How Does Financial Reporting Regulation Affect Firms' Banking?

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We examine the effects of financial reporting regulation on firms' banking. Exploiting discontinuous public disclosure and auditing requirements assigned to otherwise similar small and medium-sized private firms, we document that financial reporting regulation reduces firms' reliance on concentrated and local bank relationships and increases banks' reliance on firms' financial reporting, consistent with a shift in firms' banking from relationship toward transactional approaches. Our evidence suggests that financial reporting regulation substitutes for banks' information production role by burdening firms with the disclosure and auditing of their financial statements, consistent with institutional complementarities between reporting and banking systems. (*JEL* M41, M48, G38)

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Information frictions impede the functioning of capital markets. This market failure frequently motivates the regulation of firms' financial reporting as a remedy (e.g., Leuz 2010; Leuz and Wysocki 2016; Minnis and Shroff 2017). Absent regulation, however, information frictions would not remain

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unaddressed (e.g., Coase 1960; Leftwich 1980). Most notably, banks serve as the market response to information frictions, allocating capital based on private information obtained through screening and monitoring (e.g., Diamond 1984).

Despite the potential interdependence of financial reporting regulation and banking, we know little about the empirical effects of financial reporting regulation on firms' banking. This lack of evidence stems from an equity market focus in financial reporting regulation and the corresponding research (e.g., in the United States) and from the lack of suitable control groups required for the empirical study of regulatory effects. Most financial reporting regulations are uniformly imposed on comparable firms (e.g., Minnis 2011) and rarely significantly change over time (e.g., Greenstone, Oyer, and Vissing-Jorgensen 2006). Moreover, firm-level information is often unobservable for unregulated firms.

In this paper, we investigate how financial reporting regulation affects firms' banking, exploiting a quasi-natural experiment in Germany.[1] In accordance with European Union (EU) accounting directives, German law stipulates size-based public disclosure and auditing requirements for limited liability firms. Firms classified as "small" must only disclose an unaudited, abbreviated balance sheet, including brief notes, whereas firms classified as "medium" must disclose an audited, extended balance sheet, extensive notes, a management report, and an income statement. A firm is "small" ("medium") if it falls beneath (exceeds) any two of three size thresholds (related to total assets, sales, and employees) for two consecutive years.

Two features of our setting make it suitable to test the effect of financial reporting regulation on firms' banking. First, unlike financial reporting regulation in the United States that focuses on publicly listed firms, German regulation affects all limited liability firms, including small and medium-sized private firms that lack access to public capital markets and have otherwise publicly opaque information environments. For these firms, banks are the typical capital providers, and firms' mandatory financial reporting constitutes the primary source of firm-specific financial information available to the public. Second, the regulatory assignment of incremental reporting requirements based on size thresholds provides us with data for both more and less regulated firms and permits us to compare these firms using a variant of a regression discontinuity design (e.g., Reardon and Robinson 2012).

We predict that financial reporting regulation shifts firms' banking from relationship toward transactional approaches (e.g., Rajan and Zingales 2003a, 2003b). In particular, we expect that public disclosure and audit requirements level the informational playing field between incumbent and competing banks through the public dissemination and/or hardening of firms' financial information. As a result, we expect public disclosure and audit requirements

[1] We refer to the bundle of public disclosure and audit requirements as "financial reporting regulation."

to foster banking competition and reduce incumbent banks' incentives to acquire relationship-specific private information through screening and monitoring. This shift is not unambiguously desirable for firms, as they incur financial reporting costs (e.g., proprietary disclosure and audit costs) and lose relationship benefits as the result of incumbent banks' reduced acquisition of private information (e.g., Bigus and Hakenes 2016).

There are credible arguments for why the financial reporting regulation may have different effects or none at all. One alternative prediction is that the regulation does not mainly reduce information asymmetries between incumbent and competing banks but rather between firms and all their banks. Thus, reporting regulation would reduce firms' financing frictions rather than increase banking competition (e.g., Stiglitz and Weiss 1981). Another alternative prediction holds that reporting regulation fosters the collection of soft information because banks strategically respond to firms' increased disclosure of (hard) information, stifling rather than spurring banking competition (e.g., Boot and Thakor 2000; Karapetyan and Stacescu 2014). Finally, reporting regulation may not matter if all treated firms already voluntarily provided audited financial statements to competing banks or if the incremental disclosure and auditing were of no value to banks and other stakeholders (e.g., competitors).

To examine the effect of financial reporting regulation on firms' banking, our empirical approach compares financial reporting and banking outcomes of firms treated with differing disclosure and audit requirements near the regulatory thresholds. Exploiting this comparison of otherwise similar firms, we explore the chain of regulatory impacts link by link (e.g., Snyder and Strömberg 2010): We investigate how financial reporting requirements affect firms' actual reporting, banks' (public) information endowment, and ultimately firms' banking outcomes.

We first document that firms treated with incremental financial reporting requirements disclose substantially more and have a higher audit rate than otherwise similar firms. Treated firms' public disclosures, measured by the number of characters (including letters, numbers, and symbols), exceed those of untreated firms by about 182%. Moreover, treated firms' audit rate is 80 percentage points higher than that of untreated firms. These results suggest that, absent the financial reporting regulation, firms privately prefer lower levels of reporting, hinting at a preference for close banking relationships and supporting the relevance of the regulatory requirements for firms' actual reporting.

We next document that banks are active users of the official website that publishes firms' financial disclosures online, which is similar to the SEC's EDGAR Web site in the United States. Additionally, banks access disclosures made by firms treated with greater financial reporting requirements more frequently than those made by otherwise similar firms. These results suggest that firms' regulated financial reporting is credit relevant and enters into banks' information sets.

With a view to banking outcomes, we document that firms treated with greater public disclosure and audit requirements contract with more banks and at greater distances. They also work with a higher share of centralized commercial banks, as opposed to decentralized savings or cooperative banks. Importantly, these results suggest that the regulation shifts firms' banking from concentrated relationship toward more dispersed transactional approaches, consistent with our main prediction.

To explore the potential mechanisms underlying this shift in firms' banking, we provide three further tests. First, we explore the effect of the financial reporting regulation on the maturity of firms' liabilities. We find that the regulation shortens debt maturities. This result is consistent with a shortening of relationship durations and a shift from private information-based monitoring to more transactional monitoring (e.g., via frequent repayment events) (Rajan and Winton 1995). This result is inconsistent with the alternative prediction that financial reporting regulation, first and foremost, reduces firm-bank information asymmetries, because lower information asymmetries are positively correlated with debt maturities in prior studies.[2]

Second, we investigate how geographic variation in banking and product market competition mediates the effects of reporting regulation. We find that the effects of regulation on firms' banking are stronger in more concentrated local banking and product markets. These results suggest that financial reporting regulation has the greatest impact in local markets in which incumbent banks' private information advantage and firms' proprietary costs of information disclosure are greater, consistent with a pro-competitive effect of financial reporting regulation.

Finally, we investigate whether reporting regulation affects high-risk firms differently than low-risk ones because the literature suggests that firms, especially risky ones, exhibit relationship benefits from privately informed banking (e.g., Petersen and Rajan 1994). We find that high-risk firms have worse access to banks than low-risk ones and that financial reporting regulation magnifies the difference between them, consistent with a greater ex ante differentiation based on publicly observable risk characteristics. Since our measure of firm risk is constructed using firms' financial statement information, the increased ex ante differentiation is also consistent with financial reporting regulation increasing banks' reliance on firms' reports (e.g., in the spirit of Minnis 2011).[3]

Our study contributes novel evidence on the effects of financial reporting regulation on firms' banking. Prior equity market evidence suggests that financial reporting regulation can alleviate problems of adverse selection and

[2] For example, Bharath, Sunder, and Sunder (2008), Garcia-Teruel, Martinez-Solano, and Sanchez-Ballesta (2010), Kirschenmann and Norden (2012), and El Ghoul et al. (2016).

[3] We caution that we cannot discern whether banks actually use financial statement information or whether financial statement information merely reflects the information used by banks (e.g., Holthausen and Watts 2001).

moral hazard (e.g., Bushee and Leuz 2005; Greenstone et al. 2006), but also suggests that strict regulation can be too costly for smaller firms (e.g., Bushee and Leuz 2005; Iliev 2010). Our study extends this literature by investigating the effect of reporting regulation on smaller, private firms and their banking. Our work suggests that financial reporting regulation can foster banking competition through the reduction of information asymmetries between banks. The heightened competition, however, comes at the (potentially unintended) consequence of crowding out mutual relationship benefits shared between incumbent banks and their borrowers (e.g., Bigus and Hakenes 2016; Goldstein and Yang 2017). Thus, our study supports the existence of complementarities between countries' financial reporting systems and other institutions of their financial systems (e.g., La Porta et al. 1997; Ball, Kothari, and Robin 2000; Ball 2001; Leuz and Wüstemann 2004; Leuz and Wysocki 2016).

Our study closely relates to the literature on financial information sharing and relationship banking. One string of this literature investigates the effects of information sharing institutions (e.g., credit bureaus) on credit markets. This literature suggests that these institutions can spur competition in credit markets, which in turn increases access to and lowers cost of credit in developing countries with weak creditor rights. Our study differs from this market-level approach by investigating the effects of firm-level financial reporting in an otherwise developed credit market with strong creditor protection. In our setting, greater banking competition due to financial reporting regulation is not unambiguously desirable for firms, which explains their reluctance to replicate market-wide credit information sharing with (voluntary) firm-level financial reporting (e.g., Rajan 1992; Petersen and Rajan 1995; Hakenes et al. 2015; Sutherland 2017).

Another string of the literature investigates the relation between firms' information environment (e.g., their financial reporting) and relationship banking. This literature documents the matching of low transparency firms with relationship banks, suggesting that relationship banking allows firms to economize on proprietary costs of public financial reporting (e.g., Bharath et al. 2008; Dhaliwal, Khurana, and Pereira 2011; Chen, Cheng, and Lo 2013; Bischof 2014; Lo 2014; Bigus and Hillebrand 2017). Conceptually, our study differs from this literature by investigating the regulatory effects of requiring firms to expand their reporting above the voluntary levels documented in prior studies. Our study also differs in that it exploits plausibly exogenous differences in firms' information environments rather than broad information (asymmetry) proxies, such as firms' size, age, or accruals.[4]

[4] For example, prior literature relies on firm size or age (e.g., Petersen and Rajan 1994), the existence or length of firm-bank relationships (e.g., Bharath et al. 2011), the distance between firms and lenders (e.g., Hollander and Verriest 2016), accrual/earnings properties of firms (e.g., Bharath et al. 2008; Ball, Bushman, and Vasvari 2008; Zhang 2008), or disclosure changes around public capital raising events (e.g., Hale and Santos 2009; Schenone 2010) as proxies for firms' information environment or incumbent banks' information advantage.

1. Institutional Background

Germany is a major bank-based economy that has traditionally relied on insider access to private information to resolve information frictions (Elsas and Krahnen 1998; Leuz and Wüstemann 2004). Its banking sector consists of decentralized savings and cooperative banks operating within local districts, following a so-called regional principle, and centralized commercial banks operating nationwide but located only in larger cities (e.g., Puri, Rocholl, and Steffen 2011; Hakenes et al. 2015). Small and medium-sized firms in Germany tend to rely on one or only a few banks, so-called *Hausbanken*. These firms tend to mainly contract with local banks whose bankers know their region's economy and learn about the creditworthiness of particular firms through private channels and sources, such as the firm owners' checking accounts and payment histories (Elsas 2005).

In line with EU accounting directives, German law sets forth a size-based disclosure and audit regulation. Firms are classified as small (medium) if they do not (exceed) any two of three thresholds related to total assets, sales, and employees for two consecutive years (Table A1 in the Online Appendix). The threshold values are 4,840 (4,015) thousand Euro in total assets, 9,680 (8,030) thousand Euro in sales, and 50 employees in and after fiscal year 2008 when the thresholds were revised (before 2008).[5]

Small firms must publish only an unaudited, abbreviated balance sheet, including brief notes, whereas medium firms must provide an audited set of financial statements, including a detailed balance sheet with extended notes, a management report, and an income statement. (For an example, refer to Figure A1.) Except for the audit mandate, there are no differences in terms of preparation of financial statements. That is, both types of firms must provide the same set of financial statements for internal and tax reporting purposes. Hence the financial reporting regulation mandates differential public availability of hardened financial information across the two types of firms.

The German implementation of the accounting directives has been geared toward easing the reporting requirements for small and medium-sized private firms. In particular, Germany used the highest threshold values and broadest exemptions possible under the EU framework, and did not enforce the reporting requirements until pressured to do so by the EU in 2006. In line with a preference for opacity, firms' compliance rates were low in the pre-enforcement reform period (e.g., Bernard 2016), and their voluntary disclosures and audits above and beyond the regulatory requirements are scant in the post-enforcement reform period (e.g., Breuer, Hombach, and Müller 2016). These institutional features suggest that our sample firms prefer resolving information frictions

[5] Note that, while other regulatory requirements are attached to individual size dimensions (e.g., labor representation is tied to the number of employees), the specific multivariate assignment rule uniquely pertains to the financial reporting regulation that is the focus of our study.

through close banking relationships, rather than through extensive (voluntary) financial reporting.[6]

2. Economic Theory

2.1 Reporting regulation and banking competition

Firms' financial reporting can level the informational playing field between incumbent and competing banks, improving their outside financing options and fostering banking competition (e.g., Dell'Ariccia, Friedman, and Marquez 1999). Firms' financial reporting, however, is not costless. For one, the provision of public information can reduce incumbent banks' incentives to invest in relationship-specific monitoring and screening (Goldstein and Yang 2017). As a result, firms' financial reporting can impair mutual relationship benefits that originate from banks' private information acquisitions and are shared between firms and their incumbent banks (e.g., Petersen and Rajan 1994; Gehrig and Stenbacka 2007; Bigus and Hakenes 2016). For another, firms' financial reporting can give rise to costs associated with the revelation of proprietary information to competitors, besides the direct costs associated with the preparation, verification, and dissemination of firms' financial information (e.g., Bhattacharya and Chiesa 1995).

Absent regulation, firms decide on their financial reporting weighing its costs and benefits. Evidence on firms' financial reporting shows that small and medium-sized private firms exhibit low voluntary disclosure and audit rates, suggesting that the relationship and proprietary information costs of financial reporting tend to outweigh benefits associated with banking competition for these firms (e.g., Breuer et al. 2016; Lisowsky and Minnis 2016; Bigus and Hillebrand 2017).

Therefore we expect that financial reporting regulation forces firms to increase their reporting above their voluntary levels. Reporting regulation thus shifts the burden of reducing information frictions from incumbent banks to firms, leveling the informational playing field among banks and crowding out incumbent banks' private information acquisition (e.g., screening and monitoring). In essence, we expect that financial reporting regulation shifts firms' banking from relationship toward transactional approaches (e.g., Berger and Udell 2006). (For a stylized framework formulizing our arguments, please refer to the section entitled "Framework: Reporting Regulation and Banking" in the Online Appendix.)

2.2 Public disclosure and audit

Public disclosure and audit requirements are bundled in our setting. Accordingly, we cannot empirically disentangle the separate effects of the

[6] For details, refer to the section entitled "Enforcement of Private Firm Reporting Requirements in Germany" in the Online Appendix.

public disclosure requirement and the audit requirement in our empirical section. It is nevertheless instructive to consider the conditions under which either requirement can matter for banking in our setting.

The public disclosure requirement can matter if firms, absent regulation, do not provide all their financial statement information to competing banks (i.e., there are costs to the public *and* private dissemination of information). The existence of private dissemination costs is necessary because all firms are required to prepare a full set of financial statements internally, regardless of the disclosure requirement. Accordingly, the public disclosure requirement can only matter if the internally available (hard) information is not otherwise (privately) disseminated to competing banks. If this condition is met, the public disclosure requirement can theoretically shift firms' banking from relationship toward transactional approaches by increasing the reliance on public information.

The existence of private dissemination costs is supported by growing empirical evidence, suggesting that firms do not (even privately) share all their (hard) information with competing banks. For example, Asker and Ljungqvist (2010) and De Franco, Edwards, and Liao (2016) show that firms take proprietary information spillovers (among banks' clients) into account when choosing their banks (see also Lin, Zhang, and Zhao 2017). In a similar vein, Garmaise and Natividad (2016) and Berger, Minnis, and Sutherland (2017) provide evidence of within-bank information spillovers across bank clients. Thus, we expect the public disclosure requirement to lead to a significantly wider dissemination of firms' information compared to their voluntary (public and private) disclosure levels.

The audit requirement can matter if a mandatory audit hardens firms' financial information, increasing the effectiveness of either publicly or privately disseminated financial information in reducing incumbent banks' information advantage. If this condition is met, the audit requirement can theoretically shift firms' banking from relationship toward transactional approaches by increasing the reliance on hard information.[7]

2.3 Alternative predictions

Our main prediction relies on the assumption that financial reporting regulation mainly reduces interbank information asymmetries. Alternative predictions obtain if we assume that financial reporting regulation mainly reduces firm-bank information asymmetries or spurs banks' soft information collection.

If financial reporting regulation mainly reduced information asymmetries between firms and *all* (including incumbent) banks, we would expect financial reporting regulation to alleviate credit rationing and to improve the functioning

[7] The audit requirement can also work through the dissipation of private information, similar to the public disclosure channel. For example, Aobdia (2015) documents that firms' proprietary information spills over to competitors among their auditors' clients.

of credit markets (e.g., Stiglitz and Weiss 1981). If financial reporting regulation mainly spurred banks' strategic soft information collection in response to firms' release of hard financial information, we would expect that financial reporting regulation increases banks' reliance on private information and lessens banking competition (e.g., Boot and Thakor 2000; Karapetyan and Stacescu 2014).

While the validity of either prediction is ultimately an empirical question, we note that our main prediction incorporates many of the multifaceted effects of firms' financial reporting that are likely to be at work in our setting. Our prediction acknowledges that financial reporting regulation levels the informational playing field between incumbent and competing banks but does not necessarily lead to new information for incumbents.[8] Moreover, our prediction accounts for the crowding out of private information central to theories of public disclosure (e.g., Kurlat and Veldkamp 2015; Kanodia and Sapra 2016; Goldstein and Yang 2017). Lastly, our prediction accounts for the multiple audiences problem of public disclosure by explicitly considering how competing banks and product market competitors influence firms' voluntary financial reporting and banking, absent regulatory requirements (e.g., Bhattacharya and Chiesa 1995; Bhattacharya, Boot, and Thakor 2004).[9]

3. Data

We obtain panel data on private, limited liability, nonfinancial firms' accounting information and bank relations from Bureau van Dijk's *dafne* and *amadeus* databases for the fiscal years 2006 to 2012.[10] We enrich these data with information on firms' regulatory size class (small or medium), the length of firms' disclosures, the availability of an audit opinion, and statistics of online views of firms' public disclosures, which we obtain from the Federal Gazette (*Bundesanzeiger*), the official online publication outlet in Germany.[11]

Our sample period covers the post-enforcement reform period (Table A2). The enforcement reform in 2007, relating to filings for fiscal years ending in 2006 and later, increased the rate of compliance with the public disclosure

[8] In our setting, it seems reasonable to assume that incumbent banks receive available financial statement information independent of firms' public disclosure as Basel II requires banks to use credit scoring for risk management (http://www.bis.org/publ/bcbsca.htm).

[9] Consistent with the survey evidence of Minnis and Shroff (2017), we regard the effect on banks and competitors as the first-order effects (relevant for our study). We, however, acknowledge that financial reporting regulation can also affect firms and their banking through a number of further channels, including through effects on other stakeholders (e.g., suppliers or employees) and through a direct effect of audit costs or proprietary costs on firms' credit demand. In the section entitled "Further channels" of our Online Appendix, we briefly discuss and test the importance of these alternative channels.

[10] Our sample period includes the most recent financial crisis. In the section entitled "Financial Crisis" of our Online Appendix, we document that our results are not materially affected by the crisis years.

[11] Using public records provided by RIPE (www.ripe.net), we identified all IP networks that can be classified as belonging to German banks based on their first three blocks (octets). The Federal Gazette mapped this bank classification to temporarily stored, anonymized IP addresses on an ongoing basis and provided us with the number of bank clicks for each filing.

regulation from about 10% to more than 90% (e.g., Schlauss 2010). We focus on the post-enforcement period for two reasons. First, the enforcement reform ensures the observability of small and medium firms, independent of their voluntary disclosure incentives.[12] Second, the incremental disclosure and audit requirements that we exploit in our identification strategy have relevance for firms' financial reporting only if enforced.

The available data have two major limitations. First, we lack information on sales and employees for a number of small and medium firms, as they are not required to report this information.[13] However, it is pivotal for our identification strategy to control for these size dimensions, because they codetermine the financial reporting requirements and are likely correlated with firms' banking. Accordingly, we restrict our sample to firms with available information on sales and employees. This sample selection tends to work against identifying differences between small and medium firms' banking relationships due to mandatory disclosure requirements by reducing the sample size (i.e., lower power) and selecting on voluntarily more transparent firms (i.e., weaker treatment).

Second, the information on bank relations only reaches comprehensive coverage from 2009 onward. We regard unavailable bank relation data as missing values and focus on variation among firms with available bank data. As long as the likelihood of being covered by the database (extensive margin) varies across firms, our results should be unaffected.[14]

4. Empirical Strategy

To test whether financial reporting regulation shifts firms' banking from relationship to transactional approaches, we use three different banking outcomes: the number of banks, the maximum distance to a bank, and the share of commercial banks among all banks a firm contracts with.[15] (Table A.1 in the Appendix provides all variable definitions.)

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[12] We begin our sample period after the enforcement reform as financial information is comprehensively available in the database only after enforcement of the mandate. Hence, we cannot exploit the enforcement shift via a difference-in-differences approach.

[13] While medium firms must disclose an income statement, they may summarize sales and cost of goods sold into one position (i.e., gross profit), making the separate disclosure of sales voluntary. We complement publicly available data with separate data on sales and employees collected by the Federal Gazette for firms around the threshold. As part of their mandate, the Federal Gazette performs checks to ensure that firms comply with the requirement.

[14] If the number of bank relations collected per firm also mechanically varies across the small and medium sample (intensive margin), our results would be contaminated by such a data collection approach. Given that Bureau van Dijk collects banking data through channels other than publicly disclosed annual reports, we regard the former as more probable than the latter.

[15] To obtain the distance to banks, we match location data to firms' ZIP codes and to bank branches' ZIP codes. Based on geographical coordinates, we calculate the bilateral (linear) distance between a firm and its banks.

In line with the literature, we expect that more competitive transactional banking manifests in a greater number of banks, a further distance to banks, and a higher share of centralized banks among all banks a firm contracts with. In particular, contracting with more banks reflects the increased number of banks competing for the firm due to reduced adverse selection concerns (e.g., Dell'Ariccia et al. 1999; Detragiache, Garella, and Guiso 2000). A greater distance to banks reflects the reduced informational distance to farther banks and the correspondingly greater set of competing banks (e.g., Petersen and Rajan 2002; Degryse and Ongena 2005; Mian 2006; Hauswald and Marquez 2006; Agarwal and Hauswald 2010). A higher fraction of centralized commercial banks, relative to decentralized local savings banks, reflects the increased reliance on public (hard) information and transactional approaches (e.g., Stein 2002; Berger, Miller, Petersen, Rajan, and Stein 2005; Qian, Strahan, and Yang 2015).

We specify our empirical model as follows.

$$Y_{i,t+1} = \beta Medium_{i,t} + \varphi f(Size_{i,t}) + \gamma X + \delta_{d,j,t} + \varepsilon_{i,t+1}, \quad (1)$$

where $Y_{i,t+1}$ is some banking outcome (e.g., the number of bank relations) of firm i in year $t+1$; $Medium_{i,t}$ is an indicator variable taking the value of one if the firm is classified as medium under the financial reporting regulation and zero if it is classified as small; $f(Size_{i,t})$ is a control function, including the regulatory size determinants; $\delta_{d,j,t}$ is a fixed effect for each district d, industry j, and year t combination; and $\varepsilon_{i,t+1}$ is an error term.[16]

This setup resembles a parametric regression discontinuity design with $Medium_{i,t}$ as our measure of the extent of financial reporting requirements.[17] Recall that the financial reporting regulation ($Medium_{i,t}$) stipulates that medium firms must disclose a full set of audited financial statements, whereas small firms only need to disclose an unaudited and abbreviated balance sheet including brief notes. Notably, $Medium_{i,t}$ is a discontinuous function of three firm-size dimensions. In particular, firms are classified as medium if they exceed any two out of three size criteria, related to total assets (TA), sales (SA), and employees (EM), for two consecutive years. Formally, the assignment rule can be summarized as follows:[18]

[16] The dependent variable is forwarded to account for the fact that financial statements of year t are commonly disclosed with a one-year publication lag.

[17] Our setting differs from standard regression discontinuity settings because of multiple assignment variables. While the multivariate nature of the assignment rule limits our ability to provide graphical evidence (due to the high dimensionality), the parametric regression discontinuity approach generalizes to our case of multiple determinants (e.g., Garmaise and Natividad 2010; Reardon and Robinson 2012).

[18] The representation holds for all cases except for medium firms fall beneath any two of the three thresholds for only one of two consecutive fiscal years. The latter firms are still subject to the requirements for medium firms until they fall beneath any two of the three size thresholds for two consecutive years.

$$Medium_{i,t} = g(Size_{i,t}, Size_{i,t-1})$$

$$= \begin{cases} 1 & \min\left[\sum_{n=1}^{3}\sum_{m\neq n} I_{i,t}^{n} I_{i,t}^{m}, \sum_{n=1}^{3}\sum_{m\neq n} I_{i,t-1}^{n} I_{i,t-1}^{m}\right] > 0 \\ 0 & \min\left[\sum_{n=1}^{3}\sum_{m\neq n} I_{i,t}^{n} I_{i,t}^{m}, \sum_{n=1}^{3}\sum_{m\neq n} I_{i,t-1}^{n} I_{i,t-1}^{m}\right] = 0 \end{cases}, \quad (2)$$

where $I_{i,t}^{1} = 1\left(Size_{i,t}^{TA} > T_{t}^{TA}\right)$ is an indicator variable taking the value of one if firm i's total assets ($Size_{i,t}^{TA}$) exceed the respective total assets related threshold (T_{t}^{TA}). Similarly, $I_{i,t}^{2} = 1\left(Size_{i,t}^{SA} > T_{t}^{SA}\right)$ and $I_{i,t}^{3} = 1\left(Size_{i,t}^{EM} > T_{t}^{EM}\right)$ are variables indicating whether firm i exceeds the sales and employee thresholds, respectively.

While small and medium firms differ in terms of size as a result of the regulatory assignment of $Medium_{i,t}$, we know and observe the determinants of $Medium_{i,t}$. Conditional on these observable determinants, any difference in firms' reporting and banking outcomes right at the regulatory thresholds can be attributed to the causal impact of discontinuous financial reporting requirements if financial reporting and banking outcomes are a continuous function of firm size, absent the financial reporting requirements.

We make use of our knowledge of the determinants of $Medium_{i,t}$ in a parameterized control function, including all regulatory determinants:

$$\begin{aligned} \varphi f(Size_{i,t}) = &\sum_{n=1}^{3}\varphi_{n} I_{i,t}^{n} + \sum_{n=1}^{3}\varphi_{3+n} h(Size_{i,t}^{n}) + \sum_{n=1}^{3}\varphi_{6+n} h(Size_{i,t}^{n}) I_{i,t}^{n} \\ &+ \sum_{n=1}^{3}\varphi_{9+n} I_{i,t}^{n} I_{i,t}^{Revision} + \sum_{n=1}^{3}\varphi_{12+n} h(Size_{i,t}^{n}) I_{i,t}^{Revision} \\ &+ \sum_{n=1}^{3}\varphi_{15+n} h(Size_{i,t}^{n}) I_{i,t}^{n} I_{i,t}^{Revision}, \end{aligned} \quad (3)$$

where we include indicator variables, $I_{i,t}^{n}$, capturing the isolated effect of crossing each individual threshold to account for firm heterogeneity. Given that the regulatory treatment requires at least two thresholds to be crossed, the inclusion of the individual indicators allows us to better isolate the regulatory discontinuity by comparing firms exceeding the same types of thresholds. Hence our identification comes from the exact assignment rule and not from the fact that some firms exceed certain size thresholds.

$h(Size_{i,t}^{n})$ is the natural logarithm of $Size_{i,t}^{n}$ over T_{t}^{n}. Hence, we control for firms' relative distances to the respective thresholds of each contemporaneous size dimension. We further allow for distinct mappings between the relative distances and our outcomes depending on the sign of the distance, that is,

the slope for negative distances can vary from the slope for positive distances. Finally, we fully interact an indicator variable taking the value of one for periods after the threshold revision in 2008, $I_{i,t}^{Revision}$, with the remaining terms to allow for distinct mappings between our outcomes and size controls before and after the threshold revision.[19]

In addition to controlling for the regulatory determinants, we include a control vector, X, of firm-level controls. First, it contains the logarithm of firm age over average firm age. Given the two-year lookback feature of the assignment rule and the relation between firms' reputation and banks' monitoring efforts (e.g., Diamond 1991), firm age is likely an important factor correlated with both the assignment of treatment and our outcome variables. Similar to the relative size covariates, we allow the relation between the relative age and our outcomes to take on distinct slopes in the pre- versus post-threshold revision period. Second, the control vector includes legal form fixed effects to account for level differences associated with distinct legal types. We cluster standard errors at the district level, accounting for arbitrary correlation across firms and time within districts.

Given the above setup, our main identifying assumption is that, conditional on our covariates, firms' reporting requirements ($Medium_{i,t}$) are uncorrelated with other determinants of firms' banking: $\rho(Medium_{i,t}, \varepsilon_{i,t+1} | f(Size_{i,t}), X) = \rho(g(Size_{i,t}, Size_{i,t-1}), \varepsilon_{i,t+1} | f(Size_{i,t}), X) = 0$.

The validity of this assumption crucially depends on our ability to account for differences related to firm size. We rely on a flexible control function ($f(Size_{i,t})$) to account for continuous firm-size related differences between small and medium firms. We favor this approach over explicitly limiting our sample to firms within a narrow bandwidth around the thresholds, because the existence of multiple assignment variables and threshold combinations complicates the explicit determination of closeness to relevant thresholds. Accordingly, we follow the literature in using the full-sample control function approach in dealing with multiple assignment variables (e.g., Garmaise and Natividad 2010; Reardon and Robinson 2012).

5. Results

5.1 Firm size and financial reporting regulation

We begin our empirical analysis by providing descriptive evidence on the firm-size distribution of our sample. Figure 1 plots separate histograms for small and medium firms along a combined size dimension labeled as "least distance to threshold." (For histograms along each individual size dimension, refer to Figure A2.) The least distance to the threshold ($LDT_{i,t}$) dimension is the second highest value of the set of our three relative distances to the

[19] The main effect of the revision indicator is subsumed by our fixed effects structure.

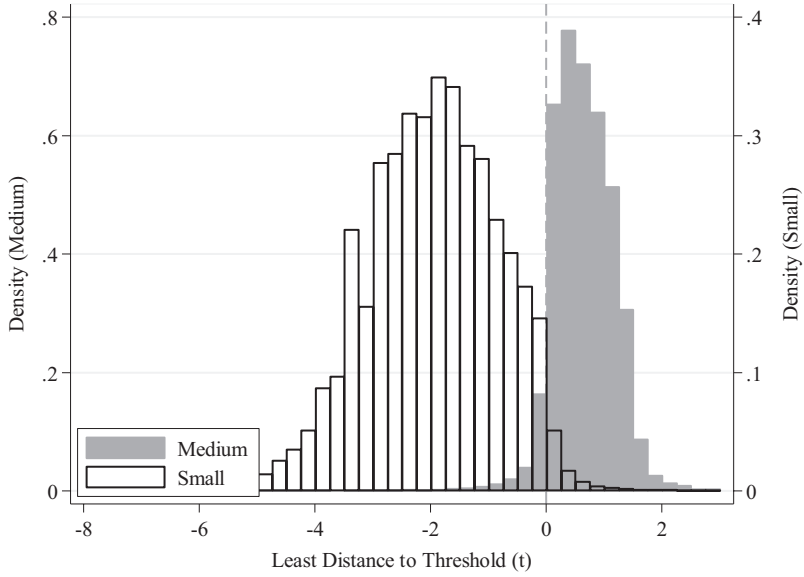

Figure 1
Density of firms around financial reporting threshold
The figure presents empirical densities separately for small and medium firms with respect to a combined firm-size measure labeled "least distance to threshold." The combined firm-size measure attempts to map firms' distances to the three regulatory thresholds related to total assets, sales, and employees into one dimension.

respective regulatory thresholds.[20] We use this combined size dimension for illustration, because the regulatory assignment rule is multivariate, resulting in a dimensionality that we cannot conveniently capture in one graph. Using a combined size dimension mirrors the intuition underlying commonly used regression discontinuity designs based on one assignment variable.

Figure 1 provides two insights. First, the empirical density of small firms drops discontinuously, while the empirical density of medium firms spikes discontinuously when two of three current size dimensions exceed their respective threshold values. This suggests that the disclosure regulation is strictly enforced during our sample period, as documented by prior literature (e.g., Schlauss 2010). Second, there is considerable overlap of small and medium firms around the threshold, owing to the lookback feature of the assignment rule. A small firm can have exactly the same firm size along all three size dimensions as a medium firm if the smaller one exceeds the thresholds for the first time in the last two years. Similarly, this can occur when a medium firm undercuts the thresholds for the first time in the last two years. The dynamic

[20] The least distance to threshold is the second-order statistic, $LDT_{it}^{(2)} = \{\ln(Size_{i,t}^{TA}/T_t^{TA}), \ln(Size_{i,t}^{SA}/T_t^{SA}), \ln(Size_{i,t}^{EM}/T_t^{EM})\}$, because 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.

aspect of the regulatory assignment leads to observing similarly sized firms with distinct financial reporting requirements.

5.2 Financial reporting regulation, firms' financial reporting, and banks' information

Next, we investigate the relevance of the financial reporting requirements for firms' financial reporting and banks' public information about firms. We measure the extent of a firm's disclosures as the log number of characters in its filing (labeled "Disclosure") (Breuer et al. 2016). We approximate banks' interest in a firm's financial disclosures by an indicator variable that takes the value of one if a bank accesses a firm's filing on the regulatory publication platform (labeled "Bank Click").

To build intuition for our underlying regression discontinuity design, we continue to use $LDT_{i,t}$ as our combined size variable on the horizontal axis and zoom into the region right around the threshold. Unlike in the previous figure, we now plot frequencies of small and medium firm observations in the background (Figure 2, upper left graph). In the foreground, we plot two locally smoothed averages of the extent of firms' disclosures. The first local average function calculates the average disclosures for all firms (small and medium) to the left of the threshold, whereas the second function extends over the domain to the right of the threshold.[21]

We observe that the average disclosure amount jumps discontinuously at the threshold. The large difference in disclosure levels is unlikely due to major size differences between the firms just to the left versus those just to the right of the threshold. More likely, this disclosure difference is due to the significant change in the relative frequencies of small versus medium firms around the threshold. Just to the left of the threshold, we observe substantially more small firms than medium firms. By contrast, just to the right, we observe markedly more medium firms than small ones.

We can tighten this graphical analysis by separately examining small and medium firms just around the threshold. Specifically, we can exploit their overlap at the threshold to calculate separate local average functions at the same $LDT_{i,t}$ values. Figure 2 (upper right graph) plots the respective functions and supports our previous insight. At the threshold, that is, the point at which small and medium firms are most comparable in terms of size, the average level of disclosures of medium firms exceeds the average level of small firms' disclosures by more than 1 log point. This finding suggests that the financial reporting regulation forces treated firms' public disclosures substantially above their voluntary disclosure level (Breuer et al. 2016).

With respect to banks' interest in firms' financial disclosures, we observe that, at the combined threshold, about 34% of small firms' filings and about 44%

[21] This analysis is akin to a fuzzy regression discontinuity design as the probability of treatment discontinuously jumps around the threshold.

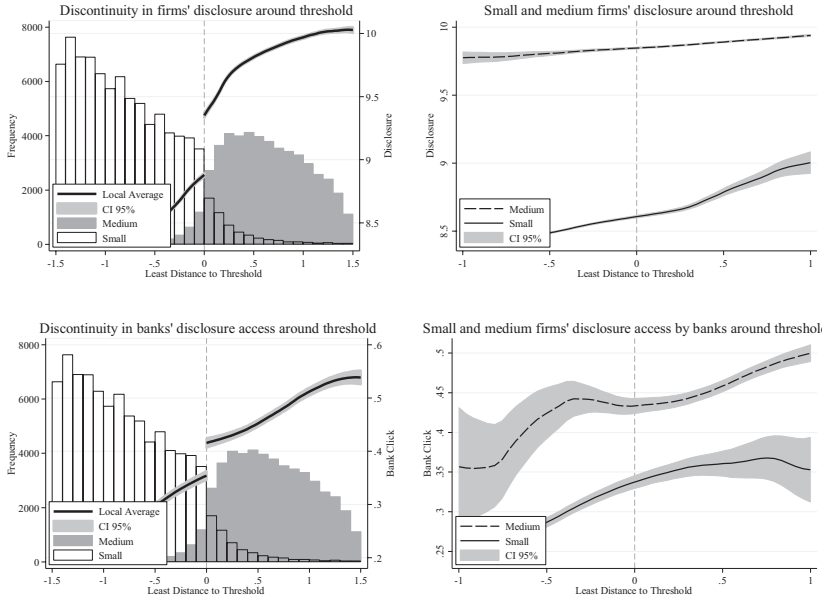

Figure 2
Local differences in firms' disclosure and banks' disclosure access
The figure presents graphical representations of our regression discontinuity-based research design. The upper left graph presents a smoothed local average function of disclosure (measured in log number of characters in firms' disclosures) with respect to a combined firm size measure labeled "least distance to threshold" in the foreground and a frequency distribution of small and medium firms in the background. The function calculates smoothed local averages separately for values to the left and right of the combined threshold. The upper right graph presents smoothed local average functions of disclosure separately for small and medium firms around the combined threshold. The lower graphs provide the same analyses for the likelihood of a bank accessing firms' disclosures as the dependent variable.

of medium firms' filings are accessed by banks (Figure 2, lower right graph). These percentages suggest that firms' public financial statements provide credit-relevant information for banks. Moreover, they indicate that medium firms' filings are not only more extensive but also exhibit a higher likelihood of entering into banks' information set.

While these graphs provide an intuitive representation of our identification strategy, they rely on an ad hoc mapping of our three size dimensions to the univariate $LDT_{i,t}$ dimension. Our parametric approach follows the idea of our graphical representation but allows us to more flexibly and comprehensively account for multivariate size dimensions and other covariates.

Table 1 presents the results of parametric regressions of firms' financial reporting (public disclosure quantity and audit rate) and banks' information access on financial reporting requirements ($Medium_{i,t}$) and controls capturing the multivariate assignment rule, based on different measures of firm size. The results corroborate our graphical evidence. Financial reporting requirements of medium firms at the thresholds increase disclosure levels by about 1.037 log

Table 1
Relevance of financial reporting regulation: Firms' financial reporting and banks' public information

	RD-OLS	RD-OLS	RD-OLS	RD-OLS
	Disclosure	**Audit**	**Bank click**	**Bank clicks**
Medium	1.037***	0.798***	0.027***	0.063***
	(0.016)	(0.008)	(0.008)	(0.022)
		Controls		
Total assets (TA)	Yes	Yes	Yes	Yes
Sales (SA)	Yes	Yes	Yes	Yes
Employees (EM)	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes
I_{TA}(Total assets >T_{TA})	Yes	Yes	Yes	Yes
I_{SA}(Sales >T_{SA})	Yes	Yes	Yes	Yes
I_{EM}(Employees >T_{EM})	Yes	Yes	Yes	Yes
$I_{Revision}$(Year >2007)	Yes	Yes	Yes	Yes
Total assets*I_{TA}	Yes	Yes	Yes	Yes
Sales*I_{SA}	Yes	Yes	Yes	Yes
Employees*I_{EM}	Yes	Yes	Yes	Yes
Total assets*$I_{Revision}$	Yes	Yes	Yes	Yes
Sales*$I_{Revision}$	Yes	Yes	Yes	Yes
Employees*$I_{Revision}$	Yes	Yes	Yes	Yes
Age*$I_{Revision}$	Yes	Yes	Yes	Yes
I_{TA}*$I_{Revision}$	Yes	Yes	Yes	Yes
I_{SA}*$I_{Revision}$	Yes	Yes	Yes	Yes
I_{EM}*$I_{Revision}$	Yes	Yes	Yes	Yes
Total assets*I_{TA}*$I_{Revision}$	Yes	Yes	Yes	Yes
Sales*I_{SA}*$I_{Revision}$	Yes	Yes	Yes	Yes
Employees*I_{EM}*$I_{Revision}$	Yes	Yes	Yes	Yes
Functional form	Linear	Linear	Linear	Linear
Fixed effects	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form
Observations	90,876	90,876	136,527	26,295
Number of clusters (districts)	424	424	427	409
Adjusted R-squared	0.721	0.843	0.282	0.178

The table presents estimates of regressions gauging the relevance of financial reporting regulation for firms' financial reporting and banks' information endowment. We regress disclosure, audit, bank click,and bank clicks on financial reporting requirements (*Medium*) and controls for firm size in terms of total assets, sales, and employees, firm age, legal form, and industry-district-year fixed effects. We allow the coefficients on firm size to vary above and below their respective regulatory threshold and before and after a threshold revision in 2008. *Disclosure* is measured as the logarithm of characters in the firm's disclosures. *Audit* is an indicator taking the value of one for a firm with audited disclosures and zero otherwise. *Bank click* is an indicator taking the value of one if a bank has accessed the firm's disclosures online. *Bank clicks* is the logarithm of the number of bank clicks on a firm's disclosures. *Medium* is an indicator taking the value of one for firms subject to extensive financial reporting requirements (i.e., medium firms) and zero otherwise (i.e., for small firms). Our inferences are based on standard errors (in parentheses) accounting for arbitrary temporal and cross-sectional correlation within districts. *, **, and *** denote statistical significance at the two-tailed 10%, 5%, and 1% level, respectively.

points (or 182%). Furthermore, the financial reporting requirements result in an 80-percentage-point increase in firms' likelihood of providing audited financial statements.

With a view to banks' interest in firms' financial reporting, we find that the likelihood of a bank accessing a firm's filings is about 2.7 percentage points (or 8% relative to small firms' average bank click likelihood at the threshold of 34%) higher for medium as compared to similarly sized small firms. Similarly,

banks access medium firms' filings approximately 6.3% more often than filings of comparable small firms.[22]

Overall, these results suggest that the financial reporting requirements are highly relevant for firms' financial reporting and banks' public (hard) information about firms. Accordingly, our financial reporting regulation can matter for firms' banking, because it forces firms to publicly disclose more (hard) information than voluntarily provided and banks actually access this information.

5.3 Financial reporting regulation and firms' banking

Our main tests examine the relation between financial reporting regulation and firms' banking. (For a graphical representation using the combined size measure, refer to Figure A3.) The first column of Table 2 presents estimation results for firms' number of banks. We find a significant relation between financial reporting regulation ($Medium_{i,t}$) and firms' number of banks. In particular, medium firms, on average, exhibit about a 4% greater number of bank relations than similar small ones (coefficient = 0.071; small firms' average number of banks at the threshold = 2). The second column of Table 2 presents the estimate for firms' distances to their farthest bank. The result suggests that medium firms, on average, exhibit 14% greater distances to their farthest banks (coefficient = 0.132; small firms' average distance to their farthest bank at the threshold = 17 km). The third column of Table 2 provides the estimate for firms' share of commercial banks among all their banks. Medium firms exhibit an about 4.3 percentage points or 10% greater share of commercial banks among the banks they contract with than otherwise comparable small firms (coefficient = 0.043; small firms' average commercial bank share at the thresholds = 0.44).

In sum, these results are consistent with our prediction that financial reporting regulation shifts firms' banking from relationship toward transactional approaches. In particular, financial reporting regulation, through the wider dissemination and/or hardening of information, appears to increase banking competition by lowering informational barriers, which enables geographically distant and centrally organized commercial banks, relying on hard information, to compete with local savings/cooperative banks (e.g., Degryse and Ongena 2005; Berger et al. 2005; Mian 2006; Agarwal and Hauswald 2010; Qian et al. 2015).

With a view to the effect sizes, we note that the significant differences in financial reporting between otherwise comparable small and medium firms do not chiefly move firms' first-order banking structure (i.e., number of banks, distance, type of banks). Considering that firms' banking structure does not change frequently and that banks obtain substantially more detailed information

[22] In line with Breuer et al. (2016), these magnitudes are moderate relative to the increase in the extent of firms' financial reporting. Nevertheless, our findings suggest that the financial reporting requirements increase banks' likelihood and frequency of accessing firms' public disclosures on the margin.

Table 2
Financial reporting regulation and firms' banking

	Banks (t+1)	Distance (t+1)	Commercial bank share (t+1)	Maturity (t+1)
Medium	0.071***	0.132***	0.043***	−0.052***
	(0.027)	(0.049)	(0.010)	(0.019)
Observations	90,876	90,851	90,876	35,476
Number of clusters (districts)	424	424	424	417
Adjusted R-squared	0.277	0.191	0.217	0.081
		Controls		
Size (TA, SA, EM)	Yes	Yes	Yes	Yes
I_{Size}(Size >T_{Size})	Yes	Yes	Yes	Yes
$I_{Revision}$(Year >2007)	Yes	Yes	Yes	Yes
Size*I_{Size}	Yes	Yes	Yes	Yes
I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes
Size*I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes
Age*$I_{Revision}$	Yes	Yes	Yes	Yes
Functional form	Linear	Linear	Linear	Linear
Fixed effects	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form

The table presents reduced form estimates of ordinary least squares regressions of firms' banking outcomes on financial reporting regulation. The dependent variable is firms' number of banks (*Banks*), distance to the farthest bank (*Distance*), share of commercial banks among all of firms' banks (*Commercial bank share*), and firms' debt maturity (*Maturity*), respectively. *Medium* is an indicator taking the value of one for firms subject to extensive financial reporting requirements (i.e., medium firms) and zero otherwise (i.e., for small firms). In all columns, we include controls for firm size in terms of total assets, sales, and employees, firm age, legal form, and industry-district-year fixed effects. We allow the coefficients on firm size to vary above and below their respective regulatory threshold and before and after a threshold revision in 2008. Our inferences are based on standard errors (in parentheses) accounting for arbitrary temporal and cross-sectional correlation within districts. *, **, and *** denote statistical significance at the two-tailed 10%, 5%, and 1% level, respectively.

about firms through continued relationships than through the incremental financial reporting, the moderate effects of financial reporting regulation on firms' number of banks, distance to their farthest banks, and commercial bank share seem plausible. The limited informativeness of financial statements prepared under German accounting law (Leuz and Wüstemann 2004), firms' tendency to choose low-cost audits when forced to obtain a statutory audit by regulation (Lennox and Pittman 2011), and banks' potential anticipation of disclosure changes for firms' around the threshold may further contribute to the moderate effect sizes.

5.4 Financial reporting regulation and firms' debt maturity

To explore the potential mechanisms underlying the shift in firms' banking, we provide three further tests. First, we examine the effect of financial reporting regulation on firms' debt maturity. If reporting regulation reduces incumbent banks' incentives to acquire private information and fosters banking competition, we expect banks to substitute costly relationship-type monitoring,

generating private information, with transactional monitoring, based on short-term debt maturities (Rajan and Winton 1995).[23] If, however, financial reporting regulation mainly reduces information asymmetries between firms and all of their banks, we expect medium firms to exhibit longer maturities than similar small firms, as lower information asymmetries are robustly positively correlated with debt maturities in the literature (e.g., Bharath et al. 2008; Garcia-Teruel et al. 2010; El Ghoul et al. 2016).

The fourth column of Table 2 provides evidence consistent with our prediction that financial reporting regulation, on average, crowds out private information and fosters banking competition, rather than alleviating firms' information asymmetries vis-à-vis all banks (e.g., Sutherland 2017). We find that the financial reporting requirements are associated with a 5.2 percentage points or 22% reduction in the ratio of long-term to total liabilities (coefficient: -0.052; small firms' average maturity at the threshold: 0.24).[24]

5.5 Financial reporting regulation and local competition

Next, we examine the mediating role of banking and product market competition on the effect of financial reporting regulation on firms' banking. We expect interbank information asymmetries to be most pronounced in concentrated banking and product markets. In concentrated banking markets, incumbent banks have privileged access to local (soft) information (e.g., Petersen and Rajan 1995; Agarwal and Hauswald 2010). In concentrated product markets, firms attempt to avoid proprietary information loss by choosing a concentrated banking approach (e.g., De Franco et al. 2016) and competing banks have fewer opportunities to learn from the disclosures of borrowers' peers (e.g., Breuer et al. 2016; Berger et al. 2017). As a result, we expect that financial reporting regulation provides greater incremental information to competing banks and reduces incumbent banks' information advantage more in concentrated banking and product markets. Accordingly, we expect that financial reporting regulation shifts firms' banking more strongly from relationship toward transactional approaches in more concentrated (i.e., less competitive) local banking and product markets.

To test the mediating role of local banking competition, we interact our $Medium_{i,t}$ indicator with the log number of bank branches in a particular district and year provided by the Bundesbank as a measure of local banking competition (D'Acunto, Prokopczuk, and Weber 2017). To test the mediating role of local

[23] The idea is that shorter maturities, for example, allow banks to learn about their borrower through more frequent repayments.

[24] We are limited to measuring firms' debt maturity based on their total short-term and long-term liabilities on the balance sheet at a given date. We, however, fail to find evidence that financial reporting regulation alters firms' trade credit intensity, suggesting that firms' debt maturity reduction is plausibly related to their bank financing (Table A4). Still, we acknowledge that our maturity test does not to hold all other financing terms and regulatory effects constant, limiting its ability to conclusively rule out the alternative prediction that financial reporting regulation reduces firms' information frictions vis-à-vis all their banks.

product market competition, we interact our $Medium_{i,t}$ indicator with the log number of firms in a particular district, industry, and year as a measure of local product market competition (e.g., Breuer et al. 2016).

Panel A of Table 3 presents descriptive evidence consistent with the mediating role of local banking competition. We find that the effect of financial reporting regulation on firms' number of banks, distance to the farthest banks, and commercial bank share decreases with the competitiveness of local banking markets. Likewise, Panel B of Table 3 presents descriptive evidence consistent with the mediating role of local product market competition. We find that the effect of financial reporting regulation on firms' number of banks, distance to the farthest banks, and commercial bank share decreases with the competitiveness of local product markets.

A more nuanced picture emerges when examining the independent roles of banking and product market competition, including both interactions of financial reporting regulation with banking and product market competition at the same time.[25] Panel C of Table 3 documents descriptive evidence that financial reporting regulation has a weaker effect on firms' distance to banks in more competitive banking markets. This result is consistent with both competing banks being located closer to medium firms and interbank information asymmetries being relatively limited among local banks.

Panel C of Table 3 further documents that financial reporting regulation has a stronger effect on firms' public disclosure and a weaker one on banks' public (hard) information acquisition and firms' number of banks in district-industry combinations with more competitive product markets. Consistent with information spillovers documented by Berger et al. (2017), Shroff, Verdi, and Yost (2017), and Breuer et al. (2016), these results suggest that banks' demand for firms' own financial reporting is lower in more competitive markets where banks can learn from a greater number of similar (peer) firms. Given banks' reduced interest in firms' own financial reporting (Column 2 of Table 3), firms' incremental mandatory financial reporting has a muted impact on their number of banks (Column 3 of Table 3). At the same time, firms provide fewer voluntary disclosures (as reflected by the widened gap between small and medium firms' disclosures in Column 1 of Table 3).[26]

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[25] We caution that the above results on the (relative) moderating roles of banking and product market competition constitute purely descriptive evidence. The two competition measures are strongly positively correlated with each other (coefficient = 0.51) and also likely correlated with other local conditions, preventing us from cleanly disentangling the relative moderating roles of banking and product market competition from each other and from other geographic differences.

[26] Besides this disclosure demand channel, the moderating results can obtain via the following supply channel: in competitive product markets, the proprietary cost of each individual firms' financial reporting is relatively low because local peers learn about each other through alternative sources (market prices, similar clients, switching employees, etc.) (e.g., Hoberg and Phillips 2010) and firms can only earn limited (proprietary information) rents (e.g., Arrow 1962). (For example, in a perfectly competitive product market, firms only care about the market price, not other firms' actions, and earn zero rents.) Thus, the proprietary information loss from contracting with multiple banks is relatively low in more competitive markets. Therefore, in competitive product markets, both

Table 3
Financial reporting regulation and local competition

A. Bank market	Disclosure (t)	Bank click (t+1)	Banks (t+1)	Distance (t+1)	Commercial bank share (t+1)
Medium	0.951***	0.045	0.455***	0.943***	0.170***
	(0.068)	(0.043)	(0.151)	(0.231)	(0.061)
*Medium*Banking Competition*	0.018	−0.004	−0.080**	−0.172***	−0.026**
	(0.015)	(0.009)	(0.031)	(0.049)	(0.013)
Observations	86,246	129,309	86,246	86,221	86,246
# clusters	409	409	409	409	409
Adjusted R-squared	0.723	0.283	0.276	0.196	0.217
B. Product market	**Disclosure (t)**	**Bank click (t+1)**	**Banks (t+1)**	**Distance (t+1)**	**Commercial bank share (t+1)**
Medium	0.944***	0.069***	0.418***	0.585***	0.109***
	(0.035)	(0.016)	(0.061)	(0.094)	(0.03)
*Medium*Product Competition*	0.016**	−0.007***	−0.060***	−0.079***	−0.011**
	(0.005)	(0.002)	(0.009)	(0.016)	(0.005)
Observations	90,876	136,527	90,876	90,851	90,876
# clusters	424	427	424	424	424
Adjusted R-squared	0.721	0.282	0.279	0.193	0.217
C. Banking market and product market	**Disclosure (t)**	**Bank click (t+1)**	**Banks (t+1)**	**Distance (t+1)**	**Commercial bank share (t+1)**
Medium	0.951***	0.044	0.457***	0.942***	0.165***
	(0.068)	(0.039)	(0.133)	(0.205)	(0.059)
*Medium*Banking Competition*	−0.001	0.008	−0.013	−0.104**	−0.017
	(0.014)	(0.008)	(0.029)	(0.047)	(0.011)
*Medium*Product Competition*	0.017***	−0.010***	−0.056***	−0.057***	−0.007
	(0.006)	(0.003)	(0.011)	(0.017)	(0.005)
Observations	86,246	129,309	86,246	86,221	86,246
# clusters	409	409	409	409	409
Adjusted R-squared	0.723	0.283	0.277	0.196	0.217

(*continued*)

Table 3
Continued

	Controls				
Size (TA, SA, EM)	Yes	Yes	Yes	Yes	Yes
I_{Size}(Size >T_{Size})	Yes	Yes	Yes	Yes	Yes
$I_{Revision}$(Year >2007)	Yes	Yes	Yes	Yes	Yes
Size*I_{Size}	Yes	Yes	Yes	Yes	Yes
I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Size*I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Age*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Functional form	Linear	Linear	Linear	Linear	Linear
Fixed effects	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form

The table presents estimates of supplementary tests investigating cross-sectional differences in the effect of financial reporting regulation on firms' banking with respect to local competition. We provide regressions of firms' banking outcomes on financial reporting requirements (*Medium*) interacted with a measure of local banking market competition (panel A), product market competition (panel B), and both (panel C). *Banks* is the number of banks. *Distance* is the distance to a firm's farthest bank. *Commercial bank share* is the share of commercial banks among all of a firm's banks. *Bank click* is an indicator taking the value of one if a bank has accessed the firm's disclosures online. *Maturity* is the ratio of long-term over total liabilities. *Medium* is an indicator taking the value of one for firms subject to extensive financial reporting requirements (i.e., medium firms) and zero otherwise (i.e., for small firms). *Banking competition* is the natural logarithm of the number of bank branches in a given district and year. *Product competition* is the natural logarithm of the number of firms in a given district, industry, and year. Our inferences are based on standard errors (in parentheses) accounting for arbitrary temporal and cross-sectional correlation within districts. *, **, and *** denote statistical significance at the two-tailed 10%, 5%, and 1% level, respectively.

5.6 Financial reporting regulation and banks' risk differentiation

Lastly, we examine the mediating role of firms' risk profiles for the effect of financial reporting regulation on firms' banking. Prior evidence suggests that, compared to transactional banking, relationship banking is more conducive to financing risky firms that require intense screening and monitoring (e.g., Diamond 1991; Petersen and Rajan 1994). Accordingly, we expect that financial reporting regulation makes firms' banking more contingent on their (ex ante) publicly observable risk profile by shifting firms' banking from relationships to transactional approaches.

To test the mediating role of firms' risk profiles, we classify firms as "high risk" if their standard deviation of return on assets is in the top tercile of the sample firms' risk distribution and "low risk" if their standard deviation of return on assets is in the bottom tercile. Table 4 presents the descriptive findings on the mediating role of firms' risk profiles for the effect of financial reporting regulation on firms' banking. We find that small low-risk firms receive fewer bank clicks, contract with more banks, at shorter distances, with a lower share of commercial banks among their banks, and exhibit longer debt maturities than otherwise similar high-risk firms. This evidence is consistent with comparably easy access to bank financing without greater monitoring demands for these small low-risk firms and provides comfort that our risk measure captures the desired construct.

With a view to the medium firms, we find that the spread in banking outcomes and financing terms between low- and high-risk firms are significantly widened. This evidence suggests that financial reporting regulation results in an increased ex ante differentiation of firms based on their risk profiles. Although we cannot ultimately test that this increased differentiation is actually based on firms' financial reporting information (Holthausen and Watts 2001), we note that our risk proxy is constructed based on firms' publicly observable financial reporting information. Thus our results at least suggest that financial reporting regulation increases banks' reliance on firms' financial reporting (e.g., in the vein of Minnis 2011).

Our evidence suggests that financial reporting regulation limits local banks' ability to subsidize high-risk firms through the pooling of high-risk with low-risk firms and the intertemporal pricing of loans. Pooling is deterred because local banks' ability to extract information rents from low-risk firms is reduced through low-risk firms' improved outside options (Table 4, Column 2). Similarly, intertemporal loan pricing is deterred because local banks are less able to extract future information rents from high-risk firms that ex post turn out to be profitable. As a result, local banks are ex ante less likely to finance high-risk firms, forcing these firms to ask for financing at more distant banks

small and medium firms contract with a relatively high number of banks, resulting in a low difference between small and medium firms' number of banks.

Table 4
Financial reporting regulation and banks' risk differentiation

	Bank click (t)	Banks (t+1)	Distance (t+1)	Commercial bank share (t+1)	Maturity (t+1)
Low risk	−0.008*	0.047***	−0.047*	−0.017**	0.003
	(0.005)	(0.016)	(0.025)	(0.007)	(0.007)
High risk	0.014***	−0.012	0.060**	0.030***	−0.016**
	(0.004)	(0.013)	(0.030)	(0.006)	(0.007)
Medium	0.034***	0.087***	0.108	0.051***	−0.074**
	(0.013)	(0.042)	(0.070)	(0.015)	(0.032)
*Medium*Low risk*	−0.032***	0.027	0.001	−0.034**	0.083**
	(0.010)	(0.039)	(0.067)	(0.013)	(0.040)
*Medium*High risk*	−0.016	−0.105**	0.014	−0.004	0.021
	(0.015)	(0.051)	(0.088)	(0.017)	(0.045)
Spreads between low-risk and high-risk firms					
Low-high (small)	−0.022***	0.060***	−0.107***	−0.047***	0.019**
	(0.005)	(0.015)	(0.032)	(0.008)	(0.008)
Low-high (medium)	−0.038***	0.192***	−0.120	−0.077***	0.081**
	(0.015)	(0.048)	(0.087)	(0.015)	(0.039)
Low-high (medium) -	−0.016	0.132***	−0.012	−0.031**	0.062
Low-high (small)	(0.015)	(0.048)	(0.086)	(0.015)	(0.040)
			Controls		
Size (TA, SA, EM)	Yes	Yes	Yes	Yes	Yes
I_{Size}(Size >T_{Size})	Yes	Yes	Yes	Yes	Yes
$I_{Revision}$(Year >2007)	Yes	Yes	Yes	Yes	Yes
Size*I_{Size}	Yes	Yes	Yes	Yes	Yes
I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Size*I_{Size}*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Age*$I_{Revision}$	Yes	Yes	Yes	Yes	Yes
Functional form	Linear	Linear	Linear	Linear	Linear
Fixed effects	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form	Industry-district-year, legal form
Observations	95,515	62,545	62,531	62,545	26,274
Number of clusters (districts)	425	422	422	422	404
Adjusted R-squared	0.272	0.264	0.191	0.214	0.077

The table presents estimates of supplementary tests investigating cross-sectional differences in the effect of financial reporting regulation on firms' banking with respect to banks' risk differentiation. We provide regressions of banking outcomes on financial reporting requirements (*Medium*) interacted with indicators for low- and high-risk firms (measured as the terciles of the standard deviation distribution of return on assets). *Banks* is the number of banks. *Distance* is the distance to a firm's farthest bank. *Commercial bank share* is the share of commercial banks among all of a firm's banks. *Bank click* is an indicator taking the value of one if a bank has accessed the firm's disclosures online. *Maturity* is the ratio of long-term over total liabilities. *Medium* is an indicator taking the value of one for firms subject to extensive financial reporting requirements (i.e., for medium firms) and zero otherwise (i.e., for small firms). *Low risk* (*High risk*) is an indicator taking the value of one for firms in the upper (lower) tercile of the standard deviation of return on assets. Our inferences are based on standard errors (in parentheses) accounting for arbitrary temporal and cross-sectional correlation within districts. *, **, and *** denote statistical significance at the two-tailed 10%, 5%, and 1% level, respectively.

(Table 4, Column 3), at less preferred banks (Table 4, Column 4), and at worse maturity terms (Table 4, Column 5).[27]

[27] Firms appear to prefer local savings cooperative banks over commercial banks (Table 4, Column 4) and long maturities over short maturities (Table 4, Column 5), as evidenced by the equilibrium bank "choice" of the least constrained (low-risk) firms.

6. Robustness

In further empirical tests, we support the validity of our identifying assumption, document the robustness of our results with respect to estimation approaches and functional forms, and assess the sensitivity of our results with respect to hypothetical unobservable variable bias. We briefly summarize the pertaining conclusions below. (For more detail, refer to the robustness section in the Online Appendix.)

6.1 Conditional independence

We assume that firms' financial reporting requirements ($Medium_{i,t}$) are uncorrelated with other determinants of firms' banking once we control for the known regulatory size determinants of $Medium_{i,t}$. Although it is impossible to test this identifying assumption exhaustively, we provide evidence consistent with its validity. We regress $Medium_{i,t}$ on several variables that are likely correlated with firms' banking (e.g., their tangibility, cash position, and performance, measured as return on assets, as well as the number of owners) and show that, conditional on the regulatory determinants, the residual variation in the financial reporting requirements appears widely unrelated to other (observable) determinants of firms' banking (Table A6).

6.2 Functional form

Our parametric regression discontinuity design requires that we correctly specify the functional form of the size-related covariates (i.e., $f(\cdot)$). We corroborate the sensitivity of our results with respect to the functional form by using less parametric approaches to controlling for firm size (e.g., employing polynomials, linear splines, bins, entropy balancing, propensity-score matching, and coarsened exact matching). Note that approaches such as propensity-score matching and coarsened exact matching explicitly restrict our sample to firms immediately around the thresholds. In our setting with multiple thresholds, these approaches resemble a regression discontinuity design with narrow bandwidths around the three regulatory thresholds.

We find that our main results are widely insensitive to alternative functional form assumptions regarding the control function of firm size and age (Table A7 and Table A8). The insensitivity of our main results with respect to the functional form of our covariates provides justification for relying on the linear functional form assumption in our main tests. It appears to introduce little bias, while resulting in substantial precision gains/variance reductions compared to less parametric approaches.

6.3 Firm size dynamics

Our main specification controls for contemporaneous firm sizes, whereas the regulatory assignment rule is based on current and lagged firm sizes (i.e., $g(Size_{i,t}, Size_{i,t-1})$, $f(Size_{i,t})$). We assume that controlling for all size-related

differences can be captured by current size dimensions given the persistence of firm sizes. We assess the sensitivity of our results with respect to any omitted firm size dynamics by controlling for a full set of main effects and interactions of all current and (one-period) lagged size dimensions.

We find that our main results are robust to controlling for the effects and interactions of contemporaneous and lagged firm size dimensions (Table A9). We take comfort in the insensitivity of our point estimates to the inclusion of firm size dynamics and firm size interactions. This evidence supports our key identifying assumption that, conditional on our contemporaneous firm size control function, financial reporting requirements ($Medium_{i,t}$) are largely uncorrelated with other determinants of firms' banking (e.g., differences in firms' growth paths do not appear to confound our results). This allows us to address the curse of dimensionality by only focusing on contemporaneous size dimensions in our control function.

6.4 Unobservable bias

The financial reporting requirements, even conditional on firm sizes, may be endogenous if firms can manipulate their size dimensions (e.g., Bernard, Burgstahler, and Kaya 2017). Although the validity of regression discontinuity designs does not hinge on the absence of any manipulation, but rather on imperfect control over the assignment variable (Lee 2008; Lee and Lemieux 2010), we provide an explicit assessment of the sensitivity of our results to hypothetical unobservable variable bias in the spirit of Imbens (2003) and Altonji, Elder, and Taber (2005) proposed by Oster (2016). This sensitivity analysis suggests that our main results are unlikely to be merely due to unobservable bias related, for example, to certain firms' disclosure avoidance (Table A10).

7. Conclusion

We examine how financial reporting regulation affects firms' banking. Exploiting discontinuous financial reporting requirements assigned to otherwise similar small and medium-sized private firms in Germany, we provide evidence consistent with financial reporting regulation shifting firms' banking from private/soft information-based approaches toward public/hard information-based transactional banking, fostering banking competition and increasing banks' reliance on public (hard) information.

In sum, our findings support the notion that financial reporting regulation and financial intermediation are two alternative approaches to alleviating information frictions plaguing the allocation of capital (e.g., Rajan and Zingales 1998, 2003a). Absent financial reporting regulation, financial intermediation in the form of concentrated relationship banking generates private information, alleviating information frictions, and improving capital allocation (e.g., Diamond 1984; Fama 1985; Gorton and Winton 2003).

Therefore reporting regulation, first and foremost, shifts the approach of capital allocation from concentrated modes, based on private information, to dispersed/competitive modes, based on public/hard information, rather than unambiguously alleviating information frictions and improving capital allocation (e.g., Lipsey and Lancaster 1956; Kurlat and Veldkamp 2015; Goldstein and Yang 2017).

In closing, we acknowledge that our estimates are specific to the financial reporting regulation in Germany, and in particular, to the small and medium-sized firms around the regulatory thresholds. The economic mechanisms underlying our results, however, are likely generalizable to other financial reporting regulations, mandating firms' public disclosure of audited financial statements (e.g., the regulation of public firms' disclosures in the United States), and to information intermediaries and stakeholders other than banks (e.g., rating agencies and investors; Diamond 1985; Kurlat and Veldkamp 2015).

Appendix A

Table A.1
Variable definitions

Variables	Source	Definition
A. Banking outcomes		
Number of banks	Bureau van Dijk	Total number of recorded bank relations
Distance to bank	Bureau van Dijk	Natural logarithm of 1 plus the kilometer distance between a firm and its farthest bank relation
Commercial bank share	Bureau van Dijk	Number of commercial banks over total recorded bank relations
Maturity	Bureau van Dijk	Long-term liabilities (>1 year) over total liabilities
B. Financial reporting and bank interest measures		
Medium	Bundesanzeiger	Indicator variable taking the value of 1 for firms classified as medium and 0 for firms classified as small
Disclosure	Bundesanzeiger	Natural logarithm of the total number of characters in a firm's annual filing
Audit	Bundesanzeiger	Indicator variable taking the value of 1 if a firm files audited financial statements and 0 otherwise
Bank click	Bundesanzeiger	Indicator variable taking the value of 1 if a firm's filing has been accessed by a bank and 0 otherwise
Bank clicks	Bundesanzeiger	Natural logarithm of the total number of bank-related accesses of a firm's filing
C. Controls and mediators		
Relative total assets (TA)	Bureau van Dijk	Natural logarithm of total assets over total assets threshold
Relative sales (SA)	Bureau van Dijk	Natural logarithm of sales over sales threshold
Relative employees (EM)	Bureau van Dijk	Natural logarithm of employees over employees threshold
Relative age	Bureau van Dijk	Natural logarithm of firm age over sample average firm age
I_{TA}	Bureau van Dijk	Indicator variable taking the value of 1 if total assets exceed the total assets threshold and 0 otherwise
I_{SA}	Bureau van Dijk	Indicator variable taking the value of 1 if sales exceed the sales threshold and 0 otherwise
I_{EM}	Bureau van Dijk	Indicator variable taking the value of 1 if employees exceed the employees threshold and 0 otherwise
$I_{Revision}$	Bureau van Dijk	Indicator variable taking the value of 1 for fiscal year 2008 and later and 0 otherwise
Tangibility	Bureau van Dijk	Fixed assets over total assets
Cash	Bureau van Dijk	Cash over total assets
Return on assets	Bureau van Dijk	Net income (as presented on the balance sheet) over total assets
Number of owners	Bureau van Dijk	Total number of individual shareholders
Product competition	Bureau van Dijk	Natural logarithm of the total number of firms within the same industry-district-year combination
Banking competition	Bundesbank	Natural logarithm of the total number of bank branches within the same district-year combination
Risk	Bureau van Dijk	Tercile of standard deviation of return on assets (low risk, bottom tercile; high risk, top tercile)

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