When you talk, I remain silent: Spillover effects of peers' mandatory disclosures on firms' voluntary disclosures

Matthias Breuer[*]
Columbia University

Katharina Hombach[†]
Carl von Ossietzky University of Oldenburg

Maximilian A. Müller[‡]
ESMT Berlin

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Abstract

We predict and find that regulated firms' mandatory disclosures crowd out unregulated firms' voluntary disclosures. Consistent with information spillovers from regulated to unregulated firms, we document that unregulated firms reduce their own disclosures in the presence of regulated firms' disclosures. We further find that unregulated firms reduce their disclosures more the greater the strength of the regulatory information spillovers. Our findings suggest that a substitutive relationship between regulated and unregulated firms' disclosures attenuates the effect of disclosure regulation on the market-wide information environment.

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[*] mb4468@gsb.columbia.edu; Columbia University, Graduate School of Business, 3022 Broadway, New York, NY 10027, United States of America.
[†] katharina.hombach@uni-oldenburg.de; Carl von Ossietzky University of Oldenburg, Ammerländer Heerstraße 114-118, 26129 Oldenburg, Germany.
[‡] maximilian.mueller@esmt.org; ESMT Berlin, Schlossplatz 1, 10178 Berlin, Germany.

1. Introduction

Disclosure regulation is frequently motivated by the desire to strengthen the market-wide information environment (e.g., Coffee 1984; Easterbrook and Fischel 1984; Dye 1990; Fox 1999; Leuz and Wysocki 2016). To be economical, the regulation often only applies to a specific segment of the market, creating a gap between regulated and unregulated firms (e.g., public vs. private firms; Zingales 2009). An unintended consequence of this regulation can be that regulated firms' public disclosures crowd out other market participants' information production (e.g., Goldstein and Yang 2017). In particular, Admati and Pfleiderer (2000) predict that regulated firms' public disclosures crowd out *unregulated* firms' public disclosures. This crowding-out would mute the regulatory effect on the market-wide information environment. Moreover, it would widen the gap between regulated and unregulated firms more than presumably intended by the regulator, exacerbating the cost of operating in regulated segments (e.g., De Fontenay 2017).

To explore the effect of regulated firms' disclosures on unregulated firms' disclosures, we examine two significant regulatory gaps among German private firms created by discontinuities in the disclosure regulation. First, the regulation requires limited-liability firms, but not unlimited-liability firms, to disclose their financial statements. Accordingly, we consider unlimited-liability firms as unregulated and limited-liability firms as regulated (**setting 1**: "unlimited vs. limited"). Second, among the limited-liability firms, the regulation prescribes differential disclosure requirements based on firm size. Firms above certain regulatory thresholds, classified as "medium" firms, face considerably increased disclosure requirements compared to firms below the threshold, classified as "small" firms. "Medium" firms must disclose an audited and more granular balance sheet, an income statement, extended notes, and a management report. "Small" firms need only disclose an unaudited and highly condensed balance sheet including short notes. As a result of this discontinuity, "small" firms around the regulatory thresholds face low disclosure requirements relative to their size and disclosure

incentives, whereas "medium" firms around the same thresholds face high disclosure requirements relative to their size and disclosure incentives. Accordingly, we consider "small" firms around the small-medium thresholds as effectively unregulated and "medium" firms around these thresholds as effectively regulated (**setting 2**: "small vs. medium").

Following Admati and Pfleiderer (2000), we predict that unregulated firms reduce their disclosures in the presence of regulated firms' disclosures due to information spillovers. If regulated firms' disclosures are useful for evaluating unregulated firms, unregulated firms can reduce their own disclosures, free-riding on the benefits conferred by regulated firms' disclosures and economizing on their own disclosure costs (e.g., Admati and Pfleiderer 2000; Baginski and Hinson 2016). In our setting, spillovers are likely to manifest within information intermediaries such as banks and credit bureaus, which can economize on their information collection efforts if they can learn about unregulated firms from observing these firms' regulated peers (e.g., Garmaise and Natividad 2016).

Ideally, we would test our prediction by comparing unregulated firms' disclosures, at the same time, across two regimes: (1) a mandatory regime, with increased disclosure requirements applying to regulated firms, and (2) a voluntary regime, without increased disclosure requirements applying to regulated firms. At any given point in time, however, we can only observe unregulated firms in either of these distinct regimes. We address this identification challenge using two complementary settings and approaches to create plausible counterfactuals approximating unregulated firms' disclosure absent regulated firms' disclosure requirements.

In the "unlimited vs. limited" setting, we use a time-series comparison to examine the impact of limited-liability firms' regulated disclosures on unlimited-limited firms' unregulated disclosures. We exploit the fact that the disclosure regulation pertaining to limited-liability firms had not been effectively enforced until a sweeping reform in 2007 (e.g., Bernard 2016). This enforcement reform

allows us to compare the disclosure of unregulated limited-liability firms before and after limited-liability firms were effectively regulated. This comparison essentially uses unregulated firms' disclosures before the reform as a plausible counterfactual for their own disclosures after the reform.

Examining confidential data on financial statements collected by the largest corporate credit bureau in Germany (*Creditreform*), we find that the availability of regulated firms' financial statements in the credit bureau's database significantly increases after the enforcement reform by about 68 percent. By contrast, the availability of unregulated firms' financial statements significantly decreases after the reform by about 43 percent. This finding is consistent with regulated firms' disclosures crowding-out unregulated firms' disclosures. Notably, it suggests one important channel for the crowding out: intermediaries, such as this credit bureau, can shift their information-collection efforts toward publicly available financial statements of regulated firms, reducing the need to privately obtain financial statements of related, but unregulated firms. In line with this channel, the credit bureau (similar to other bureaus, e.g., Dun & Bradstreet) uses information on total assets, sales, and employees from firms with available financial information to impute those values for firms in the same industry without such information.

While the credit-bureau evidence is consistent with a crowding-out, it is limited to the information collection of one particular, though important stakeholder demanding firms' disclosures. It does not immediately document that unregulated firms actually reduce their disclosures in response to regulated firms' increased disclosures and credit bureau's reduced demand. Moreover, the credit-bureau evidence is susceptible to concurrent changes potentially explaining the observed decline in unregulated firms' financial statement availability. To broaden and triangulate the credit-bureau evidence, we examine the crowding-out in a complementary setting ("small vs. medium"). In this setting, we can examine a comprehensive measure of firms' actual disclosures and rely on a different identifying assumption.

In the "small vs. medium" setting, we use a cross-sectional comparison to examine the impact of "medium" firms' more regulated disclosures on "small" firms' less regulated disclosures. For this comparison, we focus on the period after the enforcement reform (i.e., after 2007). Specifically, we compare "small" firms' disclosures observed in the mandatory regime, marked by increased disclosure requirements applying to "medium" firms, to their own disclosures approximated for the voluntary regime, absent increased disclosure requirements applying to "medium" firms. To approximate firms' disclosures in a voluntary regime, we use a set of benchmark firms effectively disclosing in a voluntary regime. The benchmark firms are larger limited-liability firms with firm sizes far exceeding the small-medium threshold. We consider their disclosures as unaffected by their own and "medium" firms' disclosure requirements. For one, larger firms have greater voluntary disclosure incentives, likely exceeding their own minimum disclosure requirements. For another, they are unlikely to benefit much from and free-ride on (comparably small) "medium" firms' disclosures.

Our benchmark firms differ from the "small" firms in terms of size. We explicitly account for these size-related differences in disclosure incentives by size-adjusting the benchmark firms' disclosures, rather than using their raw disclosures. Specifically, we scale our benchmark firms' disclosures, measured as the characters in firms' filings, by the number of clicks received for their filings on the official and exclusive publication platform. We use the number of characters because it comprehensively captures the level of financial statement disaggregation and information provided in the notes (e.g., Chen et al. 2015). We use the number of clicks to scale disclosures because clicks capture the number of firms' stakeholders, which drives firms' disclosure incentives (e.g., Breuer et al. 2020a). Accordingly, this disclosure/click multiple captures how much a firm would disclose per stakeholder in the voluntary regime. We use this benchmark multiple as a cross-sectional counterfactual for "small" firms' disclosures per stakeholder observed in the presence of "medium" firms' disclosure requirements.

Using comprehensive data on firms' public disclosure and stakeholders' clicks on the official publication platform in Germany (*Bundesanzeiger*), we compare "small" and "medium" firms' disclosure/click multiples, observed in the mandatory regime, with the benchmark multiple. We refer to the difference between the observed multiple and the benchmark multiple as abnormal disclosure. We focus our comparison on the area around the small-medium thresholds, where similarly sized "small" and "medium" firms face starkly different disclosure requirements. We find that "medium" firms around the regulatory thresholds exhibit positive abnormal disclosures: they provide around 65 percent more disclosures per stakeholder than predicted in a voluntary regime. This finding is consistent with a direct effect of the regulation on "medium" firms' disclosures. By contrast, we find that "small" firms around the regulatory thresholds exhibit negative abnormal disclosures. These firms provide 35 percent fewer disclosures per stakeholder than predicted in a voluntary regime (e.g., they reduce disclosures on sales). This finding is consistent with an indirect effect of "medium" firms' increased disclosure requirements on "small" firms' disclosures due to information spillovers.

To corroborate that the reduced disclosures of "small" firms are due to information spillovers from "medium" firms, we provide cross-sectional evidence that the crowding-out varies with the strength of the information spillovers (Admati and Pfleiderer 2000). We expect information spillovers to be stronger when firms' fundamentals are more highly correlated, when there are more regulated firms in the same peer group, and when the direct effect of the disclosure requirements on regulated firms is larger. To test these predictions, we compare the difference in abnormal disclosures of otherwise similar "small" and "medium" firms around the regulatory thresholds across different peer groups. Consistent with our predictions, we find that the disclosure gap between "small" and "medium" firms is larger in industries with stronger asset comovement, in local industry peer groups with more "medium" firms, and in local industry peer groups in which "medium" peers provide more disclosures in the mandatory regime.

Our cross-sectional results allay the concern that our finding of a spillover effect for "small" firms is driven by a flawed disclosure/click benchmark as this benchmark is differenced out in the cross-sectional specifications. Moreover, we document that the widening of the disclosure gap between "small" and "medium" firms holds using alternative disclosure proxies, namely firms' raw disclosure in the mandatory regime, disclosure timeliness, and voluntary disclosure of sales information. Unlike firms' abnormal disclosures, these alternative proxies are explicitly not based on our disclosure/click benchmark.

Collectively, our results, across two settings and various disclosure outcomes, are consistent with information spillovers from regulated firms' disclosures crowding out unregulated firms' disclosures. They suggest a notable crowding-out elasticity of -0.5 (=-0.35/+0.65), meaning unregulated firms reduce their disclosures by about 5 percent in response to a 10 percent increase in regulated firms' disclosure.[1] Our results also uncover one practical channel through which the crowding-out occurs: intermediaries such as credit bureaus reallocate their information-collection efforts. These intermediaries collect information on multiple firms. As information on regulated firms becomes more easily available, intermediaries appear to steer their collection toward these firms and away from related unregulated firms. As a result, unregulated firms can free-ride on regulated firms' disclosures.

Our paper contributes to the literature on financial-disclosure regulation (for a review, see Leuz and Wysocki 2016) by stressing that the effect of mandatory disclosure on the market-wide information environment (i.e., the total information disclosed by all firms) is muted by crowding-out effects. Crowding-out features prominently in theoretical work on firms' disclosure in the presence of endogenous information acquisition and information production by other market participants (e.g.,

[1] The magnitude of our estimates across our two settings is in line with the sizable impact of peer firms' disclosure spillovers on firms' investment decisions quantified in Kim (2020).

Admati and Pfleiderer 2000; Kurlat and Veldkamp 2015; Goldstein and Yang 2017). This line of work highlights that, as a result of crowding-out, disclosure regulation can ambiguously affect the market-wide information environment and the efficiency of resource allocation (e.g., Breuer et al. 2018; Jayaraman and Wu 2018; Bird et al. 2020; Breuer 2021). Extending this nascent literature, our paper provides direct evidence on a channel through which the effect of disclosure regulation on the market-wide information is muted: regulated firms' disclosures crowd out unregulated firms' disclosures.

Our paper echoes recent evidence on crowding-out and displacement effects of regulation in the economics literature (e.g., Crépon et al. 2013; Rotemberg 2019; Duguay et al. 2018). With respect to disclosure regulation, recent work by De Fontenay (2017) suggests that the bifurcated system in the United States, regulating public but not private firms, has contributed to the declining attractiveness of U.S. public capital markets (e.g., Gao et al. 2013; Dambra et al. 2015; Doidge et al. 2017). Consistent with this argument, our paper suggests that disclosure regulation benefits unregulated firms through information spillovers from regulated firms (e.g., Badertscher et al. 2013), while imposing costs (e.g., proprietary costs) on regulated firms (e.g., Bernard 2016). As both types of firms compete in the same product markets (e.g., Bens et al. 2011), differential disclosure regulation may contribute to the displacement of regulated firms by unregulated ones, rather than improving aggregate outcomes.

2. Prior literature

2.1. Spillovers of public disclosure

Firms' financial disclosures can provide information relevant for peer firms (e.g., Foster 1980; Foster 1981; Savor and Wilson 2016). For example, Durnev and Mangen (2009), Beatty et al. (2013), and Badertscher et al. (2013) document firms' financial disclosures are used by peers in deciding on their investments. In addition, Garmaise and Natividad (2016), Shroff et al. (2017), and Berger et al. (2017) show capital providers incorporate firms' financial disclosures in pricing and financing peer firms. By lowering capital providers' uncertainty about peer firms, firms' financial disclosures reduce

the demand for their peer firms' own disclosures. Consistent with reduced demand for peer firms' own disclosures in the presence of peer firms' disclosures, Baginski and Hinson (2016) show that firms start providing voluntary management forecasts if their peers cease to provide such forecasts. Capkun et al. (2019) provide similar evidence with respect to firms' nonfinancial disclosures. We contribute to this literature by documenting spillover effects arising from disclosure regulation affecting some, but not all firms.

2.2. Public disclosure of private firms

In contrast to the U.S., private firms' financial reporting is regulated in the EU. Therefore, public disclosure requirements importantly shape European private firms' public disclosure (e.g., Minnis and Shroff 2017; Bernard 2016; Breuer et al. 2018). Besides regulatory forces, economic forces affect private firms' public disclosure. Survey evidence in Arrunada (2011), Kitching et al. (2015), Minnis and Shroff (2017), and Gassen and Muhn (2018) suggests that private firms use public disclosure to reduce adverse selection concerns of existing and, in particular, prospective customers, suppliers, and creditors. In line with the survey evidence, Breuer et al. (2018), for example, document that private firms' public disclosures are useful for prospective creditors. Competitive and privacy concerns, by contrast, dissuade private firms from public disclosure (e.g., Minnis and Shroff 2017; Gassen and Muhn 2018). Dedman and Lennox (2009) and Bernard (2016), for example, find that private firms reduce their public disclosures if they perceive competitive disadvantages from revealing financial information to their competitors.

3. Hypothesis development

Absent disclosure regulation, a firm decides on its own disclosure by weighing benefits such as reduced adverse selection discounts against costs such as proprietary information loss (e.g., Jung and Kwon 1988; Verrecchia 1983, 1990; Admati and Pfleiderer 2000). In its disclosure decision, the

firm—explicitly or implicitly—takes peer firms' disclosure decisions into account if they provide correlated information relevant for its stakeholders (e.g., Dye 1990; Admati and Pfleiderer 2000).

Disclosures of financial statements provide correlated information allowing for direct and specific cross-firm learning (e.g., Foster 1981). In the presence of these information spillovers, own and peer firm disclosures are substitutes. Figure 1 presents the substitutive relationship between own and peer firm disclosures for the case of two correlated firms—one regulated and one not—in two scenarios—a voluntary and the mandatory regime—following the disclosure game of Admati and Pfleiderer (2000). In the voluntary regime, both firms take each other's disclosure into account leading to an equilibrium in which neither firm would prefer to increase or decrease its disclosure.

In the mandatory regime, disclosure requirements push the regulated firm's disclosure above its disclosure in a voluntary regime. This allows the unregulated firm to reduce its disclosure below its level in a voluntary regime for two reasons. First, the greater disclosure by peers reduces stakeholders' uncertainty about the firm and, hence, the firm's benefit of own disclosure. Second, the regulated peer firm cannot react to the unregulated firm's reduction of own disclosure because the regulated firm's best response function is constrained from below. The result is an equilibrium in which the unregulated firm can reduce its own disclosure and proprietary cost without suffering from an increase in its stakeholders' uncertainty. Stakeholders' uncertainty does not increase because the regulated firm cannot respond by reducing its disclosure when the unregulated firm reduces disclosure.

Based on this disclosure game, we predict that, if there are information spillovers from regulated firms, unregulated firms reduce their disclosure in the mandatory regime below what they would have provided in a voluntary regime. In our setting of German private firms (described below), we expect the substitutive relationship to primarily emerge because of information spillovers within information intermediaries such as banks and corporate credit bureaus catering to several customers

and suppliers (e.g., the *Creditreform* in Germany). These intermediaries collect information about multiple firms, allowing them to learn about unregulated firms from observing regulated ones in the same region and industry. Garmaise and Natividad (2016), for example, document that banks are more likely to lend to opaque firms if banks possess information about local peer firms. Accordingly, opaque firms can free-ride on their peers' information, reducing the value of their own information.

In contrast to our prediction of a substitutive disclosure relation due to information spillovers, alternative theories focusing on competitive spillovers (e.g., competition for attention) would suggest a complementary disclosure relation. Regulated firms' increased disclosures could, for example, shift market participants' attention toward the regulated firms. In this case, unregulated firms would increase their own disclosures to counteract the loss of market participants' interest (e.g., Ross 1977; Grossman and Hart 1980; Grossman 1981; Merton 1987; Fishman and Hagerty 1989; Lin et al. 2018). Absent any spillovers, regulated firms' public disclosures should not affect unregulated firms' disclosures. Accordingly, whether and how regulated firms' public disclosure affects unregulated firms' disclosure is ultimately an empirical question.

4. Institutional background

In accordance with the EU accounting directives, the disclosure regulation in Germany requires limited-liability, but not unlimited-liability firms to prepare and publicly disclose financial statements. The requirement aims to protect these firms' stakeholders via corporate transparency, because stakeholders have restricted recourse against firms with limited liability (e.g., Minnis and Shroff 2017). Although the requirement had been on the books since the 1980s, its enforcement had remained weak until a sweeping reform in 2007. Before the reform, firms were required to submit their financial statements to local courts and publish them in a dedicated newspaper (the paper-based *Bundesanzeiger*). As the local courts had no pro-active enforcement mandate and fines for non-compliance were negligible, firms' compliance rate was as low as 5-10 percent (e.g., Schlauss 2008).

Under mounting pressure from the EU, Germany substantially reformed the enforcement of its disclosure requirement in 2007 (e.g., Bernard 2016). It instituted a centralized enforcement by the Ministry of Justice, created a one-stop open-access electronic business register (electronic *Bundesanzeiger*), and introduced escalating fines for non-compliance. As a result, the compliance rate increased to above 90 percent, revealing the financial statements of more than 900 thousand limited-liability firms to the public for the first time.

Besides the stark difference in requirements between unlimited-liability vis-à-vis limited-liability firms, the regulation also makes a distinction between limited-liability firms of different sizes. Since its inception, it had required distinct minimum levels of disclosure for three firm-size groups ("small," "medium," and "large"). "Small" firms must disclose an unaudited, highly aggregated balance sheet with brief notes only. By contrast, "medium" firms must provide audited financial statements including a disaggregated balance sheet, an income statement, extended notes, and a management discussion. "Large" firms must additionally disclose a number of further line items and notes. Since 2012, the regulation includes a fourth group: "micro" firms. Compared to "small" firms, "micro" firms can further simplify their financial statement and opt to restrict the public access to them. The classification of firms into the distinct groups is based on total assets, sales, and employees thresholds. During our main sample period, for example, firms are classified as "small" ("medium") if they fall short of (exceeded) any two out of three firm size thresholds—total assets (€4.84 million), sales (€9.68 million), and employees (50)—for two consecutive years. Table A.1 provides a summary of the specific disclosure requirements and size-based thresholds.

In our empirical tests, we focus on two stark discontinuities created by the disclosure regulation: the extensive margin difference in disclosure requirements between unlimited-liability and limited-liability firms (setting 1: "unlimited vs. limited") and the intensive margin difference in disclosure requirements between "small" and "medium" firms (setting 2: "small vs. medium").

Among the various size categories, we focus on the "small" versus "medium" distinction because the disclosure requirements are starkly different between these two categories. This feature provides us with effectively regulated firms—"medium" firms around the small-medium thresholds—and effectively unregulated firms—"small" firms around the small-medium thresholds. By contrast, there are only minor differences in the requirements applying to "micro" vis-à-vis "small" firms and "medium" vis-à-vis "large" firms. As a result, firms around the micro-small and the medium-large thresholds are either both regulated or both unregulated. We exploit these alternative settings, which fail to simultaneously create regulated *and* unregulated firms around the thresholds, in placebo tests.

5. Data

For the "unlimited vs. limited" setting, we obtain internal data of *Creditreform*, Germany's leading corporate credit bureau, on the availability of unlimited-liability and limited-liability firms' financial statement information for the years 2000 to 2011 (via confidential access to the Mannheim Enterprise Panel). *Creditreform* offers information on corporate payment histories and credit risk to its clients, who request the information to assess the creditworthiness of their business partners. Besides clients' information requests (i.e., demand-side factors), *Creditreform*'s information collection is triggered by the availability of financial statements. Specifically, it uses both public sources (e.g., screening the electronic business register) and private information channels (e.g., direct information access) to collect firms' financial statements. The credit-bureau data allow us to evaluate whether the availability of unlimited-liability firms' financial statements in *Creditreform*'s database changed around the time of greater enforcement of limited-liability firms' public disclosure of their financial statements.

For the "small vs. medium" setting, we obtain comprehensive data on limited-liability firms' regulatory size classes ("small", "medium", or "large"), public filings (e.g., number of characters in a filing), and their stakeholders' disclosure demand (aggregated clicks on their filings) for fiscal years

2008 to 2011 from the electronic federal gazette (*Bundesanzeiger*).[2] We enrich those data with financial data from Bureau van Dijk's *dafne* database. While the *Bundesanzeiger* data are only available after the introduction of the electronic register (hence, preventing a time-series comparison around the 2007 enforcement reform), they allow us to examine comprehensive measures of "small" and "medium" firms' public disclosures. Table 1 summarizes the disclosure requirements and samples for the various settings in our study.

6. Empirical challenge

A suitable experiment to identify spillover effects of disclosure regulation features three groups of firms (e.g., Angelucci and Maro 2016; Baird et al. 2014; Boehmer et al. 2019): firms directly affected by the regulation (group 1); firms indirectly affected due to information spillovers (group 2); and firms unaffected by the regulation (group 3). The difference between indirectly affected and unaffected firms (groups 2 and 3) captures the spillover effect of interest to our study. We exploit institutional details and theory to identify groups of directly affected, indirectly affected, and unaffected firms. In particular, we use two different complementary approaches to uncover the crucial counterfactual: unaffected firms. In the "unlimited vs. limited" setting, we exploit a time-series approach (same firm, different time) to uncover this counterfactual. In the "small vs. medium" setting, we, by contrast, propose a cross-sectional approach (different firms, same time) to uncover it.

7. Evidence: "unlimited vs. limited" setting

7.1. Research design

In the "unlimited vs. limited" setting, we consider limited-liability firms after the enforcement reform as directly affected by the regulation (group 1), unlimited-liability firms after the enforcement

[2] To better reflect stakeholders' deliberate disclosure demand, the aggregated clicks are widely purged of automatized requests. A CAPTCHA test on the federal gazette provides a first filter, hampering automated requests. In addition, requests from anonymized IP addresses with extreme request frequencies have been removed from our aggregated measure of clicks.

reform as indirectly affected (group 2), and unlimited-liability firms before the reform as effectively unaffected (group 3). Given this setup, we capture the indirect impact of limited-liability firms' enforced disclosure (group 1) on the availability of unlimited-liability firms' financial statements by comparing unlimited-liability firms' financial statement availability in the post-enforcement period (group 2) with their financial statement availability in the pre-enforcement period (group 3). We summarize the correspondence between our theoretical concepts and their empirical implementation in Panel A of Table 2.

In our first specification, we test for the reform's direct effect on limited-liability firms and indirect effect on unlimited-liability firms by estimating the following basic specification:

$$Y_{i,t} = \beta_1 Limited_i + \beta_2 Limited_i \times Post_t + \beta_3 Unlimited_i + \beta_4 Unlimited_i \times Post_t + \varepsilon_{i,t}$$

where $Y_{i,t}$ is an indicator taking the value of one if the credit bureau obtained (full) financial statements of firm i in fiscal year t; $Limited_i$ is an indicator taking the value of one for limited-liability firms; $Unlimited_i$ is an indicator taking the value of one for unlimited-liability firms; and $Post_t$ is an indicator taking the value of one for fiscal years 2006 and later.[3] In this specification, we use the availability of firms' financial statements observed in the pre-enforcement period (i.e., before 2006) as a benchmark for firms' reporting in the absence of (strongly enforced) disclosure mandated for limited-liability firms.

Prior literature documents evidence of a strong direct effect of the enforcement reform on limited-liability firms' disclosure, substantially increasing their financial statement availability ($\beta_2 > 0$) (e.g., Bernard 2016; Breuer 2021). By contrast, we are interested in the indirect effect of

[3] The enforcement reform took place in calendar year 2007 and applied to firms' financial statements for fiscal year 2006 or later. We limit our sample to firms with a constant legal form (unlimited or limited) during the sample period to avoid undue influence from avoidance behavior. Our results (discussed below) are unaffected by this design choice, suggesting legal-form changes are not a major response to the reform, consistent with Vanhaverbeke et al. (2019).

the reform on the availability of unlimited-liability firms' financial statements. In the presence of information spillovers from limited-liability firms' enforced disclosure, we expect a decrease in the availability in unlimited-liability firms' financial statement availability after the reform ($\beta_4 < 0$). This decrease could reflect both, the credit bureau's reduced demand for unlimited-liability firms' financial statements and unlimited-liability firms' propensity to disclose their own statements in response to limited-liability firms' enforced disclosure.

In our second specification, we examine whether the potential indirect effect of limited-liability firms' mandated disclosure on other firms' financial statement availability is due to information spillovers. To that end, we estimate the following difference-in-differences specification in the spirit of Berg et al. (2020):

$$Y_{i,t} = \beta_1 Limited_i + \beta_2 Limited_i \times Post_t + \beta_3 Spillover_{c,j} \times Post_t + \gamma X_{i,t} + \alpha_i + \varphi_{c,t} + \lambda_{j,t} + \varepsilon_{i,t}$$

where $Spillover_{c,j}$ captures the amount of expected spillovers, approximated by the share of limited-liability firms, the number of firms, or the number of limited-liability firms in firm i's local industry (county: c, industry j). We include controls for firm size (employees and sales: $X_{i,t}$) and fixed effects for firms (α_i), county-years ($\varphi_{c,t}$), and industry-years ($\lambda_{j,t}$) to account for confounding differences across firms and differential trends at the local and industry level.

After accounting for the direct effect of greater enforcement on limited-liability firms' own financial statement availability ($\beta_2 > 0$), we expect the indirect effect of other regulated firms' disclosure (after the reform) on the availability of firms' own financial statements to be stronger if there are more regulated firms providing spillovers ($\beta_3 < 0$). We expect that this indirect effect reduces the availability of financial statements of both unlimited- and limited-liability firms. On the margin, the credit bureau can economize on the collection of information on both types of firms.

Hence, we do not differentiate between the spillover effects on unlimited- versus limited-liability firms in the above specification, which explores the heterogeneity in the indirect effect (Berg et al. 2020). This contrasts with and complements our first specification where we explicitly focus on the average effect on unlimited-liability firms.

7.2. Results

Descriptive Statistics

The *Creditreform* data capture several million firms (Panel A of Table 3), of which the majority are of unlimited liability (56 percent). The coverage of the credit bureau data closely mirrors official Census statistics (Breuer 2021). Notably, the credit bureau obtains (full) financial statements for a substantial share of these firms (38 percent of all firm-years).

Spillover effects

In Panel A of Table 4, we find that the availability of limited-liability firms' financial statements in the credit bureau data significantly increases after the enforcement reform (column 1). This finding is consistent with a strong direct effect of the enforcement reform on the public availability of financial statements, making it easier for the credit bureau to collect them. By contrast, we find that the availability of unlimited-liability firms' financial statements significantly decreases after the reform. This finding is noteworthy because the reform did not directly affect these firms. Accordingly, it is consistent with an indirect effect of limited-liability firms' financial statement availability on the availability of unlimited-liability firms' financial statements. The evidence of significant direct *and* indirect effects of the reform is robust to using a subset of unlimited-liability firms, which is more comparable to the regulated limited-liability firms (column 2), and to the inclusion of size controls to account for differences in the scale of business across the two types of firms (column 3). The magnitudes of our estimates suggest a substantial crowding-out: based on column 3, a 68

(=0.282/0.414) percent increase in the availability of regulated firms' financial statements is accompanied by a 43 (=- 0.136/0.313) percent decrease of unregulated firms' financial statements.

In Figure 2, we plot the time-series trends of limited- and unlimited liability firms over our sample period. Consistent with our regression results, Figure 2 documents that the availability of limited- and unlimited-liability firms is at similar levels before the reform, but starkly diverges afterwards. The time-series patterns are highly consistent with the predicted crowding-out.[4] The availability of limited-liability firms' financial statements increases significantly for fiscal year 2006 and thereafter. The 2006 financial statements became publicly available in late 2007 only (due to an approximately one year publication lag). Consistent with this timing, the availability of unlimited-liability information remains nearly unchanged for fiscal year 2006 but noticeably declines thereafter (i.e., when limited-liability firms' financial statements became public). The parallel trends in the availability of limited- and unlimited-liability firms' financial statements before the reform and the distinct timing of the divergence around the actual publication of the mandated financial statements after the reform provide confidence that the documented patterns reflect the reform's direct impact on limited-liability firms and its indirect impact on unlimited-liability firms.

Cross-sectional variation in strength of information spillovers

In Panel B of Table 4, we assess whether the indirect effect of the reform varies predictably with measures of the expected strengths of information spillovers from regulated peers. In column 1, we use the share of limited-liability firms in given local industry as our measure of spillover strength. The higher this share, the more this local industry is affected by the enforcement reform (e.g., Breuer 2021). Controlling for the direct effect of the regulation on limited-liability firms, we find that a higher

[4] The same patterns emerge when comparing within firms (using firm-fixed effects) and controlling for size (Figure A.2). Notably, the temporal patterns are markedly different from the short-lived slump in economic activity in Germany in fiscal year 2009, caused by the great recession (e.g., Vanhaverbeke et al. 2019); allaying concerns about a confounding impact of the great recession.

share of limited-liability firms in a local industry is associated with a significant reduction of the availability of a given firm's financial statements, after the reform (column 1). The same pattern emerges using the number of limited-liability firms in the same local industry as alternative proxies for the spillover strength (column 2). These results are consistent with information spillovers originating from regulated peers crowding out the demand for and supply of unregulated firms' own financial statements.

Collectively, the credit-bureau evidence is consistent with the predicted crowding-out due to regulated firms' reporting. It suggests an important channel for the crowding-out: information intermediaries, such as credit bureaus, shift their information collection toward readily available information of related firms. The credit-bureau evidence, however, is also subject to important limitations. For one, it widely relies on a time-series comparison, making it prone to confounding events. For another, it only provides evidence on the collection efforts of one particular, though important, stakeholder interested in firms' financial statements. It does not allow us to make claims about the information demand of all stakeholders nor about firms' actual disclosure decisions (which may be unaffected). To address these limitations, we turn to the "small vs. medium" setting which employs an alternative identification strategy and allows examining firms' actual disclosure decisions.

8. Evidence: "small vs. medium" setting

8.1. Research design

In the "small vs. medium" setting, we consider "medium" firms around the small-medium thresholds to be directly affected (group 1), "small" firms around the small-medium thresholds to be indirectly affected (group 2), and larger firms far from the small-medium threshold to be unaffected (group 3) by the increased disclosure requirements applying to "medium" firms. Given this setup, we capture the indirect impact of "medium" firms' disclosures (group 1) on "small" firms' disclosures by comparing "small" firms' disclosures (group 2) with larger firms' disclosures (group 3), while

accounting for size-related differences. Panel B of Table 2 summarizes the correspondence between our theoretical concepts and their empirical implementation.

Figure 3 illustrates our cross-sectional research design graphically. Panel A of Figure 3 plots the disclosure of firms across firm sizes in a counterfactual regime without differential disclosure requirements but with a requirement to disclose ("voluntary regime"). Consistent with ample empirical evidence and theory, we draw voluntary disclosure as an increasing function of firm size. As firm size increases, firms more frequently rely on *public* rather than private disclosure in communicating with their numerous stakeholders (e.g., Dedman and Lennox 2009), because public disclosure allows them to reach all their stakeholders at once.

The disclosure regulation has a direct effect on "medium" firms (group 1) around the small-medium threshold. The extensive minimum requirements applying to "medium" firms push their disclosures in the mandatory regime above their disclosures in the voluntary regime (Panel B of Figure 3). By contrast, "small" firms (group 2) around the threshold are similar to "medium" firms in terms of size and disclosure incentives, but face only low disclosure requirements. Hence, we expect that "small" firms around the threshold disclose more in a voluntary regime than their minimum requirements because "small" firms around the threshold are the largest ones categorized as "small" and are among the largest 10 percent of all limited-liability firms (Figure A.3). As such they likely exhibit substantially larger disclosure incentives than the typical "small" firm for which the minimum requirements are set.[5]

In the presence of information spillovers, the disclosure requirements applying to "medium" firms indirectly affect "small" firms around the threshold. Thus, under crowding-out, we expect these "small" firms to provide fewer disclosures in the mandatory regime than in the counterfactual

[5] A substantial fraction of "small" firms provides disclosures in excess of the required minimum (Figure A.1), allaying concerns that all "small" firms, even the larger ones around the threshold, provide effectively mandatory disclosures.

voluntary regime (Panel C of Figure 3). Finally, we expect larger firms' disclosures to be unaffected by their own minimum disclosure requirements as well as by information spillovers from comparably small "medium" firms' disclosures in the mandatory regime (Panel D of Figure 3). Accordingly, the larger firms' observed disclosures in a mandatory regime correspond to their disclosures in a voluntary regime ($Q_3^{Mandatory} = Q_3^{Voluntary}$; we provide supporting evidence in Section 8.3).

This correspondence allows us to estimate the relationship between firm size and firms' disclosure in a voluntary regime. Specifically, we derive a multiple ($\beta = Q_3^{Voluntary} / N_3$) relating firms' disclosures in a voluntary regime to firm size (N). Assuming that disclosures in a voluntary regime increase at an approximately constant rate with size, we can use larger firms' multiple observed in the mandatory regime to infer the disclosure of other firms in a voluntary regime. Firm *i*'s *predicted* disclosures in a voluntary regime would then be given by $\hat{Q}_i^{Voluntary} = \left(Q_3^{Voluntary} / N_3\right) N_i = \beta N_i$.

We construct the benchmark multiple β—the relation between firms' disclosure in a voluntary regime and their size—by dividing the larger firms' disclosures by the number of clicks for their disclosures on the official publication platform ("disclosure/click multiple"). We use the number of clicks as the relevant measure of firms' size because it captures the number of stakeholders interested in firms' disclosures, which is a major determinant of stakeholders' disclosure demand and hence firms' disclosure incentives (Breuer et al. 2020a). As benchmark firms, we use the larger firms in our sample, defined as firms with total assets of about €66 million.[6] For these firms, the empirical disclosure/click multiple is about 365, because they disclose about 19,000 characters ($Q_3^{Voluntary}$) and

[6] We define our benchmark firms based on their economic size (in terms of total assets), not their regulatory size class. Our set of benchmark firms contains larger firms. Many of these firms are classified as "large" firms. The larger firms, however, also include some of the larger "medium" and largest "small" firms. To distinguish between firms' economic size and regulatory size classes, we use quotation marks when referring to regulatory size classes ("small," "medium," "large").

receive about 52 clicks (N_3). Accordingly, for a "small" or "medium" firm i with twenty-two clicks ($N_i = 22$), for example, we predict a disclosure of 8,030 characters in a voluntary regime ($\hat{Q}_i^{Voluntary} = \beta N_i = 365 \times 22$).[7]

Our approach makes a cross-sectional comparison. It assumes that what the larger firms disclose per stakeholder (disclosure/click multiple) provides an accurate benchmark for what our "small" firms would disclose per stakeholder absent spillovers from "medium" firms' disclosures. This assumption would be violated if the true relation between disclosure and clicks varied across firms of different sizes. One may, for example, worry that not all clicks capture "beneficial" disclosure demand. Rather, some clicks might stem from nosy neighbors or competitors causing privacy or proprietary costs. While such "costly" clicks per se do not invalidate our approach, they would raise concerns if their relative share among all clicks were to vary across firm sizes. If anything though, we expect the relative share of "costly" clicks to increase with firm size: additional clicks may disproportionally stem from the interested public rather than suppliers or creditors. This would imply that the larger firms' disclosure/click multiple underestimates "small" firms' disclosure incentives in a voluntary regime, biasing against finding support for greater disclosures in a voluntary than the mandatory regime. (We provide empirical evidence in support of the plausibility of our identifying assumption in section 8.3.)

In our main test, we explore the difference between firms' *own* disclosures observed in the mandatory regime and disclosures predicted in the voluntary regime (Panel E of Figure 3), labeled "abnormal disclosure." We focus on abnormal disclosures by "small" and "medium" firms around

[7] We calculate the benchmark firms' disclosures and clicks using a kernel-weighted local average of firms within the (log) total-assets range of 18+1/-1, without restricting the sample of benchmark firms to a particular regulatory size class (e.g., "large" firms). Our inferences remain unchanged when using a lower (log) total-assets range of 17+1/-1. They are also unchanged when restricting the benchmark firms in the total-assets range to "medium" and "large" firms or "large" firms only. The benchmark multiples are 376 and 330, respectively, in these restricted cases.

the small-medium threshold as this is where we expect low (high) disclosure requirements to apply to "small" ("medium") firms relative to their size and disclosure incentives. If there is a direct effect of the disclosure regulation on "medium" firms' disclosures, we expect their disclosures in the mandatory regime to exceed their disclosures in the voluntary regime (positive abnormal disclosures). If there is an indirect effect of the disclosure regulation on "small" firms' disclosures due to information spillovers, we expect their disclosures in the mandatory regime to fall short of their disclosures in the voluntary regime (negative abnormal disclosures).

In our second set of tests, we explore whether the disclosure gap between "small" and "medium" firms varies with the expected strength of the information spillovers. We focus on variation in the disclosure gap between "small" and "medium" firms, rather than variation in "small" firms' disclosures, to account for confounding factors correlated with peer-group characteristics (e.g., economic differences across industries and regions).

We estimate the following specification resembling a difference-in-differences design (first difference: "small" vs. "medium"; second difference: high vs. low spillovers):

$$Log(Q_{i,t}^{Mandatory}) - Log(Q_{i,t}^{Voluntary}) = \delta_1 Small_{i,t} + \delta_2 Small_{i,t} \times Spillover_{c,j,t} + \alpha_{c,j,t} + \phi f_{i,t} + \varepsilon_{i,t},$$

where i, t, c, and j denote the firm, year, county, and industry classification, respectively. Our dependent variable, $Log(Q_{i,t}^{Mandatory}) - Log(Q_{i,t}^{Voluntary})$, is a firm's abnormal disclosure in a given year (defined as the difference between the logarithms of its mandatory and voluntarily disclosure). $Small_{i,t}$ is an indicator variable taking the value of one for firms classified as "small," and zero for firms classified as "medium" in a given year. $Spillover_{c,j,t}$ is a proxy for the expected strength of information spillovers within a peer group. $a_{c,j,t}$ represents the fixed effect for a given county-industry-year combination. $f_{i,t}$ is a control function including (log) firm sizes (total assets, sales, and

employees) centered at the small-medium thresholds and (log) firm age to focus on otherwise similar "small" and "medium" firms around the thresholds.[8]

δ_1 captures the difference between otherwise similar "small" and "medium" firms' abnormal disclosures for firms with limited or no information spillovers. δ_2, our coefficient of interest, captures the incremental impact of the expected strength of the spillover effect in a given county, industry, and year on the difference between otherwise similar "small" and "medium" firms' abnormal disclosures. If there are information spillovers due to the greater disclosure requirements applying to "medium" firms, we expect "small" firms around the small-medium threshold to reduce their abnormal disclosures more (compared to their "medium" peers) when information spillovers are stronger. Hence, we expect δ_2 to be negative.

Our main and cross-sectional tests exhibit distinct benefits. The key benefit of our main test is that we compare "small" and "medium" firms' disclosures observed in the mandatory regime with their *own* disclosures predicted for the voluntary regime. This feature allows us to separately identify the direct and indirect effect of the "medium" firm disclosure requirements on "medium" and "small" firms around the small-medium threshold. By contrast, in our cross-sectional tests, we investigate the total (direct plus indirect) effect of the "medium" firm disclosure requirements by comparing (abnormal) disclosures of "small" firms with those of "medium" firms. The key benefit of our cross-sectional approach is that it relaxes the reliance on the disclosure/click benchmark. As both, "small" and "medium" firms' abnormal disclosures are determined relative to the larger firms' disclosure/click benchmark, taking the difference between "small" and "medium" firms' abnormal disclosures cancels the benchmark out.

[8] We allow the coefficients on the size dimensions to differ above and below the respective size-based thresholds. For more details on this approach, see also Breuer et al. (2018: 1275-77).

8.2. Results

Descriptive Statistics

Panel A of Figure 4 plots firms' disclosures (measured by the number of characters) observed for the mandatory regime and predicted for the voluntary regime as a function of firm size, measured by total assets. In the left tail of the firm-size distribution, we observe that most "small" firms' disclosures in the mandatory regime exceed their disclosures predicted for the voluntary regime, consistent with the, on average, positive abnormal disclosures in Panel B of Table 3 for "small" firms. Yet, as "small" firms' size increases, their predicted disclosures in a voluntary regime likewise increase. For firms with total assets exceeding about €1.2 million (corresponding to a logarithm of about 14 on the x-axis in Figure 4), disclosures predicted for the voluntary regime start exceeding the disclosures observed in the mandatory regime. This pattern is consistent with "small" firms around the small-medium thresholds being effectively unregulated.

In the right tail of the firm-size distribution, observed disclosures in the mandatory regime are generally undistinguishable from predicted disclosures in the voluntary regime for a wide range of firm sizes among the larger firms. In part, this pattern emerges by construction because we use larger firms' disclosure patterns as the benchmark for disclosures in a voluntary regime. We calibrate predicted disclosures in a voluntary regime to the observed disclosures in the mandatory regime for larger firms with total assets of about €66 million, corresponding to a logarithm of 18 on the x-axis in Figure 4. Yet, observed and predicted disclosures continue to overlap even for large firms of substantially smaller size than our benchmark firms. The overlap approximately extends to firm sizes of about €15 million total assets, corresponding to a logarithm of 16.5 on the x-axis in Figure 4. This pattern supports the validity of our disclosure/click multiple: for firms presumably unaffected by regulatory information spillovers, predicted and observed disclosures overlap, implying that the disclosure/click multiple does not appear to strongly vary with firm size.

Spillover effects

Around the small-medium (total-assets) threshold, Panel B of Figure 4, which plots the difference between firms' disclosures in the mandatory regime and their predicted disclosures in the voluntary regime, provides prima facie evidence on the existence of spillover effects. Disclosures in the mandatory regime significantly deviate from disclosures in the voluntary regime around the small-medium threshold. In particular, firms above (to the right of) the threshold—predominantly "medium" firms—exhibit on average slightly greater disclosures in the mandatory than in the voluntary regime (consistent with positive abnormal disclosures in Panel C of Table 3 for "medium" firms). By contrast, firms just below (to the left of) the threshold—predominantly "small" firms—exhibit on average lower disclosures in the mandatory than in the voluntary regime consistent with crowding-out due to information spillovers.[9]

To strengthen the identification of a direct effect of the regulation on "medium" firms and an indirect spillover effect on "small" firms, we zoom into the area right around the small-medium discontinuity. To determine firms' effective distance to the regulatory discontinuity, we construct a distance measure ("Least Distance to Threshold") which accounts for the multivariate (total assets-, sales-, and employees-based) assignment rule of the regulation (e.g., Breuer et al. 2018; Abdulkadiroğlu et al. 2019).[10] Figure 5 plots abnormal disclosures for "small" firms to the left of the combined threshold and for "medium" firms to the right of the combined threshold. At the combined threshold, the "medium" firms exhibit abnormal disclosures of about 9,000 characters, suggesting that the

[9] Around the total-assets threshold, there are both "small" and "medium" firms as the regulatory size-class is determined by the combination of three size dimensions, not just total assets, in two consecutive years. Accordingly, the local disclosure average depicted in our figure combines both "small" and "medium" firms' disclosure. Before the total-assets threshold, the local average primarily reflects the disclosure of "small" firms, as they are the dominant firm-type below the threshold. Above the threshold, by contrast, the local average increasingly reflects the disclosure of "medium" firms as their share increases markedly after the threshold.

[10] The combined distance measure closely approximates the regulation's assignment rule, as shown by the stark change in the probability of being a "medium" firm right around the combined threshold (Figure A.4). To determine the combined distance measure, however, we need data on both firms' mandatorily reported total assets and their voluntarily reported sales and employees. In untabulated tests, we corroborate that our results are not unduly driven by this sample selection.

disclosure mandate indeed pushes their disclosures in the mandatory regime above what these would have been in the voluntary regime. By contrast, similarly sized "small" firms at the combined threshold exhibit abnormal disclosures of about -2,000 characters, suggesting that they reduce their disclosures in the mandatory regime, relative to what they would have provided in the voluntary regime.

We corroborate and sharpen these findings using multivariate regressions to account for all three regulatory size dimensions and firm age at the same point in time. In our regressions, we estimate the average abnormal disclosures separately for "small" and "medium" firms right *at* the three size-thresholds by controlling for firms' distance to the three thresholds. The regressions support our graphical evidence. "Medium" firms exhibit positive abnormal disclosures of about 8,440 characters (amounting to 2.8 pages or 65 percent of their disclosures in a voluntary regime), whereas "small" firms exhibit negative abnormal disclosures of about 3,580 characters (amounting to 1.2 pages or 35 percent of their disclosures in a voluntary regime) (Table 5). Consistent with our prediction, these patterns suggest that firms reduce their own disclosures when other firms are forced to increase theirs. The magnitude of the crowding-out of firms' disclosures implied by the "small vs. medium" setting is strikingly consistent with the magnitude of crowding-out of stakeholders' demand previously document in the "unlimited vs. limited" setting.[11]

Cross-sectional variation in strength of information spillovers

The preceding analysis suggests that "small" firms reduce their disclosures in the mandatory regime compared to the voluntary regime, whereas the increased disclosure requirements push "medium" firms above their disclosure levels of the voluntary regime. As a result, there is a gap

[11] The "unlimited vs. limited" setting implies an elasticity of unregulated firms' disclosure *demand* with respect to regulated firms' disclosure of about -0.64 (regulated: +68%; unregulated: -43%). Similarly, the "small vs. medium" setting implies an elasticity of unregulated firms' *disclosure* with respect to regulated firms' disclosure of about -0.54 (regulated: +65%; unregulated: -35%). These sizeable crowding-out elasticities are consistent with the structural estimates in Kim (2020).

between "small" and "medium" firms' abnormal disclosures. If this gap is due to information spillovers, we expect it to widen when information spillovers are stronger.

To test this prediction, we exploit variation across different peer groups in terms of the expected strength of the spillover effect. We define peer groups at the local industry level. This definition is based on prior literature documenting information commonalities among firms operating in local industry clusters (Ma 2017; Engelberg et al. 2018) and takes into account that our private sample firms likely operate in local product and labor markets. We expect information spillovers to be stronger when firms' fundamentals are more highly correlated, when there are more regulated peers, and when regulated peers provide greater abnormal disclosures because stakeholders can learn more about unregulated firms by observing regulated firms.

We report the results of our cross-sectional tests in Table 6. We find that the difference between "small" and "medium" firms' abnormal disclosures is larger in industries with a high comovement in asset growth, as indicated by the negative and significant coefficient on $Small_{i,t} \times High\_R2_j$ (column 1 of Panel A).[12] This finding supports the notion that firms and their stakeholders can learn more from peers' disclosures, and hence benefit less from firms' own disclosures, when firms' fundamentals are highly correlated (Admati and Pfleiderer 2000, p. 499). Similarly, we find that the abnormal disclosure gap between "small" and "medium" firms increases with (the natural logarithm of) the number of "medium" peers as reflected by the negative and significant coefficient on $Small_{i,t} \times \#\ of\ Medium\ Peers_{c,j,t}$ (column 1 of Panel B). This finding is

[12] To proxy for comovement in fundamentals, we obtain the R-squared from industry-specific regressions of firms' standardized asset growth on year-fixed effects, following Guiso and Parigi (1999) and Badertscher et al. (2013). This measure reflects how much of firms' variation in year-over-year asset growth can be explained by factors shared by all industry peers. This industry-specific R-squared is, however, correlated with the number of firms operating in a given industry. In particular, industries with only few firms will exhibit a higher R-squared. To purge the R-squared variation off of variation in the number of peer firms (the role of which we investigate separately using our second proxy), we residualize our R-squared measure with respect to industry size (measured by the number of firms in a given industry). We define high comovement firms as those in the top quartile of the distribution of our R-squared measure. In untabulated tests, we find similar results when using a firm-specific R-squared and when clustering standard errors by industry.

consistent with the idea that regulatory spillovers and associated free-rider concerns increase in the number of peers. Lastly, we find that the abnormal disclosure gap increases when "medium" peers provide, in total, greater abnormal disclosures (column 2 of Panel B). This finding is consistent with "small" firms around the small-medium thresholds reducing their disclosures to a greater extent when the regulation forces their "medium" peers' to disclose more, enhancing the market-wide information environment (Shroff et al. 2017).

We find similar patterns in the gap between "small" and "medium" firms' raw disclosures observed in the mandatory regime (column 2 of Panel A and columns 3 and 4 of Panel B). These results suggest that the widening of the abnormal disclosure gap is not merely driven by higher disclosure demand (i.e., clicks) for "small" firms' disclosures (e.g., due to more peers), but due to "small" firms downward adjusting their actual disclosures when their "medium" peers disclose more.

Finally, we confirm that "small" firms increase the disclosure gap when spillovers from "medium" firms are stronger for two alternative voluntary disclosure proxies: firms' publication lag (Litjens and Suijs 2014) and sales disclosure (Dedman and Lennox 2009). In particular, sales disclosure provides us with further evidence on a key individual item of interest disclosed by firms that is of relevance to information intermediaries (such as, credit bureaus) and to stakeholders of peer firms. We show that "small" firms—relative to otherwise similar "medium" firms—delay the publication of their disclosures (Litjens and Suijs 2014) and are less likely to make voluntary sales disclosures when firms are highly correlated (columns 3–4 of Panel A) or when they operate in a richer information environment due to their "medium" peers (columns 5–8 of Panel B). Notably, these alternative voluntary disclosure proxies—unlike the number of characters—are not directly affected by

differential disclosure requirements between "small" and "medium" firms.[13, 14]

Taken together, the cross-sectional patterns support the notion that "small" firms' negative abnormal disclosures are due to information spillovers from "medium" firms' disclosures and not due to both "small" and "medium" firms merely supplying the minimum disclosure levels.

8.3. Supplemental results

Our cross-sectional approach in the "small vs. medium" setting relies on a less familiar identifying assumption (e.g., compared to our time-series approach) and a number of necessary conditions. In this section, we briefly summarize supplemental results providing support for the plausibility of our identifying assumption, confirming the validity of the necessary conditions, assessing an alternative proprietary-cost-related explanation, and documenting the absence of spillover effects in placebo settings. (For more detail, see the description of supplemental tests in the appendix.)

Identifying assumption

Our approach relies on the identifying assumption that the larger firms' disclosure/click multiple provides a plausible benchmark for smaller firms' disclosure/click multiples in a voluntary regime. We document two pieces of evidence supporting this assumption. First, we find that the propensity to disclose financial statements in the pre-enforcement era is, if anything, slightly higher for smaller firms than larger firms, after adjusting for stakeholder interest (i.e., relative to online clicks) (Figure A.5). Second, we find that the correlation of firms' observed disclosure/click multiples with

[13] Table 6 also shows that, when there are no (or low) information spillovers, "small" firms publish their financial statements more quickly (negative coefficient on "Small" in columns 5 and 6 of Panel B) and are more likely to make voluntary sales disclosures (positive coefficient on "Small" in columns 7 and 8 of Panel B). These differences plausibly reflect direct effects of the different disclosure requirements. First, "medium" firms likely need longer to prepare and publish their more extensive and audited financial statements. Second, given that "medium" firms have to provide an income statement (with an option to disclose gross profit, rather than sales), providing sales information inevitably reveals their gross profit margin. Since this is a key metric of interest to competitors (Dedman and Lennox 2009), the incremental costs of sales disclosure (in addition to other income statement information) is likely higher for "medium" firms. Given these level differences, we explicitly use a difference-in-differences design and focus on the relevant interaction term.

[14] The samples for publication lag and voluntary sales disclosure are substantially larger. The sample for publication lag is larger because the publication lag, unlike disclosure and click data, is available for firms for the entire sample. The sample for voluntary sales disclosure is even larger because it does not restrict the sample to firms with sales information.

firm size (i.e., total assets) is, if anything, negative (Table A.2). Collectively, these findings suggest the larger firms' disclosure/click multiple is a reasonable benchmark for "small" firms' disclosure incentives in the voluntary regime. If anything, the benchmark appears to understate "small" firms' disclosure incentives, working against finding negative abnormal disclosures for "small" firms.[15]

Necessary conditions

Our research design relies on four central conditions. First, we require that at least some "medium" firms are effectively regulated around the small-medium thresholds (NC 1). In support of this condition, we document that firms switching from the "small" into the "medium" category exhibit a substantial increase in disclosures (column 1 of Table 7). Second, we require that at least some "small" firms are effectively unregulated around the small-medium thresholds (NC 2). In support of this condition, we document that a non-negligible fraction of "small" firms, especially those around the thresholds, provides disclosure items not required by the regulation (e.g., 42 percent of "small" firms around the total-assets threshold disclose sales). Third, we require that larger firms are effectively unaffected by their own disclosure requirements and spillovers from "medium" firms' disclosure requirements (NC 3). In support of this condition, we document that firms switching from the "medium" into the "large" category do not exhibit a significant increase in disclosures (column 2 of Table 7). Fourth, we require that our proxy of firms' stakeholder breadth (i.e., their number of clicks) is widely unaffected by their own or other firms' disclosure requirements (NC 4). In support of this condition, we document that firms switching from the "small" into the "medium" category do not experience a substantial increase in the number of clicks (column 4 of Table 7).[16] While we provide

[15] Consistent with a potential bias against a crowding-out effect, we document a slightly higher crowding-out estimate in the "unlimited vs. limited" setting than in the "small vs. medium" setting.

[16] Notably, the fact that the number of stakeholders, as measured by clicks, is unaffected by the requirements does not imply that the net benefit per stakeholder remains unaffected. To the contrary, our main results suggest stakeholders benefit more from "medium" firms' disclosures, which in turn substitutes for and reduces stakeholders' net benefit derived from "small" firms, manifesting in fewer disclosures provided per click by "small" firms.

evidence in support of all four conditions, we also note that violations of the necessary conditions would typically work against finding the predicted crowding-out.

Alternative explanation

We interpret the results in the "small vs. medium" setting as suggesting that information spillovers of regulated firms' disclosures crowd-out unregulated firms' disclosures. An alternative explanation could be that reduced disclosures of "small" firms' below the small-medium thresholds reflect the avoidance behavior of high proprietary-cost firms. Bernard et al. (2018), for example, document that some firms try to stay below the thresholds to avoid proprietary costs. Hence, firms just below the thresholds could exhibit low disclosure levels due to sorting on proprietary costs of disclosure rather than spillover effects.

Two pieces of evidence speak against the alternative proprietary-cost explanation. First, we observe that "small" firms over an extended range before the threshold disclose less than expected in a voluntary regime. For the total asset threshold, for example, we observe less disclosure starting for firms with total assets of around 1 million while the threshold is at 4.84 million. By contrast, Bernard et al. (2018) document primarily local avoidance right around the threshold. Second, we document that our results are strongest in local markets with *many* ("medium") firms (Panel B of Table 6), consistent with information spillovers (Admati and Pfleiderer 2000). By contrast, prior literature in the German setting documents that the proprietary costs of disclosure are largest in local markets with *few* existing firms (e.g., Breuer et al. 2018; Breuer et al. 2020b; Breuer 2021). In those markets, "small" firms can hide their profitability from potential competitors. In crowded markets, by contrast, firms earn limited profits to begin with and are known by their local competitors through frequent interactions in the same market place. Accordingly, our cross-sectional results support our information-spillover explanation instead of the alternative proprietary-cost explanation.

Placebo tests

In our tests, we focus on firms around the small-medium thresholds because of the stark difference in mandatory requirements applying to otherwise similar "small" and "medium" firms. This feature provides us with both effectively regulated ("medium") and effectively unregulated ("small") firms (satisfying NC 1 and NC 2). In placebo tests, we exploit two alternative settings where either all firms or no firms are effectively regulated.

The first placebo test uses an additional size category that was introduced after our main sample period. Since 2012, relaxed disclosure requirements apply to so-called "micro" firms (with total assets €0.35 million, sales below €0.70 million, and less than ten employees). "Micro" firms have an option to further aggregate their balance sheet and restrict public access to their financial statements. Around the micro-small threshold, both "micro" and "small" firms around the micro-small thresholds are effectively regulated. We consider "small" firms around the thresholds as effectively regulated by their minimum requirements because they are of very limited size. Similarly, we consider "micro" firms around the thresholds as effectively regulated because the "micro" exemption only marginally reduced the required disclosure items (Table A.1). Consistent with these arguments, both "micro" and "small" firms around the micro-small thresholds exhibit *positive* abnormal disclosures (Figure A.6).

In the absence of unregulated firms, we neither expect nor detect spillover effects of "small" firms' disclosures on "micro" firms' disclosures in the mandatory regime. In particular, we find no significant evidence that "micro" firms around the micro-small threshold reduce their disclosures more than comparable "small" firms when facing more "small" peers, when their "small" peers provide greater abnormal disclosures, and when they operate in industries with high asset comovement (Panel A of Table 8).

The second placebo test focuses on firms around the medium-large thresholds. In this setting, both "medium" and "large" firms around the medium-large thresholds are effectively unregulated. We consider "medium" firms around the thresholds as effectively unregulated by their minimum requirements because they are of substantial size. Similarly, we consider "large" firms around the thresholds as effectively unregulated because the additional requirements pertaining to "large" firms (relative to "medium" firms) are quite limited. Consistent with these arguments, both "medium" and "large" firms around the medium-large thresholds exhibit no clear evidence of abnormal disclosures (columns 2 and 4 of Table 7).

In the absence of regulated firms, we neither expect nor detect any spillover effects of "large" firms' disclosures on "medium" firms' disclosures in the mandatory regime. In particular, we find that the gap between "medium" and "large" firms' disclosures marginally increases in the number of "large" peers (inconsistent with a spillover effect) and does not vary with the expected strength of the spillover effect as proxied by our measure of high asset comovement in a given industry (Panel B of Table 8). While these results are consistent with "large" firms being, on average, unregulated, in certain counties and industries, some "large" firms could still be pushed above their voluntary disclosure levels by the regulation, leading to spillovers affecting "medium" firms' disclosures. Consistent with this idea, we find that "medium" firms' reduce their own disclosure if the "large" peers located in their particular county and industry are actually pushed above their voluntary disclosure levels (columns 3 and 6). Hence, we find results similar to those in our "small vs. medium" setting and consistent with our prediction of a spillover effect in settings where disclosure requirements effectively regulate "large" firms.[17]

[17] In untabulated tests, we do not find any crowding out using total "large" firm disclosures instead of total "large" firm abnormal disclosures. These results reinforce the notion that "large" firms' disclosures, on average, are unconstrained and do not provide (regulatory) information spillovers due to the "large" firm disclosure requirements.

9. Conclusion

We document that mandating some firms' disclosures appears to reduce *other* firms' disclosures. This evidence of crowding-out provides empirical support for theoretical work on the impact of disclosure regulation on firms' disclosures (Admati and Pfleiderer 2000) and adds to recent empirical work on the interaction of firms' and information intermediaries' information production efforts (e.g., Balakrishnan et al. 2014; Baginski and Hinson 2016; Breuer et al. 2018).

Our study is important because spillovers are relevant for regulators in designing disclosure regulations. Our evidence implies that disclosure regulation, which forces some firms to provide more disclosures, does not improve the market-wide information environment one-for-one, because unregulated firms respond by reducing their own disclosures. While such spillover effects mute its impact on the market-wide information environment, disclosure regulation can come with important distributional effects. It redistributes the incidence of costs and benefits of firms' disclosures. Notably, it not only levies costs on regulated firms, but also conveys benefits on unregulated firms (e.g., Breuer and Breuer 2021). The desirability of this redistribution depends on the relative disclosure costs of regulated vis-à-vis unregulated firms (Admati and Pfleiderer 2000). While these relative costs are unknown to us, we highlight the possibility that, in practice, the redistribution could be quite inefficient. For one, regulators, similar to us, may have a limited understanding of firms' relative disclosure costs, hampering the efficient targeting of disclosure regulation (e.g., Demsetz 1969). For another, disclosure regulation shifts the burden of disclosure from voluntarily disclosing firms toward involuntarily disclosing firms. By revealed preference, involuntarily disclosing firms exhibit lower benefits or higher costs of disclosure than voluntarily disclosing firms. The latter case (i.e., higher costs) would be a reason for concern. Hence, spillover effects *per se* do not justify the regulation of disclosure.

Variable Appendix

Variable Definitions		
Variable Name	Source	Definition
Dependent Variables		
Financial Statement Availability	Creditreform	Indicator variable taking the value of 1 if the firms' financial statements are available in the credit bureau data, 0 otherwise
Disclosure in Mandatory Regime	Federal Gazette	Number of characters in a filing, observed in the mandatory disclosure regime
Clicks	Federal Gazette	Number of online views of a filing during the twelve months after its publication
Disclosure in Voluntary Regime	Federal Gazette	Disclosure amount predicted for the a voluntary regime, calculated as number of clicks multiplied by a disclosure/click-multiple
Abnormal Disclosure	Federal Gazette	Difference between the number of characters observed in the mandatory and predicted for the voluntary regime
Publication Lag	Federal Gazette	Number of days between fiscal year-end and publication date
Voluntary Sales Disclosure	Federal Gazette, Bureau van Dijk	Indicator variable taking the value of 1 if the firm voluntarily provides sales information in a given year, 0 otherwise
Disclosure Classification Variables		
Limited	Creditreform	Indicator variable taking the value of 1 if the firm's legal form is regulated by the disclosure regulation (AG, GmbH, GmbH & Co. KG), 0 otherwise
Unlimited	Creditreform	Indicator variable taking the value of 1 if the firm's legal form is unregulated by the disclosure regulation (OHG, KG, etc.), 0 otherwise
Post	Creditreform	Indicator variable taking the value of 1 for fiscal year 2006 and after, 0 otherwise
Micro	Federal Gazette	Indicator variable taking the value of 1 for firm-years in which a firm is classified by the Federal Gazette as "micro," 0 if it is classified as "small."
Small	Federal Gazette	Indicator variable taking the value of 1 for firm-years in which a firm is classified by the Federal Gazette as "small," 0 if it is classified as "medium."
Medium	Federal Gazette	Indicator variable taking the value of 1 for firm-years in which a firm is classified by the Federal Gazette as "medium," 0 if it is classified as "small" or "large" (depending on the specification).
Large	Federal Gazette	Indicator variable taking the value of 1 for firm-years in which a firm is classified by the Federal Gazette as "large," 0 if it is classified as "small."

Control Variables		
Total Assets	Federal Gazette, Bureau van Dijk	Total assets
Sales	Creditreform, Federal Gazette, Bureau van Dijk	Sales
Employees	Creditreform, Federal Gazette, Bureau van Dijk	Number of employees
Least Distance to Threshold	Federal Gazette, Bureau van Dijk	The least distance to the threshold is the second highest value of the set of the three relative distances to the respective regulatory thresholds (i.e., ln(total assets/total-assets threshold), ln(sales/sales threshold), ln(employees/employees threshold)). The second highest size dimension (relative to the respective regulatory threshold) determines whether a firm is likely to be classified as small or medium for the purpose of the disclosure regulation.
Age	Bureau van Dijk	Number of years between incorporation and fiscal year-end
Cross-Sectional Variables		
Share of Limited Peers	Creditreform	Share of "limited" firms among all firms in a given industry, county, and year
# of Limited Peers	Creditreform	Log of 1 plus the number of "limited" firms in a given industry, county, and year
High R2	Federal Gazette, Bureau van Dijk	Indicator variable taking the value of 1 for industries with high comovement in asset growth, and 0 otherwise. To measure comovement in asset growth, we first obtain the R-squared from regressions, by industry, of firms' standardized asset growth on year indicators following Guiso and Parigi (1999). We then residualize the R-Squared with respect to the number of firms operating in the industry, and define high-comovement industries as those in the upper quartile of the distribution of residualized R-squareds.
# of Medium Peers	Federal Gazette, Bureau van Dijk	Log of 1 plus the number of (other) "medium" firms in a given industry, county, and year
Medium Abnormal Disclosure	Federal Gazette, Bureau van Dijk	The difference between the log of 1 plus the aggregate number of characters disclosed by "medium" peers in the mandatory regime and the log of 1 plus the aggregate number of characters disclosed by medium peers predicted for the voluntary regime. "Medium" peers are defined as the number of (other) "medium" firms in a given industry, county, and year.

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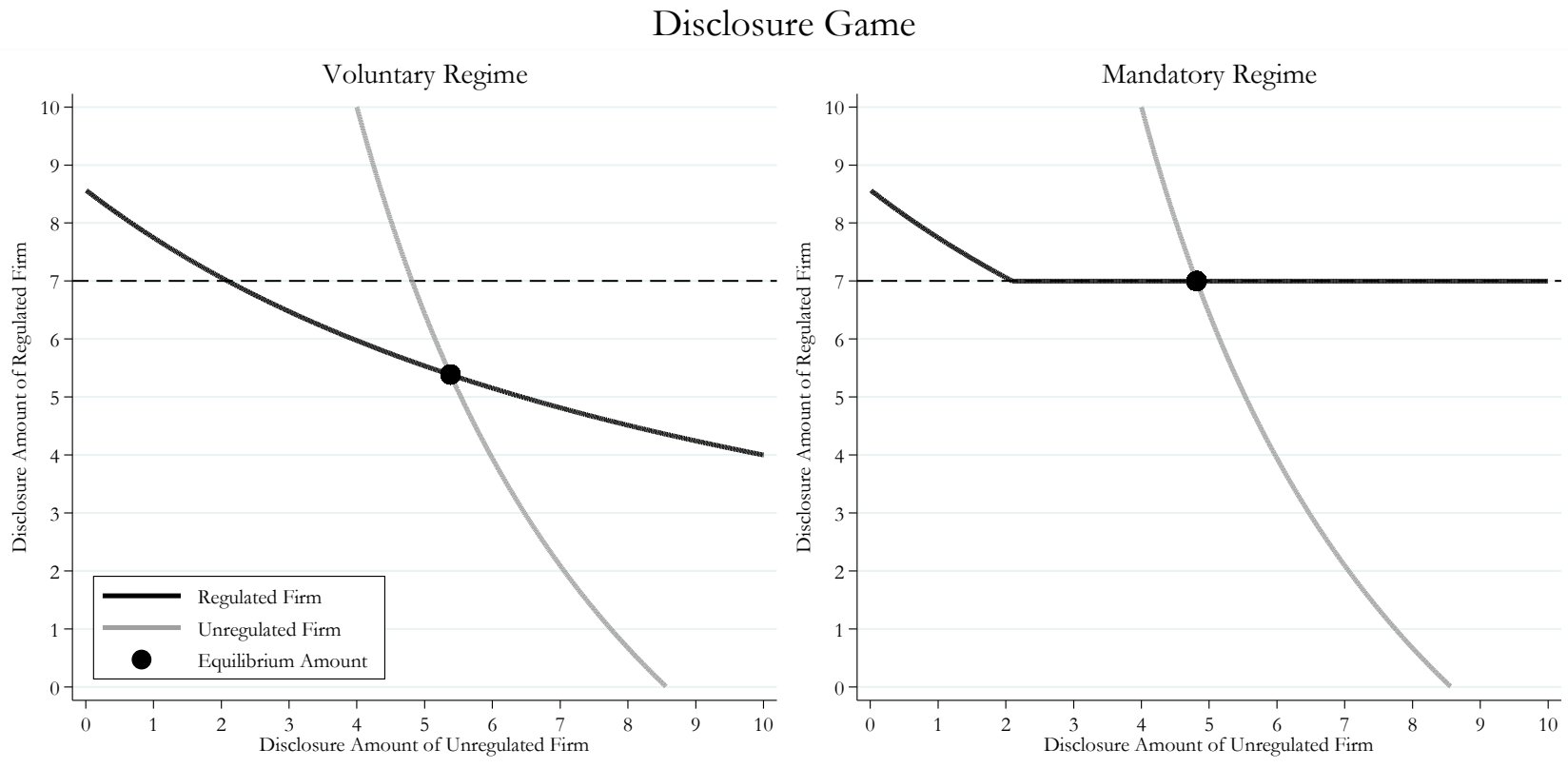
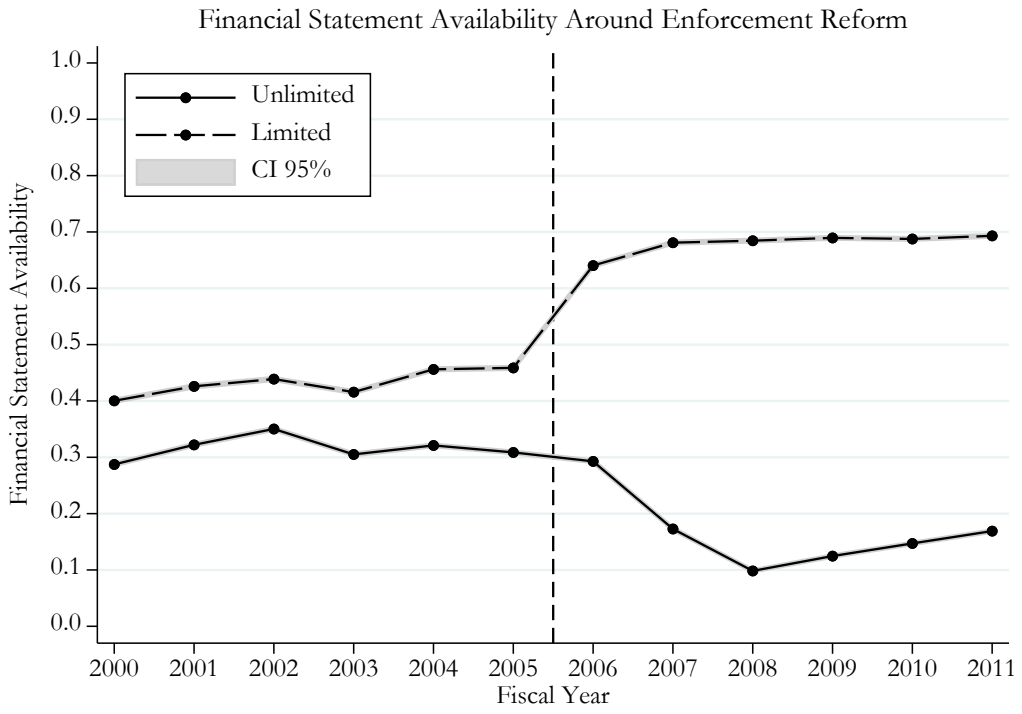
Figures & Tables

Figure 1



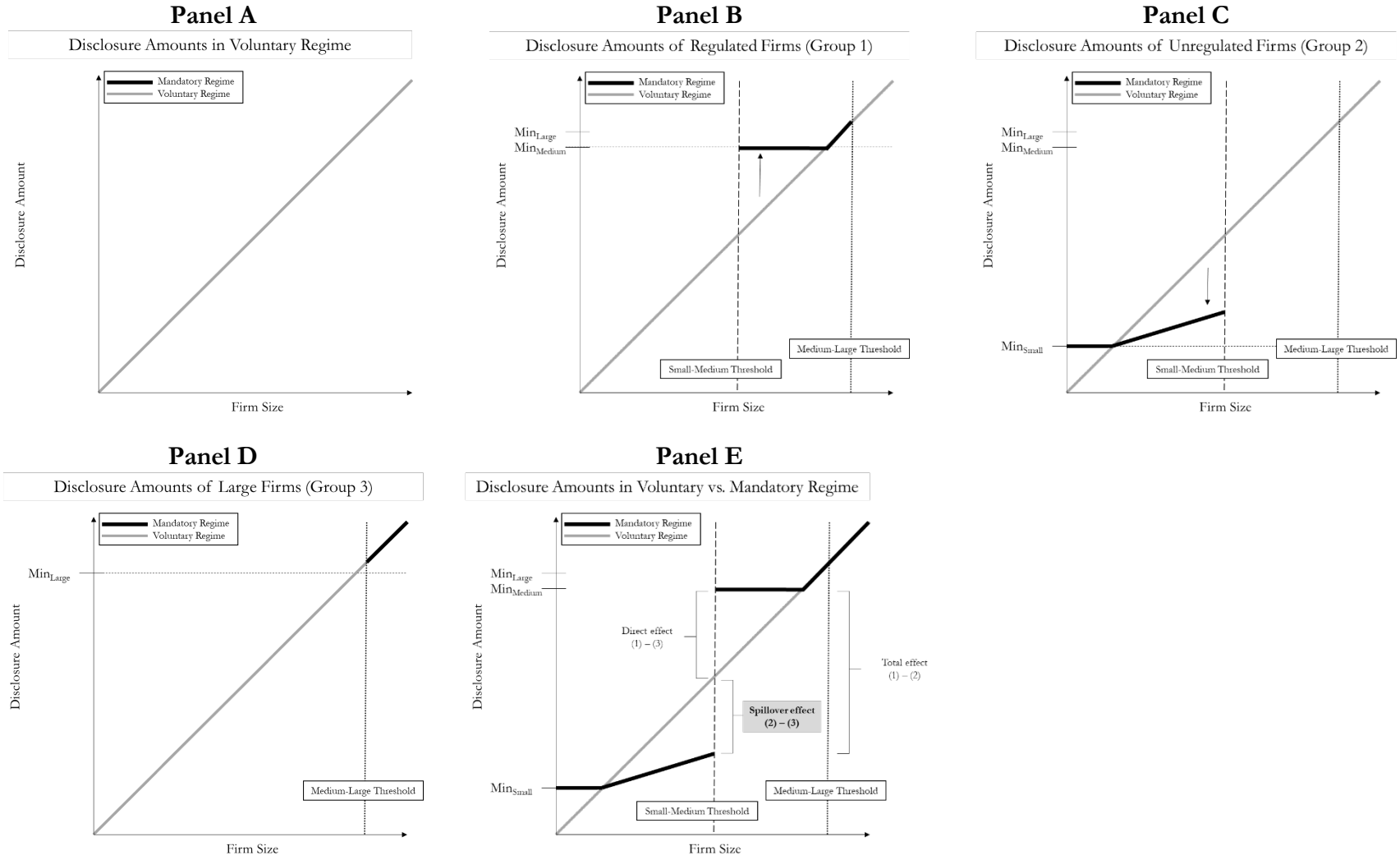
This figure illustrates the disclosure game and the predicted effect of the disclosure regulation on regulated and unregulated firms' disclosure amount (or precision). The figure is based on Figure 3 of Admati and Pfleiderer (2000). The lines depict the firms' best response functions (i.e., a firm's disclosure amount as a function of the other firm's disclosure amount). The black dot represents the equilibrium disclosure amounts of the two disclosure games. The dotted line marks the minimum-disclosure requirement applying to the regulated firm in the mandatory regime. In the voluntary regime (left side), both firms provide a disclosure amount of 5.3. In the mandatory regime (right side), the best response function of the regulated firm is constrained from below due to the minimum-disclosure requirement of 7. As a consequence, the regulated firm provides a disclosure amount of 7 and the unregulated firm provides a disclosure amount of 4.8 in the mandatory regime. The parameters chosen for the best response functions correspond to the values in Figure 3 of Admati and Pfleiderer (2000). The only exception is the correlation parameter between the two firms for which we choose a higher value (0.95) to better illustrate our prediction.

Figure 2



This figure plots the availability of financial statements in *Creditreform*'s database for limited-liability and unlimited-liability firms over time. The dots reflect averages for each category and fiscal year. The gray area captures a pointwise 95% confidence interval. The vertical dotted line separates the pre- and post-enforcement period.

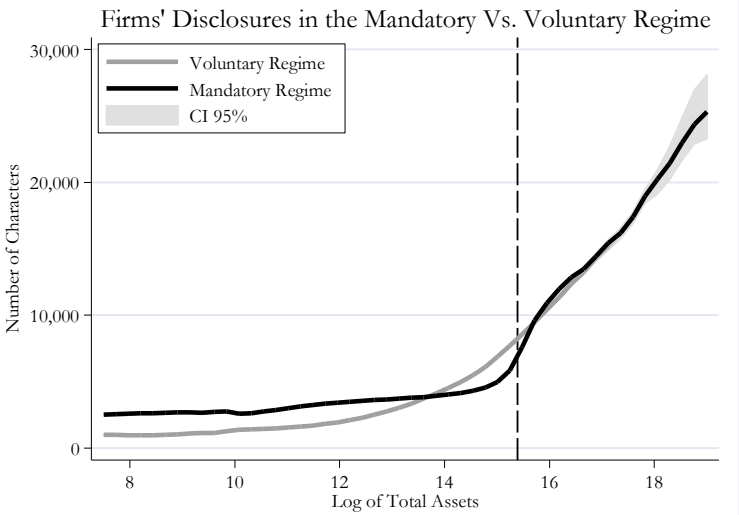
Figure 3



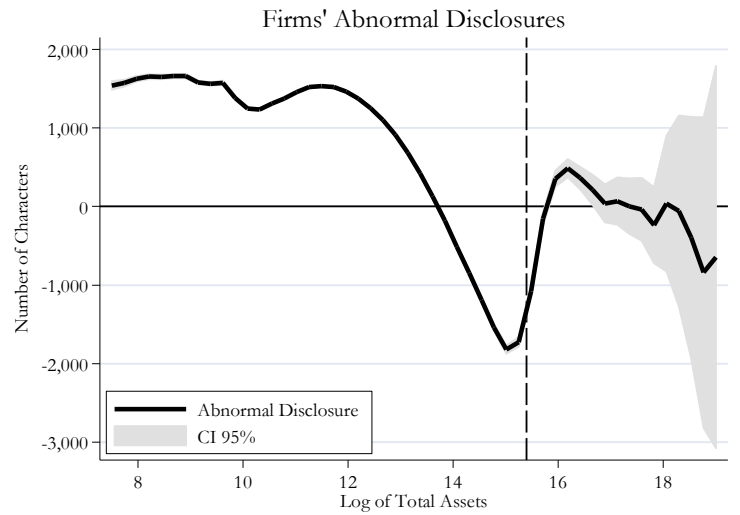
This figure illustrates our research design described in Section 4. Panel A represents the relation between disclosure and firm size in a voluntary regime (without increased disclosure requirements for regulated firms). Panel B illustrates the disclosures of regulated firms, which are directly affected by the regulation (group (1)). Panel C illustrates the disclosures of unregulated firms, which are indirectly affected by the regulation (group (2)). Panel D illustrates the disclosures of large firms, which are neither directly nor indirectly affected by the regulation (group (3)). In our empirical tests in the "small" vs. "medium" setting, we use these firms' disclosures observed in the mandatory regime to derive a disclosure multiple, allowing us to predict the disclosures of group (1) and group (2) in the voluntary regime. Panel E summarizes the direct, indirect, and total effect of the regulation. In our main tests, we document the direct effect (the disclosure gap between group (1) and group (3)) and the indirect effect (the disclosure gap between group (2) and group (3)) of the regulation. In our cross-sectional tests, we examine variation in the total effect of the regulation (the disclosure gap between group (1) and group (2)). Note that the total effect comprises the direct effect and the indirect effect of the regulation (the gap between groups (1) and (3) plus the gap between groups (2) and (3)) and is independent of the disclosures of group (3).

Figure 4

Panel A

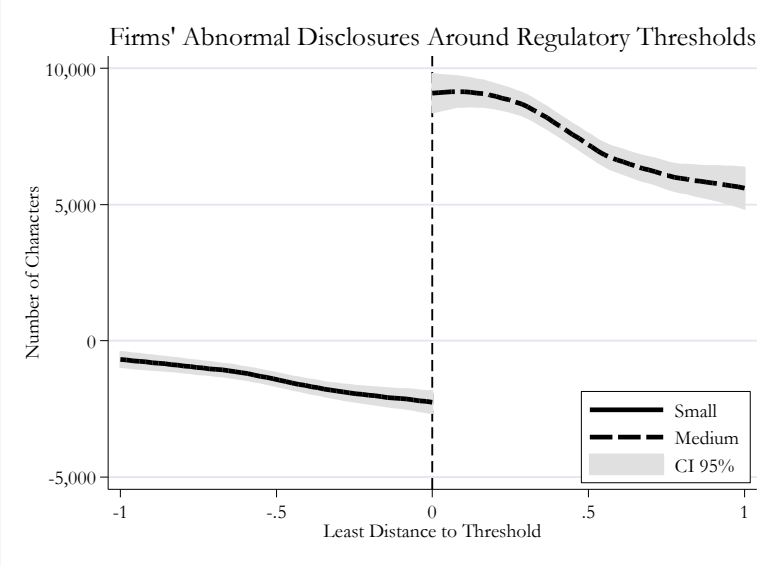


Panel B



This figure plots the local averages of firms' disclosures as a function of firm size (measured by the logarithm of total assets. Panel A shows firms' disclosures observed in the mandatory regime (black line) and their disclosures predicted for the voluntary regime (gray line) separately. We predict firms' disclosures in the voluntary regime by multiplying their observed number of clicks with a benchmark disclosure/click multiple derived from the larger firms (for details, refer to Section 4). Panel B shows firms' abnormal disclosures (the difference between observed disclosures in the mandatory regime and the predicted disclosures in the voluntary regime). Local averages are calculated using a kernel regression with an Epanechnikov kernel. The shaded gray areas present 95% confidence bands. The vertical line presents the regulatory threshold relating to total assets for "small" and "medium" firms (€ 4.84 million).

Figure 5



This figure plots local averages of abnormal disclosures for firms' around the small-medium regulatory thresholds. On the x-axis, we use a combined size dimension labeled as "least distance to threshold." In our setting, firms' regulatory size class ("small" versus "medium") is determined by two out of three size criteria (total assets, sales, and employees). The least distance to the threshold dimension is the second highest value of the set of our three relative distances to the respective regulatory thresholds (for details, see Breuer et al. 2018). The solid (dashed) line shows abnormal disclosures of "small" ("medium") firms to the left (right) of the threshold. Abnormal disclosures are measured by the difference in the number of characters of firms' disclosures observed in the mandatory regime and firms' disclosures predicted for the voluntary regime. Local averages are calculated using a kernel regression with an Epanechnikov kernel. The shaded gray areas present 95% confidence bands. The vertical line presents the regulatory threshold for "small" and "medium" firms.

Table 1

Institutional Setting					
Panel A: Disclosure Requirements and Enforcement					
Enforcement		Pre (Low)	Post (High)		
Fiscal Year		2000-2005	2006-2011	2012	Disclosure Requirements
Legal Form	Limited[1]		"Large"		Full
			"Medium"		Almost full
			"Small"		Abbreviated
				"Micro"	Further Abbreviated
	Unlimited				None

Panel B: Main Settings						
Setting	Firms	Sample Period	Source	Regulated	Unregulated	Benchmark
"Unlimited vs. Limited"	Unlimited, Limited	Pre + Post (2000-2011)	Creditreform	Limited	Unlimited	Pre-enforcement period
"Small vs. Medium"	"Small," "Medium"	Post (2006-2011)[2]	Federal Gazette, Bureau van Dijk	"Medium" at small-medium thresholds	"Small" at small-medium thresholds	Larger firms[3]

Panel C: Placebo Settings					
Setting	Firms	Sample Period	Source	Regulated	Unregulated
"Micro vs. Small"	"Micro," "Small"	Post (2012)	Federal Gazette, Bureau van Dijk	"Micro," "Small" at micro-small thresholds	-
"Medium vs. Large"	"Medium," "Large"	Post (2006-2011)	Federal Gazette, Bureau van Dijk	-	"Medium," "Large" at medium-large thresholds

This table summarizes the institutional background and settings of our study. Panel A illustrates the disclosure requirements across different groups of firms and its enforcement over time. Further detail on the regulatory thresholds and exact disclosure requirements are listed in Table A.1. Panel B presents the samples (firm types, time periods, and data source) used in our main tests. It further highlights which firms we consider as regulated vs. unregulated and how we approximate unregulated firms' disclosure in a voluntary regime (i.e., construct the benchmark) in the respective settings. Panel C presents the samples (firm types, time periods, and data source) used in placebo tests and highlights which firms we consider as regulated vs. unregulated in those tests.

[1] Limited firms include firms of a hybrid legal form, GmbH & Co. KG, that are also subject to the disclosure regulation.

[2] Our post-enforcement sample period is limited to fiscal years 2008-2011 in tests relying on data from the Federal Gazette (e.g., the number of characters and clicks).

[3] Larger firms are defined as firms with (log) total assets of 18 (+1/-1), amounting to about €66 million, irrespective of their regulatory size class.

Table 2

Correspondence Table

Panel A: "Unlimited vs. Limited" Setting

Group	Conceptual Description	Operationalization (Legal Forms and Periods)	Financial Statement Availability (Mandatory vs. Voluntary Regime)	Operationalization (Levels)	Operationalization (Differences)
(1)	(2)	(3)	(4)	(5)	(6)
1	*Regulated* firms (**Direct treatment group**)	**Limited**-liability firms in the **post**-enforcement period	$A_1^{Mandatory} > A_1^{Voluntary}$	$(\beta_1 + \beta_2) > \beta_1$	$\beta_2 > 0$
2	*Unregulated* firms potentially affected by spillovers (**Indirect treatment group**)	**Unlimited**-liability firms in the **post**-enforcement period	$A_2^{Mandatory} < A_2^{Voluntary}$	$(\beta_3 + \beta_4) < \beta_3$	$\beta_4 < 0$
3	Unregulated firms *unaffected* by spillovers (**Control group**)	**Unlimited**-liability firms in the **pre**-enforcement period	$A_3^{Mandatory} = A_3^{Voluntary}$	β_3	-

Panel A summarizes the links between our conceptual constructs of interest and their empirical counterparts for the "unlimited vs. limited" setting. Column 2 provides conceptual descriptions of the different groups of firms we need to identify the spillover effects of the disclosure regulation. Column 3 lists the types of firms and periods in our institutional setting used to operationalize the conceptual firm groups. Column 4 summarizes the predicted relative availability of financial statements in the mandatory versus the voluntary regime. Columns 5 and 6 operationalize the availability comparison. To uncover the unobserved availability of unregulated firms' in a counterfactual voluntary regime (absent disclosure requirements for limited-liability firms), we use the availability of unlimited-liability firms' financial statements in the pre-enforcement period (group 3). $A_i^{Mandatory}$ denotes the availability of financial statements in the mandatory regime of firms in group i (with $i = 1$ for limited-liability firms in the post-enforcement period, $i = 2$ for unlimited-liability firms in the post-enforcement period, and $i = 3$ for the unlimited-liability firms in the pre-enforcement period). $A_i^{Voluntary}$ denotes the disclosure amount in the voluntary regime of firms in group i.

Panel B: "Small vs. Medium" Setting

Group	Conceptual Description	Operationalization (Size Classes)	Disclosure Quantities (Mandatory vs. Voluntary Regime)	Operationalization (Disclosure/Click Multiple)	Operationalization (Predicted Disclosure in Voluntary Regime)
(1)	(2)	(3)	(4)	(5)	(6)
1	*Regulated* firms (**Direct treatment group**)	"**Medium**" firms around the small-medium thresholds	$Q_1^{Mandatory} > Q_1^{Voluntary}$	$Q_1^{Mandatory} / N_1 > \beta$	$Q_1^{Mandatory} > \beta N_1$
2	*Unregulated* firms potentially affected by spillovers (**Indirect treatment group**)	"**Small**" firms around the small-medium thresholds	$Q_2^{Mandatory} < Q_2^{Voluntary}$	$Q_2^{Mandatory} / N_2 < \beta$	$Q_2^{Mandatory} < \beta N_2$
3	Unregulated firms *unaffected* by spillovers (**Control group**)	**Larger** firms	$Q_3^{Mandatory} = Q_3^{Voluntary}$	$Q_3^{Mandatory} / N_3 = Q_3^{Voluntary} / N_3 = \beta$	$Q_3^{Mandatory} = \beta N_3$

Panel B summarizes the links between our conceptual constructs of interest and their empirical counterparts for the "small vs. medium" setting. Column 2 provides conceptual descriptions of the different groups of firms we need to identify the spillover effects of the disclosure regulation. Column 3 lists the types of firms in our institutional setting used to operationalize the conceptual firm groups. Column 4 summarizes the predicted relative disclosures in the mandatory versus the voluntary regime. Columns 5 and 6 operationalize the disclosure quantity comparison. To uncover the unobserved disclosures in the voluntary regime (absent heightened "medium" firm disclosure requirements), we use the benchmark disclosure/click multiple derived from the larger firms (group 3). $Q_i^{Mandatory}$ denotes the disclosure amount in the mandatory regime of firms in group i (with $i = 1$ for "medium" firms, $i = 2$ for "small" firms, and $i = 3$ for the larger firms). $Q_i^{Voluntary}$ denotes the disclosure amount in the voluntary regime of firms in group i. N_i denotes the number of stakeholders interested in the financial statements of firms in group i. β is the disclosure/click multiple which reflects the number of characters per stakeholder disclosed by firms in a voluntary regime and is derived from the larger firms' disclosures and number of stakeholders as shown in row 3 ($Q_3^{Mandatory} / N_3 = \beta$).

Table 3

Descriptive Statistics

Panel A: "Unlimited vs. Limited" Setting

	N	Mean	SD	P10	P50	P90
Limited	14,280,053	0.44	0.50	0.00	0.00	1.00
Unlimited (All)	14,280,053	0.56	0.50	0.00	1.00	1.00
Unlimited (OHG, KG)	6,506,352	0.04	0.19	0.00	0.00	0.00
Post	14,280,053	0.54	0.50	0.00	1.00	1.00
Financial Statement Availability	14,280,053	0.38	0.49	0.00	0.00	1.00
Sales (Logarithm)	14,280,053	-0.80	1.79	-2.71	-0.98	1.55
Employees (Logarithm)	14,280,053	-0.37	1.08	-1.22	-0.81	1.13
Share of Limited Peers	14,278,867	0.40	0.24	0.13	0.35	0.77
# of Limited Peers	14,278,867	4.56	1.68	2.32	4.62	6.63

Panel B: "Small vs. Medium" Setting – "Small" Firms						
	N	Mean	SD	P10	P50	P90
Variables used in main tests (Figures 4 and 5, Table 5)						
Disclosure Mandatory Regime (Characters)	2,045,395	3,468	1,731	1,902	3,195	5,236
Clicks	2,045,395	8	16	0	4	18
Disclosure Voluntary Regime (Characters)	2,045,395	2,761	5,838	0	1,468	6,606
Abnormal Disclosure (Characters)	2,045,395	707	5,870	-2,956	1,603	3,805
Total Assets (million Euro)	2,045,395	2.00	87.10	0.02	0.21	2.34
Total Assets (Logarithm)	2,045,395	12.26	1.91	10.11	12.26	14.66
Variables used in cross-sectional tests (Tables 6 and 8)						
Abnormal Disclosure (Logarithm)	45,434	0.94	2.10	-0.83	0.52	2.38
Disclosure Mandatory Regime (Logarithm)	45,434	8.37	0.48	7.85	8.33	8.92
Publication Lag (Logarithm)	250,235	5.85	0.32	5.43	5.91	6.16
Voluntary Sales Disclosure (Indicator)	536,322	0.49	0.50	0	0	1
Sales (Logarithm)	45,434	13.75	1.36	11.98	13.82	15.52
Employees (Number)	45,434	16	20	1	8	41
Employees (Logarithm)	45,434	2.28	1.06	0.69	2.20	3.74
Age (Number of Years)	45,434	16	15	2	13	34
Age (Logarithm)	45,434	2.48	0.93	1.10	2.64	3.56
Number of Medium Peers (Logarithm)	45,434	1.84	1.28	0	1.61	3.61
Medium Abnormal Disclosure (Logarithm)	45,434	1.09	2.37	-0.03	0.46	1.87
High R2 (Indicator)	45,434	0.30	0.46	0	0	1

Panel C: "Small vs. Medium" Setting – "Medium" Firms						
	N	Mean	SD	P10	P50	P90
Variables used in main tests (Figures 4 and 5, Table 5)						
Disclosure Mandatory Regime (Characters)	49,577	22,051	8,555	13,871	20,310	31,935
Clicks	49,577	52	46	13	42	101
Disclosure Voluntary Regime (Characters)	49,577	19,106	16,948	4,771	15,414	37,067
Abnormal Disclosure (Characters)	49,577	2,945	18,433	-16,495	5,034	20,379
Total Assets (million Euro)	49,577	18	99	4.37	9	24.77
Total Assets (Logarithm)	49,577	16.12	0.83	15.29	16.03	17.03
Variables used cross-sectional tests (Tables 6 and 8)						
Abnormal Disclosure (Logarithm)	17,639	0.53	0.93	-0.52	0.45	1.69
Disclosure Mandatory Regime (Logarithm)	17,639	10.04	0.35	9.6	10.02	10.49
Publication Lag (Logarithm)	54,667	5.89	0.32	5.46	5.94	6.19
Voluntary Sales Disclosure (Indicator)	124,025	0.45	0.50	0	0	1
Sales (Logarithm)	17,639	16.68	0.67	15.90	16.69	17.48
Employees (Number)	17,639	109	91	26	85	208
Employees (Logarithm)	17,639	4.38	0.87	3.3	4.45	5.34
Age (Number of Years)	17,639	27	25	6	19	60
Age (Logarithm)	17,639	3.01	0.82	1.95	3.00	4.11
Number of Medium Peers (Logarithm)	17,639	1.83	1.31	0	1.61	3.71
Medium Abnormal Disclosure (Logarithm)	17,639	1.07	2.39	-0.07	0.44	1.86
High R2 (Indicator)	17,639	0.34	0.47	0	0	1

Table 4

Firms' Financial Statement Availability			
Panel A: Direct and Indirect Effect			
Outcome	Financial Statement Availability		
Column	(1)	(2)	(3)
Limited	0.434***	0.434***	0.414***
	(0.008)	(0.008)	(0.007)
Limited×Post	0.246***	0.246***	0.282***
	(0.007)	(0.007)	(0.007)
Unlimited	0.316***	0.317***	0.313***
	(0.008)	(0.019)	(0.016)
Unlimited×Post	-0.147***	-0.167***	-0.136***
	(0.006)	(0.007)	(0.009)
Controls	No	No	Yes
Unlimited Definition	All	OHG, KG	OHG, KG
Observations	14,280,053	6,506,352	6,506,352
Clusters	594	570	570
Adjusted R-Squared	0.478	0.589	0.631

Panel B: Differential Spillover Effect		
Outcome	Financial Statement Availability	
Column	(1)	(2)
Limited×Post	0.475***	0.474***
	(0.008)	(0.008)
Share of Limited Peers×Post	-0.105***	
	(0.014)	
# of Limited Peers×Post		-0.012***
		(0.003)
Controls	Yes	Yes
Firm Fixed Effects	Yes	Yes
County-Year Fixed Effects	Yes	Yes
Industry-Year Fixed Effects	Yes	Yes
Unlimited Definition	OHG, KG	OHG, KG
Observations	5,894,729	5,894,729
Clusters	550	550
Adjusted R-Squared	0.457	0.457

This table presents evidence on the levels and changes in the availability of firms' financial statements in the *Creditreform* database around the enforcement reform. Panel A presents the results from regressions of an indicator for firms with available financial statements on separate indicators for limited and unlimited firms and their interactions with a post-enforcement indicator. In column 2, we restrict the sample of unlimited firms to the subset of firms (legal forms: OHG, KG) which is most comparable to the limited firms. In column 3, we further control for firm size (sales and employees; centered at their sample means). The coefficient on "Limited" captures the pre-enforcement period availability of limited firms' financial statements. The coefficient on "Limited×Post" captures the change in limited firms' financial statement availability from the pre- to the post-enforcement period. The coefficient on "Unlimited" captures the pre-enforcement period availability of unlimited firms' financial statements. The coefficient on "Unlimited×Post" captures the change in unlimited firms' financial statement availability from the pre- to the post-enforcement period. Panel B present the results from regressions of an indicator for firms with available financial statements on an indicator for limited firms and spillover strengths variables (the share of limited peers or the number of limited peers) interacted with a post-enforcement indicator. The regressions are limited to the subset of comparable limited firms, include size controls, firm-fixed effects, county-year fixed effects, and industry-year fixed effects. The coefficient on "Limited×Post" captures the change in limited firms' financial statement availability from the pre- to the post-enforcement period relative to the change in unlimited firms' financial statement availability (i.e., a difference-in-differences coefficient). The coefficient on "Share of Limited Peers×Post" ("# of Limited Peers×Post") captures the incremental change of firms' financial statement availability from the pre- to the post-enforcement period for firms with a greater share (number) of limited peers. In both panels, we drop singletons and report standard errors clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.

Table 5

Firms' Average Disclosures Around Small-Medium Thresholds				
Panel A: Abnormal Disclosures (Number of Characters)				
Control function	Linear		Piecewise Linear	
	Small	Medium	Small	Medium
Average Constant	-3,579***	8,440***	-3,796***	8,272**
	(244)	(1,325)	(307)	(3293)
Size, Age, Legal Form Controls	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes
Observations	45,434	17,639	45,434	17,639
# Clusters	398	397	398	397
Adjusted R-Squared	0.157	0.226	0.299	0.184
Panel B: Disclosure in Voluntary Regime (Number of Characters)				
Control function	Linear		Piecewise Linear	
	Small	Medium	Small	Medium
Average Constant	10,161***	13,002***	9,818***	12,677***
	(218)	(1,181)	(259)	(2,747)
Size, Age, Legal Form Controls	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes
Observations	45,434	17,639	45,434	17,639
# Clusters	398	397	398	397
Adjusted R-Squared	0.246	0.199	0.356	0.127
Panel C: Magnitude of Abnormal Disclosure				
Regulatory Effect	Spillover	Direct	Spillover	Direct
	Small	Medium	Small	Medium
% of Disclosure in Voluntary Regime	-35%	65%	-46%	65%
Number of Pages	-1.19	2.81	-1.27	2.76

This table presents evidence on the average disclosures of "small" and "medium" firms around the three small-medium thresholds (total assets, sales, and employees). Panel A presents the average constant of a regression of abnormal disclosure on control variables including the regulatory size criteria (log of total assets, log of sales, and log of the number of employees) centered at the threshold values, log of firm age, legal form indicators, and country-industry-year fixed effects. The average constant captures the average level of abnormal disclosures at the three small-medium thresholds (i.e., for the case when the centered total assets, sales, and employees controls are zero). It explicitly averages across all fixed effects (i.e., does not merely reflect the base category) (Gould 2019). Panel B presents the average constant of a regression of disclosure in a voluntary regime on control variables including the regulatory size criteria centered at the threshold values, log of firm age, legal form indicators, and country-industry-year fixed effects. The average constant captures the average level of disclosure in a voluntary regime at the three small-medium thresholds (i.e., for the case when the centered total assets, sales, and employees controls are zero). Panel C recasts the magnitude of the average abnormal disclosures (Panel A) in terms of percentage of the disclosure in a voluntary regime (Panel B) and in terms of pages (where 3,000 characters correspond to 1 page). *Abnormal Disclosure* is the difference between the firm's number of characters observed in the mandatory regime and the respective number of characters predicted for the voluntary regime. *Disclosure in Voluntary Regime* is firms' number of characters predicted for the voluntary regime. *% of Disclosure in Voluntary Regime* is the percentage of abnormal disclosures (Panel A) relative to the disclosures in a voluntary regime (Panel B). *Number of Pages* is abnormal disclosures (Panel A) divided by the average number of characters per page (3,000). We present estimates using (log-)linear size controls (*Linear*) and piecewise (log-)linear size controls (where we allow the coefficients to vary above and below the threshold) (*Piecewise Linear*). We report standard errors clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.

Table 6

Firms' Disclosure and Strength of Information Spillovers

Panel A: Firms' Disclosure and Asset Growth Comovement

	Abnormal Disclosure	Disclosure in Mandatory Regime	Publication Lag	Voluntary Sales Disclosure
	(1)	(2)	(3)	(4)
Small	-1.040***	-1.122***	-0.046***	0.129***
	(0.040)	(0.017)	(0.007)	(0.015)
Small×High R2	-0.098***	-0.026**	-0.002	-0.019**
	(0.032)	(0.011)	(0.007)	(0.009)
Size, Age, Legal Form Controls	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes
Observations	54,466	54,466	284,265	637,651
# Clusters	396	396	398	398
Adjusted R-Squared	0.194	0.793	0.101	0.126

Panel B: Firms' Disclosure and Peer Information Environment

	Abnormal Disclosure		Disclosure in Mandatory Regime		Publication Lag		Voluntary Sales Disclosure	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Small	-0.820***	-0.706***	-1.066***	-1.094***	-0.083***	-0.054***	0.316***	0.235***
	(0.091)	(0.050)	(0.042)	(0.016)	(0.019)	(0.010)	(0.034)	(0.020)
Small×# of Medium Peers	-0.089***		-0.022*		0.013**		-0.066***	
	(0.025)		(0.013)		(0.006)		(0.014)	
Small×Medium Abnormal Disclosure		-0.532***		-0.051***		0.009*		-0.110***
		(0.032)		(0.011)		(0.005)		(0.009)
Size, Age, Legal Form Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	54,466	54,466	54,466	54,466	284,265	54,466	637,651	139,464
# Clusters	396	396	396	396	398	396	398	398
Adjusted R-Squared	0.194	0.198	0.793	0.793	0.101	0.174	0.127	0.120

This table presents evidence on the cross-sectional variation in firms' disclosures with respect to the expected strength of information spillovers. *Abnormal Disclosure* is the difference between the logarithm of firms' number of characters observed in the mandatory regime less the logarithm of firms' number of characters predicted for the voluntary regime. *Disclosure in Mandatory Regime* is the logarithm of firms' number of characters observed in the mandatory regime. *Publication lag* is the log of the publication lag (measured in terms of number of days between fiscal year-end and publication dated). *Voluntary Sales Disclosure* is an indicator taking the value of one if a firm voluntarily discloses sales information, and zero otherwise. In Panel A, we show how the disclosure gap between "small" and "medium" firms varies with the comovement of fundamentals in a given industry. We regress "small" and "medium" firms' disclosure outcomes on *Small* (an indicator variable that takes the value of 1 if the firm is classified as "small" in a given year, and zero otherwise) and an interaction of *Small* with *High R2*, a proxy for the comovement of fundamentals in a given industry. To construct *High R2*, we first obtain the R-squared from industry-specific regressions of firms' standardized, year-over-year asset growth on year fixed effects, and residualize the R-squared with respect to the number of firms operating in the same industry. We then construct *High R2* as taking the value of one for industries in the top quartile of the R-squared distribution across industries, and zero otherwise. In Panel B, we show how the disclosure gap between "small" and "medium" firms varies with the richness of the peer information environment. We regress "small" and "medium" firms' disclosure outcomes on *Small* and an interaction of *Small* with proxies for the amount of information provided by firms' "medium" peers. Specifically, we use the logarithm of the number of medium firms operating in the same county-industry-year (*# of Medium Peers*) and the total abnormal disclosures provided by all "medium" peers operating in the same county-industry-year (*Medium Abnormal Disclosure*). All specifications include county-industry-year fixed effects and legal form fixed effects. We further include a control function including the regulatory size criteria (in columns (1) – (6): log of total assets, log of sales, and log of the number of employees; in columns (7) – (8): log of total assets and log of the number of employees) and firm age. We drop singletons and report standard errors clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.

Table 7

Disclosure Regulation, Firms' Disclosures, and Number of Clicks

Panel A: Regulatory Class Changes

	Disclosure in Mandatory Regime (Changes)		Number of Clicks (Changes)	
	(1)	(2)	(3)	(4)
Up (Small to Medium)	0.813***		-0.013	
	(0.085)		(0.069)	
Down (Medium to Small)	-0.701***		0.104	
	(0.090)		(0.095)	
Up (Medium to Large)		-0.006		0.005
		(0.020)		(0.053)
Down (Large to Medium)		-0.031		0.037
		(0.033)		(0.091)
Sample Firms	Small, Medium	Medium, Large	Small, Medium	Medium, Large
Size, Age, Legal Form, Other Controls	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes
Observations	9,951	2,851	9,951	2,851
# Clusters (Counties)	348	262	348	262
Adjusted R-Squared	0.252	0.019	0.033	0.034

Panel B: Fixed Effects

	Disclosure in Mandatory Regime		Number of Clicks	
	(1)	(2)	(3)	(4)
Medium	0.768***		0.015	
	(0.052)		(0.045)	
Large		0.029***		-0.012
		(0.008)		(0.029)
Sample Firms	Small, Medium	Medium, Large	Small, Medium	Medium, Large
Size, Age, Legal Form, Other Controls	Yes	Yes	Yes	Yes
Firm and Year FE	Yes	Yes	Yes	Yes
Observations	43,882	13,480	43,882	13,480
# Clusters	398	397	398	397
Adjusted R-Squared	0.210	0.169	0.044	0.087

This table presents the results from first differences (Panel A) and firm fixed effects (Panel B) analyses. *Disclosure in Mandatory Regime* is the logarithm of the number of characters in a firm's filing. *Number of Clicks* is the logarithm of one plus the number clicks a firm's filing received in the 12 months after its publication. The regressions in the columns 1 and 3 (columns 2 and 4) are restricted to "small" and "medium" ("medium" and "large" firms). In Panel A, *Up (Small to Medium)* (*Up (Medium to Large)*) takes the value of one for firms switching up in their regulatory size class from "small" to "medium" (from "medium" to "large"), and *Down (Small to Medium)* (*Down (Medium to Large)*) takes the value of one for firms switching down from the "medium" to the "small" (from the "large" to the "medium") regulatory size class. In Panel B, *Medium* (*Large*) takes the value of one when a firm is classified as "medium" ("large"), and zero when it is classified as "small" ("medium"). In Panel A, we include legal form and county-industry-year fixed effects, and control for changes in firm characteristics including a firm's total assets (log), sales (log), number of employees (log), age (log), number of owners (log), institutional ownership (%), number of banks (log), cash (in % of total assets), and fixed assets (in % of total assets). In Panel B, we include legal form fixed effects, firm fixed effects and year fixed effects and control for the levels of same firm characteristics as in Panel A. We drop singletons and report standard errors clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.

Table 8

Firms' Disclosure and Strength of Information Spillovers: Placebo Tests			
Panel A: Constrained Setting (Micro-Small Threshold)			
	Disclosure in Mandatory Regime (Log)		
	(1)	(2)	(3)
Micro	-0.448***	-0.405***	-0.450***
	(0.011)	(0.038)	(0.018)
Micro×High R2	0.011		
	(0.016)		
Micro×# of Small Peers		-0.007	
		(0.007)	
Micro×Small Abnormal Disclosures			-0.001
			(0.002)
Size, Age, Legal Form Controls	Yes	Yes	Yes
County-Industry FE	Yes	Yes	Yes
Observations	136,468	136,468	136,468
# Clusters	398	398	398
Adjusted R-Squared	0.21	0.21	0.21

Panel B: Unconstrained Setting (Medium-Large Threshold)

	Abnormal Disclosure			Disclosure in Mandatory Regime			Publication Lag		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Medium	0.015	-0.029	0.163***	-0.044***	-0.069***	-0.026***	0.028***	0.027***	-0.015
	(0.032)	(0.035)	(0.029)	(0.012)	(0.015)	(0.010)	(0.008)	(0.009)	(0.009)
Medium×High R2	-0.051			0.003			-0.002		
	(0.034)			(0.016)			(0.009)		
Medium×# of Large Peers		0.015			0.015**			0.000	
		(0.015)			(0.006)			(0.004)	
Medium×Large Abnormal Disclosures			-0.399***			-0.040***			0.004
			(0.025)			(0.009)			(0.007)
Size, Age, Legal Form Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,113	21,113	21,113	21,113	21,113	21,113	75,095	75,095	21,113
# Clusters	385	385	385	385	385	385	394	394	385
Adjusted R-Squared	0.311	0.31	0.328	0.413	0.413	0.414	0.125	0.125	0.243

This table presents evidence on the cross-sectional variation in firms' disclosure with respect to the strength of the information spillover in two placebo settings. *Abnormal Disclosure* is the difference between the logarithm of firms' observed disclosures less the logarithm of firms' disclosures predicted for the voluntary regime. *Disclosure in Mandatory Regime* is the logarithm of firms' observed disclosures. *Publication lag* is the log of the publication lag (measured in terms of number of days between fiscal year-end and publication dated). *Voluntary Sales Disclosure* is an indicator taking the value of 1 if a firm voluntarily discloses sales information, and zero otherwise. In Panel A, we show results on the disclosure gap between "small" (placebo regulated) and "micro" (placebo unregulated) firms in a constrained setting. *Micro* is an indicator variable taking the value of 1 if a firm is classified as "micro" in a given year, and zero otherwise. *High R2* is a proxy for the comovement of fundamentals in a given industry. *# of Small Peers* is the number of "small" firms operating in the same county-industry-year. *Small Abnormal Disclosure* is the total abnormal disclosure provided by "small" firms operating in the same county-industry-year. In Panel B, we show results on the disclosure gap between "medium" (placebo unregulated" and "large" (placebo regulated) firms in an unconstrained setting. *Medium* is an indicator variable taking the value of 1 if a firm is classified as "medium" in a given year, and zero otherwise. *High R2* is a proxy for the comovement of fundamentals in a given industry. *# of Large Peers* is the number of "large" firms operating in the same county-industry-year. *Large Abnormal Disclosure* is the total abnormal disclosure provided by "large" firms operating in the same county-industry-year. In Panel A, all specifications include county-industry fixed effects (given that we only have a cross-section of one year) and legal form fixed effects. In Panel B, all specifications include county-industry-year fixed effects and legal form fixed effects. We further include a control function including all three regulatory size criteria (total assets, sales, employees) and age. We drop singletons and report standard errors clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.

Appendix

Supplemental – Not intended for publication

When you talk, I remain silent: Spillover effects of peers' mandatory disclosures on firms' voluntary disclosures

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Supplemental Tests

A. Identifying Assumption

The validity of our research design in the "small vs. medium" setting rests on the assumption that the disclosure/click multiple does not vary substantially across firm sizes. This assumption is ultimately untestable, because we do not observe the counterfactual (i.e., the voluntary disclosure/click multiple absent the "medium" disclosure requirement discontinuity). Yet, we can provide evidence on the plausibility of this assumption. In support of the identifying assumption, we document two pieces of evidence consistent with a relatively stable (observed) disclosure/click multiple across firm sizes.

The first piece of evidence is that both the rate of voluntary disclosure and the number of clicks increase in a similar way with firm size (Figure A.5). Accordingly, the multiple between voluntary disclosure and clicks is reasonably stable. If anything, it appears that firms around the small-medium threshold are slightly more likely to disclose (19% disclosure rate/22 clicks=0.84), relative to their clicks, than larger firms (37% disclosure rate/52 clicks=0.71). This pattern, if anything, works against finding regulatory spillovers in our design.

For the first piece of evidence, we use the availability of firms' financial statements for fiscal year 2004 in Bureau van Dijk's *dafne* database as our proxy of voluntary disclosure, following Bernard (2016). Given the low enforcement applying to firms' financial statements before fiscal year 2006 (which included comparison information for fiscal year 2005), the 2004 financial statement are de facto voluntary disclosures. We plot the propensity to disclose against firms' number of clicks observed on the official business register in the post-enforcement period.

The second piece of evidence is that the observed disclosure/click multiple is widely unrelated to firm size (Table A.2). If anything, it appears that the disclosure-per-click multiple declines with firm size. Consistent with our first piece of evidence, this pattern, if anything, works against finding regulatory spillovers in our cross-sectional design.

For the second piece of evidence, we regress firms' disclosure/click multiple observed in the mandatory regime on firm size (log of total assets). Ideally, we of course would like to regress the multiple observed in the voluntary regime on firm size to understand whether, in the counterfactual voluntary regime, the multiple varies with firm size. To approximate this ideal test, we not only estimate the relation between the disclosure/click multiple and firm size for all firms (column 1: "small", "medium", and "large"), but also for subsamples of firms that are possibly less affected by the regulation, on average (column 2: "medium" and "large"; column 3: "large"). Figure 4 and our descriptive statistics (Table 3) clearly document that the average "small" firm is strongly affected by the regulation (i.e., its disclosure is pushed above the predicted voluntary disclosure). This result is driven by the fact that the vast majority of "small" firms are tiny. Accordingly, in our main tests, we only consider the largest "small" firms around the thresholds as effectively unregulated. As for "medium" firms, we only consider the smallest "medium" firms around the thresholds as effectively regulated. The average "medium" firm, by contrast, is less strongly affected by the regulation. Accordingly, we reduce the impact of the regulation on the multiple-size relation by excluding "small" firms in column 2. We further reduce concerns about an impact of the regulation on the relation by excluding also "medium" firms in column 3.

For all firms (column 1), we find that the multiple is negatively associated with firm size (with a small R2 of 2.5%). This association is inconsistent with the concern that the disclosure/click multiple may be increasing with size. This association, however, may be biased due to the direct impact of the regulation on the smallest firms. Consistent with such bias, we find that the relation between the observed multiple and firm size is less negative for the subsample of "medium" and "large" firms (column 2) and the subsample of "large" firms only (column 1). Still, the relation between the observed multiple and firm size remains slightly negative in both of these subsamples. This evidence suggests that even among firms which are least likely to be affected by the regulation (i.e., "medium" and "large" firms and, especially, "large" firms only), the relation is negative.

Collectively, the two pieces of evidence are inconsistent with the concern that our results of regulatory spillovers are due to an increasing relation between the disclosure/click multiple and firm size. Clearly, they, at best, provide indirect evidence on the validity of our identifying assumption. But notably, they provide consistent evidence in support of our assumption across two distinct settings/approaches. Accordingly, they provide some comfort that, while it may conceptually be possible that the multiple increases with firm size, our empirical evidence suggests, if anything, the opposite.

B. Necessary Conditions

Our research design in the "small vs. medium" setting relies on a number of necessary conditions. In this section, we extend on the brief discussion of the conditions and their empirical validity provided in our manuscript.

NC 1: Around the small-medium thresholds, at least some "medium" firms' disclosures are effectively regulated.

If this condition were violated, "medium" firms' disclosures would not be constrained by their disclosure requirements, preventing "small" firms from free-riding on regulated firms' disclosures in the mandatory regime.

Our evidence suggests that "medium" firms around the small-medium thresholds appear to exhibit disclosures in a mandatory regime that exceed their disclosures in the voluntary regime (Table 5 and Figure 5). We provide further evidence on the constraining effect of the regulation on firms' disclosures by investigating disclosure changes observed for firms switching between the "small" to the "medium" regulatory size class. If the regulation does not constrain "medium" firms' disclosure, we do not expect to observe stark differences in the same firm's disclosure when it switches size classes. By contrast, if the regulation constrains "medium" firms, we expect firms to increase (decrease) their disclosures observed in the mandatory regime when they switch up from "small" to "medium" (down from "medium" to "small"). Column 1 of Table 7 documents that a switch from the "small" to the "medium" size class increases firms' disclosures by about 125

percent (exp(0.813)≈125%), whereas a switch from the "medium" to the "small" size class reduces firms' disclosures by 102 percent. This evidence strongly supports that "medium" firms' disclosures are pushed above their voluntary levels by their disclosure requirements.

NC 2: Around the small-medium thresholds, at least some "small" firms' disclosures are effectively unregulated.

If this condition were violated, all "small" firms would merely provide the required minimum in the mandatory regime, preventing us from detecting incremental effects of "medium" firms' disclosures on "small" firms' disclosures in a mandatory regime.

In support of our second necessary condition, Figure A.1 documents that between 13 to 39 percent of all "small" firms provide additional financial-statement disclosures over and above the minimum requirement. This evidence suggests that at least some "small" firms provide disclosures voluntarily. The "small" firms around the threshold are particularly likely to provide disclosures voluntarily, because they are substantially larger than the average "small" firm (Figure A.3). In line with this evidence, our main results also support the validity of the second necessary condition. For one, Figure 5 documents that, conditional on our identifying assumption, "small' firms around the thresholds appear to exhibit disclosures in a voluntary regime that exceed their requirements in the mandatory regime. For another, our cross-sectional results in Table 6 document that "small" firms' disclosures in the mandatory regime vary predictably with the strength of information spillovers. We would not observe such cross-sectional variation if all "small" firms were only providing the uniform minimum required disclosures.

NC 3: Larger firms' disclosures are generally unconstrained by their minimum disclosure requirements and unaffected by spillovers from other ("medium") firms' disclosure requirements.

If this condition were violated, larger firms' disclosures would not constitute de facto voluntary disclosures. If larger firms' observed disclosures were pushed above their voluntary levels through their own disclosure requirements, we would overstate "small" firms' disclosures in

a voluntary regime. If, by contrast, larger firms' observed disclosures were reduced through spillovers from other ("medium") firms' disclosure requirements, we would understate "small" firms' disclosures in a voluntary regime.

To provide evidence on whether larger firms' disclosures are constrained by the regulation, we investigate disclosure changes observed for firms switching from the "medium" to the "large" regulatory class. Column 2 of Table 7 documents that this switch does not significantly increase and, in fact, slightly decreases firms' disclosures by an immaterial 1.3 percent. This evidence is consistent with the disclosures observed for the largest firms exceeding their minimum disclosure requirements as conjectured by our third necessary condition.[18]

NC 4: Firms' number of clicks is not substantially affected by firms' own or other firms' minimum disclosure requirements.

If this condition were violated, we could not use the observed number of clicks in the mandatory regime as a proxy for firms' disclosure incentives in a voluntary regime. A potential concern is that the number of clicks observed for "small" firms' disclosures in a mandatory regime could be reduced by informational spillovers from "medium" firms. Thus, we would underestimate "small" firms' disclosures in a voluntary regime by multiplying the disclosure/click multiple with a too low number of clicks. Similarly, we would overestimate "medium" firms' disclosures in a voluntary regime if the more extensive disclosure requirements applied to these firms would per se attract more clicks (e.g., by shifting stakeholders' attention). (Note that these patterns, if anything, would work against our findings.)

Our main results show that the number of clicks smoothly increases in firm size, which does not support the idea that the clicks on disclosures of "small" firms around the thresholds are

[18] The increase in disclosure requirements around the medium-large threshold is of modest magnitude (in particular compared to the stark increase in requirements around the small-medium threshold). If firms around the medium-large threshold only disclosed the mandatory minimum, we would nevertheless expect our test to capture an effect of the regulation in their disclosure outcomes. The unambiguous (positive) sign of the effect and its low variance should make it easily detectable in our tests even if the effect is of only modest magnitude.

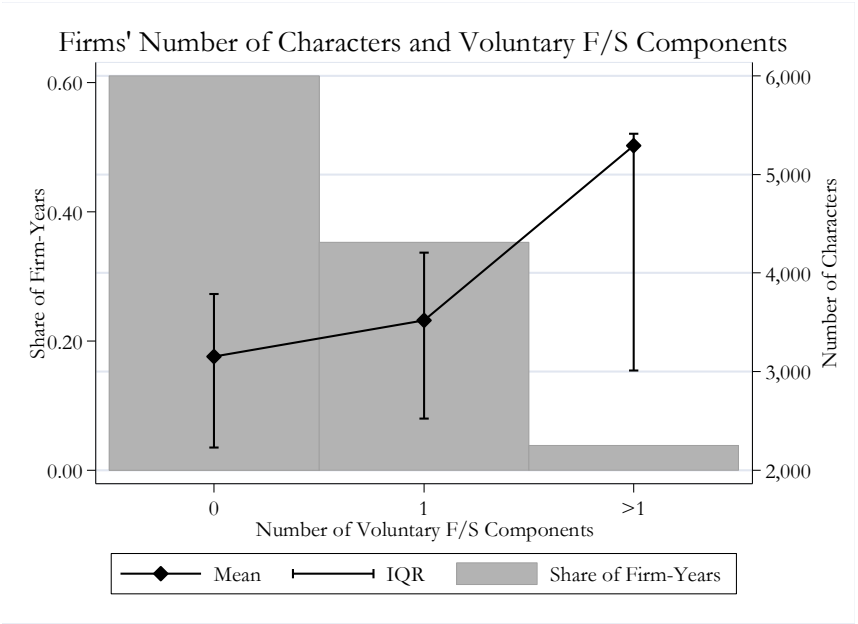
affected by "medium" firms' disclosures. We further test for the influence of firms' own minimum disclosure requirements on the number of clicks by investigating changes in the number of clicks for firms switching from the "small" to the "medium" regulatory size class. Column 3 of Table 7 documents that the number of clicks does not change significantly. Consistent with our fourth necessary condition, this evidence suggests that the number of clicks is generally unaffected by direct effects of the minimum disclosure requirements.

Notably, however, the fact that the number of stakeholders, as measured by clicks, is unaffected by the requirements does not imply that the net benefit per stakeholder remains unaffected. To the contrary, our main results suggest stakeholders benefit more from "medium" firms' disclosures, which in turn substitutes for and reduces stakeholders' net benefit derived from "small" firms, manifesting in fewer disclosures provided per click by "small" firms.

Figures and Tables

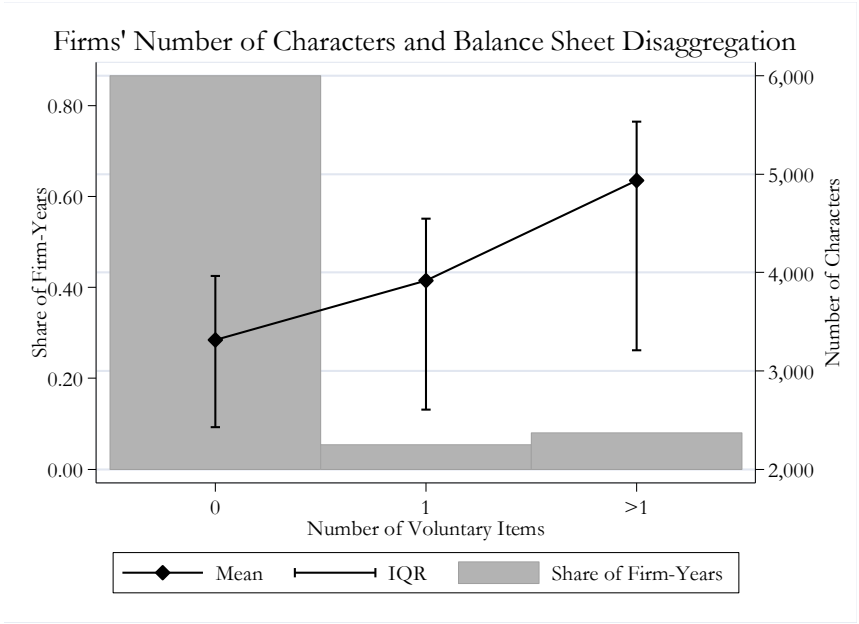
Figure A.1

Panel A



Total fraction of firm-years with voluntary disclosure: 39%

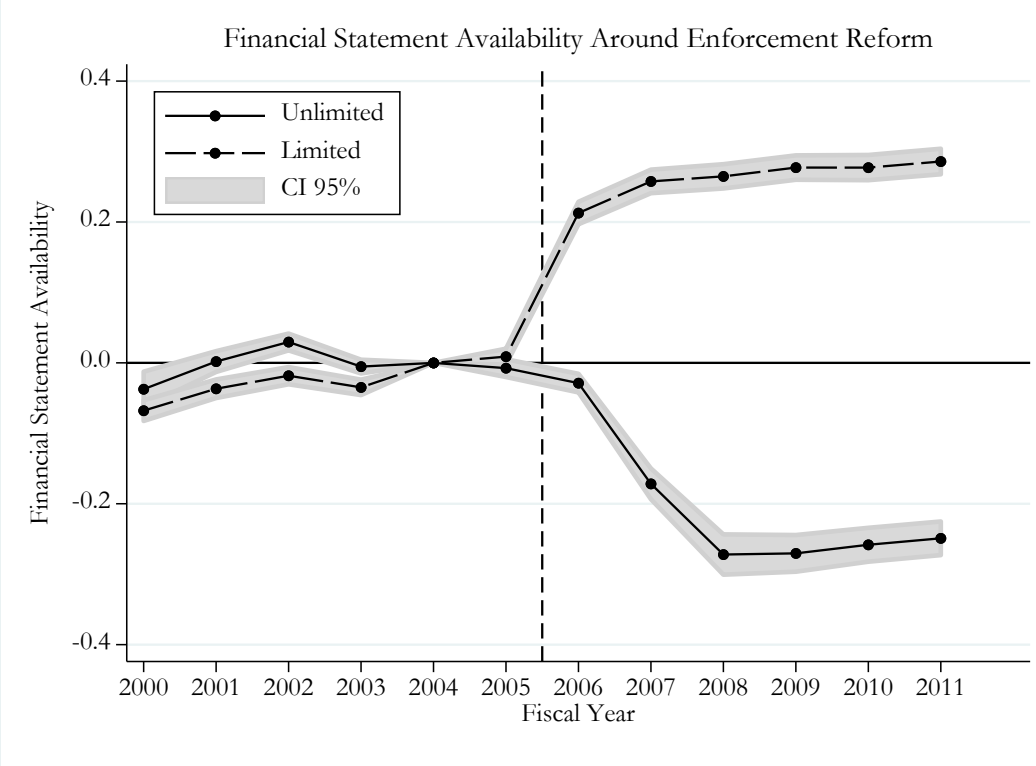
Panel B



Total fraction of firm-years with voluntary disclosure: 13%

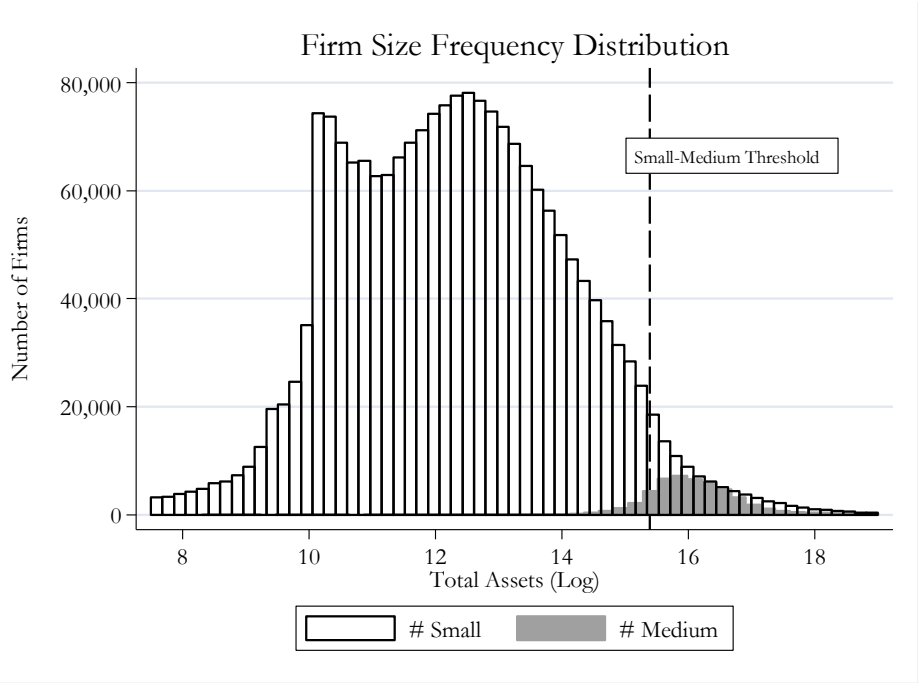
This figure shows the relation between "small" firms voluntary disclosure behavior and their number of characters. We plot the mean and interquartile ranges for different groups of "small" firms conditional on the voluntary disclosure behavior. The gray bars in the background present the share of firm-years of each group. In Panel A, we group "small" firms based on their voluntary disclosure of financial statement component. Voluntary financial statement components of "small" firms include, e.g., an MD&A or profit declaration. In Panel B, we group "small" firms based on voluntary disaggregation of their liabilities position on their balance sheet, closely following the logic in Chen et al. (2015). This figure supports the use of the number of characters in constructing our main disclosure variables. It documents, first, that a non-negligible fraction of "small" firms decides to voluntarily provide information in their publicly disclosed financial statements. Across both measures of voluntary disclosure behavior, we observe some voluntary disclosure in 47% of all "small" firm-years. Second, it documents that firms' decision to provide such voluntary information strongly correlates with the number of characters in their financial statements.

Figure A.2



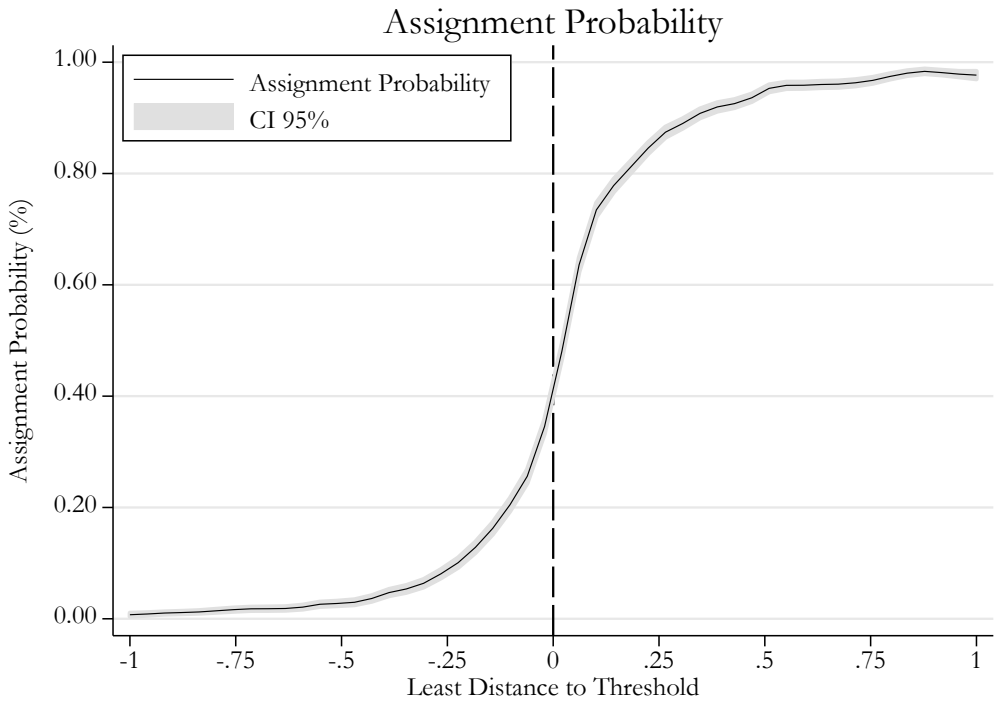
This figure plots the availability of financial statements in *Creditreform*'s database for limited-liability and unlimited-liability firms over time. The dots reflect coefficients of a regression of financial statement availability on separate year indicators for limited-liability and unlimited-liability firms. The left out base category is fiscal year 2004. The regression controls for firm-fixed effects and firms' size (sales and employees). The regression uses a narrow definition of unlimited-liability firms, which only includes KG and UHG firms; the two legal forms used by firms most comparable to the limited-liability firms. The gray area captures a pointwise 95% confidence interval using standard errors clustered at the county level. The vertical dotted line separates the pre- and post-enforcement period.

Figure A.3



This figure shows the number of "small" and "medium" firms around the small-medium threshold. The sample is the one used for our main tests in the "small vs. medium" setting. The transparent (gray) bars show the number of firms in the "small" ("medium") regulatory size category. The dashed vertical line represents the total asset threshold.

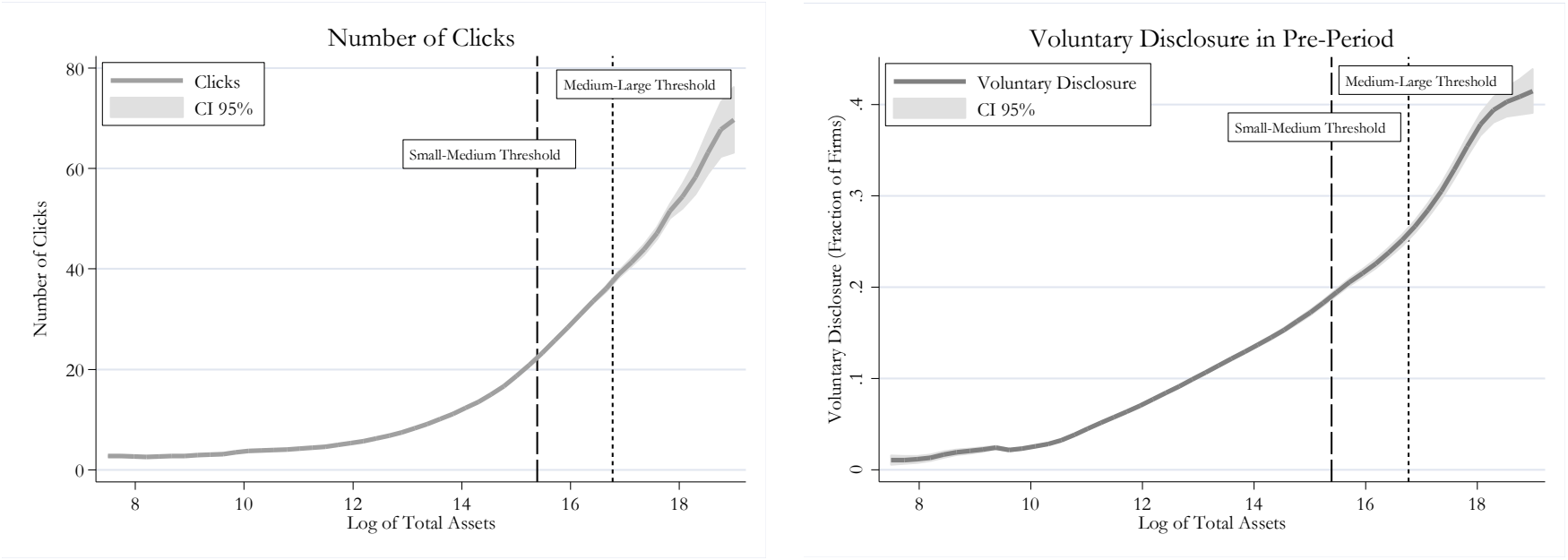
Figure A.4



This figure plots firms' probability of being assigned to the "medium" category as a function of our combined distance measure ("Least Distance to Threshold"). Local averages are calculated using a kernel regression with an Epanechnikov kernel. The shaded gray area presents the 95% confidence band.

Figure A.5

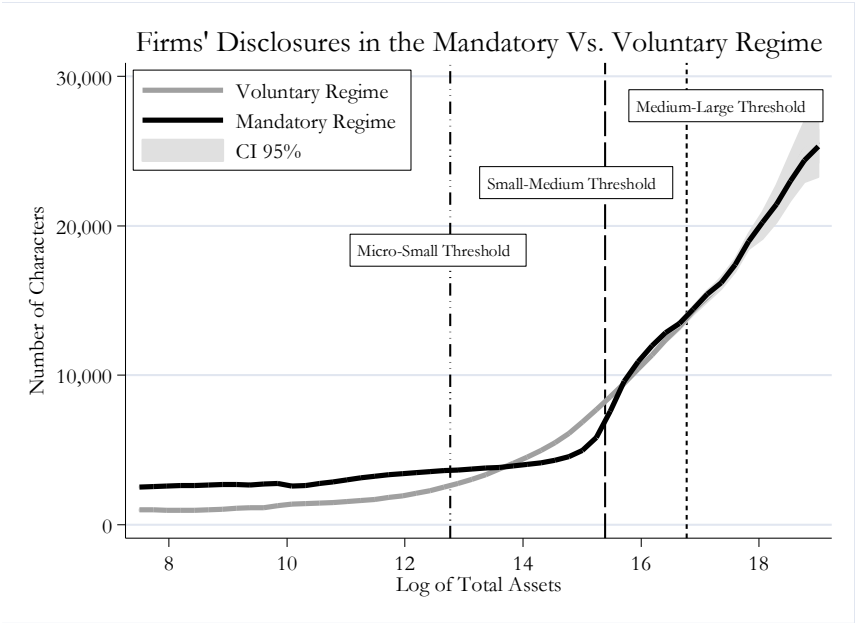
Panel A **Panel B**



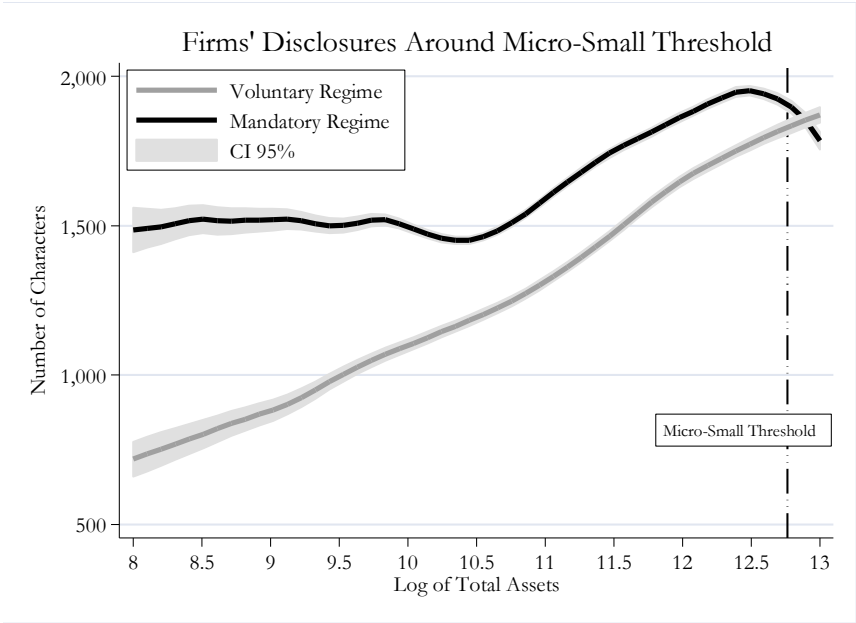
This figure compares our disclosure demand measure (Panel A) to firms' voluntary disclosure of their financial statements during the low-enforcement period pre-dating our sample period in the "small vs. medium" setting (Panel B). Disclosure demand is measured by the number of online views a filing receives on the official publication platform twelve months after its publication. We identify voluntary disclosure of financial statements in the low enforcement period based on whether or not annual financial information as of fiscal year-end 2004 is available in Bureau van Dijk's *dafne* database (as of 2013). The lines present local averages of the number of online views (Panel B) and the fraction of firms disclosing financial statements (Panel B) conditional on firm size calculated using a Kernel regression with an Epanechnikov kernel to weigh local observation. The shaded gray areas present 95% confidence bands. The vertical lines present the total asset values based on which the disclosure regulation classifies firms as "small", "medium", or "large" (see Table A.1 for details).

Figure A.6

Panel A



Panel B



This figure illustrates firms' disclosures in our two placebo settings (Section 7.2). Panel A shows firms' disclosures observed for the mandatory regime and disclosures predicted for the voluntary regime as a function of firm size as in Figure 4. Besides the small-medium threshold, Panel A includes as vertical lines the medium-large threshold distinguishing "medium" and "large" firms, as well as the micro-small threshold distinguishing "micro" and "small" firms. Note that the regulatory category of "micro" firms was introduced only after our main sample period. Panel B shows the disclosures of "micro" firms in the mandatory and a voluntary regime around the micro-small threshold. The sample comprises the 2012 financial statements by firms classified as "micro" firms by the Federal Gazette. Disclosures in the mandatory regime are measured by the number of characters observed in "micro" firms' 2012 financial statements. We predict "micro" firms' disclosures in the voluntary regime using their number of clicks on the prior year's financial statements (i.e., before any relaxations applied to "micro" firms). Local averages are calculated using a kernel regression with an Epanechnikov kernel. The shaded gray areas present 95% confidence bands.

Table A.1

Regulatory Size Thresholds and Mandatory Public Disclosure

Panel A: Thresholds implemented in German company law

Fiscal Year	Classification	Total Assets (million EUR)	Sales (million EUR)	Employees	Statutory Source
Until 2008	"Small"	X ≤ 4.015	X ≤ 8.030	X ≤ 50	s. 267 German Commercial Code
	"Medium"	4.015 < X ≤ 16.060	8.030 < X ≤ 32.12	50 < X ≤ 250	
	"Large"	X > 16.060	X > 32.12	X > 250	
Since 2008	"Small"	X ≤ 4.84	X ≤ 9.68	X ≤ 50	s. 267 German Commercial Code
	"Medium"	4.84 < X ≤ 19.25	9,68 < X ≤ 38.5	50 < X ≤ 250	
	"Large"	X > 19.25	X > 38.5	X > 250	
Since 2012	"Micro"	X<0.35	X<0.7	X<10	s. 267a German Commercial Code

Panel B: Reporting requirements

	Balance sheet	Income statement	Notes	Management Report	Audit
"Micro"	Abbreviated (10)	None	None	No	No
"Small"	Abbreviated (22)	None	Major exemptions	No	No
"Medium"	Condensed (39)	Condensed (20/25)	Minor exemptions	Yes	Yes, by chartered bookkeeper
"Large"	Full (63)	Full (27/31)	Full	Yes	Yes, by statutory auditor

This table summarizes the regulatory size thresholds and associated mandatory disclosure requirements. Panel A of this table presents the threshold values for the assignment into one of the three regulatory size categories as implemented in Germany during our sample period. A firm is classified as medium-sized or large if it exceeds the thresholds of any two of the three size criteria in two consecutive years. Panel B of this table displays the differential reporting requirements applying to the three regulatory size categories. The numbers in brackets in the balance sheet and income statement column refer to minimum number of single-line items that need to be disclosed. For medium-sized and large firms, the number of positions in the income statement reflect the number of positions required under function of expense and nature of expense method, respectively.

Table A.2

Firms' Disclosure/Click Multiple and Size			
Outcome	Disclosure/Click Multiple		
Column	(1)	(2)	(3)
Total Assets (Log)	-0.157***	-0.029	-0.100***
	(0.009)	(0.015)	(0.024)
Sample	"Small"+"Medium"+"Large"	"Medium"+"Large"	"Large"
Legal Form Controls	Yes	Yes	Yes
County-Industry-Year FE	Yes	Yes	Yes
Observations	1,662,668	49,906	7,470
# Clusters	399	396	302
Within R-Squared	0.061	0.105	0.156

This table presents evidence on the relation between the observed disclosure/click multiple and firm size. "Disclosure/Click Multiple" is the number of characters provided in firms' mandatory filings scaled by the number of online clicks firms' mandatory filings received. Total Assets (Log) is a proxy for firms' sizes calculated as the natural logarithm of firms' total assets. In column 1, we estimate the relation between the disclosure/click multiple and firm size for the entire sample of firms, including firms in the "small," "medium," and "large" regulatory size category. In column 2, we estimate the relation only for firms in the "medium" and "large" regulatory size category. In column 3, we estimate the relation only for firms in the "large" regulatory size category. All specifications include county-industry-year fixed effects and legal form fixed effects. We drop singletons and report standardized coefficients, within-R-squared values (purged of variation explained by fixed effects), and standard errors are clustered by county in parentheses. *, **, and *** denote statistical significance levels below 10%, 5%, and 1%, respectively.