NBER WORKING PAPER SERIES

MANDATED FINANCIAL REPORTING AND CORPORATE INNOVATION

Matthias Breuer
Christian Leuz
Steven Vanhaverbeke

Working Paper 26291
http://www.nber.org/papers/w26291

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 2019

We gratefully acknowledge helpful comments and suggestions from Ray Ball, Benjamin Balsmeier, Phil Berger, Jannis Bischof, Hans Christensen, Wouter Dessein, Stephen Glaeser, Laurence van Lent, Alexander Wagner (discussant), and seminar participants at the University of Chicago, University of Mannheim, the 2019 EASYS, the 2019 Conference on Regulating Financial Markets at Goethe University Frankfurt. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Mandated Financial Reporting and Corporate Innovation
Matthias Breuer, Christian Leuz, and Steven Vanhaverbeke
NBER Working Paper No. 26291
September 2019
JEL No. K22,L51,M41,M48,O43,O47

ABSTRACT

We investigate the impact of reporting regulation on corporate innovation activity. Exploiting thresholds in Europe's regulation and a major enforcement reform in Germany, we find that forcing a greater share of firms to publicly disclose their financial statements reduces firms' innovative activities at the industry level. At the same time, it increases firms' reliance on patenting to protect their innovations, to the extent they continue innovating. Our evidence is consistent with reporting mandates having significant real effects by imposing proprietary costs on innovative firms, which diminishes their incentives to engage in innovative activities. Importantly, we examine and find that this decline in innovative activity is not fully compensated by positive information spillovers (e.g., to competitors, suppliers, and customers) within industries. Thus, our evidence implies that proprietary costs induced by reporting mandates are important consideration for regulators and policy makers.

Matthias Breuer
Columbia Business School
3022 Broadway
Uris 605A
New York, NY 10027
mb4468@gsb.columbia.edu

Steven Vanhaverbeke
Rotterdam School of Management
Postbus 1738
Rotterdam 3000
Netherlands
vanhaverbeke@rsm.nl

Christian Leuz
Booth School of Business
University of Chicago
5807 S. Woodlawn Avenue
Chicago, IL 60637-1610
and NBER
cleuz@chicagobooth.edu

1. Introduction

Disclosure and reporting mandates are ubiquitous. They typically aim to improve the functioning of capital markets and to protect firms' investors and other stakeholders. Despite substantial evidence of capital-market benefits from corporate disclosures (see survey by Leuz & Wysocki 2016), firms frequently oppose disclosure and reporting regulation arguing that it forces them to reveal proprietary information and thereby dissipates the gains from innovation. Whether or not regulators should care about this concern, however, remains unclear (Zingales 2009). A mere redistribution of gains from proprietary information (e.g., from a firm to its competitors or customers) would not be a concern and could even be desirable if it generates spillover effects (e.g., via follow-on innovation). If this redistribution, however, discourages innovative activities overall (Arrow 1962), then regulators face a tradeoff. Thus, it is important to study regulatory effects at an aggregate level (e.g., industry, market, economy) to capture redistribution and spillover effects. While prior work has demonstrated that disclosure can have proprietary costs, we have less evidence when it comes to the effects of reporting mandates on innovative activity, especially at an aggregate level.[1]

In this study, we empirically investigate the effect of regulation mandating the public disclosure of financial statements on market-wide (and firm-level) innovative activity. Innovation is key to productivity and economic growth and, at the same time, an activity for which the potential proprietary costs of reporting mandates are pertinent. We examine market-wide effects to understand whether mandatory reporting merely redistributes innovative activity (e.g., from firms facing mandates to others) or affects innovative activity in the aggregate. For identification, we exploit unique features of the reporting regulation in Europe. The regulation, set forth in the Accounting Directives of the

[1] Bernard (2016), Breuer (2019), and Berger *et al.* (2019), for example, document that mandatory reporting imposes competitive costs on firms. Consistent with competitive costs of disclosure, Dedman and Lennox (2009), Li *et al.* (2017), and Gassen and Muhn (2018), among others, document that concerns about the loss of proprietary information limits firms' voluntary reporting.

European Union (EU), mandates that all limited-liability firms—private and public ones—must publicly disclose their financial statements including a management report discussing business risks, R&D activities, and the firms' strategy. However, countries can grant exemptions to smaller private firms, leading to size-based thresholds that vary by country. Exempted firms must typically provide only an abridged balance sheet with abbreviated notes, allowing them to withhold substantial information that otherwise would have been disclosed in the income statement, more detailed notes, or the management report. Additionally, the enforcement of these reporting mandates varies by country and over time. In this regard, Germany is particularly relevant because it essentially failed to enforce its reporting mandate until 2007, when mounting pressure by the EU commission triggered an enforcement reform (e.g., Bernard 2016; Breuer 2019; Vanhaverbeke *et al.* 2019).

The European setting exhibits several desirable features when investigating the effect of reporting mandates on innovative activity. First, the size-based regulation and the German enforcement reform generate substantial changes in the amount of financial information that is publicly available about otherwise opaque private firms. Second, the size-based thresholds and the enforcement change enable us to use difference-in-differences techniques and simulated instruments. Third, the regulation and enforcement reform primarily affect private firms, allowing us to focus on the proprietary costs of reporting mandates by reducing the role of offsetting capital-market benefits from financial reporting. Fourth, the regulation and enforcement reform pertain to all limited-liability firms rather than just a few public firms, plausibly resulting in aggregate effects.[2] Notably, private

[2] 80% of the 24 million active firms in Europe are limited-liability companies, and are thus affected by the Accounting Directives (EU 2019). Similar to the US, small- and medium-sized enterprises (SMEs) represent over 99.8% of active enterprises within the economy. Since our main identification strategy uses regulatory reporting differences between SMEs and large enterprises, our results directly relate to a vast majority of companies within the economy. SMEs employed 93 million people, accounting for 67 % of total employment in the EU-28 non-financial business sector (EU 2017), and a non-negligible percentage of these firms are highly innovative. According to Eurostat, 14% of private and public firms in Europe have introduced at least one new product or service in 2016 (Eurostat 2019). For firms with 10 to 49 employees, 50 to 249 employees, or more than 250 employees, this estimate changes to 13.1%, 16.9% and 17.3% of firms, respectively.

firms play an important role for innovation (e.g., Rothwell 1978; Acs & Audretsch 1990; Vossen 1998; Schneider & Veugelers 2010). Lastly, there are detailed innovation input and output data for European and especially German firms, including various innovation types, allowing us to measure innovation effects more granularly and also fairly comprehensively.

We employ two related research designs to identify the regulatory effect on innovation at the industry level. In the European setting, we exploit the fact that country-level exemption thresholds have different implications for the share of mandated firms across industries. For example, industries with greater fixed asset requirements exhibit a larger fraction of mandated firms that exceed the asset-based exemption thresholds. We use this country-industry-level variation in the *intensity* of the regulation as our market-level treatment in a *cross-sectional* difference-in-differences (within country, within industry) design. Importantly, we calculate the intensity using a representative firm-size distribution *per industry* rather than the actual country-industry-specific distributions. This intensity treatment, known as a simulated instrument, alleviates concerns about reverse causality (e.g., innovation causing growth, which in turn increases the share of firms above the thresholds) and about omitted factors correlated with country-industry-specific firm-size distributions (e.g., a country's industrial specialization).

In the German setting, we exploit the fact that the enforcement reform affected private limited-liability but not unlimited-liability or public firms. Similar to the European setting, we use a continuous treatment capturing the *intensity* of the reform, measured at the local level. Specifically, we use the fraction of affected firms, measured as the share of limited-liability firms among all firms, in a given local (county-industry) market as the treatment in a *time-series* difference-in-differences (within market, within time) design. For firm-level and robustness tests, we further use standard time-series difference-in-differences designs comparing treated (limited-liability) firms with controls, either unlimited-liability or publicly traded firms, around the enforcement reform.

The two settings and designs exhibit complementary strengths and weaknesses. The main strengths of the European setting are fourfold. First, the setting provides plausibly exogenous within-country-year regulatory variation, allowing us to address concerns about the endogeneity of variation in corporate reporting and country-level regulation, which make real-effects studies very challenging (e.g., Leuz & Wysocki 2016; Roychowdhury *et al.* 2019).[3] Second, the cross-sectional design allows for long-run equilibrium effects of mandatory reporting to play out. Third, the European setting allows for an analysis at the country-industry level, rather than a sub-country regional aggregation, which implies that potential spillover effects are captured more comprehensively. Lastly, the broad sample of industries and countries reduces concerns about the generalizability of the results, which typically arise with a single regulatory change. The main drawback of the European setting is limited detail about firms' innovation activities. By contrast, the main strength of the German setting is that it allows us to use granular data about the inputs and outputs of corporate innovation, for both public and private firms. In addition, the initial lack of enforcement implies that the treatment in the German setting applies to the entire size distribution of private firms. We can thus examine the impact of the reporting mandate on corporate innovation incentives for both SMEs and large firms. Its main drawback is that, as a single-shock design, it is susceptible to other concurrent events potentially confounding the analysis.

We collect and combine financial information on private and public firms in Europe from Bureau van Dijk's Amadeus database, patent data for European firms from Bureau van Dijk's Orbis database and the European Patent Office's PATSTAT database, industry-level information on innovation activity across Europe from Eurostat, and detailed data on innovation inputs and outputs

[3] The European setting and research design cannot address concerns about a country's regulator targeting a specific industry with the thresholds. In this case, the thresholds could be endogenous to a particular industry. But such targeting is unlikely as it would be best achieved by industry-specific thresholds, which we do not see. Moreover, as the thresholds apply country-wide, they are then plausibly exogenous for the other industries.

for German firms from the Mannheim Innovation Panel. The European sample covers more than 17 million unique firms from 26 countries over a time span of 15 years from 2001 to 2015. The German sample covers more than 20,000 unique firms over 12 years from 2002 to 2013.

In the European setting, we find that more extensive financial-reporting mandates are negatively associated with innovation inputs (e.g., R&D personnel) and outputs (e.g., new processes or products), whereas they are positively associated with firms' propensity to use patents to protect their innovations. In the German setting, we similarly find that the increase in enforcement of the reporting mandate is negatively associated with innovation spending, a variety of specific innovation outputs, including product and process innovations, as well as the economic returns to innovation (e.g., sales from new products or cost reductions due to process improvements). We also find some evidence that, in response to the enforcement change (and conditional on still innovating), firms shift from secrecy toward patenting as a means to protect proprietary information. The evidence highlights that the effect of reporting mandates on patenting is ambiguous as mandates change both the incentives to innovate and the way to protect innovation outcomes, which is an important insight.

Our evidence is remarkably consistent across the two distinct settings and designs. It suggests that disclosure and reporting mandates do not merely redistribute innovative activity, but ultimately reduce aggregate innovation within industries. Our evidence is consistent with the idea that financial-reporting regulation reduces firms' ex-ante incentives to innovate or to generate proprietary know-how because mandated reporting makes it more likely that some of the rents from innovations and proprietary knowledge are dissipated ex post. Consistent with the notion that reporting mandates dissipate proprietary information, we document in both settings that the mandates reduce reporting firms' profitability, while they generate positive profitability and innovation spillovers to suppliers and customers. These spillovers, however, appear insufficient to offset the negative effect of reporting mandates on firms' innovation incentives within the industry. We further document that reporting

mandates appear to reduce the likelihood that firms' innovative activities are hampered by financial constraints. In line with a vast literature (e.g., Leuz & Wysocki 2016), this evidence suggests mandatory reporting provides capital-market benefits. These benefits, however, are limited for the private firms in our setting and cannot explain or offset the discouraging effect of reporting mandates on corporate innovation due to the loss of proprietary information.

Our study contributes to several streams of the literature. Survey evidence suggests firms frequently point to concerns about the loss of proprietary information when justifying secrecy or opposing demands for greater transparency (e.g., Graham *et al.* 2005; Minnis & Shroff 2017).[4] While theory supports the link between proprietary costs and secrecy (e.g., Verrecchia 1983), empirically identifying proprietary costs from disclosure mandates as well as establishing the impact of proprietary costs on disclosure decisions has proven challenging (e.g., Berger 2011; Lang & Sul 2014). That said, several recent studies provide evidence supporting the proprietary cost hypothesis. Using the same settings as our study, Bernard (2016) and Breuer (2019) provide evidence that reporting mandates impose competitive costs on firms. Li *et al.* (2017), Glaeser (2018), and Gassen and Muhn (2018), in turn, provide evidence that concerns about proprietary costs lead firms to reduce their disclosures. We add to this literature by documenting an adverse effect on industry-wide innovative activity.

Prior studies on the link between disclosure and innovation tend to focus on the firm-level relation between voluntary financial reporting and innovation proxies such as R&D expenses or patents (e.g., Park 2018; Zhong 2018). These studies provide mixed evidence. Some find that more transparent firms engage in greater innovative activities due to reduced funding costs or agency

[4] Graham *et al.* (2005) provide survey evidence that 58.8% of CFOs fear giving away "company secrets" or hurting their competitive position through voluntary reporting. Similarly, Minnis and Shroff (2017) provide survey evidence indicating that 61.4% of firms believe that competitors download and view their financial statements if they are publicly available. Moreover, they document that 47.8% of surveyed firms state that they downloaded financial statement information about one of their competitors in the past.

conflicts (e.g., Brown & Martinsson 2018; Zhong 2018). Other studies suggest innovative firms choose more opaque financial-reporting practices due to concerns about proprietary costs (e.g., Dambra *et al.* 2015; Barth *et al.* 2017; Chaplinsky *et al.* 2017). We add to this stream of research in three ways. First, we study mandatory rather than voluntary financial reporting, which gives us plausibly exogenous changes in firms' reporting. Second, and consistent with our focus on mandates, we estimate aggregate effects at the market or industry level, instead of firm-level effects.[5] Third, we exploit detailed input and output data on various types of corporate innovation. Hence, we do not have to rely solely on patents, which are a relatively narrow proxy for firms' overall innovative activity (e.g., Gittelman 2008; Nagaoka *et al.* 2010). Moreover, these data stem mostly from confidential surveys, rather than financial reports, which mitigates issues related to the strategic disclosure of R&D expenses (e.g., Koh & Reeb 2015).

Our study is closely related to concurrent work on the effects of mandatory patent disclosures (e.g., Hedge *et al.* 2018; Kim 2018; Valentine 2018).[6] Our focus, however, is on the potential social costs of *reporting* regulation, rather than disclosure regimes that are directly tied to innovative activity or its patent protection. Thus, our study is more similar in focus to Allen *et al.* (2018). They examine the impact of financial-reporting regulation on innovation and provide evidence that costly financial-reporting regulations (i.e., SOX) can negatively affect young firms' innovative activity. Their study suggests that SOX diverted scarce resources away from innovative activities toward regulatory compliance, yet it did not lead to improved transparency for these young, early-stage companies. Our

[5] Importantly, Brown and Martinsson (2018) and Kim (2018) also provide market-level tests. They find, on net, that greater country-level transparency and patent disclosures, respectively, spur innovation. By contrast, we find evidence that more extensive financial-reporting regulation, on net, hurt innovation in both the European and the German setting.

[6] The papers on mandatory patent disclosures exploit the 1999 American Investors Protection Act (AIPA) which accelerated the disclosure of U.S. Patent applications. Using this law change, Dass *et al.* (2018) document an increase in patenting, liquidity, and equity financing due to enhanced disclosure, while Valentine (2018), Kim (2018), and Hussinger *et al.* (2018) document a reduction of firms' incentives to innovate due to concerns about the loss of private information in the patenting process.

study differs in its identification strategy but also because the reporting mandates that we examine come with relatively small (direct) compliance costs, yet significantly increase firms' disclosures.[7]

Our patent results also contribute to the nascent literature on the complementarities between firms' disclosure and patenting strategies (e.g., Arundel 2001; Glaeser 2018; Glaeser *et al.* 2019). This literature highlights that patenting is just one among several ways in which firms can protect their innovations. Patenting provides legal protection in exchange for public disclosure of patent information. Alternatively, firms can choose to protect their innovation through (trade) secrecy (Arundel 2001). The latter creates a link to financial reporting as financial reports can provide proprietary information (e.g., Berger & Hann 2007; Bens *et al.* 2011; Berger *et al.* 2019). Consistent with a link between patenting and financial disclosure, Glaeser (2018) and Glaeser *et al.* (2019) document that firms' patenting decisions are positively associated with firms' financial-reporting incentives. Our study adds evidence that mandatory financial reporting can increase the propensity to use patenting rather than secrecy to protect rents from innovative activities. This shift toward patenting can mask an overall decline in innovative activity and hence lead to misleading inferences if one relies solely on patenting activity to measure firms' overall innovative activity.

2. Mandated Reporting and Innovation: Conceptual Underpinnings

Firms that engage in innovative activities generate proprietary know-how, for instance, about lucrative markets, products or services as well as about new technologies and processes. This know-how allows firms to differentiate from competitors and to earn (quasi-)rents. To shield these rents from competitors and contracting partners (e.g., customers and suppliers), firms protect proprietary information through secrecy or by legal means, e.g., patenting.[8]

[7] The firms in our setting are required to prepare full financial statements irrespective of the public reporting mandate.
[8] Importantly, patenting comes with an explicit requirement to reveal some proprietary information publicly.

Financial reports, however, reveal some of this proprietary information generated by firms' business and innovative activities. For instance, the income statement shows R&D expenses, profit margins, and cost structures. A firm's profit margin is typically indicative of its competitive position (e.g., product differentiation, pricing power). Similarly, information about the cost structure (or gross margin) could reveal cost-leadership advantages in production processes and sourcing (see also Berger *et al.* 2019). The balance sheet provides information about a firm's financial resources as well as its tangible and (sometimes) intangible assets (i.e. patents, copyrights, trademarks).[9] In addition, financial reports provide extensive narrative disclosures, especially in the management report, which entails discussing key products and services, a firm's strategy, and R&D activities.

Thus, the disclosure of financial reports could impose proprietary costs by facilitating direct and indirect competitor learning. It could, for example, not only influence a competitor's strategic decisions about new investments or which markets to enter, but also trigger further information search. When a competitor learns from the financial report how profitable a firm is, the competitor could invest additional resources in figuring out what drives the high profit margin or the distinctive cost structure. The financial report could trigger a search for additional, more detailed information in scientific or industry-specific publications, patent databases, by going to trade fairs, speaking to suppliers or by reverse engineering products. While competitors operating in the same industry or market are likely aware of a firm's products and services, the financial statements provide information on how *profitable* these products and services are. Moreover, this information could induce other firms to enter the industry or market (e.g., Darrough & Stoughton 1990; Wagenhofer 1990).

[9] For example, mentioning a patent or patent application in the narrative disclosures of the financial report or recording a patent on the balance sheet can be informative, as either one points to the existence of a patent for which more detailed information is publicly available in patent office online databases (Wyatt & Abernethy 2008).

The disclosure of financial reports could further impose competitive costs by weakening a firm's bargaining power vis-à-vis its major contracting partners. It, for example, could prompt a customer of a high-margin firm to re-negotiate prices or to search for alternative producers with lower margins (e.g., Max-Planck-Institut 2009; Minnis & Shroff 2017). Similarly, it could enable a labor representative at a low-wage or high-margin firm to benchmark labor costs and profitability across firms and bargain for higher wages (e.g., Palmer 1977; Amernic 1985; Aobdia & Cheng 2018). Likewise, the disclosure of financial reports could allow suppliers and banks to identify new customers or borrowers, resulting in outside options and hence competition for existing procurement or lending relationships (e.g., Costello 2013; Breuer *et al.* 2018). The overall thrust of these arguments is that financial reporting has the potential to spur new arms' length transactions and change the resource allocation in the economy.

Firms consider these competitive costs from the revelation of proprietary information to competitors and contracting partners when making organizational, financing, and reporting choices. Innovating firms, for example, tend to work with few trusted suppliers (e.g., Bönte & Wiethaus 2007; Aobdia 2015), raise financial capital from a limited number of capital providers (e.g., Bhattacharya & Chiesa 1995; Asker & Ljungqvist 2010; Kerr & Nanda 2015), and avoid disclosing their financial reports or limit voluntary disclosures (e.g., Bhattacharya & Ritter 1983; Barth *et al.* 2017).[10]

Financial-reporting regulation, which is common around the world, counters these tendencies by mandating the public disclosure of firms' financial reports. The specific rationale for reporting mandates differs somewhat across countries, but broadly speaking, the mandates typically aim to improve the functioning of capital markets and to protect firms' investors and other stakeholders, by

[10] A large literature in accounting documents an association between firms' proprietary costs and their disclosure choices (e.g., Harris 1998; Leuz 2004; Verrecchia & Weber 2006; Berger & Hann 2007; Dedman & Lennox 2009; Bens *et al.* 2011; Li *et al.* 2017; Glaeser 2018). For reviews of this literature, see Beyer *et al.* (2010) and Lang and Sul (2014).

leveling the informational playing field between corporate insiders and outsiders. However, in light of the discussed usefulness of financial reports to competitors and contracting partners, a key concern is that mandatory reporting not only brings capital-market benefits, but also imposes competitive costs on firms, especially innovative ones (e.g., Max-Planck-Institut 2009; Zingales 2009). Consistent with this concern, firms frequently oppose new reporting mandates pointing to their proprietary or competitive costs (e.g., Graham *et al.* 2005; Minnis & Shroff 2017; Zhou 2018).[11] Thus, it is important to study the costs and benefits of reporting mandates. Prior literature provides substantial evidence on the capital-market effects of reporting mandates, but much less on their real effects, especially when it comes to innovative activities (e.g., Leuz & Wysocki 2016; Roychowdhury *et al.* 2019).

Evaluating the effects of mandatory reporting on innovation is challenging because a mandate may harm some firms, but help the competitive positions of others, necessitating an analysis at the market or economy level. The loss of proprietary information by one firm may simply be a gain by another firm. For the economy as a whole, such information spillovers could be desirable to the extent they disseminate knowledge and spur follow-on innovations (e.g., Hedge *et al.* 2018). However, the redistribution due to the reporting mandate could also be harmful if it reduces aggregate innovative activity in the economy because firms anticipate that proprietary costs diminish their returns to innovation (Arrow 1962). Thus, the net effect of reporting mandates on the aggregate innovative activity in the economy is ultimately an empirical question.[12]

While the net effect is ambiguous, the relative costs and benefits of the reporting mandates likely vary depending on a firm's competitive position and size (e.g., Max-Planck-Institut 2009; Bernard 2016; Bernard *et al.* 2018). The proprietary cost of a firm's mandated reporting, for example,

[11] However, as Berger and Hann (2007) and Leuz *et al.* (2008) discuss, firms could also oppose financial disclosures and reporting mandates for agency or private benefit reasons, nevertheless citing proprietary costs to justify their opposition.
[12] The trade-off between redistribution and effort incentive is reminiscent of the debate on optimal taxation (e.g., Mankiw *et al.* 2009).

can be expected to be higher for a local monopolist than a firm operating in a competitive market. Absent the reporting mandate, a local monopolist can protect its rents by hiding its profitability from its competitors and contracting partners. A firm in a competitive market, by contrast, earns limited rents irrespective of whether it reports or not. In a similar vein, a small firm can be expected to be hit harder by the mandate than a large firm. Absent the reporting mandate, a small firm can minimize proprietary costs by communicating privately with its narrow stakeholder base. A large firm, instead, would report publicly, and incur proprietary costs, even absent a mandate, because it needs to communicate with a broad set of stakeholders. Besides incurring lower proprietary costs from own reporting mandates, a large firm likely also reaps greater benefits from the spillovers of other firm's mandated reporting than a small firm. A large firm, for example, can use its extensive resources and bargaining power to extract a share of the reporting firm's rents. A small firm, by contrast, would find it relatively difficult take advantage of investment opportunities in new markets or to bargain with their contracting partners for better prices by threatening to switch to other suppliers or customers.

3. Institutional Background

3.1. Financial-Reporting Regulation in Europe

The EU Accounting Directives regulate firms' financial reporting in Europe since the 1980s. The EU regulation requires limited-liability firms—private and public ones—to prepare and publicly disclose a full set of audited financial statements. Typically, these financial statements include a balance sheet, an income statement, an audit opinion, extensive notes, and a management report discussing the competitive position and strategy, key products and services, business risks, investment and financing plans as well as activities in the field of research and development. To reduce the regulatory burden for smaller firms, EU regulation allows private firms below certain size thresholds to report less and/or forgo a financial statement audit. These exemptions are based on a combination

of total assets, sales, and employees thresholds and *uniformly* apply to all industries within a given country. While the EU sets maximum exemption thresholds, countries can opt to set lower thresholds, subjecting more firms to the full requirements than required by the EU. This discretion has resulted in notable variation in the relevant thresholds for reporting and auditing across EU countries.[13]

The reporting exemptions allow a substantial fraction of firms to markedly reduce what information they have to provide publicly. Exempted firms, in many countries, must disclose only an abbreviated balance sheet with abridged notes. Although these firms still have to prepare a full set of financial statements for internal purposes and private reporting to their investors, the exemption allows them to hide potentially proprietary information about (i) their innovation inputs (e.g., R&D activities and expenses) and outputs (e.g., profit margins and the cost structure) that otherwise would be revealed in the income statement as well as about (ii) their R&D activities and future actions (e.g., investments, financing, and strategy) that otherwise would have to be discussed in the management report.[14]

3.2. Enforcement Reform in Germany

Germany, as a member state of the EU, transposed the EU Accounting Directives into national law in the 1980s and hence German firms have been subject to the EU reporting mandate for a long time. The enforcement of EU directives, however, typically varies across countries (e.g., Christensen *et al.* 2016). In Germany, the reporting mandate had been weakly enforced until a

[13] The maximum thresholds recommended by the EU were around 4 million Euros in total assets, 8 million Euros in sales, and 50 employees during the majority of our sample period. For country-specific threshold variation, see, for example, Cna Interpreta (2011), Minnis and Shroff (2017), Bernard *et al.* (2018), and Accountancy Europe (2019).

[14] There is some variation in what firms have to provide or they are exempt from. For instance, firms can use one of two income-statement formats in Europe. They either classify expenses by nature (e.g., wage expense and material expense) or function (e.g., cost of goods sold, advertising expense). The former is more prevalent in continental Europe, whereas the latter is more prevalent in the UK. Thus, the estimated reporting mandate effect in the EU setting reflects the average reporting format, exemption, and enforcement level across our sample countries, industries, and years.

sweeping reform in 2007 (e.g., Bernard 2016). Before the reform, limited-liability firms were required to file their financial statements with local courts and to publish their statements in local newspapers. As local courts were not tasked to engage in proactive enforcement and monetary sanctions for non-disclosing firms were low, the share of limited-liability firms complying with the reporting mandate was as low as 5-10%.

In 2007, Germany reformed its enforcement of the reporting mandate via the Bill on the Electronic Registers for Commerce, Companies and Associations (EHUG), effective for financial statements with fiscal years ending in December 2006 or later. Germany's reform efforts were a direct response to mounting pressure from the European Commission and the transposition deadline for the Company Law Disclosures Directive (EU Directive 2003/58/EC), which required the implementation of a central electronic publication register by 2007. The reform created a central electronic publication register in charge of the dissemination of limited-liability firms' financial statements, instituted centralized and proactive enforcement of the mandate by the Ministry of Justice, and introduced escalating fines for non-disclosing firms. As a result of the reform, the share of limited-liability firms complying with the reporting mandate increased to above 90%. This compliance increase substantially enhanced corporate transparency in Germany as it meant that financial statements of more than 900,000 firms became available to the public for the first time.

4. Data

We combine financial and innovation data for limited-liability firms in Europe from several distinct sources. For the European sample, we obtain financial information from Bureau van Dijk's Amadeus database and firm-patent links from Bureau van Dijk's Orbis database. We further obtain patent data from the European Patent Office's PATSTAT database and industry-level information on innovation activity across Europe from Eurostat (based on aggregated responses to the Community

Innovation Survey). This European sample covers more than 17 million unique limited-liability firms from 26 countries over a time span of 15 years from 2001 to 2015. Within each country, we aggregate firm-level financial and patent data up to the three- and two-digit NACE industry level to create a country-industry-year level dataset for our market-wide analyses.

For the German sample, we obtain financial information on both limited- and unlimited-liability firms from the Mannheim Enterprise Panel (MEP). The MEP is based on the firm-level data of Creditreform, the dominant credit bureau in Germany.[15] It is the most comprehensive micro database of companies in Germany outside the confidential business register maintained by the Federal Statistical Office of Germany. The MEP database includes unique-patent identifiers, allowing us to link our sample firms with all patents available in the PATSTAT database to construct patent indicators (ZEW 2019). We supplement this data with detailed information on innovation inputs and outputs from the Mannheim Innovation Panel (MIP), which is based on successive issues of the Community Innovation Survey. This German sample covers more than 20,000 unique firms over 12 years from 2002 to 2013. The firm-level panel, however, is unbalanced as the innovation surveys do not ask the same questions every year and firms do not always respond to all questions. Moreover, there is substantial churn due to the limited survival time of especially smaller firms. The panel is replenished to account for the churn and non-random response bias via representative re-sampling. We account for these features, resulting in spotty data at the firm level, by primarily focusing on a county-industry-level instead of a firm-level research design. The representative sampling together with the county-industry-level aggregation relaxes the need to observe a given firm answering the same question over time (in particular, before and after the enforcement reform in Germany).[16]

[15] See Bersch *et al.* (2014) for more details about the construction of the MEP database.
[16] We choose counties as a relevant regional aggregation level. German counties represents an intermediate administrative level between municipalities and German states. They are comparable to US counties (Nomenclature of Territorial Units

5. Research Design

We exploit both of the aforementioned settings—threshold-based mandates in Europe and a major enforcement reform in Germany—to empirically investigate the effect of mandated financial reporting on corporate innovation. Both settings allow us to use difference-in-differences designs, which purge our estimates from various confounding differences across countries (e.g., code- vs. common-law countries), industries (e.g., labor- vs. capital-intensive industries), or over time (e.g., crisis vs. normal times). The two settings have complementary strength and weaknesses and allow us to provide estimates from a cross-sectional as well as a time-series difference-in-differences design.

5.1. Exemption Thresholds

A central feature of the threshold-based regulation in Europe is that a given country's exemption thresholds affect industries in differential and, importantly, predictable ways. For example, a regulation that exempts firms below the 50-employees threshold from fully complying with the reporting requirements affects labor-intensive industries more strongly than capital-intensive industries. Similar arguments can be made for a threshold based on total assets, which likely affects capital-intensive industries more strongly. Thus, the same threshold implies heterogeneous regulatory intensities across industries.

We exploit this country-industry-level heterogeneity in regulatory intensity in the following cross-sectional difference-in-differences design:[17]

$$Y_{cit} = \beta Reporting_{cit-1} + \gamma X_{cit} + \alpha_{ct} + \delta_{it} + \varepsilon_{cit},$$

for Statistics level 3). Prior research based on German data frequently relies on counties as the relevant regional level, see, for example, D'Acunto *et al.* (2018), Huber (2018), Breuer *et al.* (2018), and Breuer (2019).

[17] Our design exploits rich cross-sectional variation in country-industry-level treatment intensity. We explicitly do not focus on time-series variation for several reasons. First, there were only few, limited changes in thresholds over time. Second, these few changes coincided with other major changes at the country level. Third, market-wide innovation effects likely take time to play out, rendering short-window time-series designs less useful than cross-sectional designs.

where Y_{cit} is the dependent variable (e.g., the share of patenting firms) in a given country c, industry i, and year t; $Reporting_{cit-1}$ captures the regulatory intensity measured as the share of firms above country c's reporting-exemption thresholds in industry i and year $t-1$; X_{cit} denotes a vector of controls; α_{ct} is a country-year fixed effect and δ_{it} is an industry-year fixed effect.[18]

This cross-sectional difference-in-differences design compares more versus less intensively regulated industries within the same country at the same point in time, while accounting for systematic differences across industries. This within-country-year design addresses important concerns about the endogeneity of thresholds chosen by countries at a given point in time. Regulations differ across countries and change over time for many reasons, creating concerns about endogeneity and concurrent events (e.g., Ball 1980; Leuz 2010; Hail *et al.* 2017). By using a within-country-year design, we control for *any* confounding cross-country differences and within-country changes over time, observed or unobserved. This feature is a substantial advantage over usual (time-series) difference-in-differences designs exploiting regulatory changes within countries as their treatment.[19] Another advantage is that the potential competitive and spillover effects from reporting mandates take some time to play out. The cross-sectional difference-in-differences design essentially compares different

[18] We include the share of firms above a country's auditing-exemption thresholds ("Auditing") in the controls to isolate the effect of reporting holding auditing mandates fixed. In alternative specifications, we use a combined treatment variable based on both reporting- and auditing-thresholds due to limited separate variation in reporting and auditing intensity at the coarse two-digit industry level.

[19] After accounting for country-year and industry-year effects, the (standardized) reporting treatment essentially captures the interaction of country-level thresholds and industry-level firm-size distributions.

$$1/N_i \sum_{j=1}^{N} 1(s_{ij} > \overline{s}_{ct}),$$

where N is the number of firms in an industry, s is the size of firm j, and $\overline{s}$ is the exemption-threshold in a given country at a given point in time. By contrast, the reporting treatment would capture any endogenous changes and differences in country-industry-specific firm-size distributions, even after accounting for the country-year and industry-year fixed effects, if we were not using the standardized industry-distributions to calculate the share:

$$1/N_{cit} \sum_{j=1}^{N_{cit}} 1(s_{cijt} > \overline{s}_{ct}).$$

equilibria due to the differential effects of the thresholds, rather than shorter-term effects around regulatory changes.

While country-level differences and changes are well addressed in our design, we essentially rely on the identifying assumption that confounding factors at the country-industry level are uncorrelated with corporate innovation and the share of mandated firms. This assumption would be violated if countries were setting their reporting thresholds for specific industries. A number of institutional features suggest this is unlikely to be the case. First, the thresholds are set uniformly across industries. They are motivated by the desire to alleviate smaller firms from excessive regulatory burdens, resulting among other things from the fixed costs associated with financial-reporting requirements.[20] If the EU or countries really intended to treat industries differently, they could have set industry-specific exemption thresholds. Second, countries are constrained in their threshold choice by the maximum levels set by the EU to prevent a regulatory race to the bottom. Most countries introduced the thresholds several decades ago (before our sample period) and have updated them only infrequently. Countries' initial threshold choices, if anything, reflected their country-level economic and political systems, rather than differential industry-by-industry considerations (McLeay 1999). Collectively, these features weaken the concern about threshold endogeneity, especially within a given country at a given point in time. Moreover, even if a country tailored its country-level thresholds to one specific industry (e.g., its most important industry) or a few, then this country-industry-specific choice would render the same thresholds plausibly exogenous for all other industries, except the specifically targeted one(s), and presumably these other industries would dominate the analysis.

[20] Fixed costs depress the profit margin of firms more, the lower the firms' sales. This scale effect is not specific to a particular industry. Accordingly, the EU, for example, prescribes a uniform sales-based exemption threshold for all industries.

Our identifying assumption further requires that differences and changes in a given industry's firm-size distribution across countries and over time are uncorrelated with innovation activity in a given country, industry, and year. Observed industry-level firm-size distributions, however, vary across countries and over time for several reasons (e.g., industry-specific economic policies, differential growth across industries), which in turn are potentially correlated with innovation. This endogenous variation in industry-level firm-size distributions across countries and over time gives rise to important reverse causality, correlated measurement, and omitted variable concerns. For example, innovation in an industry of a given country may cause firm growth, which in turn increases the share of mandated firms in the respective industry. Similarly, if some firms engage in avoidance behavior below the threshold, then such behavior could reduce innovation or slow firm growth, thereby decreasing the share of mandated firms. Conversely, subsidies may spur innovation and firm growth, increasing the share of mandated firms.

To ensure that our regulatory variation is free of such endogenous firm-size variation, we follow Breuer (2019) and use one standardized firm-size distribution per industry across all countries and years in calculating the share of firms above a given country's reporting-exemption thresholds in a given year. This approach is in spirit of Currie and Gruber (1996) and Mahoney (2015). The resulting standardized measure of regulatory intensity is purged of endogenous variation related to country-industry-specific differences and changes in firm-size distributions across countries and over time, circumventing the above concerns about reverse causality, correlated measurement, and correlated omitted variables due to industry-structure endogeneity.[21]

[21] For a detailed description of the construction of the standardized firm-size distributions and the necessary assumptions underlying this research design, see Breuer (2019).

5.2. Enforcement Reform

We exploit the enforcement reform in Germany as a major shift in the effective regulation of limited-liability firms' reporting over time using the following temporal difference-in-differences design with a continuous treatment variable:

$$Y_{dit} = \beta LimitedShare_{di} \times Post_t + \alpha_{dt} + \delta_{it} + \phi_{di} + \varepsilon_{dit},$$

where Y_{dit} is the dependent variable (e.g., the share of patenting firms) in a given county (or district) d, industry i, and year t; $LimitedShare_{di}$ captures cross-sectional variation in the intensity of the reporting regulation at the county-industry level measured as the average share of limited-liability firms among all (limited- and unlimited-liability) firms in a given county d and industry i in the pre-enforcement period (2002 to 2006); $Post_t$ is an indicator taking the value of one for all years after the enforcement reform (2008 to 2013); α_{it} is a county-year fixed effect, δ_{it} is an industry-year fixed effect, and ϕ_{di} is a county-industry fixed effect.

The basic idea behind this market-level difference-in-differences design is that county-industries with a greater share of limited-liability firms should be more affected by the increase in enforcement of the reporting mandate pertaining to limited-liability firms. This county-industry "exposure" should then explain changes in innovative activities at the county-industry level around the enforcement reform, if there are any. The key identifying assumption of this design is that, absent the enforcement reform, changes in county-industries' innovation activity over time would have been unrelated to the (pre-existing) share of limited-liability firms in a given county-industry, which is essentially a parallel-trends assumption.

In supplemental tests, we complement the continuous-treatment market-level design with two firm-level difference-in-differences designs. In the first firm-level alternative, we compare the

innovation activity of limited-liability firms with the activity of unlimited-liability firms before and after the enforcement reform. In the second alternative, we compare the innovation activity of private (limited-liability) firms with the activity of public firms before and after the enforcement reform. These two alternative designs differ in the choice of the control group. Unlimited-liability firms were neither required to report publicly before nor after the reform. By contrast, public (limited-liability) firms were required to report publicly and this requirement was strictly enforced by the respective stock exchanges before and after the reform.

An important assumption for the firm-level analysis to provide unbiased estimates is that there are no spillovers from treated to control firms (or vice versa). We, however, expect that the increased reporting as a result of the enforcement reform has spillover effects, affecting all firms operating in a product or service market (or even related markets). These effects could be positive or negative. Accordingly, the magnitude of the firm-level estimates are either overstated (in case of negative competition spillovers) or understated (in case of positive information spillovers). Nevertheless, the signs of the firm-level estimates and their magnitudes are informative in conjunction with the market-level estimates. The firm-level estimates, for example, allow us to discern whether a null result in the aggregate is due to a one-for-one redistribution of innovative activity between treated and control firms or rather due to the absence of a treatment effect.

6. Results

6.1. Financial-Reporting Regulation in Europe

6.1.1. Descriptive Statistics

Table 1 presents descriptive statistics for our treatment, investment, innovation, and patenting variables for the European sample. (For a list of variable definitions, refer to the Variable Appendix.) The distribution of the reporting intensity variable ("Reporting") exhibits noteworthy features. The

average (median) intensity, measured as the share of non-exempted firms, is 23% (13%) for three-digit industries in Panel A and 22% (12%) for two-digit industries in Panel B. The intensity measure spans the full range from 0% to 100%, with the majority of the intensity values falling between 5% (5%) and 28% (25%) in Panel A (B). These features suggest that our treatment primarily captures variation in reporting mandates among the *largest* firms in a given industry (i.e., the largest 5 to 28% of firms in a given industry). These firms can be expected to be of substantial importance for market- or industry-level outcomes. Our treatment, however, also extends to relatively small firms in several cases, allowing us to not merely capture a local effect, but rather an average effect over a meaningful range of firm sizes.

With respect to innovation and patenting outcomes, the descriptive statistics suggest that 51% (50%) of firms in the average (median) industry are innovating (i.e., introducing new-to-firm products, services, or processes). By contrast, the share of patenting firms among all firms is only 1% (0%) (Panel A) in the average (median) industry, highlighting that patenting captures only a very small share of corporate innovation. Among innovating firms, this share is still rather small at 11% (6%) in the average (median) industry. These statistics suggest that innovative activities are pervasive, i.e., performed by a larger share of firms, and that only few firms use patenting as a strategy to protect their innovations.

6.1.2. Regression Results: EU Exemptions

Panel A of Table 2 presents the estimates of regressions of investment, innovation, and patenting measures on reporting intensity.[22] The outcomes are measured at the three-digit industry level using financial statement information on tangible assets, intangible assets (e.g., goodwill,

[22] See Tables 3 and 4 in Breuer (2019) for a validation of simulated reporting and auditing intensities and an assessment of correlated factors.

concessions, patents, or licenses), and reported R&D expenses from Amadeus and patent application information from PATSTAT.

We find that reporting intensity is negatively associated with average and aggregate (sales-weighted) investments in tangible assets, though significantly so only for average investments. Similarly, reporting intensity is significantly negatively associated with average and aggregate investments in intangible assets. Notably, auditing intensity is also negatively and significantly associated with the average investments in intangible assets. Although this result may reflect that auditing mandates have a separate effect on intangible investments, it is difficult to disentangle the effects of reporting and auditing mandates due to limited separate variation at the three-digit industry level. Using finer four-digit industries, Breuer (2019) documents that reporting, but not auditing mandates appear to affect industry-wide competition and resource allocation. In this paper, we prefer to use a coarser industry definition because (i) patents are sparse at the four-digit level and (ii) we intend to capture important redistributions of innovative activity, which could take place across four-digit industries. This choice in turn limits our ability to cleanly separate reporting and auditing mandates. Thus, we largely interpret both the reporting and auditing intensity measures as proxies for the extent to which firms in a given country and industry face reporting regulation. For this reason, we also report results for combined reporting and auditing intensities in later analyses.

Next, we find that auditing intensity is (significantly) negatively associated with (aggregate) reported R&D expenses. As R&D expenses are separately reported only by few firms and in few countries, the sample size for this specification drops dramatically. In the last column, we find that reporting intensity is positively associated with the share of patenting firms in a given industry, though the effect is only marginally significant.

Collectively, these results provide preliminary evidence suggesting that reporting mandates reduce corporate investments, but increase patenting. These results leave room for several interpretations. One interpretation is that reporting mandates deter overall innovation activity due to the loss of secrecy and proprietary information rents, yet increase the use of formal ways of protecting existing innovations through patents. They may, however, also imply reporting mandates increase the efficiency of innovative activities, reducing the need for undirected and wasteful search (investments), while increasing innovative outputs (patents). The analysis so far cannot differentiate between these interpretations, as doing so would require data on innovation inputs and outputs. The financial-statement-based measures (e.g., changes in intangible assets) are crude proxies of inputs and patents are a specific and quite limited measure of outputs. To address this measurement issue, we turn to official statistics on industry-level inputs (R&D expenses, R&D employees) and outputs (new-to-firm innovations) from Eurostat. These statistics, however, are only available at the two-digit (or higher) industry level, which further diminishes our ability to differentiate between reporting and auditing mandates. Thus, we explicitly combine reporting and auditing intensities into a joint intensity (the maximum of both shares) to increase the power of our tests.

In Panel B of Table 2, we find evidence that reporting mandates are negatively associated with the fraction of industries spending on R&D and employing R&D personnel, i.e., primarily along the extensive margin and for the combined intensity variable. These associations are broadly consistent with the results in Panel A, suggesting that reporting mandates reduce innovation inputs, though the analysis still suffers from having relatively coarse input measures.

In Panel C of Table 2, we find evidence that reporting mandates are negatively associated with the fraction of firms introducing a new product, service, or process. Correspondingly, the fraction of not innovating firms increases. Among (the remaining fraction of) innovating firms, we find that reporting mandates are positively associated with patenting. Jointly, this evidence suggests that

reporting mandates reduce innovation outputs and, at the same time increase the use of patenting to protect innovation outputs, but only among (still) innovating firms.[23]

Collectively, our results in the European setting are consistent with the notion that reporting mandates reduce corporate innovation. In response to reduced secrecy, the remaining innovators appear to shift toward patenting as a formal way of protecting their innovations. To corroborate these findings, we next turn to the German setting. This setting allows us to examine more specific innovation data and hence to explore in more detail how reporting mandates affect firms' innovative activities as well as the returns to these activities. Moreover, it allows us to confirm that it is indeed reporting (and not auditing) mandates that drive our results, given that the German enforcement reform forced greater public disclosure but did not change the audit mandate.

6.2. Enforcement Reform in Germany

6.2.1. Descriptive Statistics

Table 3 presents descriptive statistics for the three treatment variables ("Limited Share", "Limited", and "Private") and the innovation variables at the market (Panel A) and firm (Panel B) level. The share of limited firms ("Limited Share"), calculated for all firms in a given county, industry, and year in the MEP data, ranges from 0% to 100%. Its average (median) is 59% (60%) on the market level (Panel A). By contrast, the share of "limited" firms in the firm-level data is 97% (Panel B). The remaining 3% are a particular type of unlimited-liability firms (KG, OHG) which are most comparable to the limited firms. Similarly, the share of "private" firms in the firm-level data is 99%. The remaining 1% are publicly listed firms. The rarity of unlimited and publicly listed is in part due to representative sampling (e.g., private vs. public) and in part due to better coverage of limited firms in the MEP and

[23] Unlike the input data in Panel B, the output data in Panel C is also available for years before 2005. In this earlier period, reporting and auditing mandates diverged in several countries (Breuer 2019), allowing us to more credibly identify separate reporting and auditing effects.

MIP data. The limited number of control firms reduces the power of firm-level analyses, which further supports our market-level design in the German setting. As noted earlier, the market-level design also addresses spotty time series at the firm level in the MIP data, which poses a challenge in a time-series difference-in-differences design. Given the random sampling and replacement of the firms in the MIP data construction, we can exploit changes at the market rather than firm-level over time without substantial concerns about endogenous sample selection/attrition over time.

With respect to the descriptive statistics of the innovation variables, we find patterns highly consistent with the European sample. On average, 55% (60%) of firms are innovating in a given year, whereas only 8% (8%) of firms apply for patents in a given year in Panel A (B). In contrast to the European data, the detailed survey data for the German sample also allows assessing the novelty of the innovations. The share of firms with truly new-to-market innovations for example is 29% in Panel A and 30% in Panel B. Although this fraction is lower than the share of firms introducing new-to-firm products, processes, or services, it is still substantial, suggesting a notable share of our sample of firms contributes to innovation and growth in the economy.

6.2.2. Regression Results: Enforcement Reform in Germany

Panel A of Table 4 presents the estimates of regressions of innovation spending, product and process innovations, and patenting on the interaction of the share of limited firms in the pre-enforcement period and a post-enforcement indicator.[24] The interaction essentially instruments for the effective strength of reporting mandates at the market level. In column 1, we find that the interaction is negatively associated with average innovation spending. Panel B of Table 4 confirms this findings for total innovation spending in the county-industry. Figure 1 plots the innovation spending effect over time. Consistent with the parallel trends assumption, we do not observe a

[24] See Figure A1 in Breuer (2019) for evidence that county-industries with greater limited-liability-firm shares exhibit larger increases in public financial reporting after the enforcement reform than county-industries with lower shares.

differential trend between markets with higher vis-à-vis lower shares of limited firms in the pre-enforcement period. Only after the enforcement reform, innovation spending appears to decline gradually and significantly.[25]

In addition to innovation spending, we find that new-to-market innovations, product innovations, and process innovations decline after the enforcement reform. These results highlight reporting mandates do not only reduce innovation inputs, i.e., spending, but also innovation outputs. This pattern also makes it unlikely that the decline in innovation spending reflects an increase in innovation efficiency due to less wasteful spending and instead points to the decline of innovation activity due a dissipation of innovation rents. In support of the latter interpretation, we further document in Table 5 that the enforcement of reporting mandates is associated with decreased profit margins, diminished sales from new-to-the-market innovations, a reduced share of sales increases due to quality improvements, and fewer cost reductions due to process improvements.[26]

With respect to patenting, we find that both the stated importance of patenting and actual patent applications decline after the enforcement reform in the market-level design (Table 4 columns 6 and 7). This result is noteworthy for two reasons. For one, the negative association with both stated importance of patenting by the surveyed firms and their actual patent applications recorded in PATSTAT suggests the survey responses line up with actual behavior, essentially validating the survey responses. For another, the negative patenting result suggest that, in the aggregate, patenting can go up or down depending on the effect of reporting mandates on the underlying innovation activity. If

[25] The enforcement regime became effective for fiscal years ending December 31, 2006, and later. There is an approximately 12-months lag between the fiscal-year end and the publication date. Between December 31, 2006 and December 31, 2007, 123,446 financial statement were publicly available. The following year, 1,079,235 financial statements were publicly available, covering nearly all limited liability firms in Germany (Bundesanzeiger 2019).

[26] We calculate the aggregate percent of sales from new-to-market innovations by weighting the reported percentages with available sales data. By contrast, we aggregate the share of sales increases due to quality improvements by simply calculating the total and taking its logarithm (plus one) as the data does not allow us to observe the sales increase amount relative to which the survey respondents stated the percentage number.

many firms stop innovating as a result of the mandate, then it also leads to fewer patents, even if patenting becomes a more important means of protecting innovations.

Consistent with market-level results, we find in Panel C of Table 4 that, at the firm level, reporting mandates are negatively associated with innovation spending when comparing limited with unlimited firms and private with public firms around the enforcement reform. We further find some evidence that the importance of secrecy as a means to protect innovations is declining, while actual patenting is increasing for limited vis-à-vis unlimited firms and private vis-a-vis public firms after the enforcement reform. The latter result is in contrast to the reduced patenting activity in the market-level design. The difference in the patenting results between the market-level and the firm-level design likely reflects differences in the treated firms and their corresponding innovation spending responses to the reporting mandate. The typical treated firm in the market-level design is a local monopolist, located in one of the plenty county-industries populated by few firms. By contrast, the typical treated firm in the firm-level design is a firm operating in the most populated county-industries. Compared to firms already operating in a competitive market with many close competitors, local monopolists can be expected to suffer more from reporting mandates, which reduce their ability to hide their economic position (or even existence). Consistent with this argument, Table 6 documents that treated firms in the market-level design tend to stop innovating in response to the reporting mandate (Panel A), while those in the firm-level design (likely larger firms) tend to continue spending on innovation, albeit at lower levels (Panel B). Similarly, Table 7 documents that the negative effect of the reporting mandates is strongest in county-industries with few firms. Accordingly, we appear to find a deterioration of patenting activity in the market-design because the treated firms tend to stop innovating altogether. In the firm-level design, by contrast, we observe an increase of patenting activity, because the treated firms continue innovating at a lower scale, but for them protect the innovations has become more important, resulting in more frequent patenting.

6.3. Channels

6.3.1. Product market: competitor, supplier, and customer learning

Our results suggest reporting mandates have a negative *net* effect on innovation within broad industries populated mostly by private firms. This net effect combines the negative direct effect of firms' own reporting mandates on innovation and the positive spillover effects of other firms' reporting mandates. To disentangle these countervailing effects, we construct separate reporting intensities for a given industry's supplier and customer industries. We calculate these supplier and customer reporting intensities by weighting the regulatory reporting intensities of supplier and customer industries with their respective share of inputs to and outputs from a given focal industry. The supplier and customer intensities differ from the focal industry's reporting intensity as many but not all suppliers and customers of firms in a given two-digit industry operate in the same focal industry. This feature allows us to separately identify the impact of mandates imposed on firms and their within-industry competitors from the impact of mandates imposed on firms' suppliers and customers.

Controlling for supplier and customer reporting intensities, we continue to find that more extensive reporting mandates in a given industry decrease innovation activity, consistent with our main results (Table 8).[27] Compared to our main results, however, this decrease is now more pronounced because it excludes offsetting benefits to the focal industry derived from supplier and customer reporting. For instance, firms in the focal industry could strike tougher bargains with their suppliers when they see that (reporting) suppliers have relatively high margins.

Our estimates imply that a 10 percentage-point increase in the share of firms subject to reporting mandates would be associated with a 2.3 percentage-point decrease in the share of

[27] We find similar patterns in the German setting using input- and output-weighted limited shares as measures of supplier and customer reporting intensities (Table A1 in the Online Appendix).

innovating firms, after excluding any supplier and customer spillovers (Table 8 Panel A column 3). The same increase in the reporting share is associated with only a 1.4 percentage-point decrease when including the within-industry supplier and customer spillovers in the estimation (Table 2 Panel C column 1). These comparisons illustrate positive spillovers from customers and in particular suppliers, but they also highlight the importance of an aggregate analysis. Consistent with the notion that mandated reporting by other firms confers positive spillovers, we find that reporting mandates imposed on suppliers and customers spur innovation in the focal industry. These spillovers redistribute the gains from innovative activity from mandated (e.g., suppliers and customers) to related firms in the same industry.

Along similar lines, we find that supplier and customer mandates enhance the aggregate profitability in the focal industry (Table 9 columns 1 and 2).[28] To understand which firms in the industry drive this aggregate profitability result, we investigate the covariance between firms' market share (i.e., relative size in the industry) and their profitability (in the vein of Olley & Pakes 1996; Bartelsman *et al.* 2013). We find that the enhanced profitability in the focal industry due to supplier and customer mandates is primarily captured by larger firms, as shown by an increased size-profitability covariance (Table 9 columns 3 and 4). Firms' own reporting mandates, by contrast, appear to hurt firms with high market shares and/or profitability, as shown by a decreased size-profitability covariance. The covariance findings are consistent with a redistribution of innovation gains from mandated to other firms, especially larger ones. Mandated firms, especially profitable ones, appear to experience a reduction of their market share, whereas other firms, especially larger ones, appear to benefit from the mandate, likely as a result of increased outside options and revelation of investment opportunities. Thus, a potential consequence of reporting mandates is that they lead to a

[28] We refer to revenue productivity as "profitability" because it essentially represents a ratio-based measure of profits (Foster *et al.* 2008).

concentration of innovation activity among larger firms in industries that are less affected by the reporting mandate.

6.3.2. Capital market: financing frictions

The documented aggregate effects are inconsistent with the notion that reporting mandates spur industry-wide innovation through improved financing. The absence of a financing effect that (over)compensates for proprietary costs should not be surprising given that capital-market benefits already motivate firms' voluntary reporting. That is, firms that benefit from more disclosure can always provide it voluntarily. As a result, mandatory reporting effectively expands the reporting of firms, for whom the capital-market benefits of public reporting do *not* outweigh the corresponding costs (e.g., proprietary costs). In our sample of private firms, the capital-market benefits from public reporting are limited for most firms because they obtain financing from a limited number of capital providers (e.g., owner-managers and relationship banks) with whom they can and do communicate privately. The private communication allows firms to inform their main capital providers and to reduce financing frictions, while it avoids the leakage of proprietary information.

Although reporting mandates may come with insufficient capital-market benefits for firms that are essentially forced to report, there may still be instances in which the mandate has financing benefits for some firms in the industry or the industry as a whole (e.g., due to spillovers, standardization, and reduction of duplicate information collection efforts; Minnis & Shroff 2017). Consistent with this argument, Table 10 documents that external financing constraints to innovation indeed loosen after the enforcement of reporting mandates in Germany. We also find some evidence of reduced internal financing constraints. These results suggest reporting mandates come with capital-market benefits, especially at the market level (e.g., Garmaise & Natividad 2016), but these benefits

are not large enough to produce a positive net effect of reporting mandates on market-wide innovation.

Our evidence of lower financing constraints after the enforcement reform in Germany aligns with the literature on the capital-market benefits of public reporting (Leuz & Wysocki 2016). Moreover, it allays concerns that the negative impact on innovation documented in the German setting is due to confounding influences from the financial crisis. In particular, our evidence is inconsistent with the concern that limited-liability firms may have been hit harder by the financial or ensuing economic crisis than unlimited-liability firms (e.g., as a result of limited collateral), which would spuriously result in a negative innovation effect.[29]

7. Discussion

Using multiple settings and detailed innovation input and output data, we consistently find that reporting mandates appear to deter innovation spending and reduce innovation outputs. The decline in both innovation inputs and outputs, together with our findings in Table 5 on firms' profitability and gains from innovation, rule out that reporting mandates primarily reduce wasteful duplication of innovation efforts and increase innovative efficiency. Our evidence rather suggests that the mandates, even after accounting for positive effects from redistribution and information spillovers, reduce industry-wide innovation. This industry-wide decline in corporate innovation implies that reporting mandates have important tradeoffs. On one hand, they increase competition (Breuer, 2019). On the other hand, they can hurt corporate innovation. These joint effects provide a plausible

[29] In untabulated robustness tests, we find that our inferences remain unchanged when controlling for the local exposure of firms to the financial distress of a major German bank (Commerzbank) during the financial crisis (Huber 2018). The dynamics of the treatment effect shown in Figure 1 further contradict the influence of a temporary financial and economic crisis between 2007 and 2010. Moreover, it is worth noting that we find consistent results in the German and European setting. In the European setting, however, we do not exploit any regulatory reforms or changes around crises times but instead rely on a cross-sectional identification strategy. Accordingly, it is unlikely that financial or economic crises during our sample period confound our results.

explanation for why Breuer (2019) also finds that reporting mandates do not have positive (or maybe even negative) effects on productivity growth at the industry level.

Our evidence is consistent with the notion that reporting mandates deter corporate innovation due to the dissipation of proprietary information to competitors and contracting partners (e.g., suppliers). Looking at our evidence as well as related work, we surmise that three interrelated economic mechanisms are at play. First, reporting mandates diminish firms' bargaining power and rents (Melitz & Ottaviano 2008; Breuer 2019), limiting the rewards from innovation. Consistent with this mechanism, we find that the negative effects on profit margins and positive effects from customer and supplier reporting, consistent with learning and increased bargaining power. Second, reporting mandates have been shown to shorten the duration of firms' contracting relationships (Dewatripont & Maskin 1995; Breuer *et al.* 2018; Sutherland 2018), which in turn likely hurts the incentives for long-term investments such as R&D. Third, reporting mandates increase the number of contracting partners (Berger *et al.* 2001; Asker & Ljungqvist 2010), reducing the efficacy of secrecy as a strategy to protect proprietary information and know-how about innovative products, services and processes.

Our evidence suggests that the negative direct effect on corporate innovation outweighs the indirect spillover and follow-on innovation effects at the industry level.[30] In our mind, it makes sense that reporting mandates affect innovating firms more strongly than non-innovating firms in a given industry. Left to their own devices, innovating firms tend to report less than the non-innovating firms. Upon introducing a mandate, the non-innovating firms can learn about previously opaque innovating firms, whereas innovating firms are less likely to learn much from non-innovating firms, which were already more transparent prior to the mandate. Thus, the resulting redistribution of rents from

[30] Although we observe negative net effects not only in the local German markets, but also the highly aggregated industry level in Europe, we acknowledge that there could still be additional, positive redistribution and spillover effects beyond those captured at the industry-country or industry-county aggregation in the two settings, respectively.

proprietary information from innovating firms to non-innovating firms appears to discourage innovative firms' activities without generating sufficiently important follow-on innovation. Put differently, the notion that a mandate hits firms that have inherently greater innovative capabilities more strongly could play an important role in explaining the aggregate outcome.

While the industry-level effect of the mandates appears to be negative, we also document that there are significant information spillovers across industries, along the supply chain. Whether these cross-industry spillovers can overturn the industry-wide negative effects, however, is unclear. What appears clear though is that reporting mandates redistribute innovative activity from regulated industries to related but less regulated supplier or customer industries.

We find the strongest effects of the reporting mandates among smaller firms and in local markets with few existing competitors. This pattern suggests reporting mandates primarily affect smaller, local monopolists in niche markets. Absent reporting mandates, these firms can essentially hide their existence and profitability. By contrast, firms operating in already crowded and competitive markets earn limited rents and are well known, so they cannot hide irrespective of financial reporting. Similar arguments can be made for firms that already make very active use of patenting and hence have to provide substantial and detailed information about their innovations. They are likely less affected than smaller and lesser known firms in nice markets using primarily secrecy to protect their innovations.

Consistent with this argument, we find the strongest effects of the reporting mandates at the extensive instead of the intensive margins of innovation spending, innovations, and patenting. An interesting implication of these findings and pattern is that reporting mandates could lead to a concentration of innovative activity at larger firms operating in several industries. Consistent with this conjecture, Bernard (2016) and Breuer (2019), analyzing market entry effects, document that it is

predominantly larger competitors that enter into local niche markets in response to reporting mandates. As a result, reporting mandates can reduce market-share concentration in local markets and narrow industries (Breuer 2019), but at the same time increase the concentration of market power at the national level and across industries (Rossi-Hansberg *et al.* 2019). Such concentration of market power and innovative activity among larger firms is consistent with recent trends in innovation activity (Rammer & Schubert 2018). Accordingly, reporting mandates, similar to other information technologies (e.g., Begenau *et al.* 2018; Farboodi *et al.* 2019), may disproportionally benefit larger firms. It is plausible that the direct effect of reporting mandates on corporate innovation tends to hit larger firms less than smaller firms. Larger firms often disclose much more information voluntarily (e.g., Buzby 1975; Dedman & Lennox 2009; Breuer *et al.* 2019), can hide sensitive information through complexity (e.g., Bens *et al.* 2011), and face only smaller, resource-constrained competitors. At the same time, the indirect (spillover) effect of reporting mandates tends to benefit larger firms more than smaller firms. Larger firms can also exploit any investment opportunities that are revealed through a reporting mandate more easily, given their financial resources, data-processing capabilities, and existing infrastructure (e.g., advertising channels).

Lastly, we find that reporting mandates have an ambiguous effect on patents. Patents are a means to protect innovation. Thus, if there are fewer innovations due to a reporting mandate, the direct effect of the mandate on patenting is also negative. For every given innovation, however, formal patenting appears to become more attractive, compared to alternative mechanisms, in particular, secrecy. As a result of these countervailing direct spending and indirect protection effects, the net effect on patenting is unclear and varies across settings. This ambiguity suggests patents are a poor measure of innovative activity in studies concerned with firms' reporting. More broadly, our paper supports the notion that firms' patenting among other things represents a form of public disclosure.

As such, firms' patenting strategy is intimately related to firms' broader disclosure and reporting strategy (e.g., Glaeser *et al.* 2019).

8. Conclusion

In this study, we examine the effect of financial-reporting mandates on market-wide innovation activity. We exploit two institutional features of the financial-reporting regulation in Europe—threshold-based reporting mandates and a major enforcement reform—giving rise to plausibly exogenous differences in the intensity of reporting mandates faced by a large number of European firms.

We find evidence that mandating firms to publicly disclose their financial reports reduces firms' innovation incentives, whereas it increases firms' propensity to use patenting as a means to protect their innovations. Notably, these findings hold at the firm *and* market level. Our evidence is consistent with reporting mandates deterring firms' incentives to generate proprietary information through innovation due to concerns about the loss of proprietary information via the disclosure of financial reports. Importantly, our evidence indicates that reporting mandates redistribute existing rents from innovating firms to other market participants (e.g., competitors, customers, or suppliers), but these positive spillovers are not large enough to compensate for the decline in innovative activity at the industry level. Thus, our evidence suggests that proprietary costs and ensuing innovation effects are an important consideration for regulators and policy makers when setting reporting regulation.

References

Accountancy Europe, 2019. Audit Exemption Thresholds in Europe (2019 update). Accountancy in Europe, Available at: https://www.accountancyeurope.eu/wp-content/uploads/181114_Audit-exemption-thresholds-in-Europe_2018_survey-update_3.pdf

Acs, Z., Audretsch, D., 1990. Innovation and Small Firms. The MIT Press.

Allen, A., Lewis-Western, M.F., Valentine, K., 2018. The Innovation Consequences of Financial Regulation for Young Life-Cycle Firms. Working paper

Amernic, J.H., 1985. The roles of accounting in collective bargaining. Accounting, Organizations and Society 10, 227-253

Aobdia, D., 2015. Proprietary Information Spillovers and Supplier Choice: Evidence from Auditors. Review of Accounting Studies 20, 1504-39

Aobdia, D., Cheng, L., 2018. Unionization, product market competition, and strategic disclosure. Journal of Accounting and Economics 65, 331-357

Arrow, K., 1962. Economic Welfare and the Allocation of Resources for Invention. In: The Rate and Direction of Inventive Activity: Economic and Social Factors. National Bureau of Economic Research, pp. 609-626.

Arundel, A., 2001. The relative effectiveness of patents and secrecy for appropriation. Research Policy 30, 611-624

Asker, J., Ljungqvist, A., 2010. Competition and the Structure of Vertical Relationships in Capital Markets. Journal of Political Economy 118, 599-647

Ball, R., 1980. Discussion of Accounting for Research and Development Costs: The Impact on Research and Development Expenditures. Journal of Accounting Research 18, 27-37

Bartelsman, E., Haltiwanger, J., Scarpetta, S., 2013. Cross-Country Differences in Productivity: The Role of Allocation and Selection. American Economic Review 103, 305-334

Barth, M.E., Landsman, W.R., Taylor, D.J., 2017. The JOBS Act and Information Uncertainty in IPO Firms. The Accounting Review 92, 25-47

Begenau, J., Farboodi, M., Veldkamp, L., 2018. Big data in finance and the growth of large firms. Journal of Monetary Economics 97, 71-87

Bens, D.A., Berger, P.G., Monahan, S.J., 2011. Discretionary Disclosure in Financial Reporting: An Examination Comparing Internal Firm Data to Externally Reported Segment Data. Accounting Review 86, 417-449

Berger, A.N., Klapper, L.F., Udell, G.F., 2001. The ability of banks to lend to informationally opaque small businesses. Journal of Banking & Finance 25, 2127-2167

Berger, P.G., 2011. Challenges and opportunities in disclosure research—A discussion of 'the financial reporting environment: Review of the recent literature'. Journal of Accounting and Economics 51, 204-218

Berger, P.G., Choi, J.H., Tomar, S., 2019. Breaking it Down: Competitive Costs of Cost Disclosures. Working paper; available at SSRN: www.ssrn.com/abstract_id=3358435

Berger, P.G., Hann, R.N., 2007. Segment Profitability and the Proprietary and Agency Costs of Disclosure. Accounting Review 82, 869-906

Bernard, D., 2016. Is the risk of product market predation a cost of disclosure? Journal of Accounting and Economics 62, 305-325

Bernard, D., Burgstahler, D., Kaya, D., 2018. Size management by European private firms to minimize proprietary costs of disclosure. Journal of Accounting and Economics 66, 94-122

Bersch, J., Gottschalk, S., Müller, B., Niefert, M., 2014. The Mannheim Enterprise Panel (MUP) and Firm Statistics for Germany ZEW-Centre for European Economic Research Discussion Paper, 14-104

Beyer, A., Cohen, D.A., Lys, T.Z., Walther, B.R., 2010. The financial reporting environment: Review of the recent literature. Journal of Accounting and Economics 50, 296-343

Bhattacharya, S., Chiesa, G., 1995. Proprietary Information, Financial Intermediation, and Research Incentives. Journal of Financial Intermediation 4, 328-357

Bhattacharya, S., Ritter, J.R., 1983. Innovation and Communication: Signalling with Partial Disclosure. Review of Economic Studies 50, 331-346

Bönte, W., Wiethaus, L., 2007. Knowledge Disclosure and Transmission in Buyer–Supplier Relationships. Review of Industrial Organization 31, 275-288

Breuer, M., 2019. How does financial reporting regulation affect industry-wide resource allocation? Working paper; Available at SSRN: www.ssrn.com/abstract_id=3063320

Breuer, M., Hombach, K., Müller, M.A., 2018. How does financial reporting regulation affect firms' banking? Review of Financial Studies 31, 1265-1297

Breuer, M., Hombach, K., Müller, M.A., 2019. The Economics of Firms' Public Disclosure: Theory and Evidence. Working paper; Available at SSRN: www.ssrn.com/abstract_id=3037002

Brown, J.R., Martinsson, G., 2018. Does Transparency Stifle or Facilitate Innovation? Management Science forthcoming

Bundesanzeiger, 2019. Query of financial statements at official website of federal gazette. Accessed on 09/04/2019: https://www.bundesanzeiger.de/ebanzwww/wexsservlet

Buzby, S.L., 1975. Company Size, Listed Versus Unlisted Stocks, and the Extent of Financial Disclosure. Journal of Accounting Research 13, 16-37

Chaplinsky, S., Hanley, K.W., Moon, S.K., 2017. The JOBS Act and the Costs of Going Public. Journal of Accounting Research 55, 795-836

Christensen, H.B., Hail, L., Leuz, C., 2016. Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement. Review of Financial Studies 29, 2885-2924

Cna Interpreta, 2011. Study on Accounting requirements for SMEs. Directorate-General for Enterprise and Industry

Costello, A.M., 2013. Mitigating incentive conflicts in inter-firm relationships: Evidence from long-term supply contracts. Journal of Accounting and Economics 56, 19-39

Currie, J., Gruber, J., 1996. Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women. Journal of Political Economy 104, 1263

D'Acunto, F., Prokopczuk, M., Weber, M., 2018. Historical Antisemitism, Ethnic Specialization, and Financial Development. The Review of Economic Studies 86, 1170-1206

Dambra, M., Field, L.C., Gustafson, M.T., 2015. The JOBS Act and IPO volume: Evidence that disclosure costs affect the IPO decision. Journal of Financial Economics 116, 121-143

Darrough, M.N., Stoughton, N.M., 1990. Financial Disclosure Policy in an Entry Game. Journal of Accounting and Economics 12, 219-243

Dass, N., Nanda, V.K., Xiao, S.C., 2018. Intellectual Property Protection and Financial Markets: Patenting vs. Secrecy. Working paper; Available at SSRN: www.ssrn.com/abstract_id=2648770

Dedman, E., Lennox, C., 2009. Perceived competition, profitability and the withholding of information about sales and the cost of sales. Journal of Accounting and Economics 48, 210-230

Dewatripont, M., Maskin, E., 1995. Credit and Efficiency in Centralized and Decentralized Economies. Review of Economic Studies, 541

EU, 2017. Annual report on European SMEs 2016/2017 Focus on self-employment. https://ec.europa.eu/docsroom/documents/26563/attachments/1/translations/en/renditions/native

EU, 2019. Fact Sheets on the European Union - Company Law. http://www.europarl.europa.eu/factsheets/en/sheet/35/company-law

Eurostat, 2019. Science Technology And Innovation Database - Community Innovation Survey 2016. https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database

Farboodi, M., Mihet, R., Philippon, T., Veldkamp, L., 2019. Big data and firm dynamics. American Economic Review, Papers and Proceedings forthcoming

Foster, L., Haltiwanger, J., Syverson, C., 2008. Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability? American Economic Review 98, 394-425

Garmaise, M.J., Natividad, G., 2016. Spillovers in Local Banking Markets. Review of Corporate Finance Studies 5, 139-165

Gassen, J., Muhn, M.N., 2018. Financial Transparency of Private Firms: Evidence from a Randomized Field Experiment. Working paper; Available at SSRN: www.ssrn.com/abstract=3290710

Gittelman, M., 2008. A Note on the Value of Patents as Indicators of Innovation: Implications for Management Research. Academy of Management Perspectives 22, 21-27

Glaeser, S., 2018. The effects of proprietary information on corporate disclosure and transparency: Evidence from trade secrets. Journal of Accounting and Economics 66, 163-193

Glaeser, S., Michels, J., Verrecchia, R.E., 2019. Discretionary Disclosure and Manager Horizon: Evidence from Patenting. Working paper; Available at SSRN: www.ssrn.com/abstract_id=2939852

Graham, J.R., Harvey, C.R., Rajgopal, S., 2005. The economic implications of corporate financial reporting. Journal of Accounting and Economics 40, 3-73

Hail, L., Tahoun, A., Wang, C., 2017. Corporate Scandals and Regulation. Journal of Accounting Research 56, 617-671

Harris, M.S., 1998. The Association between Competition and Managers' Business Segment Reporting Decisions. Journal of Accounting Research 36, 111-128

Hedge, D., Herkenhoff, K., Zhu, C., 2018. Patent Disclosure Working paper

Huber, K., 2018. Disentangling the Effects of a Banking Crisis: Evidence from German Firms and Counties. American Economic Review 108, 868-98

Hussinger, K., Keusch, T., Moers, F., 2018. Insider Trading and Corporate Innovation: The Real Effects of Disclosure. Working paper

Kerr, W.R., Nanda, R., 2015. Financing Innovation. Annual Review of Financial Economics 7, 445-462

Kim, J., 2018. Mandatory Corporate Patent Disclosures and Innovation Working paper

Koh, P.-S., Reeb, D.M., 2015. Missing R&D. Journal of Accounting and Economics 60, 73-94

Lang, M., Sul, E., 2014. Linking industry concentration to proprietary costs and disclosure: Challenges and opportunities. Journal of Accounting and Economics 58, 265-274

Leuz, C., 2004. Proprietary versus Non-Proprietary Disclosures: Evidence from Germany. In: Leuz C, Pfaff D & Hopwood A (eds.) The Economics and Politics of Accounting. Oxford University Press, pp. 164–197.

Leuz, C., 2010. Different approaches to corporate reporting regulation: how jurisdictions differ and why. Accounting and Business Research 40, 229-256

Leuz, C., Triantis, A., Wang, T.Y., 2008. Why do firms go dark? Causes and economic consequences of voluntary SEC deregistrations. Journal of Accounting and Economics 45, 181-208

Leuz, C., Wysocki, P.D., 2016. The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. Journal of Accounting Research 54, 525

Li, Y., Lin, Y., Zhang, L., 2017. Trade Secrets Law and Corporate Disclosure: Causal Evidence on the Proprietary Cost Hypothesis. Journal of Accounting Research 56, 265-308

Mahoney, N., 2015. Bankruptcy as Implicit Health Insurance. American Economic Review 105, 710-746

Mankiw, N.G., Weinzierl, M., Yagan, D., 2009. Optimal Taxation in Theory and Practice. Journal of Economic Perspectives 23, 147-74

Max-Planck-Institut, 2009. Rechnungslegung und Wettbewerbsschutz im deutschen und europäischen Recht [Financial Accounting and Protection of Fair Competition in German and European Law] Springer, Heidelberg.

McLeay, S., 1999. Accounting Regulation in Europe. In: McLeay S (ed.) Accounting Regulation in Europe. Palgrave Macmillan UK, London, pp. 366-386.

Melitz, M.J., Ottaviano, G.I.P., 2008. Market Size, Trade, and Productivity. Review of Economic Studies 75, 295-316

Minnis, M., Shroff, N., 2017. Why Regulate Private Firm Disclosure and Auditing? Accounting and Business Research 47, 473-502

Nagaoka, S., Motohashi, K., Goto, A., 2010. Chapter 25 - Patent Statistics as an Innovation Indicator. In: Hall BH & Rosenberg N (eds.) Handbook of the Economics of Innovation. North-Holland, pp. 1083-1127.

Olley, G.S., Pakes, A., 1996. The Dynamics of Productivity in the Telecommunications Equipment Industry. Econometrica 64, 1263-1297

Palmer, J.R., 1977. The use of accounting information in labor negotiations. National Association of Accountants, New York :

Park, K., 2018. Financial reporting quality and corporate innovation. Journal of Business Finance & Accounting 45, 871-894

Rammer, C., Schubert, T., 2018. Concentration on the few: mechanisms behind a falling share of innovative firms in Germany. Research Policy 47, 379-389

Rossi-Hansberg, E., Sarte, P.-D., Trachter, N., 2019. Diverging Trends in National and Local Concentration. NBER Working Paper No. 25066; Available at: www.nber.org/papers/w25066

Rothwell, R., 1978. Small and Medium Sized Manufacturing Firms and Technological Innovation. Management Decision 16, 362-370

Roychowdhury, S., Shroff, N., Verdi, R., 2019. The Effects of Financial Reporting and Disclosure on Corporate Investment: A Review. Journal of Accounting and Economics forthcoming

Schneider, C., Veugelers, R., 2010. On young highly innovative companies: why they matter and how (not) to policy support them. Industrial and Corporate Change 19, 969-1007

Sutherland, A.G., 2018. Does credit reporting lead to a decline in relationship lending? Evidence from information sharing technology. Journal of Accounting and Economics 66, 123-141

Valentine, K., 2018. Can Disclosure Regulation Impede Innovation? . Working paper

Vanhaverbeke, S., Balsmeier, B., Doherr, T., 2019. Corporate Financial Transparency and Credit Ratings. Working paper

Verrecchia, R.E., 1983. Discretionary disclosure. Journal of Accounting and Economics 5, 179-194

Verrecchia, R.E., Weber, J., 2006. Redacted Disclosure. Journal of Accounting Research 44, 791-814

Vossen, R.W., 1998. Relative Strengths and Weaknesses of Small Firms in Innovation. International Small Business Journal 16, 88-94

Wagenhofer, A., 1990. Voluntary Disclosure with a Strategic Opponent. Journal of Accounting and Economics 12, 341-363

Wyatt, A., Abernethy, M., 2008. Accounting for Intangible Investments. Australian Accounting Review 18, 95-107

ZEW, 2019. https://www.zew.de/en/forschung/patent-firm-panel-infrastructure-panel-containing-patent-and-trademark-strategies-of-german-companies/?cHash=b9baa6ff48fb34680a0b842ba61a3ecb

Zhong, R., 2018. Transparency and firm innovation. Journal of Accounting and Economics 66, 67-93

Zhou, Y., 2018. A Lobbying Approach to Evaluating the Competitive Harm of Mandatory Disclosure of Proprietary Information: The Case of Segment Reporting. Working paper; Available at SSRN: https://papers.ssrn.com/abstract_id=3106787

Zingales, L., 2009. The Future of Securities Regulation. Journal of Accounting Research 47, 391-425

Variable Appendix

VARIABLE DEFINITIONS		
Panel A: Exemptions in Europe		
Treatment	Source	Description
Reporting	Amadeus	Share of firms above country-level reporting threshold calculated using a standardized firm-size distribution per industry
Auditing	Amadeus	Share of firms above country-level auditing threshold calculated using a standardized firm-size distribution per industry
Reporting or Auditing	Amadeus	Maximum of "Reporting" and "Auditing"
Reporting and Auditing	Amadeus	Minimum of "Reporting" and "Auditing"
Supplier Reporting	Amadeus/Eurostat	Reporting share of domestic supplier industries (calculated by weighting reporting shares with domestic input shares for a given focal industry using Eurostat's FIGARO input-output table)
Customer Reporting	Amadeus/Eurostat	Reporting share of domestic customer industries (calculated by weighting reporting shares with domestic output shares for a given focal industry using Eurostat's FIGARO input-output table)
Supplier Reporting and Auditing	Amadeus/Eurostat	Minimum of reporting and auditing share of domestic supplier industries (calculated by weighting reporting shares with domestic input shares for a given focal industry using Eurostat's FIGARO input-output table)
Customer Reporting and Auditing	Amadeus/Eurostat	Minimum of reporting and auditing share of domestic customer industries (calculated by weighting reporting shares with domestic output shares for a given focal industry using Eurostat's FIGARO input-output table)
Outcomes	Source	Description
Tangible Investment	Amadeus	Change in (log) tangible assets
Intangible Investment	Amadeus	Change in (log) intangible assets
R&D Expense	Amadeus	Research and development expense scaled by sales
Patenting	PATSTAT	Patent application indicator
Share of Innovating Firms	Eurostat	Share of firms with product, process, or service innovations among surveyed firms
Share of Not Innovating Firms	Eurostat	Share of firms without any product, process, or service innovations among surveyed firms
R&D Expense	Eurostat	Log (plus 1) of total R&D expense (in million)

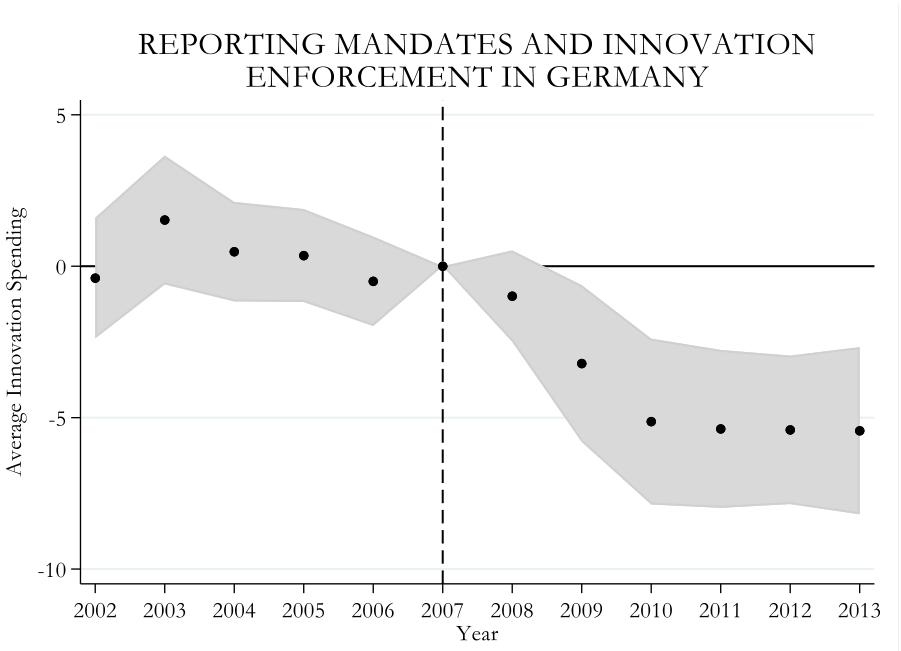
R&D Expense (Extensive)	Eurostat	Indicator taking the value of one for industries with positive total R&D expense, and zero otherwise
R&D Employees	Eurostat	Log (plus 1) of total R&D employees (head count)
R&D Employees (Extensive)	Eurostat	Indicator taking the value of one for industries with positive total R&D employees, and zero otherwise
Patenting of Innovating Firms	Eurostat	Share of patenting firms among innovating firms
Patenting of Not Innovating Firms	Eurostat	Share of patenting firms among non-innovating firms
Sales per Employee	Amadeus	Log sales less log employees
Sales per Employee and Capital	Amadeus	Log sales less 0.3 times log tangible assets and 0.7 log employees
Market Share and Sales per Employee	Amadeus	Covariance between market share and sales per employee calculated as the difference between the market-share weighted sales per employee and the simple average of sales per employee
Market Share and Sales per Employee and Capital	Amadeus	Covariance between market share and sales per employee and capital calculated as the difference between the market-share weighted sales per employee and capital less and the simple average of sales per employee and capital

Panel B: Enforcement Reform in Germany		
Treatment	Source	Description
Limited Share	Creditreform	Share of limited-liability firms among firms in county, industry, and year
Limited	Creditreform	Indicator taking the value of one for limited-liability/affected firms (GmbH, GmbH & Co. KG), and zero for unlimited-liability firms (KG, OHG)
Private	Creditreform	Indicator taking the value of one for private limited-liability firms, and zero for publicly-listed firms (sample restricted to: GmbH, GmbH & Co. KG, and AG)
Supplier Limited Share	Creditreform/Eurostat	Limited-liability share of local supplier industries for a given industry (calculated by weighting the limited share of supplier industries of a given industry in a given county by domestic input shares from Eurostat's FIGARO input-output table)
Customer Limited Share	Creditreform/Eurostat	Limited-liability share of local customer industries for a given industry (calculated by weighting the limited share of customer industries of a given industry in a given county by domestic output shares from Eurostat's FIGARO input-output table)
Post	Creditreform	Indicator taking the value of one for years after 2007, and zero before
Outcomes	Source	Description
Innovation Spending	MIP	Log (plus 1) of total innovation spending (includes in-house and external R&D, acquisition of external knowledge, equipment, machinery or software for innovation purposes, product design and professional development of innovation activities and marketing of innovation)
Innovation Spending (Extensive)	MIP	Indicator taking the value of one for firms with positive total innovation spending, and zero for firms with zero spending
Innovation Spending (Intensive)	MIP	Log of total innovation spending (for firms with positive spending only)
New-To-Market Innovations	MIP	New-to-the-market innovations (the enterprise was the first one to market these products/services)
Innovating Firm	MIP	Indicator taking the value of one for firms that introduce new or significantly improved products, processes, or services

Product Innovation	MIP	Indicator taking the value of one for firms that introduce new or significantly improved products
Process Innovation	MIP	Indicator taking the value of one for firms that introduce new or significantly improved processes
Importance of Secrecy	MIP	Importance of secrecy as a means to protect innovations (scale: 0 to 3)
Importance Patenting	MIP	Importance of patents as a means to protect innovations (scale: 0 to 3)
Patent Applications	PATSTAT	Log (plus 1) of number of applied patents
Patenting Firm	PATSTAT	Patent application indicator
Profit Margin	MIP	Level of profit margin (scale: 1 to 9)
Sales from New-to-Market Innovations	MIP	Log (plus 1) of sales from new-to-market innovations
Share of Sales from New-to-Market Innovations	MIP	Share of sales attributable to new-to-market innovations
Share of Sales Increase from Quality Improvements	MIP	Log (plus 1) share of sales increase attributable to quality improvements
Cost Reduction from Process Improvements	MIP	Indicator taking the value of one for firms with a cost reduction due to process improvements
External Financing Constraint	MIP	Indicator taking the value of one for firms for which external financing constitutes a constraint to innovation
Internal Financing Constraint	MIP	Indicator taking the value of one for firms for which internal financing constitutes a constraint to innovation
Controls	Source	Description
Employees	Amadeus/Creditreform	Log (plus 1) number of employees

Figures & Tables

Figure 1



Notes: The figure presents the relation between innovation spending and the intensity of the enforcement of reporting mandates over time. The black dots represent difference-in-differences coefficients for each year (with 2007 as the base year) from a regression of average innovation spending at the county, industry, and year level on the share of affected (limited) firms in the pre-enforcement period interacted with individual year indicators. The gray area represents a pointwise 90% confidence interval.

Table 1

DESCRIPTIVE STATISTICS:
EXEMPTIONS IN EUROPE

Panel A: Amadeus & PATSTAT (3-Digit NACE Level)

Variable	Market Level	N	Mean	SD	p1	p25	p50	p75	p99
Reporting		100,402	0.228	0.268	0.001	0.054	0.134	0.278	1.000
Auditing		100,402	0.309	0.320	0.003	0.082	0.183	0.385	1.000
Tangible Investment	Simple Average	98,456	-0.026	0.518	-2.268	-0.074	-0.004	0.076	0.845
Tangible Investment	Weighted Average	95,275	0.013	0.597	-2.588	-0.058	0.021	0.119	1.301
Intangible Investment	Simple Average	91,470	-0.185	0.634	-2.881	-0.297	-0.153	-0.020	1.279
Intangible Investment	Weighted Average	87,604	-0.086	0.840	-3.290	-0.288	-0.078	0.116	2.407
R&D Expense	Simple Average	6,065	0.687	10.428	0.000	0.001	0.015	0.064	7.554
R&D Expense	Weighted Average	6,065	0.135	3.331	0.000	0.001	0.012	0.043	0.843
Patenting	Simple Average	100,168	0.010	0.035	0.000	0.000	0.000	0.003	0.148

Panel B: Amadeus & Eurostat (2-Digit NACE Level)

Variable	Market Level	N	Mean	SD	p1	p25	p50	p75	p99
Reporting		31,551	0.220	0.272	0.001	0.054	0.122	0.252	1.000
Auditing		31,551	0.300	0.322	0.004	0.079	0.165	0.354	1.000
Reporting or Auditing		31,551	0.361	0.360	0.004	0.087	0.193	0.534	1.000
Reporting and Auditing		31,551	0.159	0.176	0.001	0.050	0.111	0.208	1.000
Supplier Reporting		16,877	0.224	0.265	0.009	0.092	0.143	0.209	0.997
Customer Reporting		16,593	0.244	0.264	0.009	0.103	0.164	0.246	0.999
Supplier Reporting and Auditing		16,877	0.158	0.155	0.009	0.088	0.136	0.187	0.993
Customer Reporting and Auditing		16,593	0.178	0.158	0.009	0.098	0.156	0.220	0.997
Share of Innovating Firms	Simple Average	3,947	0.511	0.205	0.103	0.358	0.503	0.655	1.000
Share of Not Innovating Firms	Simple Average	5,144	0.520	0.208	0.026	0.378	0.528	0.676	0.936
R&D Expense	Total	5,951	2.567	2.101	0.000	0.669	2.314	4.069	7.767
R&D Expense (Extensive)	Total	5,951	0.869	0.337	0.000	1.000	1.000	1.000	1.000
R&D Employees	Total	5,584	4.853	2.661	0.000	3.296	5.182	6.755	9.912
R&D Employees (Extensive)	Total	5,584	0.865	0.342	0.000	1.000	1.000	1.000	1.000
Patenting of Innovating Firms	Simple Average	1,310	0.108	0.130	0.000	0.015	0.063	0.146	0.565
Patenting of Not Innovating Firms	Simple Average	1,012	0.014	0.039	0.000	0.000	0.000	0.014	0.185
Sales per Employee	Weighted Average	30,977	12.676	1.481	9.766	11.780	12.544	13.302	17.518
Sales per Employee and Capital	Weighted Average	30,802	9.341	1.122	7.127	8.652	9.234	9.832	12.876
Market Share and Sales per Employee	Covariance	30,273	1.089	0.916	-0.401	0.499	0.920	1.477	4.230
Market Share and Sales per Employee and Capital	Covariance	30,044	0.705	0.735	-0.584	0.242	0.570	1.012	3.262

Notes: The table presents descriptive statistics for variables at the three-digit and two-digit NACE level based on Amadeus, PATSTAT, and Eurostat data in Panels A and B, respectively. Corresponding variable definitions can be found in the "Variable Appendix" table. Simple averages are the unweighted averages of variables within a given country, industry, and year. Weighted averages are computed as the market-share-weighted sums of variables (where the market share is calculated using sales) within a given country, industry, and year. Totals are the sums of variables within a given country, industry, and year. Covariances are the differences between weighted averages and simple averages of variables within a given country, industry, and year. Logarithm (plus 1) transformations are applied after taking averages within a given country, industry, and year.

Table 2

REPORTING MANDATES AND INNOVATION:
EXEMPTIONS IN EUROPE

Panel A: Amadeus & PATSTAT (3-Digit NACE Level)

Outcome	Tangible Investment		Intangible Investment		R&D Expense		Patenting
Market Level	Simple Average	Weighted Average	Simple Average	Weighted Average	Simple Average	Weighted Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Reporting	-0.055*	-0.014	-0.092**	-0.147**	-0.108	0.071	0.020*
	(-1.85)	(-0.41)	(-2.32)	(-2.26)	(-0.30)	(0.61)	(1.70)
Auditing	-0.012	0.004	-0.065*	-0.020	-0.365	-0.151***	-0.006
	(-0.54)	(0.14)	(-1.71)	(-0.37)	(-1.42)	(-2.76)	(-0.61)
Country-Year	X	X	X	X	X	X	X
Industry-Year	X	X	X	X	X	X	X
Observations	92,844	89,820	86,272	82,584	4,651	4,655	94,612
Clusters (Country-Year)	260	260	260	260	59	59	260
Clusters (Country-Industry)	387	387	387	387	90	88	387
Adj. R^2	0.892	0.818	0.730	0.494	0.251	0.279	0.460

Notes: Panel A presents estimates from regressions of investment and patenting outcomes on the share of firms subject to full reporting and auditing requirements. The outcome variables are simple average or sales-weighted averages calculated for a given country, industry, and year. "Reporting" is the share of simulated firms exceeding reporting-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Auditing" is the share of simulated firms exceeding auditing-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. The regressions include industry-year fixed effects (where the industries are defined using three-digit NACE classifications) and country-year fixed effects. We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: Eurostat Innovation Inputs (2-Digit NACE level)								
Outcome	R&D Expense		R&D Expense (Extensive)		R&D Employees		R&D Employees (Extensive)	
Market Level	Total	Total	Total	Total	Total	Total	Total	Total
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reporting	2.296		-0.251		1.026		-0.250	
	(1.24)		(-0.84)		(0.78)		(-0.83)	
Auditing	-1.032		-0.515		-3.480***		-0.603*	
	(-1.01)		(-1.52)		(-2.61)		(-1.78)	
Reporting or Auditing		0.978		-0.691***		-1.744		-0.768***
		(0.76)		(-2.82)		(-1.26)		(-3.16)
Country-Year	X	X	X	X	X	X	X	X
Industry-Year	X	X	X	X	X	X	X	X
Observations	5,939	5,939	5,939	5,939	5,568	5,568	5,568	5,568
Clusters (Country-Year)	190	190	190	190	191	191	191	191
Clusters (Country-Industry)	202	202	202	202	189	189	189	189
Adj. R^2	0.787	0.786	0.520	0.524	0.829	0.827	0.526	0.533

Notes: Panel B presents estimates from regressions of the R&D expenses and employees (innovation inputs) on the share of firms subject to full reporting and auditing requirements. The outcome variables are totals (in logs) and indicators for positive totals for a given country, industry, and year. "Reporting" is the share of simulated firms exceeding reporting-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Auditing" is the share of simulated firms exceeding auditing-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Reporting or Auditing" is the minimum of the two simulated shares. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel C: Eurostat Innovation Output (2-Digit NACE Level)

Outcome	Share of Innovating Firms		Share of Not Innovating Firms		Patenting of Innovating Firms		Patenting of Not Innovating Firms	
Market Level	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reporting	-0.142*		0.120*		0.129		-0.028	
	(-1.80)		(1.92)		(1.10)		(-0.63)	
Auditing	0.015		-0.056		0.128		0.001	
	(0.28)		(-0.88)		(0.87)		(0.03)	
Reporting or Auditing		-0.053		-0.003		0.261***		-0.001
		(-0.93)		(-0.04)		(2.77)		(-0.04)
Country-Year	X	X	X	X	X	X	X	X
Industry-Year	X	X	X	X	X	X	X	X
Observations	3,940	3,940	5,137	5,137	1,298	1,298	999	999
Clusters (Country-Year)	202	202	202	202	158	158	145	145
Clusters (Country-Industry)	98	98	143	143	54	54	48	48
Adj. R^2	0.680	0.680	0.688	0.687	0.474	0.479	0.209	0.210

Notes: Panel C presents estimates from regressions of the share of innovating and patenting firms (innovation outputs) on the share of firms subject to full reporting and auditing requirements. The outcome variables are simple averages for a given country, industry, and year. "Reporting" is the share of simulated firms exceeding reporting-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Auditing" is the share of simulated firms exceeding auditing-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 3

DESCRIPTIVE STATISTICS:
ENFORCEMENT CHANGE IN GERMANY

Panel A: Market Level (County and 2-Digit NACE Level)

Variable	Market Level	N	Mean	SD	p1	p25	p50	p75	p99
Limited Share		56,929	0.589	0.231	0.000	0.436	0.596	0.764	1.000
Supplier Share		37,425	0.603	0.164	0.161	0.520	0.627	0.712	0.926
Customer Share		37,425	0.606	0.139	0.225	0.529	0.621	0.698	0.898
Post		56,929	0.371	0.483	0.000	0.000	0.000	1.000	1.000
Innovation Spending ('000 Euros)	Simple Average	29,702	4,587.016	83,351.990	0.000	0.000	30.000	400.000	42,600.040
Innovation Spending ('000 Euros)	Total	29,702	7,017.119	118,556.900	0.000	0.000	40.000	510.000	61,999.950
Innovation Spending	Simple Average	29,702	7.446	6.365	0.000	0.000	10.309	12.899	17.567
Innovation Spending	Total	29,702	7.648	6.540	0.000	0.000	10.597	13.142	17.943
Spending (Extensive)	Simple Average	29,702	0.531	0.467	0.000	0.000	0.500	1.000	1.000
Spending (Extensive)	Total	29,702	0.809	1.157	0.000	0.000	1.000	1.000	4.000
Spending (Intensive)	Simple Average	17,704	12.650	2.188	8.006	11.238	12.612	14.021	18.310
Spending (Intensive)	Total	17,704	12.831	2.291	8.006	11.290	12.766	14.316	18.661
New-To-Market Innovations	Simple Average	26,725	0.291	0.424	0.000	0.000	0.000	0.667	1.000
New-To-Market Innovations	Total	26,725	0.432	0.741	0.000	0.000	0.000	1.000	3.000
Innovating Firm	Simple Average	49,466	0.551	0.445	0.000	0.000	0.600	1.000	1.000
Innovating Firm	Total	49,466	1.090	1.890	0.000	0.000	1.000	1.000	7.000
Product Innovations	Simple Average	48,876	0.441	0.444	0.000	0.000	0.400	1.000	1.000
Product Innovations	Total	48,876	0.877	1.619	0.000	0.000	1.000	1.000	6.000
Process Innovations	Simple Average	48,800	0.367	0.426	0.000	0.000	0.000	1.000	1.000
Process Innovations	Total	48,800	0.715	1.253	0.000	0.000	0.000	1.000	5.000
Importance Patenting	Simple Average	30,063	0.577	1.005	0.000	0.000	0.000	1.000	3.000
Importance Patenting	Total	30,063	0.895	1.784	0.000	0.000	0.000	2.000	7.000
Patent Applications	Simple Average	56,929	0.139	0.497	0.000	0.000	0.000	0.000	2.565
Patent Applications	Total	56,929	0.210	0.667	0.000	0.000	0.000	0.000	3.367
Patenting Firm	Simple Average	56,929	0.077	0.229	0.000	0.000	0.000	0.000	1.000
Patenting Firm	Total	56,929	0.165	0.474	0.000	0.000	0.000	0.000	2.000

Profit Margin	Simple Average	26,851	3.605	1.724	1.000	2.000	3.500	5.000	7.000
Profit Margin	Total	26,851	5.302	6.747	1.000	2.000	4.000	6.000	26.000
Sales from New-to-Market Innovations	Simple Average	26,293	10.529	9.943	0.000	0.000	16.305	19.729	24.960
Sales from New-to-Market Innovations	Weighted Average	26,293	10.699	10.106	0.000	0.000	16.540	20.060	25.386
Share of Sales from New-to-Market Innovations	Simple Average	26,293	0.037	0.103	0.000	0.000	0.000	0.025	0.500
Share of Sales from New-to-Market Innovations	Total	26,219	0.037	0.106	0.000	0.000	0.000	0.020	0.510
Share of Sales Increase from Quality Improvements	Simple Average	22,619	0.021	0.059	0.000	0.000	0.000	0.005	0.262
Share of Sales Increase from Quality Improvements	Total	22,619	0.029	0.077	0.000	0.000	0.000	0.010	0.405
Cost Reduction from Process Improvements	Simple Average	24,168	0.265	0.415	0.000	0.000	0.000	0.500	1.000
Cost Reduction from Process Improvements	Total	24,168	0.364	0.613	0.000	0.000	0.000	1.000	2.000
External Financing Constraint	Simple Average	24,562	0.329	0.440	0.000	0.000	0.000	1.000	1.000
External Financing Constraint	Total	24,562	0.489	0.832	0.000	0.000	0.000	1.000	3.000
Internal Financing Constraint	Simple Average	24,451	0.369	0.452	0.000	0.000	0.000	1.000	1.000
Internal Financing Constraint	Total	24,451	0.551	0.903	0.000	0.000	0.000	1.000	3.000
Employees (Persons)	Simple Average	55,601	401.813	4,482.303	1.000	14.000	45.000	143.000	4,153.000
Employees (Persons)	Total	55,601	868.681	8,925.645	1.000	17.000	69.000	261.000	10,808.000
Employees	Simple Average	55,601	3.950	1.606	0.693	2.708	3.829	4.970	8.332
Employees	Total	55,601	4.360	1.847	0.693	2.890	4.248	5.568	9.288

Panel B: Firm Level

Variable	N	Mean	SD	p1	p25	p50	p75	p99
Limited	129,739	0.972	0.166	0.000	1.000	1.000	1.000	1.000
Private	123,692	0.991	0.093	1.000	1.000	1.000	1.000	1.000
Post	135,437	0.565	0.496	0.000	0.000	1.000	1.000	1.000
Innovation Spending ('000 Euros)	51,500	4,083.832	85,419.280	0.000	0.000	10.000	280.000	36,300.000
Innovation Spending	51,500	6.646	6.417	0.000	0.000	9.210	12.543	17.407
Spending (Extensive)	51,500	0.533	0.499	0.000	0.000	1.000	1.000	1.000
Spending (Intensive)	27,449	12.470	2.156	8.006	11.002	12.429	13.816	18.120
New-To-Market Innovations	44,462	0.297	0.457	0.000	0.000	0.000	1.000	1.000
Innovating Firm	110,582	0.564	0.496	0.000	0.000	1.000	1.000	1.000
Product Innovations	108,796	0.453	0.498	0.000	0.000	0.000	1.000	1.000
Process Innovations	108,476	0.369	0.482	0.000	0.000	0.000	1.000	1.000
Importance Secrecy	38,191	0.991	1.257	0.000	0.000	0.000	2.000	3.000
Importance Patenting	55,249	0.591	1.079	0.000	0.000	0.000	1.000	3.000
Patent Applications	135,437	0.113	0.474	0.000	0.000	0.000	0.000	2.398
Patenting Firm	135,437	0.080	0.271	0.000	0.000	0.000	0.000	1.000
Employees (Persons)	131,797	408.530	5,942.451	1.000	11.000	33.000	117.000	4,129.000
Employees	131,797	3.748	1.640	0.693	2.485	3.526	4.771	8.326

Notes: The table presents descriptive statistics for variables at the market (county and two-digit NACE) and firm level based on Creditreform and MIP data in Panels A and B, respectively. Corresponding variable definitions can be found in the "Variable Appendix" table. Simple averages are the unweighted averages of variables within a given county, industry, and year. Weighted averages are computed as the market-share-weighted sums of variables (where the market share is calculated using sales) within a given county, industry, and year. Totals are the sums of variables within a given county, industry, and year. Logarithm (plus one) transformations are applied after taking averages within a given county, industry, and year.

Table 4

REPORTING MANDATES AND INNOVATION:
ENFORCEMENT CHANGE IN GERMANY

Panel A: County-Industry Level (Average: 2-digit NACE level)

Outcome	Innovation Spending	New-To-Market Innovations	Innovating Firm	Product Innovations	Process Innovations	Importance Patenting	Patent Applications
Market Level	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Limited Share×Post	-3.026***	-0.073	-0.132***	-0.126***	-0.086**	-0.375***	-0.032
	(-4.06)	(-1.29)	(-3.46)	(-3.30)	(-2.32)	(-2.68)	(-1.59)
County-Industry FE	X	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X
Observations	26,774	23,597	47,283	46,680	46,592	27,976	54,947
Clusters (County-Industry)	5,857	5,459	8,193	8,163	8,156	5,621	8,560
Adj. R^2	0.528	0.412	0.393	0.415	0.322	0.726	0.691

Notes: Panel A presents estimates from regressions of market-level innovation and patenting outcomes on the intensity of enforcement of reporting mandates. The market level outcomes represent simple averages at the county, industry, and year. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: County-Industry Level (Aggregate: 2-digit NACE level)							
Outcome	Innovation Spending	New-To-Market Innovations	Innovating Firm	Product Innovations	Process Innovations	Importance Patenting	Patent Applications
Market Level	Total	Total	Total	Total	Total	Total	Total
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Limited Share×Post	-3.050***	-0.213***	-0.510***	-0.462***	-0.340***	-0.597***	-0.076**
	(-4.02)	(-2.73)	(-6.09)	(-5.89)	(-4.94)	(-2.68)	(-2.48)
County-Industry FE	X	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X
Observations	26,778	23,597	47,279	46,672	46,589	27,980	54,955
Clusters (County-Industry)	5,861	5,460	8,178	8,150	8,148	5,621	8,571
Adj. R^2	0.528	0.377	0.561	0.550	0.440	0.616	0.645

Notes: Panel B presents estimates from regressions of market-level innovation and patenting outcomes on the intensity of enforcement of reporting mandates. The market level outcomes represent totals at the county, industry, and year. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel C: Firm Level								
Outcome	Innovation Spending		Importance Secrecy		Importance Patenting		Patent Applications	
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Limited×Post	-0.785**		-0.575***		0.063		0.016**	
	(-2.02)		(-3.59)		(0.74)		(2.00)	
Private×Post		-1.416***		-0.233		0.150		0.086***
		(-2.99)		(-0.86)		(1.22)		(3.03)
Controls	X	X	X	X	X	X	X	X
Firm FE	X	X	X	X	X	X	X	X
County-Year	X	X	X	X	X	X	X	X
Industry-Year FE (4-digit)	X	X	X	X	X	X	X	X
Observations	36,909	36,768	32,275	32,238	46,084	46,150	112,106	110,809
Clusters (Firm)	9,742	9,585	9,130	9,054	11,138	11,048	22,418	21,494
Adj. R^2	0.751	0.760	0.943	0.941	0.912	0.913	0.882	0.898

Notes: Panel C presents estimates from regressions of firm-level innovation and patenting outcomes on two different treatment indicators. "Limited" is an indicator taking the value of one for affected (limited-liability) firms, and zero for unaffected (unlimited-liability) firms. "Private" is an indicator taking the value of one for affected (private limited-liability) firms, and zero for unaffected (publicly-listed limited-liability) firms. "Post" is an indicator taking the value of one for the post-enforcement reform period. The regressions include firm, county-year, and industry-year fixed effects (where the industries are defined using four-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the firm level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 5

REPORTING MANDATES AND INNOVATION:
ECONOMIC RETURNS TO INNOVATION (GERMANY)

Panel A: County-Industry Level (Average: 2-digit NACE level)

Outcome	Profit Margin	Sales from New-To-Market Innovations	Share of Sales from New-To-Market Innovations	Share of Sales Increase from Quality Improvements	Cost Reduction from Process Improvements
Market Level	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)
Limited Share×Post	-0.356*	-3.798***	-0.017*	-0.010*	-0.085
	(-1.69)	(-3.30)	(-1.84)	(-1.65)	(-1.54)
County-Industry FE	X	X	X	X	X
County-Year FE	X	X	X	X	X
Industry-Year FE	X	X	X	X	X
Observations	24,768	23,141	23,088	19,154	20,846
Clusters (County-Industry)	5,787	5,388	5,329	4,748	5,086
Adj. R^2	0.535	0.553	0.403	0.311	0.433

Notes: Panel A presents estimates from regressions of market-level returns to innovation on the intensity of enforcement of reporting mandates. The market level outcomes represent simple averages at the county, industry, and year level. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: County-Industry Level (Aggregate: 2-digit NACE level)					
Outcome	Profit Margin	Sales from New-To-Market Innovations	Share of Sales from New-To-Market Innovations	Share of Sales Increase from Quality Improvements	Cost Reduction from Process Improvements
Market Level	Total	Total	Weighted Average	Total	Total
Column	(1)	(2)	(3)	(4)	(5)
Limited Share×Post	-1.112**	-3.911***	-0.021**	-0.013	-0.145*
	(-2.40)	(-3.35)	(-2.13)	(-1.49)	(-1.89)
County-Industry FE	X	X	X	X	X
County-Year FE	X	X	X	X	X
Industry-Year FE	X	X	X	X	X
Observations	24,767	23,140	23,016	19,165	20,850
Clusters (County-Industry)	5,778	5,387	5,323	4,765	5,087
Adj. R^2	0.576	0.553	0.415	0.266	0.352

Notes: Panel B presents estimates from regressions of market-level returns to innovation on the intensity of enforcement of reporting mandates. The market level outcomes represent totals or sales-weighted averages at the county, industry, and year level. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 6

REPORTING MANDATES AND INNOVATION:
INNOVATION SPENDING MARGINS

Panel A: Market Level				
Outcome	Innovation Spending			
Margin	Extensive		Intensive	
Market Level	Simple Average	Total	Simple Average	Total
Column	(1)	(2)	(3)	(4)
Limited Share×Post	-0.180***	-0.347***	-0.590	-0.741*
	(-3.18)	(-3.65)	(-1.50)	(-1.80)
County-Industry FE	X	X	X	X
County-Year FE	X	X	X	X
Industry-Year FE	X	X	X	X
Observations	26,780	26,779	14,105	14,106
Clusters (County-Industry)	5,864	5,860	3,579	3,579
Adj. R^2	0.491	0.500	0.555	0.549
Panel B: Firm Level				
Outcome	Innovation Spending			
Margin	Extensive		Intensive	
Column	(1)	(2)	(3)	(4)
Limited×Post	-0.060		-0.029	
	(-1.62)		(-0.13)	
Private×Post		-0.058		-0.337**
		(-1.58)		(-2.18)
Controls	X	X	X	X
Firm FE	X	X	X	X
County-Year	X	X	X	X
Industry-Year FE (4-digit)	X	X	X	X
Observations	36,896	36,771	15,228	15,783
Clusters (Firm)	9,755	9,599	4,592	4,696
Adj. R^2	0.692	0.697	0.846	0.864

Notes: Panel A presents estimates from regressions of the extensive and intensive margins of market-level innovation spending on the intensity of enforcement of reporting mandates. The market level outcomes represent simple average at the county, industry, and year. The enforcement intensity is instrumented by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). Standard errors (in parentheses) are clustered at the county-industry level. Panel B presents estimates from regressions of the extensive and intensive margins of firm-level innovation spending on two different treatment indicators. "Limited" is an indicator taking the value of one for affected (limited-liability) firms, and zero for unaffected (unlimited-liability) firms. "Private" is an indicator taking the value of one for affected (private limited-liability) firms, and zero for unaffected (publicly-listed limited-liability) firms. "Post" is an indicator taking the value of one for the post-enforcement reform period. The regressions include firm, county-year, and industry-year fixed effects (where the industries are defined using four-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the firm level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 7

REPORTING MANDATES AND INNOVATION:
NUMBER OF FIRMS (CROSS-SECTION)

Outcome	Innovation Spending		Innovation Spending (Extensive)		Innovating Firm		Sales from New-to-Market Innovations	
Market Level	Simple Average		Simple Average		Simple Average		Simple Average	
Number of Firms	High	Low	High	Low	High	Low	High	Low
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Limited Share×Post	-2.554	-4.373***	-0.005	-0.313***	-0.100	-0.132***	-1.615	-4.913***
	(-1.51)	(-4.56)	(-0.03)	(-4.52)	(-1.09)	(-2.83)	(-0.54)	(-3.47)
County-Industry FE	X	X	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X	X
Observations	12,273	12,673	12,307	12,642	22,825	23,234	10,341	10,745
Clusters (County-Industry)	2,466	3,110	2,474	3,108	3,640	4,446	2,195	2,824
Adj. R^2	0.500	0.538	0.449	0.508	0.363	0.403	0.529	0.560

Notes: The table presents estimates from regressions of innovation inputs and outputs on the intensity of enforcement of reporting mandates for county-industries with a high vis-à-vis low number of firms in the pre-enforcement period (median split). The market level outcomes represent simple average at the county, industry, and year. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 8

REPORTING MANDATES AND INNOVATION:
SUPPLIER & CUSTOMER LEARNING CHANNEL (EUROPE)

Panel A: Reporting Only

Outcome	R&D Expense	R&D Employees	Share of Innovating Firms	Share of Not Innovating Firms	Share of Product Innovating Firms	Share of Process Innovating Firms	Patenting of Innovating Firms	Patenting of Not Innovating Firms
Market Level	Total	Total	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reporting	-1.596	-1.656	-0.233**	0.125	-0.064	-0.251*	-0.106	0.014
	(-0.79)	(-1.04)	(-2.35)	(1.58)	(-0.60)	(-1.83)	(-0.95)	(0.49)
Supplier Reporting	5.200**	3.846*	0.396**	-0.229	0.571***	0.618***	0.528**	0.091*
	(2.47)	(1.75)	(2.12)	(-1.25)	(3.03)	(2.91)	(2.34)	(1.78)
Customer Reporting	4.629***	3.592***	0.059	-0.078	-0.139	-0.041	0.208	-0.036
	(4.23)	(3.21)	(0.54)	(-0.71)	(-1.53)	(-0.45)	(1.40)	(-0.63)
Country-Year	X	X	X	X	X	X	X	X
Industry-Year	X	X	X	X	X	X	X	X
Observations	4,169	4,138	2,398	3,292	1,176	1,175	888	658
Clusters (Country-Year)	174	174	169	169	165	164	137	128
Clusters (Country-Industry)	192	191	94	137	48	48	51	44
Adj. R^2	0.796	0.846	0.708	0.714	0.725	0.631	0.548	0.323

Notes: Panel A presents estimates from regressions of innovation inputs and outputs on the shares of firms, suppliers, and customers subject to full reporting requirements. The outcome variables are totals or simple averages for a given country, industry, and year. "Reporting" is the share of (simulated) firms exceeding reporting-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Supplier Reporting" is the input-share-weighted intensity of reporting mandates in the supplier industries of a given country, industry, and year. "Customer Reporting" is the output-share-weighted intensity of reporting mandates in the customer industries of a given country, industry, and year. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. Standard errors (*t*-statistics in parentheses) are clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: Reporting and Auditing

Outcome	R&D Expense	R&D Employees	Share of Innovating Firms	Share of Not Innovating Firms	Share of Product Innovating Firms	Share of Process Innovating Firms	Patenting of Innovating Firms	Patenting of Not Innovating Firms
Market Level	Total	Total	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reporting and Auditing	-4.095**	-3.492**	-0.292**	0.223**	-0.340**	-0.237	-0.176	0.063
	(-2.10)	(-2.09)	(-2.49)	(2.39)	(-2.50)	(-1.64)	(-1.12)	(1.61)
Supplier Reporting and Auditing	7.482***	4.903**	0.352**	-0.195	0.573***	0.599***	0.517**	0.091*
	(2.97)	(2.33)	(2.04)	(-1.15)	(3.34)	(3.15)	(2.27)	(1.72)
Customer Reporting and Auditing	2.796**	2.821**	-0.008	-0.023	-0.110	-0.137**	0.060	-0.067
	(2.32)	(2.49)	(-0.08)	(-0.22)	(-1.12)	(-2.06)	(0.44)	(-1.10)
Country-Year	X	X	X	X	X	X	X	X
Industry-Year	X	X	X	X	X	X	X	X
Observations	4,169	4,138	2,398	3,292	1,176	1,175	888	658
Clusters (Country-Year)	174	174	169	169	165	164	137	128
Clusters (Country-Industry)	192	191	94	137	48	48	51	44
Adj. R^2	0.796	0.846	0.707	0.714	0.726	0.632	0.543	0.328

Notes: Panel B presents estimates from regressions of innovation inputs and outputs on the shares of firms, suppliers, and customers subject to full reporting and auditing requirements. The outcome variables are totals or simple averages for a given country, industry, and year. "Reporting and Auditing" is the share of (simulated) firms exceeding reporting- and auditing-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Supplier Reporting" is the input-share-weighted intensity of reporting and auditing mandates in the supplier industries of a given country, industry, and year. "Customer Reporting" is the output-share-weighted intensity of reporting and auditing mandates in the customer industries of a given country, industry, and year. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 9

REPORTING MANDATES AND PROFITABILITY:
SUPPLIER & CUSTOMER LEARNING CHANNEL (EUROPE)

Panel A: Reporting Only

Outcome	Sales per Employee	Sales per Employee and Capital	Market Share and Sales per Employee	Market Share and Sales per Employee and Capital
Market Level	Weighted Average	Weighted Average	Covariance	Covariance
Column	(1)	(2)	(3)	(4)
Reporting	-0.548	-0.394	-0.825**	-0.631*
	(-1.30)	(-1.08)	(-2.04)	(-1.91)
Supplier Reporting	1.412**	1.430**	1.205**	1.283**
	(2.23)	(2.50)	(2.05)	(2.53)
Customer Reporting	0.702**	0.490	0.668**	0.569**
	(2.00)	(1.40)	(2.17)	(2.08)
Country-Year	X	X	X	X
Industry-Year	X	X	X	X
Observations	15,769	15,738	15,543	15,456
Clusters (Country-Year)	247	247	247	247
Clusters (Country-Industry)	372	372	368	369
Adj. R^2	0.790	0.741	0.493	0.493

Notes: Panel A presents estimates from regressions of profitability (or productivity) measures on the shares of firms, suppliers, and customers subject to full reporting requirements. The outcome variables are sales-weighted averages or covariances (differences between sales-weighted and equally weighted measures) in a given country, industry, and year. "Reporting" is the share of (simulated) firms exceeding reporting-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Supplier Reporting" is the input-share-weighted intensity of reporting mandates in the supplier industries of a given country, industry, and year. "Customer Reporting" is the output-share-weighted intensity of reporting mandates in the customer industries of a given country, industry, and year. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: Reporting and Auditing

Outcome	Sales per Employee	Sales per Employee and Capital	Market Share and Sales per Employee	Market Share and Sales per Employee and Capital
Market Level	Weighted Average	Weighted Average	Covariance	Covariance
Column	(1)	(2)	(3)	(4)
Reporting and Auditing	-0.162	-0.001	-0.465	-0.298
	(-0.37)	(-0.00)	(-1.12)	(-0.90)
Supplier Reporting and Auditing	1.634***	1.484***	1.293**	1.130**
	(2.80)	(2.85)	(2.42)	(2.43)
Customer Reporting and Auditing	0.787**	0.544	0.713**	0.624**
	(2.24)	(1.64)	(2.28)	(2.35)
Country-Year	X	X	X	X
Industry-Year	X	X	X	X
Observations	16,169	16,129	15,937	15,845
Clusters (Country-Year)	247	247	247	247
Clusters (Country-Industry)	372	372	368	369
Adj. R^2	0.792	0.744	0.491	0.492

Notes: Panel B presents estimates from regressions of profitability (or productivity) measures on the shares of firms, suppliers, and customers subject to full reporting and auditing requirements. The outcome variables are sales-weighted averages or covariances (differences between sales-weighted and equally weighted measures) in a given country, industry, and year. "Reporting and Auditing" is the share of (simulated) firms exceeding reporting- and auditing-related exemption thresholds in a given country, industry, and year using a standardized firm-size distribution per industry across all countries and years. "Supplier Reporting and Auditing" is the input-share-weighted intensity of reporting and auditing mandates in the supplier industries of a given country, industry, and year. "Customer Reporting and Auditing" is the output-share-weighted intensity of reporting and auditing mandates in the customer industries of a given country, industry, and year. The regressions include industry-year fixed effects (where the industries are defined using two-digit NACE classifications) and country-year fixed effects. We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level (where the industries are defined using one-digit NACE classifications) and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 10

REPORTING MANDATES AND INNOVATION: FINANCING CHANNEL (GERMANY)				
Outcome	External Financing Constraint		Internal Financing Constraint	
Market Level	Simple Average	Total	Simple Average	Total
Column	(1)	(2)	(3)	(4)
Limited Share×Post	-0.123*	-0.403***	-0.033	-0.393***
	(-1.78)	(-3.68)	(-0.48)	(-3.49)
County-Industry FE	X	X	X	X
County-Year FE	X	X	X	X
Industry-Year FE	X	X	X	X
Observations	22,528	22,535	22,418	22,420
Clusters (County-Industry)	5,199	5,197	5,191	5,184
Adj. R^2	0.666	0.580	0.663	0.573

Notes: The table presents estimates from regressions of financing constraints on the intensity of enforcement of reporting mandates. The market level outcomes represent averages or totals at the county, industry, and year. The enforcement intensity is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Online Appendix

(for online publication only)

Table A1

REPORTING MANDATES AND INNOVATION:
SUPPLIER & CUSTOMER LEARNING CHANNEL (GERMANY)

Panel A: County-Industry Level (Average: 2-digit NACE level)

Outcome	Innovation Spending	Innovation Spending (Extensive)	Innovating Firm	Sales due to New-To-Market Innovations	Importance Patenting	Patent Applications
Market Level	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)	(6)
Limited Share×Post	-6.218***	-0.322***	-0.279***	-7.442***	-0.507*	-0.109**
	(-4.40)	(-2.83)	(-3.61)	(-3.32)	(-1.75)	(-2.09)
Supplier Limited Share×Post	1.807	0.295*	0.200*	7.441**	0.983**	0.182**
	(0.80)	(1.74)	(1.73)	(1.98)	(2.26)	(2.15)
Customer Limited Share×Post	5.064**	0.121	-0.060	-2.301	-0.549	-0.036
	(1.98)	(0.64)	(-0.45)	(-0.56)	(-1.06)	(-0.39)
County-Industry FE	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X
Observations	17,131	17,133	31,281	14,660	17,955	35,951
Clusters (County-Industry)	3,651	3,654	5,154	3,359	3,543	5,347
Adj. R^2	0.509	0.472	0.372	0.526	0.706	0.658

Notes: Panel A presents estimates from regressions of market-level innovation and patenting outcomes on the intensity of enforcement of reporting mandates for firms, suppliers, and customers. The market level outcomes represent simple averages at the county, industry, and year. The enforcement intensity of mandates for firms is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). "Supplier Limited Share" is the input-share-weighted share of affected firms in supplier industries of a given county-industry. "Customer Limited Share" is the output-share-weighted share of affected firms in customer industries of a given county-industry. The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Panel B: County-Industry Level (Aggregate: 2-digit NACE level)						
Outcome	Innovation Spending	Innovation Spending (Extensive)	Innovating Firm	Sales due to New-To-Market Innovations	Importance Patenting	Patent Applications
Market Level	Total	Total	Total	Total	Total	Total
Column	(1)	(2)	(3)	(4)	(5)	(6)
Limited Share×Post	-6.062***	-0.627***	-0.918***	-7.767***	-1.469***	-0.219***
	(-4.16)	(-3.30)	(-4.94)	(-3.42)	(-3.00)	(-2.61)
Supplier Limited Share×Post	1.712	0.023	0.407	6.975*	1.788**	0.331**
	(0.74)	(0.08)	(1.42)	(1.83)	(2.29)	(2.44)
Customer Limited Share×Post	5.117*	0.639*	0.235	-1.044	-0.738	-0.067
	(1.95)	(1.88)	(0.74)	(-0.25)	(-0.83)	(-0.44)
County-Industry FE	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X
Observations	17,133	17,133	31,284	14,658	17,961	35,962
Clusters (County-Industry)	3,653	3,652	5,151	3,358	3,541	5,354
Adj. R^2	0.509	0.431	0.518	0.526	0.602	0.620

Notes: Panel B presents estimates from regressions of market-level innovation and patenting outcomes on the intensity of enforcement of reporting mandates for firms, suppliers, and customers. The market level outcomes represent totals at the county, industry, and year. The enforcement intensity of mandates for firms is captured by the interaction of the share of affected (limited-liability) firms in the pre-enforcement period in a given county and industry ("Limited Share") and a post-enforcement reform indicator ("Post"). "Supplier Limited Share" is the input-share-weighted share of affected firms in supplier industries of a given county-industry. "Customer Limited Share" is the output-share-weighted share of affected firms in customer industries of a given county-industry. The regressions include county-industry, county-year, and industry-year fixed effects (where the industries are defined using two-digit NACE classifications). We truncate the outcomes at the 1st and 99th percentile of their distributions, after accounting for the fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.