e., there were no contractual obligations to disclose financial statements other than at the initial quotation) prior to the eligibility rule—which differs from the settings of studies of the 1934 and 1964 Acts—and a significant number of firms did not disclose financial statement information.

My study differs from prior work by examining the basic question of whether financial statement information is reflected in stock prices when disclosure of financial statement information is voluntary, and whether modern mandatory SEC disclosure requirements increase the association between stock prices and financial statement information. The premise of the SEC disclosure system has been disclosure of current firm-specific information to capital market participants and arguably the most significant firm-specific disclosure is financial statements. In fact, the main justification for the 1933, 1934, 1964 Acts and the eligibility rule was a lack of current, reliable financial statement information about issuers. This setting provides insights about whether and how equity values are associated with financial statement data provides insights about the relative credibility of financial statements in voluntary and mandatory disclosure regimes.

3.2. OTC markets

Several studies examine the market microstructure of OTC markets.²² Collectively, this work documents lower market quality (i.e., lower liquidity, higher volatility, higher crash risk, and lower returns) for OTC stocks than exchange-listed stocks. Jiang, Petroni, and Wang (2015) and Bruggeman et al. (2018) find disclosure of financial statement information is positively associated with liquidity, consistent with the findings of Bushee and Leuz (2005) and Greenstone et al. (2006). My study differs in that I examine the relationship between equity and accounting information. Further, I exploit the regulatory change as a way to explore whether prices reflect nondisclosed accounting information.

4. Hypotheses development and research design

4.1. Hypotheses development

How investors interpret silence by firms on the OTCBB is of considerable interest. Do prices reflect financial statement information, even in the absence of disclosure? Theoretically, skeptical investors will interpret silence as negatively as possible, unless they believe that disclosure is costly. Theoretical predictions from the voluntary disclosure literature suggest that, in the absence of disclosure, OTCBB investors set prices that, on average, correctly infer nondisclosed information (Verrecchia, 1983; Dye, 1985). Information asymmetry is not fully resolved in this situation because investors cannot assume the worst about nondisclosure.

Public disclosure, however, is not the only way information can be incorporated into stock prices. The absence of disclosure on the OTCBB created incentives for investors to acquire private information (Hirshleifer, 1971; Grossman and Stiglitz, 1980). For smaller firms quoted on the OTCBB, there was little analyst or media coverage to aid in information acquisition, which likely made the effort of acquiring such information more profitable. In particular, local investors were likely able to obtain information about firms, especially more easily observable information, such as sales and size (e.g., Coval and Moskowitz, 1999).

Further, insiders trading in a stock will incorporate private information into their decisions to buy and sell. Low regulatory enforcement of the OTCBB made insider trading easier to execute than for exchange-listed companies. Kyle (1985) suggests that, without a public information signal, insiders reveal some but not all of their private information. Bhattacharya et al. (2000) find evidence consistent with insiders incorporating all of their private information into stock prices. Thus, in the absence of disclosure, it is not clear how much financial statement information was incorporated into stock prices for nondisclosing firms.

The lack current financial information about issuers was the main SEC justification for approving the eligibility rule, and the nondisclosing firms were the firms expected to benefit the most from the mandatory disclosure requirement. Compliance with the rule causes a significant shift in the amount of financial statement disclosure for nondisclosing firms. Whether mandatory disclosures strengthen the association between equity values and financial statement data depends on how much nondisclosed information was incorporated into stock prices via information channels other than disclosure. Empirical work on the 1934 and 1964 Acts raises doubts about the benefits of mandatory disclosure (e.g., Benston, 1973; Battaolio et al., 2011). This leads to my first hypothesis (null form).

Hypothesis 1. For nondisclosing firms, the association between equity values and financial statement data is not different before and after the eligibility rule.

²² For example, Luft, Levine, and Larson (2001); Luft and Levine (2004); Bollen and Chrisite (2009); Ang, Shtauber, and Tetlock (2013); and Bruggeman et al. (2018).

I further examine whether investors view the voluntary disclosures of the disclosing firms as credible before the eligibility rule and whether mandatory disclosure enhances their credibility. OTCBB firms are small, and they operate in poor information environments. The best source of information about a given firm is likely to be the firm itself; the literature on voluntary disclosure documents that firms benefit more from increased voluntary disclosure in low information environments (e.g., Botosan, 1997; Blankespoor et al., 2013). Nonetheless, a critical assumption for disclosure to resolve information asymmetry between investors and the firm is that the disclosure must be credible (Grossman, 1981; Milgrom, 1981). Managers have incentives to make self-serving disclosure choices, which raises doubts about their credibility. In particular, investors may be more skeptical of favorable news (e.g., Sivakumar and Waymire, 1993). Without a credible commitment to disclosure regardless of the economic outcomes, voluntary disclosure may be discounted by investors (Verrecchia, 2001). Before the eligibility rule, trading on the OTCBB did not involve any contractual commitment to disclosure.²³ The asymmetry between the ease of entry into the SEC mandatory disclosure system and difficulty of exit makes registering with the SEC a credible commitment to disclose, regardless of economic outcomes (Rock, 2002). Thus, even though disclosing firms voluntarily disclosed their financial statements before the eligibility rule, the association between their equity values and financial statement data might be strengthened under the SEC's mandatory disclosure system. Formally, I hypothesize the following (null form).

Hypothesis 2. For disclosing firms, the association between equity values and financial statement data is not different before and after the eligibility rule.

4.2. Research design

To examine whether equity values reflect financial statement data, I follow the literature that examines the value relevance of financial data. The firms in my sample are generally young, entrepreneurial firms that are investing significantly both in growing their operations and developing technology. Many of them incur losses and/or have negative book values, which makes them quite similar to the firms in the entrepreneurial finance literature that analyzes venture capital. This literature extensively employs a log-linear model to examine the association of firm value and financial statement data, because this approach can handle nonlinear relationships arising from real options that are prevalent in young firms' equity values as well as those arising from biased accounting from large expenditures on intangible assets (e.g., Lerner, 1994; Gompers and Lerner, 1999, 2000a, 2000b; Hand, 2005; Heughebaert and Manigart, 2012).²⁴ An additional advantage of the log-linear model is its econometric robustness to outliers in the underlying nonlogged data.

The regressions that I estimate closely follow the work of Hand (2005) and model firms' equity values as a function of the major components of their book value and net income, rather than book value and net income. Hand (2005) notes, with the young biotech firms he studies, high investments in R&D (as well as SG&A costs that are likely to provide future benefits), which results in biased financial statements. Hand (2003, 2004) finds evidence consistent with Zhang's (2001) analytical model that demonstrates accounting conservatism, combined with rapid growth in intangible assets, can distort the association between firms' equity values and financial statement data. He demonstrates this distortion can be avoided by replacing book value and net income with their key components.²⁵ Accordingly, I estimate the following log-linear regression with one year of data prior to complying with the eligibility rule and then estimate a separate regression using one year of data after complying.

$$\log(MV_i) = \beta_0 + \beta_1 \log(\text{Assets}_i + 1) + \beta_2 \log(\text{Liabilities}_i + 1) + \beta_3 \log(\text{Sales}_i + 1) + \beta_4 \log(\text{COGS}_i + 1) + \beta_5 \log(\text{SG\&A}_i + 1) + \beta_6 \log(\text{R\&D}_i + 1) + \varepsilon_i \quad (1)$$

All financial statement data are in \$000s and are log-transformed with the natural logarithm plus one. *MV* is the market value six months after year-end. I use the market value six months after the fiscal year-end to be consistent with how firms are classified as either disclosing or nondisclosing in the voluntary reporting regime. The operational definition of current disclosure in this market was defined by SEC Rule 15c2-11 as six months from a fiscal year-end.

Since assets are probable future economic benefits and liabilities are sacrifices of future economic benefits, the coefficients on these variables should be positive and negative, respectively. I expect to find a positive coefficient on sales. Based on prior research, I do not have an expectation for COGS. Armstrong et al. (2006) find COGS is positively valued by private equity investors pre-IPO, consistent with it having investment characteristics in early stages, but find that it is negatively valued post-IPO, consistent with investors viewing these costs as operating costs, once firms mature. OTCBB firms are small, growing firms with characteristics most resembling the firms in Armstrong et al. (2006) during the pre-IPO stage. SG&A is a mixture of period expenses (such as utility and rent costs) as well as costs that are likely to provide future benefits (such as

²³ Firms affected by the 1934 Act contractually committed to disclose balance sheets and earnings with the NYSE and firms affected by the 1964 Act contractually committed to disclose financial statements to the NASD.

²⁴ Nonlinear relationships between equity values and financial statement data for OTCBB firms can arise from the abandonment option (Hayn, 1995) or their option to adapt their resources to a superior alternative use (Burgstahler and Dichev, 1997).

²⁵ A significant number of other studies examining firms that are more likely to incur losses regress market values on the components of book value and net income including Trueman et al. (2000), Rajgopal et al. (2003), Keating et al. (2003), Joos and Plesko (2005), Guo, Lev, and Zhou (2005), Armstrong et al. (2006), among many others.

salaries for senior management and marketing personnel). Many of the firms in the sample are early-stage firms in which activities of management and startup efforts are likely to provide future benefits. Banker et al. (2011) find SG&A expenditures are positively associated with long-term value when managers have higher equity incentives. Based on their findings, the high ownership concentration in my sample implies that SG&A expenditures may be positively associated with firm value. Thus, SG&A expenses may be positively or negatively associated with firm value. Lastly, the coefficient on *R&D* should be positive because the benefits of research and development expenditures are largely realized in future periods.

A fundamental concern with voluntary disclosure is potential endogeneity (Leuz and Wysocki, 2016). That is, the decision to disclose is predictable and not random. A strength of this setting is that I can use a Heckman self-selection correction procedure only because I can obtain the information the nondisclosing firms chose to withhold.²⁶ To mitigate potential bias, due to self-selection, I follow the literature (e.g., Leuz and Verrecchia, 2000; Cheng et al., 2013) and adjust for selection bias between disclosing and nondisclosing firms by using a first-stage probit model from equation (3). This approach is a variant of Heckman's (1979) two-stage technique. I then calculate the inverse Mills ratio (*IMR*), which represents the probability of firms choosing to voluntarily disclose financial statement information, and include it in the following regression.

$$\log(MV_i) = \beta_0 + \beta_1 \log(\text{Assets}_i + 1) + \beta_2 \log(\text{Liabilities}_i + 1) + \beta_3 \log(\text{Sales}_i + 1) + \beta_4 \log(\text{COGS}_i + 1) + \beta_5 \log(\text{SG\&A}_i + 1) + \beta_6 \log(\text{R\&D}_i + 1) + \beta_7 \text{IMR}_i + \varepsilon_i \quad (2)$$

Lennox, Francis, and Wang (2012) note the challenge of using this procedure is identifying variables in the first stage that are exogenous to the outcome variable in the second stage. Therefore I follow their suggestion and present my analysis both with and without the inverse Mills ratio.

5. Data

5.1. Data collection

Table 1 provides the details of my sample based on data obtained from the OTCBB.²⁷ My study focuses on the set of firms that were not filing with the SEC but initiate filing to comply with the eligibility rule. Before the rule, 3503 firms were quoted on the OTCBB that did not file with the SEC. As documented by Bushee and Leuz (2005), the vast majority of these firms (2677) elected not to comply with the rule and moved to the Pink Sheets, leaving 826 Newly Compliant firms. I exclude banks and insurance companies because they were not required to file with the SEC, but were instead permitted to file with their respective regulators. This results in 599 Newly Compliant nonbank and non-insurance companies.

Of these 599 firms, I cannot locate SEC filings for 198. Of the remaining 393 firms, 233 were shell companies. These represent firms with minimal assets and no operations or specific business plan, other than to identify suitable acquisitions. These companies likely choose to comply with the eligibility rule because the cost of compliance is low (i.e., minimal audit costs). For 45 firms, the current year of operations represented their first year of operations, and so no data was available for the prior year. This leaves a final sample of 123 Newly Compliant firms with suitable data.

As noted earlier, disclosure of financial statement information prior to the eligibility rule was not entirely voluntary. SEC Rule 15c2-11 required firms to provide financial statement information to the initial market maker upon initiating quotation on the OTCBB. For 30 firms, the year of prior period financial statement information that I observe in their SEC filing is the same information they would have provided to the market maker at their initial quotation. I exclude these firms, leaving a final sample of 93 firms where disclosure of financial statement information is voluntary in the period prior to the eligibility rule.

Fig. 1 depicts the differences in disclosure for disclosing and nondisclosing firms before and after the rule. Prior to the rule, disclosing firms voluntarily disclosed financial statement data within six months of their fiscal year-end. I identified firms that voluntarily disclosed financial statement information based on a Lexis-Nexis search, using each firm's name. I then read each article for each firm to determine whether a firm disclosed at least earnings within six months of the fiscal year-end of the year prior to complying with the eligibility rule. I also searched S&P Daily News, a low-cost method commonly used in the OTC markets to disseminate financial statement data, and Moody's (now Mergent's) Annual Corporation Manual. Specifically, in the year prior to compliance with the eligibility rule, I classify any firm that publicly disclosed at least earnings within six months of its fiscal year-end as a disclosing firm and as a nondisclosing firm otherwise.²⁸

Since nondisclosing firms did not voluntarily disclose their financial statement data, I obtain that data for the year prior to the eligibility rule from their initial filing with the SEC. For example, in Fig. 1, for a firm with a calendar year-end that

²⁶ For example, if one wanted to study the association between equity values and financial statement data of Pink Sheet firms where disclosure is voluntary, a fundamental challenge would be the inability to correct for selection bias because the financial statement data for the non-disclosing firms is not available.

²⁷ The initial list of securities quoted on the OTCBB on January 4, 1999 is available on the OTCBB website: www.otcbb.com. I then used daily lists of additions, deletions and changes, also available on the website, to determine compliance.

²⁸ Twelve firms disclosed a balance sheet and income statement. The rest disclosed at least earnings and gave a contact, typically for an investors relations representative, to get more financial information or provided a link to the financial statements. For example, National Rehab Properties Inc. provided a link to its financial statements on its website: "The entire Audit has been listed in NRPI's Internet Web Site: <http://www.NRPI.com>." Based on this evidence, I believe these firms made their financial statements publicly available and that it is best to classify them as disclosing. For financial items that are not disclosed, I use the initial SEC filing to collect data.

Table 1
Sample formation.

Non-SEC filers quoted on the OTCBB prior to the eligibility rule	3503
Noncompliant with eligibility rule	(2677)
Newly Compliant firms	826
Less banks and insurance firms	(227)
Non-bank and non-insurance firms	599
Less firms without registration statement or 10-K filing	(198)
Less shell companies	(233)
Less firms with no prior year data in filings	(45)
Newly Compliant firms	123

Notes: The table presents the sample selection of OTCBB firms that complied with the eligibility rule. Newly Compliant firms consist of non-SEC filers in 1998 that begin filing with SEC.

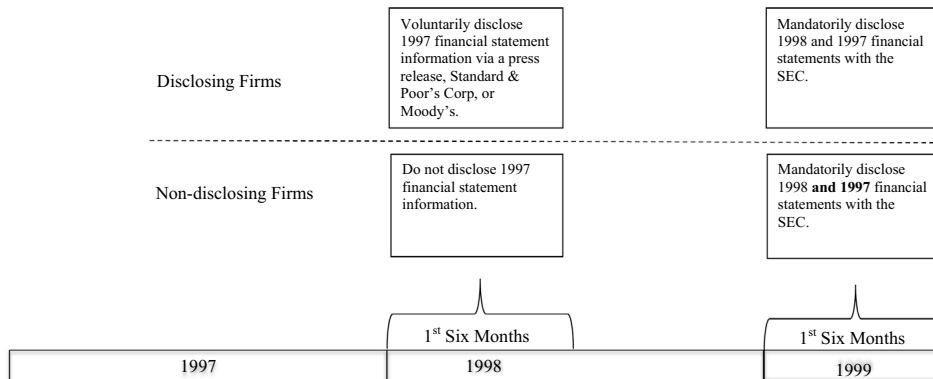


Fig. 1. Timeline of disclosure. Notes: Figure depicts an example of the timeline of voluntary and mandatory disclosure before and after the eligibility rule for firms with calendar fiscal year-ends that comply with the rule by June 30, 1999. Price quotations were available before and after the rule for both disclosing and nondisclosing firms. The rule was phased in on a monthly basis, starting in July 1999 (these firms had to comply by June 30, 1999) and ending June 2000, based on firms' ticker symbols on January 4, 1999.

complied with the eligibility rule before June 30, 1999, the year before the rule is 1997 and the year afterward is 1998. The firm's initial SEC filing reports 1997 and 1998 financial statement data. Thus I can obtain the 1997 data the firm previously chose to withhold. I can also obtain the 1998 data from the initial SEC filing (for both disclosing and nondisclosing firms). I obtain price data from FactSet, which provides information about dividends and stock splits.

Panel B of Table 2 details that of the 93 firms where disclosure was voluntary prior to the eligibility rule. Sixty-five (70%) firms chose not to publicly disclose financial statement information, while 28 (30%) firms publicly disclosed.

5.2. Disclosure and firm characteristics

Table 3 presents the descriptive statistics for the 93 firms I study. The information in the "before" columns is based on each firm's final year of information prior to the eligibility rule, except for the information for *DSE*, *Auditor*, *GC*, and *Ownership*, which are only available for the mandatory disclosure period. The information in "after" columns is based on each firm's first year of information in the mandatory disclosure regime. Panels A and B reveal that all firms are small, whether measured by sales, assets, or market value. Both nondisclosing and disclosing firms' operations on average generate negative earnings and operating cash flows. Panels A and B also reveal that the firms do not change dramatically after the eligibility rule. The primary exception to this observation is that market value roughly triples for nondisclosing firms (significant at the 5% level). Disclosing firms also experience a large increase in market value (median is significant at the 10% level).

When comparing nondisclosing firms to disclosing firms, unreported tests indicate disclosing firms are larger in terms of sales, gross margin, SG&A expenses, assets, stockholders' equity, and market value (differences significant at least at the 5% level). Nondisclosing firms invest more in research and development, which is consistent with these firms guarding propriety information. A larger portion of the nondisclosing firms are DSEs (46%) than the disclosing firms (29%): *SFAS No. 7* classifies a company as a DSE when its efforts are focused on establishing a new business and either its primary operations have not yet begun or no significant revenues have been earned. Thus a significant portion of these firms are startups working on implementing their business plans.

Industry Concentration suggests that the average level of competition in the industries nondisclosing and disclosing firms operate in is similar. I calculate this measure of industry concentration following [Botosan and Stanford \(2005\)](#) as the sales of

Table 2
Newly Compliant firms' disclosure prior to the eligibility rule.

Voluntary status	Number	Percent
<i>Panel A: Voluntary vs. Mandatory Disclosing firms</i>		
Disclosure is voluntary	93	76%
Disclosure is mandatory per SEC Rule 15c2-11	30	24%
	123	100%
Disclosure status	Number	Percent
<i>Panel B: Voluntary firms' public disclosure choices</i>		
Non-Disclosing firms	65	70%
Disclosing firms	28	30%
	93	100%

Notes: I classify those firms in the mandatory disclosure per SEC Rule 15c2-11 group if the prior period information I observe *ex post* in a firm's filing would have been provided to the initial market maker based on the date the firm initiated quotation on the OTCBB. I classify any firm that publicly disclosed at least earnings within six months of its fiscal year-end in the year prior to compliance with the eligibility rule as a disclosing firm, and as a non-disclosing firm otherwise.

the top four firms, relative to all firms' sales in a three-digit SIC code for a given year—higher levels of concentration indicate less competitive industries. *Ownership*, which represents the total ownership of both insiders and blockholders with more than 5% ownership of the company, is higher for nondisclosing firms. This likely reflects less demand for public disclosure in nondisclosing firms, since insiders and blockholders own more of the firm. Only a small percentage of nondisclosing and disclosing firms employs a Big N auditor. The high incidence of going-concern opinions (54% and 46% for nondisclosing and disclosing firms, respectively) indicates many firms are distressed and need additional capital for survival. Overall, the descriptive statistics paint a picture of nondisclosing and disclosing firms as small startup companies pursuing new business ideas to become profitable.

Panel C of [Table 3](#) shows the industry classifications for nondisclosing and disclosing firms. Approximately 60 percent of nondisclosing firms are in either manufacturing or services. Disclosing firms are in four primary industries: manufacturing, retail trade, services, and transportation and utilities.

[Table 4](#) presents Pearson and Spearman correlations between firms' disclosure choices and proxies for the costs and benefits of disclosure. The statistically significant positive correlation between *Disclosure* and the existence of research and development activities is consistent with firms guarding proprietary information.²⁹ [Berger \(2011\)](#) notes that guarding proprietary information is particularly important for small firms. The statistically significant positive correlation between size and disclosure is consistent with several interpretations. One is that disclosure costs decrease in firm size, due to a fixed component to preparation and dissemination of financial statements ([King et al., 1990](#)). Another is the legal cost hypothesis ([Skinner, 1994](#)), whereby disclosure increases in firm size because the dollar value of damages in securities litigation are a function of size. The statistically significant negative correlation between *Disclosure* and *DSE* is consistent with *DSE* firms not disclosing financial statements to equity investors, because this information is less useful in valuing these firms than non-*DSE* firms ([Willenborg, 1999](#)). The statistically significant negative association between higher ownership concentration and *Disclosure* may reflect lower demand for disclosure, due to accounting playing a smaller role in resolving information asymmetry when ownership concentration is high.

I further analyze firms' disclosure choices using the following probit model, based on firm characteristics associated with the costs and benefits of voluntary disclosure.

$$\text{Prob}(\text{Disclose}_i = 1) = F(\beta_0 + \beta_1 \text{BM}_i + \beta_2 \text{Profit}_i + \beta_3 \text{R\&D}_i + \beta_4 \text{Size}_i + \beta_5 \text{DSE}_i + \beta_6 \text{Ownership}_i + \beta_7 \text{Industry Concentration}_i). \quad (3)$$

The model employs variables based on the literature and resembles the model of [Cheng et al., 2013](#). The results are reported in [Table 5](#). Consistent with the Pearson and Spearman correlations, I find a statistically significant negative association between voluntarily disclosing financial statement information and *R&D* and *Ownership* and a positive association with *Size*. I estimate the marginal effect using the average of marginal effects evaluated at each observation, except for dummy variables, which are the discrete changes in the quantities of interest as the dummy variable changes from 0 to 1.³⁰ Marginal effects indicate that a firm with research and development expense is 24% less likely to disclose and a unit change in *Ownership* represents a 28% lower probability of disclosure. A unit change in *Size* is associated with a 9% higher likelihood of disclosure. For

²⁹ I use an indicator variable for *Profit* and *R&D* because a suitable scalar is not readily available. Total assets suffers from a small denominator problem, and many firms do not have sales. For *R&D*, I obtain similar results if I scale by total expenses.

³⁰ [Greene \(2003, p. 668\)](#) states that averaging the individual marginal effects is the preferred method of estimating marginal effects for small samples.

Table 3
Descriptive statistics.

Variable	Before			After																																																																									
	Mean	Median	Std Dev	Mean	Median	Std Dev																																																																							
<i>Panel A: Non-Disclosing firms (65 firms)</i>																																																																													
Sales	554	52	1633	708	57	1715																																																																							
GM	210	8	732	271	21	700																																																																							
SG&A	628	351	816	919	902	846	**	##																																																																					
R&D	69	0	208	80	0	166																																																																							
Earnings	(677)	(306)	993	(822)	(625)	1089																																																																							
Profit	0.11	0.00	0.31	0.14	0.00	0.35																																																																							
CFO	(380)	(175)	554	(384)	(327)	725																																																																							
Assets	969	263	2326	1505	479	2898																																																																							
SE	(937)	(49)	5725	(587)	18	6048																																																																							
MV	7751	3195	9184	25,516	878	42,352	**	###																																																																					
BM	-0.35	0.00	1.81	-0.12	0.00	0.71																																																																							
ROA	-1.40	-0.62	1.88	-1.43	-0.61	2.23																																																																							
D-to-A Ratio	1.63	0.87	2.03	1.41	0.82	1.78																																																																							
Industry Concentration	0.58	0.53	0.23	0.62	0.59	0.25																																																																							
DSE				0.46	0.00	0.50																																																																							
Auditor				0.05	0.00	0.21																																																																							
GC				0.54	1.00	0.50																																																																							
Ownership (%)				52	56	23																																																																							
<i>Panel B: Disclosing firms (28 firms)</i>																																																																													
Sales	4854	535	11,981	6143	500	13,345																																																																							
GM	1582	154	3831	1779	227	3656																																																																							
SG&A	1604	1055	1870	2528	1473	2913																																																																							
R&D	32	0	131	8	0	36																																																																							
Earnings	(532)	(610)	2117	(2306)	(1037)	4281	*																																																																						
Profit	0.14	0.00	0.37	0.14	0.00	0.37																																																																							
CFO	(288)	(447)	1339	(985)	(700)	1856																																																																							
Assets	5404	1160	10,280	4711	1475	8601																																																																							
SE	2190	224	7238	2033	493	8509																																																																							
MV	17,043	11,082	18,284	33,793	22,671	55,303		#																																																																					
BM	0.23	0.01	1.12	0.07	0.02	0.23																																																																							
ROA	-0.94	-0.59	1.81	-1.78	-1.12	2.01																																																																							
D-to-A Ratio	0.72	0.67	0.53	1.05	0.81	1.54																																																																							
Industry Concentration	0.66	0.62	0.24	0.66	0.58	0.22																																																																							
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Wholesale Trade	3	5%	2	7%																																																																									
	65	100%	28	100%																																																																									

Notes: The table presents descriptive statistics based on each firm's final year of information in the voluntary disclosure regime (Before) and each firm's first year of information in the mandatory disclosure regime (After). All variables are in thousands, except for ratios and dummy variables. *GM* is Sales minus cost of goods sold. *SG&A* is selling, general and administrative expenses. *R&D* is research and development expense. *Earnings* is net income. *Profit* is one if net income is positive, and zero otherwise. *CFO* is cash flows from operations. *SE* is stockholders' equity. *MV* is market value calculated as price at the fiscal year-end times common shares outstanding. *BM* is stockholders' equity divided by market value. *ROA* is net income divided by total assets. *D-to-A Ratio* is total liabilities divided by total assets. Industry Concentration is the four-firm concentration ratio based on 3-digit SIC sales. *DSE* is one if the entity is a Development Stage Enterprise, and zero otherwise. *Auditor* is one if the auditor is a Big N auditor, and zero otherwise. *GC* is one if the audit opinion is a going concern opinion, and zero otherwise. Ownership is the combined ownership of officers and directors and blockholders holding greater than 5%. ***, **, * indicates *t*-test of means statistically different at the 1%, 5%, and 10% level, respectively (two-tailed). ###, ##, # indicates Wilcoxon test statistically different at the 1%, 5%, and 10% level, respectively (two-tailed).

Table 4

Pearson (Spearman) correlations above (below) diagonal.

Variable	Disclose	BM	Profit	R&D	Size	DSE	Ownership	Industry Concentration
Disclose	1.00	-0.05 (0.57)	0.13 (0.21)	-0.20 (0.04)	0.26 (0.01)	-0.16 (0.06)	-0.19 (0.06)	0.03 (0.85)
BM	0.15 (0.12)	1.00	0.00 (1.00)	0.22 (0.04)	-0.27 (0.01)	0.13 (0.25)	0.04 (0.72)	0.11 (0.33)
Profit	0.13 (0.21)	0.28 (0.01)	1.00	-0.15 (0.17)	-0.15 (0.18)	-0.27 (0.01)	-0.02 (0.87)	0.02 (0.89)
R&D	-0.20 (0.04)	-0.12 (0.29)	-0.15 (0.17)	1.00	0.03 (0.78)	0.17 (0.11)	-0.12 (0.29)	-0.12 (0.30)
Size	0.25 (0.01)	-0.11 (0.33)	-0.07 (0.54)	0.03 (0.78)	1.00	-0.02 (0.87)	-0.18 (0.11)	0.04 (0.75)
DSE	-0.16 (0.06)	-0.17 (0.12)	-0.27 (0.01)	0.17 (0.11)	0.00 (0.99)	1.00	-0.06 (0.57)	-0.08 (0.49)
Ownership	-0.21 (0.04)	0.06 (0.61)	-0.05 (0.68)	-0.04 (0.70)	-0.20 (0.04)	-0.04 (0.71)	1.00	0.05 (0.68)
Industry Concentration	0.04 (0.78)	0.31 (0.00)	0.00 (0.98)	-0.11 (0.32)	0.00 (1.00)	-0.08 (0.48)	0.03 (0.79)	1.00

Notes: *Disclose* is equal to one if firms voluntarily disclosed at least earnings within six months of its fiscal year-end in the year prior to compliance with the eligibility rule, and zero otherwise. *BM* is the book-to-market ratio defined as stockholders' equity divided by the market value of equity. *Profit* is equal to one if net income is positive, and zero otherwise. *R&D* is equal to one if a firm has research and development expenses, and zero otherwise. *Size* is the log of market value of equity at the beginning of the year. *DSE* is one if a firm is a Development Stage Enterprise, and zero otherwise. *Ownership* is the combined ownership percentage of insiders and blockholders. *Industry Concentration* is the four-firm concentration ratio calculated as the top four firms' sales in an industry year (3-Digit SIC) divided by total industry sales. p-values in (italics). **Bold** represents significant correlation at least at the 10% significance level (one-tailed test when there is a prediction).

Table 5

Analysis of firms' voluntary disclosure choices.

Variable	Expectation	Disclose Coefficient	p-value	Marginal Effect
Intercept		-5.09	**	0.01
BM	-	0.07		0.13
Profit	±	0.58		0.27
R&D	-	-0.38	**	0.02
Size	+	0.10	***	0.00
DSE	-	-0.09		0.11
Ownership	-	-0.31	**	0.04
Industry Concentration	-	-0.22		0.44
Likelihood Ratio		14.69	**	0.04
Pseudo R ²		0.18		
N		93		

Notes: This table presents the results of probit regression of firms' disclosure choices in year before compliance with the eligibility rule. *Disclose* is equal to one if firms voluntarily disclosed at least earnings within six months of its fiscal year-end in the year prior to compliance with the eligibility rule, and zero otherwise. *BM* is the book-to-market ratio defined as stockholders' equity divided by the market value of equity. *Profit* is equal to one if net income is positive, and zero otherwise. *R&D* is equal to one if a firm has research and development expenses, and zero otherwise. *Size* is the log of market value of equity at the beginning of the year. *DSE* is one if a firm is a Development Stage Enterprise, and zero otherwise. *Ownership* is the combined ownership percentage of insiders and blockholders. *Industry Concentration* is the four-firm concentration ratio calculated as the top four firms' sales in an industry year (3-Digit SIC) divided by total industry sales. The marginal effect is the average marginal effect, computed as the mean of marginal effects evaluated at each observation, except for dummy variables which are the discrete changes in the quantities of interest as the dummy variable changes from 0 to 1. ***, **, * indicates statistical significance at the 1%, 5%, and 10% level (one-tailed tests where directional prediction), respectively, based on robust standard errors.

the restricted sample of firms that comply with the eligibility rule, these results are consistent with firms having more proprietary information and where accounting plays less of a role in resolving information asymmetry being less likely to disclose while larger firms are more likely to disclose.

6. Analysis of equity values and financial statement data

Columns 1 and 2 of [Table 6](#) show that equity values are associated with financial statement data, even in the absence of public disclosure for the year prior to compliance with the eligibility rule. Specifically, Column 1 of [Table 6](#) indicates that equity value is statistically significantly positively associated with *Assets* and *SG&A*. This suggests OTCBB investors view *SG&A* as activities that will benefit future periods. Ownership concentration is high among the firms on the OTCBB, which makes it likely that managers focus on deploying resources carefully to generate future benefits. This finding is consistent with [Banker et al.'s \(2011\)](#) finding that managers with greater equity incentives generate more long-term value with their

Table 6

Log-linear regressions of firms' market values on financial statement data for nondisclosing firms one year before and after compliance with the eligibility rule.

Variable	Coefficient	Expectation	Before		After			
			(1)	(2)	(3)	(4)		
log(<i>Assets</i> + 1)	β_1	+	0.26 (2.01)	** 0.13 (1.06)		0.38 (3.21)	*** 0.09 (1.32)	*
log(<i>Liabilities</i> + 1)	β_2	-	-0.01 (-0.07)	0.10 (1.20)		-0.14 (-1.04)	0.07 (0.76)	
log(<i>Sales</i> + 1)	β_3	+	-0.30 (-1.26)	-0.32 (-1.27)		-0.10 (-1.06)	-0.21 (-1.23)	
log(<i>COGS</i> + 1)	β_4	±	0.17 (1.15)	0.12 (1.79)	*	-0.01 (-0.18)	0.07 (1.09)	
log(<i>SG&A</i> + 1)	β_5	±	0.33 (2.26)	** 0.24 (2.27)	**	0.45 (3.20)	*** 0.11 (1.04)	
log(<i>R&D</i> + 1)	β_6	+	0.02 (0.30)	0.31 (4.76)	***	0.01 (0.22)	0.37 (6.85)	***
<i>IMR</i>	β_7	?		-2.01 (-6.66)	***		-2.27 (-9.64)	***
N			65	65		65	65	
Adjusted R ²			0.14	0.52		0.29	0.69	
Z-Statistic: 1 vs. 3, 2 vs. 4						2.02	** 1.92	*

Notes: The table reports the ordinary least squares regression of the market value of equity on financial statement data for nondisclosing firms for the year before (columns 1 and 2) and after firms comply with the eligibility rule (columns 3 and 4). All variables are log-transformed. The dependent variable is the natural logarithm market value six months after the fiscal year-end. The intercept is estimated but not reported. *IMR* is the inverse Mills ratio to correct for the endogenous selection of disclosure estimated from the probit regression model from equation (3). ***, **, * indicates statistical significance at the 1%, 5%, and 10% level, respectively, under a one-tailed test of the predicted sign (two-tailed where there is no sign prediction) based on robust standard errors. t-statistics in (italics). Z-Statistic based on Cramer (1987).

SG&A expenditures. This is also consistent with the results of Armstrong et al. (2006), who find SG&A has investment characteristics for private equity investors in the pre-IPO period. One possibility is that recent research demonstrates that firms strategically underreport R&D expenditures (e.g., Koh and Reeb, 2015; Koh et al., 2017) and instead bundle these costs in SG&A.³¹ The coefficients on *Liabilities*, *Sales*, *COGS*, and *R&D* are not statistically significant.

Column 2 reports that, after adjusting for selection bias using *IMR*, the income statement data takes prominence. The coefficient on *IMR* is negative and statistically significant, which supports rejecting the null of no selection bias. In other words, failing to include a control for firms' characteristics that influenced firms' decision to disclose (*IMR*) results in biased coefficient estimates on the financial statement data.³² The coefficient on *Assets* is no longer statistically significant, while the coefficients on *COGS*, *SG&A*, and *R&D* are statistically significantly positive. This finding is consistent with those of Armstrong et al. (2006), who find that all three of these costs exhibit positive associations with private equity valuations pre-IPO.³³

The strength of the association between equity values and financial statement data is relatively strong. The adjusted R² in column 1 of Table 6 is 14%. Despite financial statements not being publicly available, equity values appear to reflect some of this information. Several explanations are possible. Theory from the voluntary disclosure literature assumes that investors can infer some, but not all, information from nondisclosure. Informed trading by insiders and investors who acquired private information also likely incorporate financial statement information into stock prices.

Columns 3 and 4 of Table 6 report the log-linear regression results for the year after nondisclosing firms comply with the eligibility rule and initiate reporting with the SEC. In this period, the financial statements are publicly available to investors on the OTCBB for the nondisclosing firms. Columns 3 and 4 of Table 6 indicate a stronger association between equity values and financial statement data for nondisclosing firms than in the period prior to the eligibility rule. Specifically, the adjusted R²s in both regressions increase significantly. Comparing column 1 in Table 6 to column 3 in Table 6, the adjusted R² more than doubles to 29% from 14% and is a statistically significant increase, based on the Cramer (1987) Z-Statistic. This supports rejecting the null of Hypothesis 1. This provides support that, during the prior voluntary disclosure period, the nondisclosed financial statement data was only partially reflected in equity values. The evidence suggest mandatory disclosure strengthens the association between equity values and financial statement data.

Table 7 reports the association between equity values and financial statement data for disclosing firms for the year before (columns 1 and 2) and after compliance with the eligibility rule (columns 3 and 4). Columns 1 and 2 from Table 7 report

³¹ Laplante et al. (2019) demonstrate firms also strategically overreport R&D to generate tax savings, but this is unlikely to apply to OTCBB firms because so few of them pay income taxes.

³² This highlights a strength of this setting. Observing the financial information for the nondisclosing firms enables me to control for the firm characteristics that influence their disclosure decision. However, I follow Lennox et al. (2012)'s advice to present results with and without the *IMR*, due to the challenge of identifying variables in the first stage that are exogenous to the outcome variable in the second stage.

³³ Post-IPO they find a statistically significant negative coefficient on *COGS* and *SG&A*, consistent with the market viewing these as operating costs for more mature firms. The firms in my sample exhibit characteristics more similar to firms in the pre-IPO stage of Armstrong et al.'s (2006) study.

Table 7

Log-linear regressions of firms' market values on financial statement data for disclosing firms one year before and after the compliance with the eligibility rule.

Variable	Coefficient	Expectation	Before		After		
			(1)	(2)	(3)	(4)	
$\log(\text{Assets} + 1)$	β_1	+	-0.07 (-0.26)	-0.03 (-0.49)	0.46 (2.26)	** (1.28)	0.25 (1.28)
$\log(\text{Liabilities} + 1)$	β_2	-	-0.09 (-1.77)	-0.07 (-1.63)	-0.34 (-1.62)	* (-1.90)	-0.33 (-1.90)
$\log(\text{Sales} + 1)$	β_3	+	-0.19 (-0.96)	-0.63 (-0.94)	-0.37 (-1.24)		-0.41 (-1.36)
$\log(\text{COGS} + 1)$	β_4	\pm	0.20 (1.14)	0.58 (4.26)	0.16 (1.25)	***	0.18 (1.55)
$\log(\text{SG\&A} + 1)$	β_5	\pm	0.67 (3.46)	0.17 (1.08)	0.62 (1.75)	*	0.59 (1.73)
$\log(\text{R\&D} + 1)$	β_6	+	0.07 (0.29)	0.83 (4.39)	-0.13 (-1.27)	***	0.18 (1.01)
<i>IMR</i>	β_7	?		-2.64 (-4.88)		***	-1.68 (-3.29)
N			28	28	28		28
Adjusted R ²			0.25	0.69	0.29		0.46
Z-Statistic:							
1 vs. 3, 2 vs. 4 vs. Non-Disclosing Firms			0.88	0.96	0.11 0.01		0.98 1.65

Notes: The table reports the ordinary least squares regression of the market value of equity on financial statement data for disclosing firms for the year before (columns 1 and 2) and after firms comply with the eligibility rule (columns 3 and 4). All variables are log-transformed. The dependent variable is the natural logarithm market value six months after the fiscal year-end. The intercept is estimated but not reported. *IMR* is the inverse Mills ratio to correct for the endogenous selection of disclosure estimated from the probit regression model from Eq. (3). ***, **, * indicates statistical significance at the 1%, 5%, and 10% level, respectively, under a one-tailed test of the predicted sign (two-tailed where there is no sign prediction) based on robust standard errors. t-statistics in (italics). Z-Statistic based on Cramer (1987).

evidence suggesting that prior to the rule investors view the voluntary disclosure of financial statements as credible.³⁴ The adjusted R² of 25% in column 1 indicates a strong association between equity values and financial statement data. The coefficient on *Liabilities* statistically significantly negative, while the coefficient on *SG&A* is statistically significantly positive. In column 2, the coefficient on *IMR* is negative and statistically significant, which supports rejecting the null of no selection bias. After adjusting for selection bias, the coefficients on *COGS* and *R&D* become statistically significantly positive, while the coefficient on *SG&A* is no longer statistically significant. The results generally indicate that investors view the major costs as having investment characteristics, consistent with the findings of Armstrong et al. (2006). The lack of significance on sales may indicate that investors view sales as transitory and nonrecurring. The coefficient on the sales estimate resembles the findings of Hand (2005) about early rounds of venture capital funding.

The adjusted R²s in columns 3 and 4 of Table 7 increase modestly for the voluntary disclosing firms without adjusting for self-selection bias and decrease when adjusting for self-selection, but neither of the differences is statistically significant based on Cramer's (1987) test for differences in adjusted R²s. Thus I fail to reject the null of hypothesis 2. This further supports that voluntary disclosure of financial statement data was viewed as credible by investors prior to the eligibility rule.

Comparing the adjusted R²s between the disclosing and nondisclosing firms, I cannot reject the null of no difference in the periods before or after the eligibility rule. The difference between the adjusted R² for nondisclosing firms and disclosing firms is economically significant, but not statistically significant. This could be due to the low statistical power from the small sample size.

6.1. Caveat

An important caveat in interpreting my results is that I study firms that chose to comply with the eligibility rule. I cannot conduct the same study for the Noncompliant firms that chose to leave the OTCBB. Thus I identify a local effect that may not generalize to a broader cross-section of firms. Specifically, my results might differ if the firms that opted out of complying with the SEC disclosure requirements had instead been forced to comply.

7. Conclusion

I exploit the SEC's adoption of the eligibility rule to study the relationship between equity values, financial statement data and disclosure in unregulated markets and how mandatory changes this relationship. For the set of firms that begin filing

³⁴ For the firms that only disclosed earnings, I make the assumption that their financial statements were publicly available from the investor relations representative listed in the earnings press release. In untabulated results, I regress stock price on the book value, earnings, and *IMR* for the disclosing firms in the year prior to the eligibility rule. The earnings are based on the voluntarily disclosed earnings for all firms. I find a statistically significant positive coefficient of 2.02 on book value, a statistically significant negative coefficient of -2.61 on earnings, and a statistically significant negative coefficient of -1.43 on *IMR*. The negative coefficient on earnings is consistent with loss firms' expenses having investment characteristics as argued by Hand (2005). This suggests the market viewed the voluntary disclosures as credible and corroborates the results presented in Table 7.

reports with the SEC under the 1934 Act to comply with the eligibility rule, I observe at least one prior year of accounting information in their initial SEC filings, which enables me to observe the accounting information that nondisclosing firms had previously withheld (but could have voluntarily disclosed).

In the voluntary disclosure period, I find equity values exhibit a relatively strong association with financial statement data for nondisclosing firms, even though the data was not publicly available. Financial statement data are associated with equity values in economically sensible ways, given the life stage of the firms. Equity values are positively related to assets, COGS, SG&A, and R&D. This is consistent with theoretical work, which assumes that, even in the absence of disclosure, investors set prices that, on average, correctly infer nondisclosed information (e.g., Verrecchia, 1983; Dye, 1985). Further, less disclosure increases the incentives of individual investors to acquire information to make profitable trades. Since investors voluntarily and willingly trade in these stocks in the absence of disclosure, these results imply their trades reflect at least part of the economic information communicated through financial statements.

I also show that investors view the voluntary disclosure of financial statement data as credible. Voluntarily disclosed data prior to the eligibility rule exhibits a strong association with equity values. Equity values exhibit reasonable associations with financial statement data for young, growth-oriented firms. Liabilities are negatively associated with equity values, while COGS, SG&A, and R&D expenses are positively associated with equity values. The positive association with SG&A and R&D expenses is consistent with these costs providing benefits beyond the current period for firms in their early phases.

The imposition of mandatory SEC reporting requirements strengthens the association between equity values and financial statement data for nondisclosing firms. This suggests that equity values reflected some, but not all, accounting information in the absence of disclosure. The association between equity values and financial statement data is similar for the disclosing firms before and after the regulatory change, which is consistent with voluntarily disclosure having credibility similar to mandatory disclosure for these firms.

Lastly, I provide evidence on the determinants of firms' voluntarily disclosure decisions. I find firms' disclosure choices relate negatively to research and development activities and ownership concentration. These results are consistent with firms guarding proprietary information and not disclosing when financial statements play less of a role in resolving information asymmetry. I also find that firms' disclosure choices are positively associated with size, which is consistent with fixed costs of disclosure, greater returns to information acquisition, increased litigation risk, or a combination of these.

This study focuses on one aspect of the impact of mandatory disclosure regulation—the relationship between equity values and financial statement data. I focus on financial statement information because the lack of reliable and current financial information about issuers was the main justification cited by the SEC in approving the eligibility rule. Future research might examine whether my results are robust to the inclusion of banks and insurance companies, which largely began filing with their respective industry regulators rather than the SEC.

Appendix A. Example of firm's voluntary disclosure prior to the eligibility rule

On June 20, 1998 Knox Nursery Inc. (OTCBB Ticker: KNUR) disclosed its income statement and balance sheet for the year ended December 31, 1997. Knox Nursery Inc. made this disclosure through S&P Daily News. As its names suggests, Knox Nursery Inc. sells plants.

Income Statement (Thous. \$)	
	Yr. Ended 12/31/1997
Net Sales	5,647
Costs & Expenses	5,803
Operating Income	d156
Interest Income	8
Gain on Sale of Equipment	5
Other Income	d15
Total Income	d158
Depreciation & Amortization	675
Interest Expense	462
Capitalized Interest	cr32
Income Tax	cr129
Net Income	d1,134
EPS	d\$0.14
Average Shares	8,001
d - Deficit	

Balance Sheet (Thous. \$)	
	12/31/1997
Assets:	
Cash & Equivalents	44
Accounts Receivable, net	431
Inventories	893
Due from Officer	40
Other Current Assets	110
Total Current Assets	1,518
Investments	14
Net Property	6,782
Deferred Loan Costs	68
Total Assets	8,382
Liabilities*:	
Current Debt Maturing	864
Accounts Payable	981
Accruals	250
Total Current Liabilities	2,095
Long Term Debt	4,313
Long Term Deferred Income Tax	512
Due to Stockholders	85
Common Stock (p. \$0.001)	8
Paid-in Capital	306
Retained Earnings	1,063
Total Liabilities	8,382

*The balance sheet format used by S&P Daily News labeled the Liabilities and Stockholders' Equity section as Liabilities.

Appendix B. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jaccpubpol.2020.106716>.

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