Disaggregated Financial Statement Information in an Unregulated Environment

by

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Abstract

This paper examines whether disaggregated financial statement information during the late 1920's reduced information asymmetry. After controlling for firms endogenously selecting their level of disaggregation, I find that disaggregation reduced the information asymmetry between market participants and between the firm and outside investors. Disaggregators had lower bid-ask spreads and short sellers paid lower loan fees for borrowing disaggregators' stocks. In addition, disaggregators were more likely to raise capital in the following year. These results are consistent with firms using high-quality financial reporting to reduce information asymmetry even in the absence of regulation as a bonding mechanism.

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1 Introduction

A central decision that financial statement preparers make is the level at which they aggregate financial statement information. At one extreme, financial statement preparers could provide users with transaction-level detail and not aggregate any information, as 46 states in the United States do (Watts, 2013). At the other extreme, preparers could aggregate all expenses and revenues into one line and not disaggregate any information, as 2% of industrial firms did in 1929 (Barton and Waymire, 2004). For publicly traded companies, we seldom see these corner solutions, in part because of regulation and in part because the transaction-level detail of any one of the millions of transactions a firm engages in is unlikely to be material to decision makers. However, we do see significant variation in the extent to which firms disaggregate information between these extremes.

In this paper, I attempt to add to our understanding of the effects of aggregation on financial statement users by studying the disaggregation decisions of firms in the period prior to the founding of the Securities and Exchange Commission (SEC). During this period, firms were not subject to positive requirements to disclose material information and could effectively choose the level of disaggregation for their financial statements. The listing requirements of the New York Stock Exchange (NYSE) during this time specified little beyond a balance sheet, an income account to reconcile the change in retained earnings, and the frequency of future disclosures (Shultz, 1936). Some firms at this time chose not to disaggregate net income into revenues and expenses, while other firms provided income statement information similar to today's financial statements.

I hypothesize that disaggregated financial statement information reduces the in-

formation asymmetry between equity market participants by allowing investors to estimate future cash flows more precisely. When information asymmetry is higher, individual investors have differing information sets and place relatively more weight on their private signals when estimating fundamental value. The greater weight on private signals decreases the asset's liquidity (Akerlof, 1970; Grossman and Stiglitz, 1980). In contrast, when a firm disaggregates a financial statement item, all investors have that same piece of information as an input to their estimates of future cash flows, making investors' information sets more similar. Having more similar information sets increases the weight on public signals and reduces the weight on private signals when estimating price. The Kyle (1985) model and other similar models predict that, when information asymmetry is higher, transaction costs are higher. I use the bid-ask spread and demand from short sellers, reflected in the cost of shorting, as measures of the information asymmetry between equity market participants.

I also hypothesize that disaggregated financial statement information reduces the information asymmetry between the firm and capital providers. I use the issuance of new securities as a measure of the information asymmetry between the firm and capital providers. Higher information asymmetry between the firm's managers and outside capital providers increases the cost of raising capital (Jensen and Meckling, 1976) and decreases the probability of accessing it (Myers and Majluf, 1984). Disaggregating financial statement information increases (decreases) the probability of raising capital to finance new projects if the additional information brings investors' information set closer to (further from) that of managers.

To examine the effects of disaggregation, I collect financial statements information for a sample of NYSE firms from Moody's Industrial manuals. I fit the information collected from firms' financial statements into a taxonomy of 46 financial statement items based on firms' descriptions of the information provided. Using the taxonomy, I determine whether each sample firm discloses a given item. I then classify firms into two types, disaggregators and aggregators, using cluster analysis on the set of disclosures the firm provides.

Merging the disaggregation information with stock return data, I examine the ef-

fect of disaggregation on transaction costs in both the "long" and "short" markets. The effective bid-ask spread, the cost of trading in the equity market, is a common proxy for information asymmetry between investors. A distinctive feature of the pre-SEC era is that the loan fee, the explicit cost that short sellers pay to short a stock incremental to the bid-ask spread, was publicly available for a subset of NYSE stocks. In that time, as now, the short sellers trading at these rates were sophisticated investors (Jones and Lamont, 2002). This active market provides a test of disaggregation on information asymmetry among sophisticated investors who have better access to individual information. Thus, information asymmetry in the short market is larger, potentially offering a more powerful setting to test the effects of disaggregation on information asymmetry. My research design to test this hypothesis includes controls for investors' demand in both markets unrelated to information asymmetry and other aspects of the information environment. To determine whether the firm raised capital, I examine the changes in firms' balance sheets. The model for capital raising includes controls for firms' growth options, performance, and reputation in the capital market.

In the absence of disclosure regulation, the decision to disaggregate a given financial statement item is endogenous. To address this endogeneity, I model the decision to disaggregate using proxies for the agency and proprietary costs that I expect to influence disclosure. I find that firms with higher leverage (i.e., higher agency costs from debtholder-shareholder conflicts) are more likely to disaggregate. Firms with more growth options and younger firms (i.e., firms that have not been able to build a reputation in capital market) are also more likely to disaggregate. I then estimate the effect of disaggregation on information asymmetry and raising outside capital by using a model that attempts to address the endogenous choice to disaggregate.

I find that disaggregation reduces information asymmetry between market participants. The bid-ask spread is 45% lower for disaggregators than aggregators, indicating that disaggregation decreases information asymmetry between all types of equity investors. In terms of the absolute spread, disaggregation reduces the spread by 9.23 cents per share traded. Over the year, the transaction costs savings is eight basis points of market value. The cost to short sellers of borrowing disaggregators' stock,

the loan fee, is also lower, indicating that disaggregation also decreases information asymmetry between sophisticated investors. Disaggregation also has a large impact on the loan fee (a 72% reduction relative to the sample mean). Small and medium aggregators are more likely to be added to the short sale list. This indicates that sophisticated investors have lower demand for disaggregators' stocks because these investors place lower weight on private signal when estimating disaggregators' prices. Disaggregation helps to equalize the information that all market participants have, reducing the information asymmetry between them.

I also find that disaggregation reduces information asymmetry between the firm and capital providers. Disaggregation increases the probability of raising capital from external sources by 51 percentage points. The difference between disaggregators' and aggregators' disclosure These results suggest that disaggregating disclosures such as depreciation, tax expense, and non-operating income so that investors can calculate an additional proxy for operating cash flows has economically significant benefits. These disclosures assist investors in estimating the firm's operating cash flows. This piece of information helps investors determine the value of the securities the firm offers.

The results of this study are likely to be of interest to both regulators and academics. The Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) have begun a joint project on Financial Statement Presentation (also known as the Income Statement Project) with the aim of increasing the level of disaggregation in firms' financial statements (IASB, 2010). The FASB and the IASB have expressed concern that the level of aggregation in current financial statements impairs financial statement users' ability to predict firms' future cash flows and to compare investment opportunities across firms. Most of the prior research on increasing disclosure does not distinguish between the frequency and quantity of disclosure (e.g., Lang and Lundholm, 2000). These studies often create a measure of disclosure that combines different types of disclosures, such as press releases, the text in regulatory filings, in addition to disaggregated financial statement numbers (e.g., Welker, 1995). My measure is a function of only numbers

presented in the financial statements of reports occurring with the same frequency across firms. My results provide an upper bound on the benefits that may accrue from proposed disaggregation since current Generally Accepted Accounting Principles (GAAP) already requires firms to disaggregate the financial statement items I examine.

This study contributes the accounting literature by examining the effects of disclosure on information asymmetry in an unregulated environment. An unregulated environment provides a setting to examine the market clearing equilibrium of demand for and supply of accounting information. While a few studies examine the effect of disclosure on information asymmetry solely in an unregulated environment (e.g., Granja, 2014), most studies on information asymmetry using unregulated settings generally examine the extension of regulation to new markets (e.g., Benston, 1969; Benston and Hagerman, 1974; Bushee and Leuz, 2005; Mahoney and Mei, 2006). In the latter set of studies, the outcomes in the unregulated period simply serve as a baseline against which to compare outcomes after regulation rather than as a setting in themselves. In addition, this study is one of the first to examine a relation between disclosure and transaction costs in the short sale market. Only one recent study (Beneish, Lee, and Nichols, 2014) examines the effect of disclosure on the cost to short a stock.

The paper is organized as follows. In Section 2, I review the prior literature and develop my hypotheses. I discuss my research design and sample selection in Section 3. I present my results in Section 4. Section 5 concludes.

2 Prior literature and hypothesis development

2.1 Prior research on pre-SEC disclosure

Firms made widely varying disclosure decisions before regulation, potentially offering greater power in testing hypotheses related to the effects of disclosure. However, there is less research about accounting choices during this period than there is about

current accounting choices. The main reason for this is that the environment in which firms produced financial statements is different along many dimensions, so it can be hard to apply the results to accounting questions that firms and regulators wrestle with today (Leftwich, 2004). In addition, the accounting data are not available in an electronic format, and institutional knowledge about the period is harder to obtain.

Researchers studying this period find that financial statements in the early 1900's changed investors' estimates of future cash flows. Porter, Sivakumar, and Waymire (1995) find that the American Sugar Refining Company experienced significant positive abnormal returns of 1.6% when the company released its financial statements in 1908. Using a broader sample from 1905 to 1910, Sivakumar and Waymire (1993) find that financial statements produced significant volume reactions when firms published them. While the volume reaction indicates that these financial statements changed investors' estimates of future cash flows, providing financial statement information did not often have a significant effect on price, the marginal investor's estimate of future cash flows. Investors reacted significantly only to reported losses but not to positive income unless dividend changes accompanied the positive income.

Sivakumar and Waymire (1993, 1994) offer three explanations for this muted price reaction to financial statement information. The first is that investors found the information from other sources in a more timely manner. During this period, there were no regulations prohibiting insider trading, so the set of investors included insiders who had access to financial statement information before its release. These insiders could impound the information into price before the firm released its financial statements. A second explanation is that firms could not demonstrate a commitment to disclose information regardless of the content of the information. There was no regulation to compel disclosure, and it is not clear that auditors were an effective commitment to disclosure (Merino, Mayper, and Sriram, 1994). Disclosure reduces information asymmetry only when there is a credible commitment to disclose both the good and bad information a firm receives (Diamond, 1985; Leuz and Verrecchia, 2000). Finally, the muted price reaction could stem from a lack of standardized accounting methods. Financial statements rarely disclosed the accounting policies that led firms to report

the financial statement information they did disclose (Hoxsey, 1930, pp. 254–255). Without this context and without the ability to compare accounting methods across firms, financial statement users may not have valued the incremental information provided by the financial statements. For all of these reasons, disclosure may not have reduced information asymmetry in this setting.

The heterogeneity in disclosure during this period extends to firms' choices about the level of disaggregation in their financial statement information. Nearly two-fifths of firms in the late 1920's concealed their margins by aggregating revenue and various operating expenses (Barton and Waymire, 2004; Benston, 1969). Some firms began their income statements with earnings before interest, taxes, depreciation, and amortization (EBITDA); others started with operating income. Two percent of firms aggregated all of the information from their income statements into net income, depriving investors of the incremental information from revenues and expenses observed in modern markets (Swaminathan and Weintrop, 1991). While Sivakumar and Waymire (1993) recognize this variation in disaggregation, they do not examine the reaction to the release of financial statements as a function of the disaggregated financial statement information that the firms provided.

Studies that do examine firms' choices to disaggregate financial statement information during this period use a cross-section of firms at one point in time. For example, Ely and Waymire (1999) examine the value relevance of all 405 NYSE industrial firms' intangible assets disclosure for the year 1927. Their study does not examine the choice to disaggregate other financial statement information. The study most similar to this one is Barton and Waymire (2004). Barton and Waymire examine the financial reporting quality of all 540 firms listed on the NYSE in October 1929 that are neither railroads nor financial service firms. They find that firms with higher financial reporting quality have less negative returns during the 1929 stock market crash. Their definition of financial reporting quality is a composite measure derived from a factor analysis of income statement disaggregation, balance sheet disaggregation, auditor size, and unconditional balance sheet conservatism. The degree to which disaggregated financial statement information reduces crash risk, as opposed to the

other factors, is not entirely clear from the study.

When analyzing the determinants of financial reporting quality, Barton and Waymire (2004) also examine whether these determinants predict each component of financial reporting quality separately. More determinants are significantly related to income statement disaggregation than balance sheet disaggregation. Newer firms and more leveraged firms are more likely to disaggregate income statement numbers, while regulated firms provide more aggregated disclosure. Contrary to Barton and Waymire's expectations, firms with more volatile net income, higher profitability, and greater divergence between ownership and control rights provide more aggregated income statement information. Greater balance sheet disaggregation, in contrast, is significantly related only to two industry groupings: technology-intensive and unregulated industries.

This study differs from that of Barton and Waymire (2004) in its focus and in measuring the construct of interest. Barton and Waymire (2004) examine the effect of financial reporting quality on crash risk, a measure of information asymmetry during extreme negative events. They do not examine the effect of their composite measure of financial reporting quality on information asymmetry during less extreme events. I examine measures of information asymmetry during a period when stocks generally performed well rather than an extreme negative event. I specifically examine disaggregated financial statement information rather than a composite measure such as financial reporting quality. The disaggregation components of financial statement quality that Barton and Waymire (2004) use implicitly assumes that each item is equally informative. In contrast, I use cluster analysis to classify firms as disaggregators or aggregators. The cluster analysis is based on firms' actual disaggregation decisions and allows disaggregation of different financial statement items to have different impacts on determining the overall level of disaggregation in the financial statements. While the two studies examine similar data, the research questions and methods differ significantly.

2.2 The effect of disaggregation on information asymmetry between market participants

In the model Kyle (1985) develops, a lower variance of the fundamental value causes the market maker to reduce transaction costs. Both more timely financial statement information and more disaggregated financial statement information allow market participants to estimate the firm's fundamental value more precisely. The prior literature on the effects of disclosure does not generally make a distinction between an increase in the frequency of disclosure, such as providing more frequent forecasts of earnings per share, and an increase in the quantity of disclosure, such as disaggregation (e.g., Welker, 1995; Lang and Lundholm, 2000). Some studies have examined the impact of increased disaggregation on information asymmetry by examining changes in regulation that require all firms to provide information some firms voluntarily provided before the regulation. Greenstein and Sami (1994) find that firms that disclose segment sales and income for the first time after the SEC required it experienced larger decreases in their bid-ask spreads than firms that provided this information voluntarily before the SEC requirement and than single-segment firms. However, it is not clear that investors could *ex ante* identify firms with multiple segments that did not report segment sales and income in order to penalize them for the higher information asymmetry (Dye, 1985; Jung and Kwon, 1988). Frino and Jones (2005) find that bid-ask spreads for Australian firms disclosing cash flow from operations for the first time fell relative to Australian firms voluntarily providing cash flow statements before the requirement to do so. The effect was also larger for firms with a lower correlation between cash flow from operations and proxies based on the other available financial statement numbers.

These studies indicate that even though investors can approximate the disaggregated financial statement information based on other available disclosures, firms can still reduce information asymmetry by providing this information directly. However, the magnitude and significance of the results may be affected by the commitment or enforcement mechanism that compels disaggregating the additional information.

Empirically, commitment is particularly important for disaggregated disclosures to reduce information asymmetry. Leuz and Verrecchia (2000) find that large German firms whose auditors certified the additional information required under International Accounting Standards had lower information asymmetry than firms that reported under German GAAP. However, firms that disclosed the same information but did not have an auditor certify the additional information did not have lower information asymmetry. Leuz and Verrecchia conclude that disclosure without the commitment to disclosing good and bad news from engaging an independent auditor have no effect on information asymmetry.

Another potential reason not to disaggregate financial statement information is that the disaggregated information may be quite noisy. If each transaction is measured with some error, the greater specificity of disaggregated financial statement items decreases the signal-to-noise ratio because fewer of the error terms from individual transactions are averaged together. In contrast, more highly aggregated financial statement items such as net income average relatively more error terms, increasing the precision of the overall measurement and increasing investors' reliance on aggregated disclosures to estimate future cash flows. Investors' will assign a nonzero weight to a very noisy signal or one highly correlated with other signals, but such signals receive low weights. If a firm incurs fixed costs to set up an information system to measure the disaggregated financial statement information or proprietary costs from the additional disclosures, the benefit of better disclosures may not offset these costs if the additional disaggregated information is relatively noisy or highly correlated with other disclosures. In addition, if competition is imperfect, net trading reveals information about firm value. A portion of the benefits from improved public disclosure substitutes for the information contained in demand (Fischer and Verrecchia, 1999). Under imperfect competition, volume becomes an additional signal that can reduce the value of disaggregated financial statement information to investors.

While models demonstrate that public disclosure on net reduces information asymmetry between investors (Fischer and Verrecchia, 1999; Gao, 2008), the magnitude of the net effect is not clear because of the noise in and correlation between all of

the other signals available to investors. For instance, Porter et al. (1995), in their case study of the American Sugar Refining Company (ASR), do not find a significant change in the bid-ask spread around ASR's decision to publish annual financial statements (footnote 33 on p. 138). A possible reason for this is that investors had access to a significant amount of the information contained in the first annual report before it was published. ASR's first annual report consisted of a balance sheet and net income. Massachusetts state law required ASR to publish balance sheets in the financial press prior to ASR's decision to publish annual financial statements. Net income is simply the change in retained earnings adjusted for dividends. Since the financial press reported extensively on dividends, investors could approximate net income based on the balance sheet disclosures without the separate disaggregation of net income. While the results of this case study may not generalize to the set of all disclosures, studies of the disaggregated disclosures required by the Securities Exchange Act of 1934 generally do not find a significant reduction in information asymmetry after firms disclose this new information (e.g., Benston and Hagerman, 1974; Daines and Jones, 2007; Mahoney and Mei, 2006).

H_1: Disaggregated financial statement information reduces information asymmetry between market participants.

2.3 The effect of disaggregation on information asymmetry between the firm and capital providers

The need for capital is one reason for managers to reduce information asymmetry. A firm's choice between raising capital and relying on internally generated funds is a function of the information asymmetry between the firm and outside capital providers (Myers and Majluf, 1984). Firms with no information asymmetry, and hence no underpricing from information asymmetry, take advantage of every project with positive net present value by issuing equity. Lang and Lundholm (2000) find that firms increase disclosure prior to seasoned equity offerings (SEO's) to bring potential investor's information set closer to that of managers. These firms receive better terms

for their offerings even though a subset of high disclosure firms reduces disclosure after the SEO. Disaggregating financial statement information provides investors with a more precise estimate of the firm's fundamental value, causing them to discount the firm's stock less and increasing the likelihood of raising external capital.

H_2: Disaggregated financial statement information reduces information asymmetry between the firm and capital providers.

2.4 Determinants of endogenous disaggregation

Models of disclosure choice find that agency costs and growth options increase the extent of disclosure and that proprietary costs and the richness of the external information environment decrease the extent of disclosure. Increased disaggregation, along with other corporate governance mechanisms, provides parties whose interests conflict with the information necessary to make sure that their interests are protected (Jensen and Meckling, 1976). Firms with more growth options have greater information asymmetry between insiders and outsiders (Smith, Jr. and Watts, 1992). Managers who have information about valuable projects stemming from these growth options can convey that information through increased disclosure. Proprietary costs can lead managers to provide less than full disclosure. By aggregating disclosure, managers can obscure the firm's production function and prevent potential competitors from reverse engineering a profitable firm's strategy (Darrough and Stoughton, 1990). This preserves economic rents that the firm can extract through lower competition. Porter et al. (1995) document that proprietary costs were much lower in 1907 when the American Sugar Refining Company began providing annual financial statements than when the American Sugar Refining Company was founded in the 1890's and chose not to provide financial statements. When investors have other sources of information about firms, through the financial press or through past interactions in the marketplace, they do not need to rely on the firm itself to disclose as much information.

3 Research design and sample selection

3.1 Research design

Measure of disaggregation

To measure the extent of disaggregation, I collect financial statement information from Moody's Industrial manuals, following Barton and Waymire (2004). I fit the information I collect into the taxonomy reported in Appendix A. For each of the 46 financial statement items, I create indicator variables that take the value of one if the firm discloses the financial statement item. I use the indicator variables for financial statement information from the income statement to determine whether investors could calculate six income statement subtotals.[1] I then use cluster analysis on the full set of 52 financial statement items to separate the observations into natural groupings using Ward's hierarchical clustering method. This is an agglomerative hierarchical clustering procedure that merges similar observations into clusters (Dey, 2008). The clustering algorithm maximizes the differences between groups and minimizes the differences within groups.

This method of measuring disaggregation is different than using an index. Using a

[1] A concern with this definition of disaggregation is that some firms do not disaggregate a given financial statement item because its value is not material (i.e., financial statement users' decisions based on statements disaggregating the item would not be different from the decisions reached using financial statements that aggregates the item with other financial statement items) or a firm does not have a given item because of its economics (e.g., intangible assets) or financing decisions (e.g., long-term debt and associated interest expense). As seen in Table 3, the five largest difference are income statement items or subtotals that rely on three disclosures beyond net income: tax expense, depreciation expense, and a distinction between operating and non-operating or financing income and expenses. All firms are U.S. firms and subject to corporate income taxes. While few firms report a loss, firms could carry losses forward for two years to offset future income taxes (Wilson, 2012, p. 22). All firms have at least 4% of their assets invested in long-term assets and 75% of my sample has at least a quarter of total assets invested in property, plant, and equipment (PP&E). Given this distribution, it seems likely that depreciation expense is material for these firms. Lastly 86% of the sample disaggregate non-operating income or interest expense from operating expenses (allowing investors to calculate EBITDA as in Appendix B) or does not disclose tax expense (depriving investors of the ability to calculate EBITDA). Of the 76 observations that disaggregate tax expense but not non-operating income, only 48 (9% of the sample) disaggregate depreciation expense. Overall, this method correctly classifies at least 86% of the sample and may classify 91% correctly. On balance, this evidence indicates that aggregation because of the materiality of the financial statement item does not have a significant effect on classification as a disaggregator or aggregator.

clustering method ensures that the identification of firms as disaggregators or aggregators is based on the relative disaggregation of the sample firms' financial statement information. Creating an index relies on an observer considering certain disclosures to be important. More importantly, an index that counts financial statements implicitly assumes that each item in the index is equally important. Cluster analysis does not make a similar assumption in calculating the differences between clusters. The main drawbacks of using cluster analysis are that choosing the number of clusters to divide the sample into is heuristic and that the resulting clusters may not be reasonable. While there is no accepted criterion for determining the optimal number of clusters, the pseudo-F- and pseudo-t^2-statistics provide an indication of the appropriateness of dividing the sample into a given number of clusters from a statistical perspective. If the difference between the pseudo-F-statistic for n clusters and the statistic for $n+1$ clusters is large, then, statistically, it is appropriate to divide the sample into n clusters. If the difference between the pseudo-t^2-statistic for $n-1$ clusters and the statistic for n clusters is large, then, statistically, it is appropriate to divide the sample into n clusters. In Table 1, both the pseudo-F- and pseudo-t^2-statistics indicate that it is appropriate to divide the sample into two clusters. I discuss the reasonableness of the results of the cluster analysis in Section 3.3.[2]

Tests of the effect of disaggregation on information asymmetry between market participants

I use transaction costs as a measure of the information asymmetry between market participants in my test of H_1. The main transaction costs equity market participants face is the bid-ask spread. All equity market participants must absorb the difference between the market maker's bid and ask prices, the bid-ask spread, when they establish and liquidate positions in a stock. Transaction costs, λ in the Kyle (1985) model, are a function of the variance of the firm's fundamental value and the variance of

[2]Table 2 presents the correlations between the cluster-based approach to identifying disaggregators and the indices that Barton and Waymire (2004) use. The variable *Disaggregator* that identifies the cluster with disaggregated financial statement information is significantly correlated with both the income statement and balance sheet indices that Barton and Waymire (2004) use and with the sum of the two indices. The correlation is highest with the income statement index.

the quantity demanded by noise traders (i.e., traders without the private information about firm value and, hence, no weight on private information on their estimate of firm value). I use stock volatility over the year contemporaneous with the disclosure as a proxy for the variance of the fundamental value unrelated to disclosure. I use the the volume of the stock traded as a proxy for the variance in noise trading. When the variance of the quantity noise traders demand is high, informed traders are also willing to trade more of the asset. Thus, high volume, whether or not the volume ultimately comes from noise traders, indicates that the variance of the quantity noise traders demand is high.

Firm size is likely correlated with both of the constructs in the Kyle (1985) model. Firm size is negatively correlated with the variance of fundamental value because larger firms receive more attention from market participants and the financial press. This increased public attention increases investors' understanding of the firm as well as the similarity of investors' information sets. The greater public attention also makes it less likely that other market participants have an information advantage, increasing noise traders' willingness to trade the stock after a liquidity shock. These control variables (stock volatility, volume, and firm size) are the same set used in several studies of bid-ask spreads, including studies of the effects of disclosure on measures of liquidity (e.g., Chordia, Roll, and Subrahmanyam, 2000; Christensen, Hail, and Leuz, 2013; Daske, Hail, Leuz, and Verdi, 2008). I control for denominator effects from using the relative bid-ask spread by including the natural logarithm of year-end price. Welker (1995) examines effective bid-ask spreads before decimalization (i.e., when spreads were quoted in eighths) and includes price as a determinant of the effective bid-ask spread. I define all variables in Appendix C.

However, the Kyle (1985) model is an abstraction in which the market maker simply matches buyers and sellers. In reality, transaction costs are also a function of order processing costs, specialists' monopoly power as market makers, and inventory holding costs (Glosten and Harris, 1988). The information asymmetry component may not be the most significant component of the bid-ask spread (Huang and Stoll, 1997), though the bid-ask spread is definitely related to information asymmetry (Madha-

van, 2000). Thus, the bid-ask spread is a noisy proxy for the information asymmetry between investors.

Model of the endogenous choice to disaggregate financial statement information

Disaggregation is an endogenous choice during this period. The New York Stock Exchange required firms to present a balance sheet and the income account to reconcile the changes in equity, but did not specify what items to disaggregate until 1930 (Shultz, 1936). Therefore, I use instruments to model disaggregation. Because disaggregation is a binary choice, I use a first-stage probit model to predict disaggregation, the endogenous treatment choice. To aid in identification, the probit model contains instruments that are excluded from the second stage. I use leverage and the payout ratio as proxies of the agency costs from debtholder-shareholder conflicts and from manager-shareholder conflicts, respectively. Disaggregation can help contracting parties protect their varied interests and reduce agency costs (Jensen and Meckling, 1976). Since the bid-ask spread is a measure of information asymmetry among equity investors, this group has a homogeneous set of interests in the agency conflict so agency costs should not affect trading costs among this group. Therefore, these instruments should be related to the probability of disaggregation but not related to the bid-ask spread. I use the book-to-market ratio to measure firms' growth options, which should also increase disclosure, including disaggregation. I use the number of firms in the industry and performance as proxies for firms' proprietary costs. I use age and size to measure firms' external information environment. Since the information environment directly affects the information asymmetry between investors, these are not instruments that meet the exclusion restriction. The requirements necessary to consistently estimate the instrumented treatment effect are much lower than using linear two stage least squares (Wooldridge, 2010, pp. 939–940). This makes an endogenous treatment model (ETM) an attractive research design for this setting given that the proxies for the determinants of disaggregation may not have a very strong correlation with the underlying constructs.

Test of the effect of disaggregation on information asymmetry using the short sale market

Demand from short sellers increases in disagreement about fundamental value, which is a consequence of information asymmetry (Dechow, Hutton, Meulbroek, and Sloan, 2001; Karpoff and Lou, 2010; Miller, 1977). If market participants can estimate future cash flows more precisely for disaggregators, their stocks are less likely to be overpriced. The reduction in potential overpricing will decrease short sellers' demand to short disaggregators' stocks because these stocks present relatively less profitable opportunities. However, there is no volume data in the short sale market (also called short interest) for my sample period (Jones and Lamont, 2002) to measure short sellers' demand directly. Meeker (1932) provides a list of 33 firms with short interest in excess of $500,000 on Novermber 12, 1929. This list does not provide a panel of short sellers' demand and is compiled shortly after stock market crash in October 1929. Further, the dollar-based cutoff excludes identifying firms with large short interest as a percentage of shares outstanding for small firms (e.g., Asquith, Pathak, and Ritter, 2005; Dechow et al., 2001). While I cannot measure short sellers' demand directly, short sellers' higher demand from information asymmetry *ceteris paribus* increases the cost of shorting a stock (D'Avolio, 2002). In addition to the bid-ask spread, short sellers face two additional costs in shorting a stock. The first is the search costs of finding a share to borrow. Through at least 1932, a group of securities lenders (the "Loan Crowd") met intermittently throughout the day and at the close of the market to lend shares to short sellers (Meeker, 1932, p. 38). The search costs for the stocks fell when they were added to the Loan Crowd list. Once on the list, the search costs for the stocks this group actively lent were minimal and homogeneous.

The second cost is the loan fee, the explicit cost of shorting a stock. The loan fee is an opportunity cost that short sellers face. Short sellers must post collateral while the stock loan is outstanding (Jones and Lamont, 2002; Lamont, 2004). While the security lender pays interest on this collateral, the interest earned on the collateral (also known as the rebate rate) is lower than the market interest rate. In extreme

cases when demand is very high, the rebate rate is negative, and the short seller pays the security lender interest on the collateral (D'Avolio, 2002). Since the market interest rate is common to all investors, the rebate rate is the key determinant of the price that short sellers pay (Lamont, 2004). The Loan Crowd publicly disclosed the rebate rates paid on the stocks they were willing to lend. The *Wall Street Journal* published a list of the rebate rates daily from at least 1919 through 1933 (Jones and Lamont, 2002). Using the data on market interest rates and the Loan Crowd's rebate rates, I calculate the loan fee related to shorting stocks the Loan Crowd was willing to lend as an indirect proxy for short sellers' demand. As an indirect proxy for short sellers' demand, the loan fee will include noise from changes in supply. Additional noise in this proxy will come from demand from short sellers engaging in convertible arbitrage, which caused some extreme spikes in demand (Jones and Lamont, 2002).

If disaggregation reduces information asymmetry and, hence, the weight placed on private signals about fundamental value, then short sellers' demand to short the stock will be lower, reducing the loan fee. To determine the effect of disaggregation on information asymmetry about stocks on the Loan Crowd list, the research design controls for other determinants of short sellers' demand. Disagreement about fundamental value is larger when the variance of future cash flows is larger. As with the bid-ask spread, I use stock volatility as a proxy for this uncertainty. Investors in the late 1920's used short sales to hedge market risk (Meeker, 1932). Since large stocks have the most influence on value-weighted market returns, demand for shorting large stocks should be larger. The large short positions that Meeker (1932) lists are more likely to be based on many participants hedging market risk rather than on a few short sellers with private information taking very large position. Assuming that the set of firms used to hedge market risk was reasonably stable over my panel and through the October 1929 crash, I use the inclusion on the list as a proxy for demand from hedgers rather than from information asymmetry. Firms with higher past returns and lower book-to-market ratios are also more likely to be overpriced. This potential overpricing increases short sellers' demand for the stock (Dechow et al., 2001; Beneish et al., 2014). On the supply side, most measures of lendable supply,

such as institutional ownership, are not available during my sample period. However, D'Avolio (2002) finds that firms with higher turnover have higher loan fees. This is consistent with lenders being more likely to sell high-turnover stocks and requiring higher compensation to forgo the option to sell the stock themselves. I estimate the effect of disaggregation using an ETM for the same reasons that I use an ETM to estimate the effect of disaggregation on the bid-ask spread.

Test of the effect of disaggregation on information asymmetry between the firm and capital providers

I use firms' balance sheets to determine whether firms raise capital during the year. I calculate the difference in the value of long-term debt (bonds and mortgages payable) and the par values of preferred and common stock. If the par value of common stock increases, I also calculate the difference in capital surplus (if disclosed) or the difference in surplus net of income, surplus adjustments, and dividends declared (if the firm does not disclose the capital surplus). I add this change to the change in the par values and the value of long-term debt. If the sum of these changes is positive and greater than five percent of total assets at the beginning of the year, then I identify the firm as raising capital in that year. Adding the changes together excludes refinancing transactions. Excluding refinancing opportunities allows me to focus on how disaggregation affects the information asymmetry between managers and capital providers from growth opportunities rather than the variation in agency costs related to capital structure.

Since raising capital and disaggregation both have binary outcomes, I estimate the effect of disaggregation on capital raising using a bivariate probit model. This accounts for the fact that the errors at both stages are correlated with the regressors (Baum, 2013). Using a bivariate probit model also ensures that the predicted probabilities for both the endogenous decision to disaggregate financial statement information and to raise capital fall between zero and one. In the second stage of the bivariate probit model, I control for performance, growth opportunities, and reputation in the capital market, all of which should make it easier for a firm to raise capital.

The controls for performance are stock returns over the fiscal year and accounting performance using the return on assets (ROA). For growth opportunities, I use the book-to-market ratio, stock volatility (Cao, Simin, and Zhao, 2006), and the payout ratio. Firms with high payout ratios do not anticipate needing the capital they pay-out to finance new investments. To measure firms' reputation, I use age, size, and an indicator variable for an investment grade security.[3]

3.2 Sample selection

The Center for Research in Securities Prices (CRSP) database reports daily price and volume data beginning on December 31, 1925. To reduce concerns about reverse causality, I examine the effect of disaggregation and other controls on future proxies for information asymmetry: the bid-ask spread, the loan fee, and capital raising. Therefore, my sample begins with firms' 1926 financial statements to match firms' financial statements to controls such as stock volatility and turnover. I end my panel with firms' 1928 financial statements to minimize the effect of the stock market crash in October 1929 on the year-ahead outcomes.

My sample comprises two subsets of U.S. industrial firms with return and volume information in CRSP. The sample comprises industrial firms because these firms offer the most powerful test of the trade-offs from disaggregated disclosure. I exclude railroads and public utilities because the Interstate Commerce Commission (Sivakumar and Waymire, 2003) and state regulators (Barton and Waymire, 2004), respectively, used these firms' financial statements to cap the rates they charged. This regulation commits these firms to a specific set of disaggregation choices and creates a set of financial reporting objectives that industrial firms do not have. I construct my measure of disaggregation using financial statement items such as inventory, cost of goods sold, and gross profit, which do not extend easily to financial firms, so I exclude financial firms as well.

[3]During this period, Moody's rated not only firms' debt but also their preferred and common stocks. Basu, Prakash, and Waymire (2004) find that these ratings are related to the level of financial statement ratios such as the return on equity and the current ratio but do not examine the effect of not disaggregating the information necessary to calculate these ratios on security ratings.

The first subset consists of industrial firms in CRSP for which the "Loan Crowd," a centralized market for short sellers to borrow stock, sets rebate rates. While the *Wall Street Journal* published these rebate rates daily, I follow Jones and Lamont (2002) in collecting monthly observations of rebate rates rather than collecting daily observations. Approximately one-fifth of the CRSP industrial firms have rebate rates published in the *Wall Street Journal* at some point during my sample period. For each firm that appears on the Loan Crowd list at any point over the sample period, I collect financial statement data for all available years whether or not the firm-year has corresponding data on the rebate rate. I use these additional observations in the bid-ask spread and capital raising tests.

The subset of firms with easily shortable stock is not random. Firms on the Loan Crowd list are larger, less volatile, and have higher turnover than the full sample of all stocks. (Compare Panels A and B of Table 6.) In addition to firms with short sale data available, I sort industrial firms in CRSP that never appear on the short sale list by decreasing market capitalization on December 31, 1926. I then collect data on every third firm after randomly selecting the starting number. I repeat the same procedure for firms that enter the CRSP database in 1927 and 1928. Supplementing the short sale sample in this way alleviates concerns that the non-random selection of firms with short sale data influences my tests that do not require an active short sale market.

3.3 Descriptive statistics

Tables 3 and 4 present the percentage of firms in the sample and within each cluster that disaggregate the individual financial statement items listed in Appendix A. These tables also present the difference in the propensity to disclose the various financial statement items and the t-test that the propensities are equal. Table 3 lists the financial statement items that disaggregators are more likely to disclose sorted by the magnitude of the difference in the propensity to disclose the financial statement items. Table 4 presents the financial statement items that aggregators are more likely to disclose, again sorted by the magnitude of the difference. The first observation is

that disaggregators are more likely to disclose three times as many financial statement items as aggregators are (35 or 76% as opposed to 11 or 24% of the 46 financial statement items). Disaggregators are also more likely to disclose 26 (76%) of the 30 financial statement items with differences significant at the 5% level. In addition, 12 financial statement items in Table 3 have differences with a larger magnitude than the magnitude of the largest difference in Table 4. All of this indicates that the clustering procedure successfully divided the observations into a set of observations with more disaggregated financial statement information and a set of observations with more aggregated financial statement information.

Examining the specific differences in disaggregation between disaggregators and aggregators, disaggregators are much more likely to disclose income statement subtotals, such as EBITDA, operating income, and gross profit. Disaggregators are also much more likely to disclose the expenses that separate these financial statement subtotals, such as tax expense, depreciation expense, and other income. The largest difference between disaggregators and aggregators is the disclosure of EBITDA. Disaggregators are ten times more likely to provide this additional signal of future cash flows that is not perfectly correlated with net income. Since discounted future cash flows determine the value of the firm today, providing a correlated but not identical measure of future cash flows, such as EBITDA, in addition to net income helps investors better estimate the value of those cash flows. All of the ten largest differences are income statement items related to the flow of economic resources into and out of the firm. The financial statement items that aggregators are more likely to disclose are mainly balance sheet items that provide a value at a specific point in time rather than potentially recurring cash flows.

Disclosure of income statement items has a higher odds ratio in classifying firms as disaggregators or aggregators (i.e., the magnitude of the differences for income statement items is larger than the magnitude for balance sheet items). Greater standardization of the balance sheet is consistent with accountants' focus on the balance sheet in the early 1900's (Previts and Merino, 1998) as well as with the first audits being verifications of firms' balance sheets for credit decisions (Ely and Waymire,

1999, p. 24). However, disaggregators are significantly more likely to disaggregate balance sheet items such as tax reserves (similar to "taxes payable") and accumulated depreciation. Disaggregators are also significantly more likely to disclose capital surplus (now called additional "paid-in capital") and earned surplus (now called "retained earnings") rather than aggregate these numbers into an ambiguous disclosure labelled "surplus." The magnitude of the differences for these balance sheet items, however, is simply not as large as the magnitude of the differences in the propensity to disclose income statement items.

Table 5 provides the number of observations per year and per firm for both the full sample and the short sale subsample. Observations in the sample are spread fairly evenly across all three years. Similarly, disaggregators and aggregators are not clustered in any year. However, the growth in the number of disaggregators for the full sample is larger than the growth in the number of aggregators. I have a full panel (three years) of observations for 71% of the full sample (67% of the short sale sample).

Table 6 provides the descriptive statistics for the variables used in this analysis. The payout ratio (the ratio of dividends paid to net income) is very large. In the early 1900's, investors debated whether firms should retain *any* profits beyond what was needed to replace long-lived assets because retaining earnings circumvented investors' veto over new projects (Previts and Merino, 1998). The agency costs of resources retained in the firm prompted investors to demand high payout ratios. The mean (median) effective bid-ask spread (the absolute bid-ask spread scaled by stock price) for my sample is 1.5% (1.1%), which is similar to some studies of modern markets (e.g., Welker, 1995) and lower than the effective bid-ask spreads of small modern firms (e.g., Cheng, Liao, and Zhang, 2013). The distribution of the effective bid-ask spread is highly skewed. Following other studies (e.g., Christensen et al., 2013; Daske et al., 2008; Welker, 1995), I regress the natural logarithm of the effective bid-ask spread on its determinants. The distribution of the loan fee (presented in Panel B) is not as highly skewed as that of the effective bid-ask spread. Therefore, I regress the untransformed loan fee on its determinants. Firms with an active short sale market for their stocks were much larger than the full sample of firms. Also, these firms'

stock was more liquid and less volatile than stocks overall.

4 Results

4.1 Univariate tests

Table 7 presents a univariate analysis of the characteristics of disaggregators and aggregators. Given the endogenous choice to disaggregate financial statement information, a number of the determinants of disaggregation are significantly different across disaggregators and aggregators. Firms with higher agency costs from debtholder-shareholder conflicts (higher leverage) are more likely to disaggregate. Firms with higher proprietary costs (fewer competitors and higher performance) are less likely to disaggregate. Younger firms with a shorter track record for investors to follow are more likely to disaggregate. Contrary to the intuition that larger firms rely on a better external information environment rather than disaggregation, larger firms are more likely to disaggregate. Larger firms have more assets and are more likely to have different types of assets with different types of cash flows. This heterogeneity may make disaggregation more natural, regardless of the information environment. The significant differences in agency and proprietary costs underscore the importance of using a research design that addresses the endogenous choice to disaggregate financial statement information.

Disaggregators and aggregators do not have significantly different effective bid-ask spreads. However, aggregators have a higher stock price than disaggregators. Controlling for denominator effects in the distribution of the effective bid-ask spread by including price as a control is important for the research design. Disaggregators have lower loan fees, though the difference is not significant at conventional levels. Disaggregators are also slightly (but not significantly) more likely to raise capital in the following year. The univariate tests do support my hypotheses, but any univariate results would have been tenuous. These tests do not control for other determinants of my proxies for information asymmetry or the endogenous choice to disaggregate

financial statement information.

4.2 Multivariate tests

Table 8 presents the results of an ETM regression of the natural logarithm of the median effective bid-ask spread in year $t+1$ on disaggregation and other determinants of the effective bid-ask spread in year t.[4] The results of the ETM regression indicate that the effective bid-ask spread is significantly lower for disaggregators. The control variables are highly significant and have the expected signs in the second-stage model. Consistent estimation of an ETM requires that the probability of treatment varies with covariates in the first-stage prediction model (Wooldridge, 2010, pp. 939–940). A subset of the excluded instruments is significantly related to the decision to disaggregate. The results indicate that disaggregators have 45% lower[5] effective bid-ask spreads than aggregators.

The estimation of ETM regression hinges on the strength and validity of the instruments (Puhani, 2000). Also, the results from two-stage estimates are inherently biased. Econometricians often suggest also presenting ordinary least squares (OLS) regressions as one way to help assess whether the choice of instruments is crucial to the results (e.g., Angrist and Pischke, 2009; Larcker and Rusticus, 2010). Therefore, I also present ordinary least squares (OLS) regression of the effect of disaggregation on the effective bid-ask spread. In the OLS regression, disaggregation has almost no effect on the effective bid-ask spread. OLS assumes exogenous rather than systematic assignment of disaggregation. If disaggregation does reduce information asymmetry, firms with the highest net benefits from disaggregation (i.e., firms that inherently have higher information asymmetry) endogenously choose to disaggregate financial statement information to reduce their level of information asymmetry to a low level.

[4] I use a more efficient full-information maximum likelihood (FIML) method to estimate the ETM results rather than a limited-information maximum likelihood, or two-step, estimator that uses the inverse Mills ratio an additional explanatory variable in the second stage of the selection model. The two-step estimator imposes an implicit assumption on the distribution of the outcome but requires significantly less computing power to calculate relative to the FIML estimator. While the FIML estimator does not impose any assumptions on the data generating process, the estimator relatively sensitive to the exclusion restriction (Puhani, 2000).

[5] This is calculated as $e^{-0.600} - 1 = -0.451$.

Firms with inherently lower levels of information asymmetry have less to gain from disaggregation because they already have a low level of information asymmetry. A researcher observes that both types of firms have low levels of information asymmetry, but the reasons for this outcome are completely different. By ignoring the counterfactual level of information asymmetry before the endogenous choice to disaggregate, the OLS estimate of the effect may be biased toward zero. Given that both estimates may be biased, I place more weight on the results that ETM estimate which explicitly addresses the endogenous choice to disaggregate financial statement information.

Table 9 presents the results of the ETM regression of the median loan fee in percentage points in year $t+1$ on disaggregation and other determinants of the loan fee in year t. After considering the endogenous disaggregation decision, the ETM estimate is significantly negative. The reduction in the loan fee is 72% of the mean loan fee.[6] Short sellers must place a large weight on their private information in order to initiate a short position. This indicates that sophisticated investors place significantly more weight on their private signals when the firm does not provide alternate signals of future cash flows. For comparison with the ETM results, I also present the OLS estimate of the effect of disaggregation. In the OLS regression, disaggregation has an insignificantly negative effect on the loan fee. While firms are unlikely to actively choose to lower the costs to short sellers, they may want to decrease the demand from short sellers (Lamont, 2004), which will reduce the cost of short selling. If firms that are more likely to interest short sellers choose to disaggregate to reduce short sellers' demand, then short sellers' demand, and the loan fee, will be low. If other firms have low short interest for other reasons and choose not to disaggregate, short sellers' demand, and the loan fee, will also be low. Therefore, the OLS estimate may be biased toward zero.

Table 10 presents the results of a bivariate probit regression of raising capital in year $t+1$ on disaggregation and other determinants of the probability of raising capital in year t. Disaggregation significantly increases the probability of raising capial in the bivariate probit model. The marginal effect from the bivariate probit model

[6]This is calculated as $\frac{2.402}{3.357} = 71.55\%$.

(calculated according to Nichols, 2011) indicates that disaggregation increases the probability of raising capital by 51 percentage points. Given that, at the sample mean for control variables, the probability of a disaggregator raising capital is 10%, an increase of this magnitude is quite large. There are two points that make such a large estimate more plausible. The first is that these are fairly basic disclosures. For example, disclosing depreciation expense and providing potential creditors with EBITDA will increase the probability of securing a loan by helping these investors estimate what the cash flows available to repay the debt will be. Secondly, the difference between disaggregators and aggregators may be concentrated in the extremely low probability of raising capital for firms that switch from disaggregators to aggregators. The seven (sixteen) observations where firms decrease (increase) their level of disaggregation greatly reduces the power of tests for the effects of these changes. However, the effect would be consistent with investors harshly punishing firms that deviate from the equilibrium sustained by the repeated game of annual financial reporting. The Folk Theorems could justify a sustained equilibrium, such as high-quality financial reporting, in a repeated game where the game itself is a commitment device. A necessary condition for this equilibrium is that investors have a credible strategy to minimize the maximum payoff that the firm can achieve after deviating from equilibrium. Locking firms out of the capital markets may be such a min-max strategy to punish firms that defect from the equilibrium level of disaggregation. The validity of the instruments is least plausible for this specification.

While the functional form of the probit model for the first stage can identify the effect (Wooldridge, 2010, pp. 939–940), the results of selection models are most fragile when there are no excluded instruments (Puhani, 2000). In the probit regression, disaggregation has an insignificantly positive effect on raising capital, though the magnitude of the t-statistic is much larger than those from the OLS estimate of the effect on the effective bid-ask spread and the loan fee. Not addressing the endogeneity of the disaggregation decision may bias the results if firms less likely to raise capital are the same firms to use disaggregation to reduce information asymmetry.

4.3 Robustness

Variations of the main tests

Bid-ask spreads during this period are quoted in eighths, making the absolute bid-ask spreads discontinuous. While scaling the discontinuous absolute bid-ask spread by price creates the continuous effective bid-ask spread, scaling also makes the effective bid-ask spread dependent on price (Callahan, Lee, and Yohn, 1997). The effect of information asymmetry on price is ambiguous (Akerlof, 1970; Harrison and Kreps, 1978) and potentially affects the estimated relation between disaggregation and the effective bid-ask spread. In addition, the significant difference in price between disaggregators and aggregators in Table 7 makes price an important determinant of the difference in the effective bid-ask spread across disaggregators and aggregators. A way to remove the dependence on price is to estimate an endogenous treatment Poisson regression of the effect of disaggregation on the absolute bid-ask spread. The results of this estimation in Table 11 indicate that disaggregation significantly reduces the absolute bid-ask spread. Disaggregators' bid-ask spread is 0.74 eighths[7] or 9.23¢ lower per share traded. While the magnitude of the reduction on a per-share-traded basis may seem small, it translates into a mean (median) savings of approximately $87,000 ($23,000) in the late 1920's for a firm-year. These values are approximately 0.08% (0.08%) of the mean (median) firm's market value of equity. The benefit in terms of the market value of equity is approximately half of the upper end of the effect of adopting International Financial Reporting Standards on liquidity that Christensen et al. (2013) find. The results from a Poisson regression, which does not rely on instruments to identify the effect, is negative and almost marginally significant (one-sided p-value: 0.11). The magnitude of the effect according to the Poisson estimate is 19% of the previous estimate,[8] yielding a transaction cost savings of 1.5 basis points of market value per year.

[7] This is calculated as $e^{-1.340} - 1 = -0.738$

[8] This is calculated as $e^{-0.154} - 1 = -0.142$ eighths or 1.78¢ lower per share traded.

Additional tests

Chang, Cheng, and Yu (2007) use abnormal returns around the lifting of restrictions on short selling in the Hong Kong stock market to measure the extent of disagreement about prices while the constraints on short sales were binding. While there were no formal restrictions on short selling in my setting, adding a stock to the Loan Crowd list essentially reduced the search costs for short sellers to zero and eliminating a key barrier to shorting a stock (Lamont, 2004). If short sellers did not have a ready private supply of shares to borrow before the stock was added to the short sale list, aggregators should be more likely to join the Loan Crowd list and have lower returns than disaggregators because there is more disagreement in price stemming from the higher level of information asymmetry around disaggregators. Further, additions to the Loan Crowd list were based on increases in short sellers' demand rather than firms' choices (Jones and Lamont, 2002), making the additions more clearly exogenous events.

Table 12 shows the frequency of additions to the Loan Crowd list by date and disaggregation cluster. As Jones and Lamont (2002) note, stocks join the Loan Crowd list in waves. From February to April 1926, almost as many stock joined the list each month as joined the list during all of 1927. This clustering in additions leads Jones and Lamont to speculate that firm-specific factors are not significant determinants of joining the list. The composition of the additions in terms of disaggregation is not significantly different from the composition of my full sample. However, the full sample overweights firms that appear on the short sale list at some point. The full sample may not be a good benchmark against which to compare the disaggregation decisions of firms added to the Loan Crowd list. The subsample of firms that never appear on the Loan Crowd list are a more plausible sample against which to compare the additions since additions, by definition, are not on the Loan Crowd list. The number of additions that disaggregate financial statement information is different from the subsample of firms that never appear on the Loan Crowd list, and the difference is marginally significant.

Demand to short larger stocks may come from traders who want to hedge market risk rather than traders who negative private information. Negative private information is more likely increases the demand to short small and medium firms whose returns have less impact on market returns. Focusing on firms that are not in the top three deciles of market capitalization should reduce concerns that hedgers drive the change in short sellers' demand. The number of small and medium disaggregators relative to small and medium aggregators is more skewed toward aggregators than all additions. The composition in terms of disaggregation is marginally different than small and medium firms in the full sample and significantly different than the sample of small and medium firms that never appear on the Loan Crowd list. This indicates that short sellers give much more weight to their private signals of firm value when the firm aggregates its financial statement information. The larger weighting means larger changes in short sellers' demand and a higher likelihood of addition to the Loan Crowd list.

Table 13 presents the abnormal returns to stock added to the Loan Crowd list. There are relatively few additions during my sample period, potentially making the returns test a relatively low power test of the effect of disaggregation. More than half of the additions to the Loan Crowd list are concentrated in the first several months of the CRSP database. This means that it is not possible to adjust the returns for the beta or market risk of the stock. Similarly, the return series for Fama-French size and book-to-market portfolios begin in June 1926, after most of the additions in my sample have taken place. Therefore, I examine the abnormal returns for the month of and the month after addition to the Loan Crowd list relative to the value-weighted market return.

The equal-weighted average abnormal return to the 15 disaggregators added to the Loan Crowd list relative to the market portfolio is much higher than the average abnormal return to the 27 aggregators added to the list. The difference (8.83%) is marginally significant using a one-sided test. The difference between the returns to small and medium disaggregators and aggregators is larger but not statistically significant. The small sample size and its sensitivity to outliers may decrease the sig-

nificance. The equal-weighted average abnormal returns may be driven by extreme returns to a very small firm and not generalizable. One way to address this concern is to use value-weighted returns. The value-weighted average abnormal to the two groups using all additions to the Loan Crowd list are nearly identical, with aggregators having slightly higher returns than disaggregators. However, the returns to larger firms, where hedging rather than private information also changes short sellers' demand, drive value-weighted returns. Considering small and medium firms added to the Loan Crowd list, the difference in value-weighted average returns is positive and economically large but not statistically significant. Again, sample size reduces the power of this test. Another way to reduce the influence of outliers is to examine the median returns using a nonparametric test. The differences in the median return to disaggregators is significantly higher than the median return to aggregators for the sample all firms added to the Loan Crowd list. Examining the median returns for small and medium firms, the difference is positive and marginally significant in spite of the sample size. Overall, the abnormal returns around the exogenous addition of stocks to the Loan Crowd list provides evidence that information asymmetry was lower for disaggregators than aggregators.

5 Conclusion

This paper studies the effect of disaggregation on information asymmetry. Using financial statement data from the late 1920's, I create a measure of disaggregation based on cluster analysis of the propensity to disclose 46 financial statement items. The clustering procedure divides the sample into a group of firms that are much more likely to disaggregate income statement information (disaggregators) and a group of firms somewhat more likely to disclose a much smaller set of balance sheet information (aggregators). I find that the significant variation in the propensity to disaggregate financial statement information had significant effects on the information asymmetry between market participants and the information asymmetry between the firm and capital providers. Using an endogenous treatment model, I find that disaggre-

gation reduced the effective bid-ask spread by 45%. Disaggregation also reduced the transaction costs that short sellers, a subset of sophisticated investors, pay by 72% of the sample average. The larger proportion of sophisticated investors in the short sale market exacerbates the adverse selection market participants face, increasing the benefits from disaggregating financial statement information. Finally, using a bivariate probit model, I find that disaggregation increases the probability of raising capital by 51 percentage points at the margin.

These effects from disaggregating basic financial statement information and providing an alternate proxy for free cash flows, such as EBITDA and operating income, in addition to net income is quite large. The Securities and Exchange Commission (SEC) required these disclosures before the earliest codification of Regulation S-X, which compiles the disclosure requirements of the Securities Act of 1933 and the Securities and Exchange Act of 1934 (SEC, 1940). While requiring these disaggregated disclosures from all firms does not consider the market forces that lead firms to aggregate this financial statement information, it seems logical that regulators would require these disclosures first, given the large capital market benefits that accrued to disaggregators. However, the magnitude of the results may not be comparable to additional disaggregated items that regulators are currently considering. It is not clear how far from this high upper bound the benefits of an additional noisy proxy for free cash flows from additional disaggregated financial statement information are.

This research design could easily extend to transaction costs in the bond and preferred stock markets. These markets had relatively high liquidity in the late 1920's. Bondholders' and preferred stockholders' payoffs change these investors' reactions to reported financial statement items relative to equity investors (Easton, Monahan, and Vasvari, 2009). Additionally, how the endogenous decision to engage an auditor affects firms' disclosure choices and market outcomes could help disentangle some of the observationally equivalent outcomes in markets with audit requirements. Finally, extending the sample to increase the number of firms that switch from aggregators to disaggregators, and vice versa, will increase our understanding of voluntary disclosure choices. A larger sample of switching firms can also provide insight into how market

participants maintained an equilibrium level of disclosure in the absence of regulation by examining the tâtonnement process of establishing a new equilibrium after these deviations from the previous equilibrium.

Table 1: Test statistics for the cluster analysis

This table presents test statistics associated with Ward's hierarchical clustering method for dividing the sample into ten or fewer clusters. The difference in the pseudo-F-statistics for n clusters is the pseudo-F-statistic for n clusters less the pseudo-F-statistics for $n+1$ clusters. The difference in the pseudo-t^2-statistics for n clusters is the pseudo-t^2-statistic for $n-1$ clusters less the pseudo-t^2-statistic for n clusters. When the difference in the pseudo-F- or pseudo-t^2-statistics for n clusters is large, these test statistics indicate it is appropriate to divide the sample into n clusters.

Number of clusters	R^2	Approximate expected R^2	Pseudo-F-statistic	Difference in pseudo-F-statistics	Pseudo-t^2-statistic	Difference in pseudo-t^2-statistics
10	0.241	0.249	20.2		11.8	−1.2
9	0.227	0.240	21.1	0.9	10.6	0.3
8	0.213	0.229	22.3	1.2	10.9	1.8
7	0.197	0.217	23.4	1.1	12.7	−1.1
6	0.179	0.203	25.2	1.8	11.6	3.5
5	0.160	0.185	27.5	2.3	15.1	2.1
4	0.136	0.160	30.3	2.8	17.2	3.6
3	0.107	0.130	34.6	4.3	20.8	2.7
2	0.070	0.086	43.8	9.2	23.5	20.3
1	0.000	0.000			43.8	

Table 2: Correlation of measures of disaggregation

This table presents the Pearson (Spearman) correlations above (below) the diagonal between the cluster-based measure of disaggregation (*Disaggregator*) and the transparency indices developed by Barton and Waymire (2004). ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

		Barton and Waymire (2004) indices		
	Disagg.	Inc. stmt.	Bal. sheet	Sum
Disaggregator		0.45***	0.11**	0.39***
Income statement index	0.44***		0.08*	0.77***
Balance sheet index	0.08*	0.07		0.69***
Sum	0.39***	0.77***	0.66***	

Table 3: Financial statement items disaggregators are more likely to disclose

This table and Table 4 present the propensity to disclose the financial statement items that compose the taxonomy listed in Appendix A for the full sample, the subsample of disaggregators, and the subsample of aggregators. The difference is the propensity of disaggregators to disclose the financial statement item less the propensity of aggregators to disclose the item. This table reports the financial statement items that disaggregators are more likely to disclose (positive differences). The items are sorted by the magnitude of the difference in propensities to disclose. The t-statistics testing that there is no difference in the propensity to disclose across disaggregators and aggregators are reported in the last column. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Propensity to Disclose				
Financial Statement Item	Sample	Disaggregators	Aggregators	Difference	t-statistic
EBITDA	42.5%	90.1%	8.6%	81.5%	32.28***
EBDA	53.4%	88.3%	28.7%	59.7%	17.85***
Operating Income	57.7%	91.0%	34.1%	57.0%	17.29***
Depreciation Expense	68.3%	97.8%	47.5%	50.3%	16.81***
IBIT/Tax Expense	71.9%	95.1%	55.4%	39.7%	12.54***
Interest Expense	44.3%	61.9%	31.8%	30.0%	7.22***
SG&A Expense	30.9%	46.2%	20.1%	26.1%	6.47***
Gross Profit	29.6%	43.0%	20.1%	23.0%	5.72***
Other Income	70.0%	83.4%	60.5%	22.9%	6.15***
NOPAT	75.8%	88.8%	66.6%	22.2%	6.53***
Bonds Payable	50.1%	59.2%	43.6%	15.6%	3.59***
Other Long-term Assets	63.7%	72.6%	57.3%	15.3%	3.74***
Other Long-term Liabilities	30.7%	38.6%	25.2%	13.4%	3.28***
Tax Reserve	66.3%	74.0%	60.8%	13.2%	3.26***
Inc. Attributable to Min. Int.	17.7%	24.7%	12.7%	11.9%	3.45***
Notes Payable	33.9%	40.8%	29.0%	11.8%	2.87***
Other Current Liabilities	56.1%	62.8%	51.3%	11.5%	2.66***
Gross PP&E	73.7%	80.3%	69.1%	11.2%	2.99***
Acc. Dep./Dep. Reserve	74.3%	80.7%	69.7%	11.0%	2.96***
Long-term Investments	77.8%	83.9%	73.6%	10.3%	2.93***
Mortgages Payable	13.0%	18.8%	8.9%	9.9%	3.22***
Cost of Goods Sold	18.4%	24.2%	14.3%	9.9%	2.83***
Other Current Assets	34.1%	39.5%	30.3%	9.2%	2.22**
Minority Interests	23.5%	28.7%	19.7%	9.0%	2.37**
Earned Surplus	14.5%	19.3%	11.1%	8.1%	2.55**
Capital Surplus	13.8%	17.9%	10.8%	7.1%	2.28**
Dividends on Common Stock	70.4%	73.5%	68.2%	5.4%	1.35
Notes Receivable	25.9%	28.7%	23.9%	4.8%	1.25
Misc. Reserves	65.2%	67.7%	63.4%	4.3%	1.04
Interest Payable	15.6%	17.9%	14.0%	3.9%	1.23
Pre-paid Expenses	90.9%	92.8%	89.5%	3.3%	1.36
Interest Receivable	7.1%	9.0%	5.7%	3.2%	1.39
Revenue	54.0%	55.2%	53.2%	2.0%	0.45
Wages Payable	8.2%	9.0%	7.6%	1.3%	0.55
Net PP&E	97.2%	97.8%	96.8%	0.9%	0.67

Table 4: Financial statement items aggregators are more likely to disclose

This table and Table 3 present the propensity to disclose the financial statement items that compose the taxonomy listed in Appendix A for the full sample, the subsample of disaggregators, and the subsample of aggregators. The difference is the propensity of disaggregators to disclose the financial statement item less the propensity of aggregators to disclose the item. This table reports the financial statement items that aggregators are more likely to disclose (negative differences). The items are sorted by the magnitude of the difference in propensities to disclose. The t-statistics testing that there is no difference in the propensity to disclose across disaggregators and aggregators are reported in the last column. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Propensity to Disclose				
Financial Statement Item	Sample	Disaggregators	Aggregators	Difference	t-statistic
Intangible Assets	48.8%	40.8%	54.5%	−13.7%	−3.14***
Net Accounts Receivable	30.9%	25.1%	35.0%	−9.9%	−2.46**
Other Equity	11.4%	6.7%	14.6%	−7.9%	−3.03***
Surplus Adjustments	26.4%	22.4%	29.3%	−6.9%	−1.78*
Common Stock (Par)	91.8%	87.9%	94.6%	−6.7%	−2.64***
Dividends on Preferred Stock	52.5%	49.3%	54.8%	−5.4%	−1.24
Dividends Payable	43.2%	40.4%	45.2%	−4.9%	−1.12
Marketable Securities	51.2%	48.4%	53.2%	−4.8%	−1.09
Surplus	89.2%	87.0%	90.8%	−3.8%	−1.35
Preferred Stock	57.2%	55.6%	58.3%	−2.7%	−0.62
Stock Dividends	5.8%	4.5%	6.7%	−2.2%	−1.11

Table 5: Sample size and composition

This table presents the number of observations per year for the full sample in Panel A, the number of observations per year for the subsample with short sale rates available in Panel B, and the number of observations per firm for both the full sample and for the subsample with loan fees available in Panel C.

Panel A: Observations per year			
	Bid-ask spread and capital raising sample		
Year	Full sample	Disaggregators	Aggregators
1926	164	64	100
1927	182	77	105
1928	191	82	109
Total	537	223	314

Panel B: Observations per year			
	Short sale subsample		
Year	Full subsample	Disaggregators	Aggregators
1926	55	19	36
1927	55	21	34
1928	51	19	32
Total	161	59	102

Panel C: Obervations per firm		
No. of Obs.	Bid-ask spread and capital raising sample	Short sale subsample
3	148	43
2	33	11
1	27	10
Total	208	64

Table 6: Descriptive statistics

This table presents descriptive statistics for the full sample in Panel A and the subsample with loan fees available in Panel B. See Appendix C for variable definitions.

Panel A: Full sample						
Variable	Obs	Mean	Std. Dev.	Q1	Median	Q3
Disaggregator	537	41.5%	49.3%	0	0	1
Leverage	537	8.9%	12.2%	0.0%	1.0%	16.3%
Payout	537	62.5%	98.5%	29.5%	58.7%	80.4%
Book-to-market	537	1.26	1.41	0.50	0.88	1.43
Firms in industry	537	10.54	11.22	3	6	12
Return on assets (ROA)	537	8.6%	9.0%	3.6%	7.4%	11.4%
Age	537	21.42	12.04	12	20	28
Total assets ($ Million)	537	$105.66	$241.02	$14.44	$37.80	$103.03
Effective bid-ask spread	537	1.5%	1.4%	0.6%	1.1%	1.9%
Turnover	537	0.4%	0.4%	0.1%	0.2%	0.4%
Standard deviation of daily returns	537	2.3%	1.2%	1.5%	2.0%	2.8%
Price	537	$68.22	$57.82	$26.25	$54.00	$93.75
Capital raising	537	23.6%	42.5%	0	0	0
Annual return	537	28.4%	68.2%	−7.6%	−15.1%	48.8%
Investment grade rating	537	53.4%	49.9%	0	1	1

Panel B: Short sale subsample						
Variable	Obs	Mean	Std. Dev.	Q1	Median	Q3
Disaggregator	161	36.6%	48.3%	0	0	1
Leverage	161	8.3%	11.8%	0.0%	1.0%	13.9%
Payout	161	77.4%	108.2%	44.1%	60.5%	83.6%
Book-to-market	161	1.43	1.76	0.46	0.82	1.63
Firms in industry	161	11.01	11.13	3	6	20
Return on assets (ROA)	161	8.7%	7.8%	4.0%	8.0%	11.1%
Age	161	22.60	11.22	13	24	29
Total assets ($ Million)	161	$193.09	$361.39	$37.64	$83.02	$194.99
Loan fee	161	3.4%	2.9%	1.0%	2.5%	6.0%
Turnover	161	0.6%	0.6%	0.1%	0.3%	0.8%
Standard deviation of daily returns	161	2.1%	1.0%	1.3%	1.7%	2.5%
Large short interest	161	19.3%	39.6%	0	0	0
Annual return	161	28.9%	79.5%	−4.1%	13.7%	49.6%

Table 7: Differences in mean values of outcome and control variables for disaggregators and aggregators

This table presents mean of the variables of interest and the control variables for the full sample, disaggregators, and aggregators. The difference is the mean value for disaggregators less the mean value for aggregators. The t-statistics testing that there is no difference in the mean value across disaggregators and aggregators are reported in the last column. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	Mean Value				
Variable	Sample	Disaggregators	Aggregators	Difference	t-statistic
Leverage	8.9%	11.0%	7.5%	3.5%	3.30***
Payout	62.5%	56.5%	66.8%	−10.2%	−1.19
Book-to-market	1.26	1.11	1.30	−0.10	0.79
Firms in industry	10.54	11.87	9.59	2.29	2.24**
Return on assets (ROA)	8.6%	7.8%	9.2%	−1.3%	−1.70*
Age	21.42	20.11	22.35	−2.25	−2.18**
Total assets ($ Million)	$105.66	$135.04	$84.79	$50.25	2.09**
Effective bid-ask spread	1.5%	1.5%	1.5%	0.1%	0.46
Turnover	0.4%	0.4%	0.3%	0.0%	0.91
Std. dev. of daily returns	2.3%	2.2%	2.4%	−0.2%	−1.52
Price	$ 68.22	$ 58.67	$75.00	−$16.33	−3.48***
Loan fee	3.4%	2.9%	3.6%	−0.7%	−1.49
Large short interest	19.3%	15.3%	21.6%	−6.3%	−0.98
Annual return	28.4%	24.3%	31.2%	−6.9%	−1.22
Capital raising	23.6%	26.0%	22.0%	4.0%	1.08
Investment grade rating	53.4%	56.5%	51.3%	5.2%	1.20

Table 8: Effect of disaggregation on the effective bid-ask spread

This table presents Endogenous Treatment Model and Ordinary Least Squares (OLS) regressions of the natural logarithm of the relative bid-ask spread on disaggregation and other firm characteristics. The t-statistics reported in parentheses are based on robust standard errors clustered by firm. ***, **, *, and $^{+}$ indicate significance at the 1, 5, 10, and 20% levels, respectively, using two-tailed tests. Variables are defined in Appendix C.

	ln(Effective bid-ask spread)		
	Endogenous treatment model		
	Effects model	Treatment prob.	OLS
Disaggregator	−0.600***		0.001
	(–3.09)		(0.02)
ln(Std. dev. of daily ret.)	0.516***		0.564***
	(6.53)		(7.42)
ln(Turnover)	−0.166***		−0.176***
	(–7.41)		(–7.53)
ln(Total assets)	−0.221***	0.052	−0.216***
	(–7.01)	(0.73)	(–7.83)
ln(Price)	−0.173***		−0.188***
	(–4.10)		(–4.68)
Leverage		0.952^{+}	
		(1.41)	
Payout		−0.082^{+}	
		(–1.61)	
Book-to-market		−0.129*	
		(–1.73)	
Firms in industry		−0.002	
		(–0.21)	
ROA		1.745^{+}	
		(1.47)	
ln(Age)		−0.109	
		(–0.99)	
Observations	537	537	537
Year Fixed Effects?	Yes	Yes	Yes
Fama-French 12 Industry Fixed Effects?	Yes	Yes	Yes
Adjusted R-squared			0.664

Table 9: Effect of disaggregation on the loan fee

This table presents Ordinary Least Squares (OLS) and Endogenous Treatment Model regressions of the loan fee on disaggregation and other firm characteristics. The t-statistics reported in parentheses are based on robust standard errors clustered by firm. ***, **, *, and $^+$ indicate significance at the 1, 5, 10, and 20% levels, respectively, using two-tailed tests. Variables are defined in Appendix C.

	Loan fee		
	Endogenous treatment models		
	Effects model	Treatment prob.	OLS
Disaggregator	−2.402**		−0.110
	(–2.37)		(–0.23)
ln(Std. dev. of daily ret.)	1.205$^+$		1.152$^+$
	(1.57)		(1.58)
Large short volume	−0.491		−0.419
	(–0.67)		(–0.60)
ln(Total assets)	−0.902***	0.052	−1.056***
	(–3.72)	(0.41)	(–5.08)
Annual return	0.546***		0.553***
	(2.99)		(3.13)
Book-to-market	0.371**	0.006	0.422***
	(2.56)	(0.06)	(2.89)
ln(Turnover)	−0.547**		−0.608**
	(–2.41)		(–2.51)
Leverage		1.338	
		(1.01)	
Payout		−0.067	
		(–0.66)	
Firms in industry		0.026**	
		(2.08)	
ROA		2.904$^+$	
		(1.45)	
ln(Age)		−0.209	
		(–1.04)	
Observations	161	161	161
Year fixed effects?	Yes	Yes	Yes
Fama-French 12 industry fixed effects?	No	No	No
Adjusted R-squared			0.532

Table 10: Effect of disaggregation on the propensity to raise capital

This table presents Bivariate Probit and Probit regressions of capital raising on disaggregation and other firm characteristics. The t-statistics reported in parentheses are based on robust standard errors clustered by firm. ***, **, *, and $^{+}$ indicate significance at the 1, 5, 10, and 20% levels, respectively, using two-tailed tests. Variables are defined in Appendix C.

	Capital raising		
	Bivariate probit		
	Effects model	Treatment prob.	Probit
Disaggregator	1.577***		0.135
	(5.60)		(0.99)
Annual return	0.223***		0.246***
	(2.58)		(2.93)
ROA	0.836	−0.760	−0.025
	(0.99)	(–0.70)	(–0.03)
Book-to-market	0.006	−0.089	−0.040
	(0.08)	(–1.03)	(–0.52)
ln(Std. dev. of daily ret.)	−0.243		−0.510**
	(–0.93)		(–2.23)
Payout	−0.031	−0.061	−0.104*
	(–0.54)	(–1.10)	(–1.85)
ln(Age)	−0.004	−0.211^{+}	−0.197*
	(–0.04)	(–1.60)	(–1.86)
ln(Total assets)	−0.074	0.021	−0.079
	(–1.06)	(0.24)	(–1.18)
Investment grade	0.013		0.078
	(0.08)		(0.48)
Leverage		1.387**	
		(2.02)	
Firms in industry		−0.008	
		(–0.72)	
Observations	537	537	537
Year fixed effects?	Yes	Yes	Yes
Fama-French 12 industry fixed effects?	Yes	Yes	Yes
			$\chi^2_{(21)}$: 61.27
p-value			0.00
Pseudo-R^2			0.096

Table 11: Effect of disaggregation on the bid-ask spread

This table presents Endogenous Treatment Poisson and Poisson model regressions of the tick size on disaggregation and other firm characteristics. The t-statistics reported in parentheses are based on robust standard errors clustered by firm. ***, **, *, and $^{+}$ indicate significance at the 1, 5, 10, and 20% levels, respectively, using two-tailed tests. Variables are defined in Appendix C.

	Tick size		
	Endogenous treatment Poisson		
	Effects model	Treatment prob.	Poisson
Disaggregator	−1.340***		−0.154
	(–3.30)		(–1.23)
ln(Std. dev. of daily ret.)	−0.790***		−0.741***
	(–4.87)		(–5.55)
ln(Turnover)	−0.014		−0.028
	(–0.27)		(–0.47)
ln(Total assets)	−0.167***	0.025	−0.162***
	(–2.67)	(0.31)	(–3.56)
Leverage		1.629**	
		(2.57)	
Payout		−0.010	
		(–0.22)	
Book-to-market		−0.099^{+}	
		(–1.45)	
Firms in industry		0.006	
		(0.53)	
ROA		0.163	
		(0.18)	
ln(Age)		−0.173^{+}	
		(–1.51)	
Observations	537	537	537
Year Fixed Effects?	Yes	Yes	Yes
Fama-French 12 Industry Fixed Effects?	Yes	Yes	Yes
		$\chi^2_{(16)}$:	160.48
p-value			0.00
Pseudo-R^2			0.121

Table 12: Additions to the Loan Crowd short sale list by date

This table presents the frequency of additions to the Loan Crowd list of shares lent in a centralized market for short sellers as well as a χ^2 test of the equality of the distribution of additions to other sample distributions. $^{+++}$, $^{++}$, and $^{+}$ indicate significance at the 1, 5, and 10, respectively, for the χ^2 statistics. Variables are defined in Appendix C.

	All additions			Small and medium firms		
Addition Date	Disagg.	Agg.	Subtotal	Disagg.	Agg.	Subtotal
Feb. 1926	4	12	16	1	10	11
Mar. 1926	3	3	6	2		2
Apr. 1926	3	5	8		2	2
Jun. 1926	1		1	1		1
Feb. 1927		4	4		4	4
Mar. 1927	1		1			
Aug. 1927	1	1	2	1	1	2
Nov. 1927	1		1			
Mar. 1928		1	1			
Jun. 1928		1	1		1	1
Aug. 1928	1		1			
Total	15	27	42	5	18	23
Benchmark sample			$\chi^2_{(1)}$			$\chi^2_{(1)}$
Full sample	223	314	0.54	136	200	3.17^{+}
Firms never on the Loan Crowd list	128	129	2.87^{+}	95	118	4.44^{++}

Table 13: Abnormal returns around additions to the Loan Crowd list

This table presents the abnormal returns for the month of and the month following the addition to the Loan Crowd list shown in Table 12. $^{+++}$, $^{++}$, and $^{+}$ indicate significance at the 1, 5, and 10, respectively, using one-tailed tests for the t-statistics. Variables are defined in Appendix C.

	All additions			Small and medium firms		
Summary statistic	Disagg.	Agg.	Diff.	Disagg.	Agg.	Diff.
Equal-weighted average	−2.50%	−11.32%	8.83%$^{+}$	−4.26%	−19.18%	14.92%
Value-weighted average	0.35%	0.49%	−0.14%	−10.64%	−17.19%	6.56%
Median	−1.71%	−9.05%	7.33%$^{++}$	−1.40%	−17.02%	15.67%$^{+}$

A Taxonomy of financial statement items

Accounts that are the same across the two presentation formats are presented in grey in Presentation 2. Accounts that appear in different positions in the two presentation formats are in bold italics.

Income Statement

Presentation 1	Presentation 2
Revenue	Revenue
Cost of Goods Sold (CoGS)	CoGS
Gross Profit	Gross Profit
Selling, General, and Administrative (SG&A) Expenses	SG&A Expenses
Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	EBITDA
	Interest Expense
	Tax Expense
	Earnings Before Depreciation and Amortization (EBDA)
Depreciation Expense	Depreciation Expense
Operating Income	Net Operating Profit After Tax (NOPAT)
Interest Expense	
Other Income and Expenses	Other Income and Expenses
Income before Income Taxes	
Tax Expense	
Earnings attributable to Minority Interests	Earnings attributable to Minority Interests
Net Income	Net Income
Surplus Adjustments	Surplus Adjustments
Preferred Dividends	Preferred Dividends
Common Dividends	Common Dividends
Stock Dividends	Stock Dividends
Changes in Earned Surplus	Changes in Earned Surplus

"PP&E" is an acronym for Property, Plant, and Equipment. "Acc. Dep." is an abbreviation of Accumulated Depreciation. Accounts that are the same across the two presentation formats are presented in grey in Presentation 2. Accounts that appear in different positions in the two presentation formats are in bold italics.

Balance Sheet

Presentation 1		Presentation 2	
Assets	Liabilities and Equity	Assets	Liabilities and Equity
Cash	Accounts Payable	Cash	Accounts Payable
Marketable Securities	Dividends Payable	Marketable Securities	Dividends Payable
Net Accounts Receivable	Interest Payable	Net Accounts Receivable	Interest Payable
Notes Receivable	Wages Payable	Notes Receivable	Wages Payable
Accrued Interest Receivable	Notes Payable	Accrued Interest Receivable	Notes Payable
Inventory	Tax Reserve	Inventory	Tax Reserve
Other Current Assets	Other Current Liabilities	Other Current Assets	Other Current Liabilities
Gross PP&E		Gross PP&E	
Acc. Dep.			***Depreciation Reserve***
Net PP&E			
Intangible Assets	Bonds Payable	Intangible Assets	Bonds Payable
Long-term Investments	Mortgages Payable	Long-term Investments	Mortgages Payable
Pre-paid Expenses	Miscellaneous Reserves	Pre-paid Expenses	Miscellaneous Reserves
	Other Long-term Liabilities		Other Long-term Liabilities
	Preferred Stock		Preferred Stock
	Minority Interest		Minority Interest
	Common Stock (Par)		Common Stock (Par)
	Capital Stock } Surplus		Capital Stock } Surplus
	Earned Surplus }		Earned Surplus }
Other Assets	Other Equity	Other Assets	Other Equity
Total Assets	Total Liabilities and Equity	Total Assets	Total Liabilities and Equity

B Applying the taxonomy

Figure B-1: Canada Dry Ginger Ale's 1926 Income Statement

Canada Dry Ginger Ale Fiscal Year 1926		Income Statement Items		Income Statement Subtotals	
Net sales	$8,400,389	Revenue?	☒		
		Cost of goods sold?	☐	Gross profit?	☐
Costs, expenses, etc.	6,168,071	SG&A expenses?	☐		
				EBITDA?	☒
Depreciation	87,553	Depreciation expense?	☒		
Operating income	$2,144,765			Operating income?	☒
Other income	64,480	Other income and expenses?	☒		
Total income	$2,209,245				
Other expenses	203,244				
		Interest expense?	☐		
				Income before income taxes?	☒
Tax expense	269,703	Tax expense?	☒		
Net income	$1,736,298	Net income?	☒		

The income statement that Canada Dry Ginger Ale provided for 1926, shown in Figure B-1, contains most of the same information that appears on a contemporary income statement. The largest difference is that Canada Dry does not disaggregate Cost of goods sold from Selling, general, and administrative (SG&A) expenses, aggregating these numbers into the line Costs, expenses, etc.

To determine whether Canada Dry provides the income statement subtotals, I start building up from the bottom of the income statement. Since Canada Dry disaggregates tax expense, investors can calculate Income before income taxes (IBIT). Since Canada Dry provides the information to calculate IBIT and disaggregates non-operating income, investors can calculate Operating Income. Canada Dry also provides operating income as a subtotal on its income statement.

Since Canada Dry provides operating income and disaggregates Depreciation expense, investors can calculate Earnings before interest, taxes, depreciation, and amortization (EBITDA). While Canada Dry does not disaggregate Interest expense, investors know operating income and depreciation expense. Investors can estimate a measure of operating cash flow, which is the concept behind EBITDA, even though

Canada Dry does not disaggregate all of Interest, Tax, Depreciation, and Amortization expenses.

Since Canada Dry does not disaggregate SG&A expenses from Cost of goods sold, investors cannot calculate Gross profit. I combine this set of indicator variables with the indicator variables related to Canada Dry's balance sheet to create an input into the clustering algorithm.

Figure B-2: Park & Tilford's 1926 Income Statement

Park & Tilford Fiscal Year 1926		Income Statement Items		Income Statement Subtotals	
		Revenue?	☐		
		Cost of goods sold?	☐		
				Gross profit?	☐
		SG&A expenses?	☐		
				EBITDA?	☐
		Depreciation expense?	☐		
				Operating income?	☐
		Other income and expenses?	☐		
				Income before income taxes?	☐
		Tax expense?	☐		
Net income	$533,414	Net income?	☒		

The income statement that Park & Tilford provided for 1926, shown in Figure B-2, does not disaggregate net income into any expenses or revenues and do not disaggregate operating income from non-operating income. Investors cannot calculate any financial statement subtotals because the expenses used to differentiate them are not disaggregated on the income statement. I combine this set of indicator variables with the indicator variables related to Park & Tilford's balance sheet to create an input into the clustering algorithm.

C Variable definition

Disaggregator	An indicator variable for observations that belong to the cluster more likely to disclose the financial statement items in Appendix A.
Leverage	The sum of the book values reported in Moody's Industrial manual of mortgages and bonds payable scaled by *Total assets*. This value is set to zero if the firm does not report any long-term debt.
Payout	The ratio of the sum of common and preferred dividends paid to net income. Moody's Industrial manuals report these data.
Total assets	The value of all assets reported in Moody's Industrial manual. If the firm reports its depreciation reserve (equivalent to accumulated depreciation) as a liability, I subtract the value of the reserve from total assets as reported to standardize the measure across observations.
Book-to-market	The ratio of the book value of equity to the market value of equity. The book value of equity is *Total assets* less current liabilities, bonds payable, mortgages payable, preferred stock, and minority interest. If the Moody's Industrial manual does not record any of the last four items, I assume that their value is zero.
Firms in industry	The number of firms reported in CRSP with the same three-digit Standard Industrial Classification (SIC) code.
Return on assets (ROA)	Net income reported in Moody's Industrial manual (before any surplus adjustments) scaled by *Total assets*.
Effective bid-ask spread	The median over the fiscal year of the bid-ask spread scaled by the average of the bid and ask prices. This value $\left(\frac{ask-bid}{\frac{bid+ask}{2}}\right)$ is calculated daily from the CRSP database.

Turnover	The median over the fiscal year of the ratio of the number of shares traded to the number of shares outstanding. The ratio $\left(\frac{vol}{1000*shrout}\right)$ is calculated daily from the CRSP database.
Std. dev. of daily returns	The standard deviation of daily returns (*ret*) over the fiscal year. These data are from the CRSP database.
Price	The closing price in the CRSP database at the end of the fiscal year.
Loan fee	The median over the fiscal year of the difference between the call money rate and the rebate rate. These data are closing rates at the end of each month as reported in the *Wall Street Journal*. See Jones and Lamont (2002, p. 214).
Large short interest	An indicator variable for the 33 firms Meeker (1932, pp. 251–252) identifies with short interest in excess of $500,00 on November 12, 1929.
Annual stock return	The return, including dividends, over the 12 months ending on the fiscal year-end. These data are from the CRSP database.
Capital raising	An indicator variable for a year-on-year increase in long-term debt accounts, preferred stock, or common stock that increases beginning-of-the-year *Total assets* by at least five percent. These data are from the Moody's manuals.
Investment grade	An indicator variable for whether Moody's rates at least one of the the firm's largest debt issuance, preferred stock, or common stock at least *Baa* in the manual with the associated financial statement information.
Tick size	The median over the fiscal year of the number of eighths above one-eighth in which the bid-ask spread is quoted. This value $8 * (ask - bid) - 1$ is calculated daily from the CRSP database.

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