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MANDATED FINANCIAL REPORTING AND CORPORATE INNOVATION

Matthias Breuer
Christian Leuz
Steven Vanhaverbeke

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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 same time, it increases firms' reliance on patenting to protect their innovations, to the extent they continue innovating. Our evidence is consistent with mandated reporting having significant real effects by imposing proprietary costs on innovative firms, which in turn diminishes their incentives to engage in innovative activities. Importantly, we examine aggregate effects at the industry level, net of spillovers. Thus, our results imply that positive information spillovers (e.g., to competitors, suppliers, and customers) within industries are not large enough to compensate the negative direct effect on the prevalence of innovative activity. The spillovers instead appear to concentrate innovation among a few large firms in a given industry. In sum, financial reporting regulation has important distributional and aggregate effects on corporate innovation.

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 financial 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. How serious this concern is, however, remains unclear (Zingales 2009). A mere redistribution of gains from proprietary information (e.g., from a firm to its competitors or customers) may 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 also 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 regulation 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 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 reporting regulation in Europe. The regulation, set forth in the Accounting Directives of the European Union

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.

(EU), mandates that all limited-liability firms—private and public ones—must disclose their financial statements, including a management report discussing business risks, R&D activities, and firm 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 to be 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 a substantial enforcement reform (e.g., Bernard 2016; Breuer 2019; Vanhaverbeke *et al.* 2019).

The European setting exhibits several desirable features when investigating the effect of mandatory reporting on innovative activity. First, the size-based thresholds across EU countries and the German enforcement reform generate substantial variation in the amount of financial information that otherwise opaque private firms are required to provide. Second, both the size-based thresholds and the enforcement change enable us to use difference-in-differences techniques. Third, the EU regulation and the German enforcement reform pertain to all limited-liability firms rather than a few public firms, plausibly resulting in aggregate effects.² Notably, private 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

² Out of the 24 million active firms in Europe, 80% are limited-liability companies, and are thus affected by the Accounting Directives (EU 2019b). Similar to the US, small- and medium-sized enterprises (SMEs) represent over 99.8% of active enterprises within the economy. SMEs employ 93 million people, accounting for 67 % of total employment in the EU-28 non-financial business sector (EU 2017), and a significant percentage of these firms are innovative. According to the European Commission (EU 2019a), 38.3% of EU-28 SMEs developed at least one product or process innovation in the period 2014-2016, compared to 67.8% of the large enterprises. Some SMEs developed disruptive or breakthrough innovations, while others innovated in more incremental ways. The proportion of innovative SMEs (large enterprises) that introduced at least one new-to-the-market innovation between 2014 and 2016 was 13% (32%).

firms, including various innovation types, allowing us to measure innovation effects more granularly and also fairly comprehensively.

We employ two research designs to identify the effect of reporting regulation on innovation at the market or 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 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 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 market level. Specifically, we use the pre-determined share of limited-liability firms among all firms, in a given local (county-industry) market as the treatment (akin to Bartik instruments; Goldsmith-Pinkham *et al.* 2019) and employ a *time-series* difference-in-differences design. For firm-level and robustness tests, we also use standard time-series difference-in-differences designs comparing treated (limited-liability) and control firms, either unlimited-liability or publicly traded firms, around the enforcement reform.

The two settings and designs exhibit complementary strengths and weaknesses. The main strength of the European setting is that it is more likely to estimate the aggregate net impact of

mandatory reporting, which comprises the direct effects on firms facing the mandate and the indirect effects at the country-industry level. That is, the country-industry-level aggregation of the European captures spillovers to other firms more comprehensively than the German setting with regional aggregation. Specifically, the European analysis includes any redistribution effects across firms at the country-industry level, including positive spillover effects for customers, suppliers and competitors within the same coarse industry. In addition, the European analysis essentially compares different country-industry equilibria and as such accounts for long-run adjustments in industries along all margins, including potential financing benefits spurred by greater industry-wide transparency. In this sense, our estimates of the country-industry analysis represent the *net-net* effect of the mandate with respect to innovation.³ The high level of aggregation comes at the cost of power (i.e., limited observations at the country-industry level). By contrast, the main strengths of the German setting are the power that comes with the granular *county*-industry (or firm-level) variation in enforcement and the detailed input and output measures of corporate innovation. The within-country regional aggregation neglects potentially important spillovers, but the more granular analyses in the German setting help to explore the mechanism, i.e., are better suited to estimate the direct effects on firms (instead of the net impact of the mandate) and to uncover the various forces shaping the net impact. Thus, the enforcement reform analysis complements the aggregate analysis in the European setting.

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, information on innovation inputs and outputs in Eurostat's Community Innovation Surveys and the Mannheim Innovation Panel. The

³ We acknowledge that our country-industry analysis neglects spillovers crossing broad industry and country boundaries. If such spillovers are substantial, our aggregate results need to be interpreted with caution. In support of our country-industry analysis, we find that the largest market for the vast majority of our sample firms (80%) is at the local or national level. Similarly, sales to customers outside of firms' own country amount to only 2% for the average firm.

European sample covers up to 26 countries over a time span of 15 years from 2000 to 2014. The German sample covers more than 20,000 unique firms over 12 years from 2002 to 2013.

In the European setting, we find that mandatory financial reporting is significantly negatively associated with the prevalence of corporate innovation (e.g., fewer innovating firms) at the country-industry level. Thus, within-country-industry spillovers are generally not large enough to compensate for the negative direct effect on firms' innovative activities. We do not find significant evidence that the mandates reduce total innovation spending though. These results suggest that, while reporting mandates discourage many firms' innovation activities, a few firms appear to increase their spending. Consistent with this redistribution of innovative activity, we find that reporting mandates imposed on *other* firms spur innovation, especially for larger firms or customers and suppliers.

In the German setting, we also find that forcing firms to provide financial reports is negatively associated with the number of innovating firms in local markets, consistent with the European results. Unlike the European results, we even find that reporting mandates are significantly negatively associated with the total innovation spending in local markets. This decline in spending at the county level appears to be driven by firms operating in markets with few existing competitors. These local monopolist frequently stop innovating altogether, likely because mandated reporting dissipates the gains from innovation. In line with this proprietary-cost explanation for the effect of mandatory reporting on innovation, we document that the mandates are negatively associated with firms' profit margins, sales from new-to-market innovations, and cost reductions due to process improvements.

In supplemental tests, we investigate the impact of reporting mandates on firms' financing, patenting, and financial-statement-based innovation measures. We first 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 rather limited for the private firms in our setting and cannot offset the discouraging effect of the mandate on corporate innovation due to the loss of proprietary information. Next, we find that reporting mandates exhibit an ambiguous relation with patenting. On the one hand, reporting mandates discourage innovations, and thus imply fewer patents. On the other hand, reporting mandates appear to increase the use of patenting, rather than secrecy, to protect firms' remaining innovations. We finally document that reporting mandates are negatively associated with financial-statement-based innovation measures (e.g., changes in intangible assets), corroborating our innovation-survey-based findings.

Our evidence is remarkably consistent across the distinct settings and designs. It suggests that disclosure and reporting mandates discourage innovation activities of mandated firms, especially local monopolists, and redistribute innovative activity toward a few larger firms. At the country-industry level, our highest aggregation level, it appears that the negative direct effect of reporting mandates possibly outweighs any positive spillover effects. Whether this negative net impact also generalizes to the economy-wide level is unclear, given potential cross-industry and cross-country spillovers neglected in our country-industry analysis. What appears clear though is that reporting mandates concentrate innovative activity among a few, typically larger firms. This distributional impact of reporting mandates can have important ramifications for the type of innovations and market structure (e.g., Acs & Audretsch 1987, 1988; Holmstrom 1989; Rossi-Hansberg *et al.* 2019).

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

⁴ Graham *et al.* (2005) provide survey evidence that 59% of CFOs fear giving away “company secrets” or hurting their competitive position through voluntary disclosure. Similarly, Minnis and Shroff (2017) provide survey evidence indicating that 61% of firms believe that competitors download and view their financial statements if they are publicly available.

Although 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), Breuer (2019), and Glaeser and Omartian (2019), for example, 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 the distributional and industry-wide effects on 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 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 and potentially misleading proxy for firms'

Moreover, they document that 48% of surveyed firms state that they downloaded financial statement information about one of their competitors in the past.

⁵ Importantly, Brown and Martinsson (2018) and Kim (2019) 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.

overall innovative activity (e.g., Gittelman 2008; Nagaoka *et al.* 2010; Reeb & Zhao 2020). 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; Valentine 2018; Kim 2019).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 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; Reeb & Zhao 2020). 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

⁶ The papers on mandatory patent disclosures exploit the 1999 American Inventors Protection Act (AIPA) which accelerated the disclosure of U.S. Patent applications. Using this law change, Dass *et al.* (2018) and Saidi and Zaldokas (2019) document an increase in patenting, liquidity, and external financing due to enhanced disclosure, while Valentine (2018), Kim (2019), 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.

⁷ The firms in our setting are required to prepare full financial statements irrespective of the public reporting mandate.

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. Reporting Regulation 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.

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).⁸ 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 its R&D activities.

⁸ 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).

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.⁹ In addition, this information could induce new firms to enter the industry or market (e.g., Darrough & Stoughton 1990; Wagenhofer 1990).

Survey evidence supports the notion that firms are concerned about disclosing financial statements to the public because it can reveal proprietary information. For example, Minnis & Shroff (2017) find that 61% of firms are concerned that competitors download and view their financial statements if they are publicly available. Moreover, 48% of surveyed firms state that they downloaded financial statement information about one of their competitors in the past. Similarly, Graham *et al.* (2005) document that 59% of CFOs fear giving away "company secrets" or hurting their competitive position through voluntary disclosure.

Importantly, the disclosure of financial reports is not only relevant with respect to competitors, but could also impose competitive costs by weakening a firm's bargaining power vis-à-vis its major

⁹ Similar concerns are raised by managers and regulators. A review by the ICAEW (2013, p. 33) stated: "A firm's knowledge of what is profitable and what is not is a form of intellectual capital—akin to an invention, but often much more transient. If this information is disclosed, then the firm's competitors benefit as they learn which fields to move into and which to avoid, without having to incur the costs of being first movers. In this situation, the winners from disclosure are the imitators, and the losers are the pioneers."

contracting partners. For example, it 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-Institute 2009; Minnis & Shroff 2017). Survey evidence in Minnis & Shroff (2017) supports this notion. They document that 46% (37%) of companies download the financial report of their customers (suppliers). According to survey evidence in Arrunada (2011), 85% (25%) of firms use information services to access information about their clients (suppliers). 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; Liberty & Zimmerman 1986; 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 arm's length transactions and change the resource allocation in the economy (e.g., Hombert & Matray 2016).

Firms consider competitive costs resulting 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

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).

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 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-Institute 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 regulation. 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 aggregate level, be it the market or the economy. 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, such redistribution could also be harmful if mandatory reporting 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 mandatory reporting on the aggregate innovative activity in the economy is ultimately an empirical question.¹²

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 While the firm-level relation between competition and innovation is generally ambiguous, Schmutzler (2010) documents that competition for ex-post rents (e.g., spurred by disclosure) is unambiguously negative for ex-ante innovation incentives. Accordingly, the relevant question is whether the negative direct impact is offset by positive spillovers in the aggregate.

While the net effect is ambiguous, firm-specific costs and benefits of reporting mandates likely depend on a firm's competitive position and size (e.g., Max-Planck-Institute 2009; Bernard 2016; Bernard *et al.* 2018). For example, the proprietary costs of a mandate are likely higher for a local monopolist than a firm operating in a competitive market. Absent the reporting mandate, the 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 has to report or not. In a similar vein, a small firm should be hit harder by a 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 would report publicly, and incur proprietary costs, even without a mandate, because it needs to communicate with a broad set of stakeholders (e.g., Buzby 1975). In addition, a large firm likely benefits more from the spillovers caused by mandating other firms to report, compared to a small firm (e.g., Max-Planck-Institute 2009). A large firm, for example, can leverage its extensive resources and bargaining power to extract a share of the other firms' rents (e.g., Bernard 2016). A small firm would find it more difficult to take advantage of investment opportunities in new markets or to bargain with its contracting partners for better prices by threatening to switch to other suppliers or customers. Thus, this discussion highlights that reporting regulation potentially has important distributional consequences that are worth studying.

3. Institutional Background

3.1. 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 (see example in Online Appendix). 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 thresholds defined for total assets, sales, and employees. These thresholds *uniformly* apply to all industries within a given country. While the EU sets maximum exemption thresholds, countries can set lower levels, subjecting more firms to the full reporting requirements. This discretion has resulted in notable variation in the relevant thresholds for reporting and auditing across EU countries.¹³

The threshold-based exemptions allow a substantial fraction of firms to reduce markedly what information they have to provide publicly. In many countries, exempted firms 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 shareholders, 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 In the Online Appendix, we provide an example of exempted reporting and show for this

¹³ The respective maximum thresholds set 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.

firm how reporting changes once it crosses the thresholds and has to comply with full reporting.¹⁵

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 national laws resulting from the EU directives, however, varies across countries (e.g., Christensen *et al.* 2016). In Germany, the reporting mandate had been weakly enforced until a 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. The local courts were not tasked to ensure compliance or to engage in proactive enforcement, and monetary sanctions for non-compliance were low. Not surprisingly, the resulting 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-compliant firms. As a result of the reform, the share of limited-liability firms providing the required financial reports increased to above 90%. This compliance increase substantially enhanced corporate transparency in Germany as it meant that

¹⁵ While this example illustrates how much more information a firm provides once it is subject to full reporting, we emphasize that our identification strategy does not rely on such over-time variation when firms outgrow the thresholds.

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 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 information on innovation activity across Europe from Eurostat’s Community Innovation Survey.¹⁶ We obtain information on European countries’ reporting-exemption thresholds from Breuer (2019). This European sample covers up to 26 countries over a time span of 15 years from 2000 to 2014. Within each country, we aggregate firm-level financial and patent data to the three- or two-digit NACE industry level to create a country-industry-year level dataset for our market-wide analyses. In aggregating the innovation-survey responses, we use population weights to obtain aggregate measures that are representative for the population of firms in each country.

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.¹⁷ 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

¹⁶ We use confidential micro-level data (called secure-use files) accessible at Eurostat’s Safe Center in Luxembourg. We use all available survey waves (2000, 2004, 2006, 2008, 2010, 2012, and 2014). The survey is carried out by the EU member states and European Statistical System members. In each country, the data are collected by a local team of statisticians specializing in innovation studies and working at an independent research institute or the national statistical office. The survey questions are harmonized across countries, and cognitive tests are regularly conducted to assure that the questions elicit the desired information. Member states are required to provide innovation statistics to the EU, and almost all Member States require firms answer the survey. The data are used for the annual European Innovation Scoreboard and can be used for academic research at Eurostat’s Safe Center in Luxembourg. See Online Appendix for more details.

¹⁷ See Bersch *et al.* (2014) for more details about the construction of the MEP database.

us to link our sample firms with all patents available in the PATSTAT database to construct patent indicators (ZEW 2019a). We augment this data with detailed information on innovation inputs and outputs from the Mannheim Innovation Panel (MIP), which is based on successive issues of the EU’s 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 churn and adjusted for non-random response bias via representative re-sampling, but there is nevertheless sparse data at the firm level. We again aggregate data at the market level, in this case using county and industry as the relevant market. Aggregating at the county-industry-level mitigates the limitations of the panel data. That is, county-industry-level aggregation together with the representative sampling imply that it is not important for the same firm to answer the same question over time (or around the enforcement reform in Germany).¹⁸

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.

¹⁸ 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 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).

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 different and, importantly, predictable ways. For example, a regulation that exempts firms below the 50-employees threshold from full reporting affects labor-intensive industries more strongly than capital-intensive industries. Analogous 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:¹⁹

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

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.²⁰

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

¹⁹ 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.

²⁰ In alternative specifications, we use the share of firms exceeding both the reporting- and auditing-thresholds as our (credible) reporting intensity measure.

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 (e.g., property rights, education, etc.) and *any* country trends, shocks or changes over time, observed or unobserved. This feature is a substantial advantage over the usual (time-series) difference-in-differences design that exploits a regulatory change in a given country as treatment.²¹ Another advantage is that the potential competitive and spillover effects from reporting mandates take time to play out. The cross-sectional difference-in-differences design essentially compares equilibria in different countries and industries resulting from different thresholds, rather than shorter-term effects around regulatory changes.

Thus, country- and industry-level differences as well as trends and changes are well addressed in our design. We rely on the identifying assumption that confounding factors at the country-industry level are uncorrelated with corporate innovation and the share of firms to which the mandate applies. This assumption would likely be violated if countries were setting their reporting thresholds differentially 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 reduce the disproportionate regulatory burden for smaller firms (in all industries), resulting among other things from fixed costs associated with financial reporting requirements.²² If the EU or specific countries really intended to treat industries differently, they could have set industry-specific exemption

²¹ 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.

$$\frac{1}{N} \sum_{j=1}^{N_i} \mathbf{1}(s_{ij} > \bar{s}_c),$$

where N is the number of firms in an industry, s is the size of firm j , and \bar{s} is the exemption-threshold in a given country at a given point in time. In 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:

$$\frac{1}{N_{cit}} \sum_{j=1}^{N_{ij}} \mathbf{1}(s_{ijt} > \bar{s}_c).$$

²² Fixed costs depress the profit margin more, the lower a firm's sales. This scale effect is not specific to a particular industry and one reason why the EU prescribes a uniform sales-based exemption threshold for all industries (e.g., European Commission 2019)

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 specific 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 or a few specific industries (e.g., its most important ones), then this country-industry-specific choice would make the chosen thresholds plausibly exogenous for all other industries, except the specifically targeted one(s), and presumably these other industries would dominate the analysis.

Our identifying assumption requires further 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 firms facing a mandate in the respective industry. Similarly, if some firms engage in avoidance behavior to stay 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 firms required to report.

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 to calculate the share of reporting firms above a given country’s 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 the firm-size distributions across countries and over time, addressing concerns about reverse causality, correlated measurement, and correlated omitted variables due to industry-structure endogeneity.²³

5.2. Enforcement Reform

In the second design, we exploit the enforcement reform in Germany as a major shift in the effective regulation of limited-liability firms’ reporting over time and use the following temporal difference-in-differences analysis with a continuous treatment variable:

$$Y_{dit} = \beta \text{LimitedShare}_{di} \times \text{Post}_t + \alpha_{dt} + \delta_{it} + \phi_{di} + \varepsilon_{dit},$$

where Y_{dit} is the dependent variable (e.g., the share of innovating 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_{dt} is a county-year fixed effect, δ_{it} is an industry-year fixed effect, and ϕ_{di} is a county-industry fixed effect.²⁴

²³ For a detailed description of the construction of the standardized firm-size distributions and the necessary assumptions underlying this research design, see Breuer (2019).

²⁴ We measure the share of limited-liability firms in the population covered by the MEP. Aside from the confidential German census data, this panel is the most comprehensive database, spanning various types of firms, including sole-proprietorships, partnerships (e.g., OHG and KG), and corporations (e.g., GmbH and AG). Inclusion in the MEP is independent of the reporting mandate and the share is not computed based on survey responses, but the actual share in the MEP population.

The basic idea behind this market-level difference-in-differences design is that industries in counties with a greater share of limited-liability firms should be more affected by the enforcement increase for 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 and industry, which is essentially a parallel-trends assumption.

In supplemental tests, we complement this continuous-treatment, market-level design with two firm-level (and more conventional) 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 not required to report publicly before or 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 increased reporting due to 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 firm-level estimates can be informative with respect to distributional effects, especially when interpreted in

conjunction with the market-level estimates. For example, the firm-level estimates 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. Descriptive Statistics

Table 1 presents descriptive statistics for our treatment and outcome variables. (For a list of variable definitions, refer to the Variable Appendix.) In the European sample (Panel A), our main variable of interest is the reporting intensity variable “Reporting,” which captures the share of firms subject to full reporting requirements in a country and two-digit industry. The distribution of this intensity measure exhibits several notable features. The average (median) intensity for two-digit industries is 22% (12%). The intensity measure spans the full range from 0% to 100%, with the majority of the intensity values falling between 5% and 25%. These statistics suggest that the treatment variable primarily captures variation in mandatory reporting among the *largest* firms in a given industry (i.e., the largest 5 to 25% of firms in a given industry are required to report fully). These firms are likely of substantial importance for market- or industry-level outcomes. However, the intensity variable also extends to relatively small firms in many industries, allowing us to not merely capture a local effect, but rather an average effect over a meaningful range of firm sizes. The alternative treatment variable “Reporting and Auditing” captures the share of firms facing mandates for reporting and auditing. It has very similar statistics as “Reporting” but allows us to check if the results are different if reported financials are audited and hence more credible.

In the German sample (Panels B and C), the three treatment variables of interest are the share of limited firms (“Limited Share”), an indicator for limited firms (“Limited”), and an indicator for private firms (“Private”). 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%) at the market level (Panel B). In contrast, the share of “limited” firms in the firm-level data is 97% (Panel C). The remaining 3% are unlimited-liability firms of a particular type (KG, OHG), which are the 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 firms in the firm-level data is in part due to representative sampling and in part due to better coverage of limited firms in the 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, we can exploit changes at the market rather than firm-level over time without substantial concerns about endogenous sample selection or attrition over time.

With respect to innovation outcomes, the descriptive statistics for the European sample (Panel A) suggest that 36% (33%) of firms in the average (median) two-digit industry are innovating (i.e., introducing new-to-the-firm or new-to-the-market products, services, or processes).²⁵ A little less than half of these innovations (16% on average) are not only “new to the firm,” but entirely “new to the market.” By contrast, the share of patenting firms is only between 1% (0%) to 6% (2%) in the average (median) industry, highlighting that patenting captures only a very small share of corporate innovation. These statistics suggest that innovative activities are widespread in the economy, i.e., performed by a large share of firms, but only few firms use patenting as a strategy to protect their

²⁵ The Community Innovation Survey defines an innovation as “the introduction of a new or significantly improved product, process, organisational method, or marketing method by your enterprise. An innovation must have characteristics or intended uses that are new or which provide a significant improvement over what was previously used or sold by your enterprise. However, an innovation can fail or take time to prove itself” (Community Innovation Survey 2014a). For more detail and examples, refer to the methodological notes for the Community Innovation Survey (2014b) and the Online Appendix.

innovations.

In the German sample, we find very similar patterns as in the European sample, although the German sample is slightly more tilted toward innovative firms. In the average county, 55% (60%) of firms are innovating in a given year, but again only 8% (8%) of firms apply for patents in a given year and county in Panel B (C). The share of firms with entirely new-to-the-market innovations is 29% in Panel B and 30% in Panel C. In sum, there is a substantial share of innovating firms in our sample.

6.2. Reporting Regulation in Europe

6.2.1. Main Effect of Regulation on Innovation

We begin our analysis by investigating the impact of reporting regulation on aggregate innovation in the European sample. Table 2 presents country-industry-level regressions for various measures of innovation activity on reporting intensity.²⁶ Innovation activity is measured at the two-digit industry level using population-weighted survey responses from the Community Innovation Surveys. At this relatively high level of aggregation, the analysis captures potential spillovers within broader industry groupings. The population-weighting ensures the representativeness of the aggregate innovation measures in terms of firm size and industry within a country.²⁷

In Panel A, mandatory reporting intensity is not significantly associated with the average innovation spending (columns 1 and 2). However, reporting intensity is significantly negatively associated with the share of innovating firms (column 3). This share captures firms adopting products,

²⁶ See Tables 3 and 4 in Breuer (2019) for a validation of simulated reporting intensity and an assessment of correlated factors.

²⁷ Stratified random sampling was used to ensure the sample was representative. The stratification of the sample was based on the economic activity of the enterprise (NACE Rev.2 classification), on the enterprise size, and in some countries also on the geographical region (NUTS2 level). Weights are included to the responses to compensate for sampling design and unit non-response. The population weights ensure that the averages are representative for the whole industry and country. For example, in the few countries where the survey is not mandatory, it allows us to take into account that larger firms are more likely to respond to the survey compared to smaller firms. In addition, some countries oversampled larger firms in their survey, and by using population weights we adjust for such biases.

processes, or services that are new to the firm or new to the market. Next, we decompose this broad measure of innovation activity into its key components. We find that mandatory reporting or mandatory reporting and auditing exhibit negative associations with all the key components, albeit at varying levels of significance: the share of firms reporting new-to-the-market innovations (columns 5 and 6), product innovations (columns 7 and 8), and process innovations (columns 9 and 10). In Panel B, we document similar evidence using total innovation spending and the total number of firms with innovations as our outcomes. By using totals, rather than simple averages, we essentially present size-weighted, aggregate results.

In terms of economic magnitude, our estimates imply that increasing the share of limited-liability firms that are subject to mandatory reporting by, for instance, 10 percentage points is associated with a 1.2 percentage-point decrease in the share of innovating firms (column 1 of Panel A). Considering the range in the reporting intensity, this effect is economically meaningful (but also plausible). Importantly, this estimate represents the *net* effect at the two-digit industry level. It is net of any redistribution across firms as well as positive spillovers among customers, suppliers, and competitors within the same industry, including any potential financing benefits.²⁸ Moreover, it is net of any long-run changes in the industries (e.g., a shift toward arm's length contracting and greater entry into the industry) spurred by greater industry-wide transparency.

Collectively, the results in Table 2 provide a first indication that reporting mandates reduce corporate innovation even after allowing for industry-wide redistribution and spillovers. The aggregate results, while economically significant, are statistically tenuous. The tenuous nature likely reflects not only low statistical power (relatively few observations at the two-digit industry-country

²⁸ In subsequent sections, we explore the channels that make up the net effect of mandatory reporting. We disentangle the direct and indirect (redistribution and spillover) effects in section 6.2.2 and investigate the relative importance of financing benefits vis-à-vis proprietary costs in section 6.4.

level), but also the existence of countervailing forces, i.e., a negative direct impact for the firms that are forced to report vs. positive indirect effects or spillovers on the other firms in the market. Consistent with potentially important spillovers and redistribution, the results in Table 2 document that the number of innovating firms appears to decline, while aggregate innovation spending appears unaffected. Together, these results already hint at a redistribution of innovative activity toward a limited number of (likely larger) firms, resulting in a concentration of innovation in the economy.

6.2.2. Direct vs. Indirect Effects of Reporting Regulation

To explore the forces underlying the aggregate effect, we decompose the *net* effect of reporting regulation in a market into the direct effect of firms' own reporting mandates and the indirect spillover effects resulting from other firms' reporting mandates.

To empirically implement this decomposition, we construct reporting intensities capturing the extent to which *other*, yet related firms are subject to reporting mandates. We identify such related firms using input-output linkages. Specifically, for each focal industry, we construct reporting intensities for its input ("supplier") and output ("customer") industries. We then weight the reporting intensities of supplier and customer industries with their respective shares of inputs to and outputs from the respective focal industry. The resulting supplier and customer reporting intensities differ from the focal industry's reporting intensity because many but not all suppliers and customers operate in the same two-digit industry as firms in the focal industry. This feature allows us to separately identify the impact of mandatory reporting imposed on a set of firms (including their within-industry competitors) from the impact of mandates imposed on firms' suppliers and customers.

Table 3 presents the estimates from country-industry-level regressions of innovation activity on a focal industry's own reporting intensity and its supplier and customer reporting intensities. Controlling for supplier and customer reporting intensities, we continue to find that more extensive

reporting mandates in a given industry decrease corporate innovation, consistent with our results in Table 2. Compared to these results, however, the decline in innovation is now more pronounced (for all proxies). This result makes sense because in this specification offsetting spillovers from suppliers and customers that face reporting mandates are separately estimated. Consistent with the notion that firms benefit from these spillovers, the coefficients on the supplier and customer intensities are typically positive and often statistically significant.

In terms of economic magnitude, our estimates imply that a 10 percentage-point increase in the share of firms subject to mandatory reporting is associated with a 2.2 percentage-point decrease in the share of innovating firms, after excluding supplier and customer spillovers (column 3 of Panel A in Table 3). The same increase in the reporting share is associated with only a 1.2 percentage-point decrease when including supplier and customer spillovers (column 3 of Panel A in Table 2). These comparisons nicely illustrate the positive spillovers from reporting mandates for customers and, in particular, suppliers. The results also highlight why it is important to conduct the regulatory analysis at an aggregate level, as otherwise one does not capture the net impact.

The results in Table 3 suggest the industry-level net effect of reporting mandates combines negative direct effects with positive indirect effects on corporate innovation. They are consistent with the notion that reporting mandates redistribute firms' gains from innovation to other related firms. For instance, customers could strike tougher bargains with their suppliers when they see that (reporting) suppliers have relatively high margins.

To further explore the redistribution of gains from innovation, Table 4 presents estimates from regressions of aggregate profitability (or productivity) on a focal industry's own reporting intensity and its supplier and customer reporting intensities. We find that imposing mandates on suppliers and customers enhances the aggregate profitability in the focal industry (columns 1 and 2),

consistent with a redistribution of gains from innovation.²⁹ We further find that the increase in profitability due to supplier and customer mandates is primarily captured by larger firms (columns 3 and 4), as shown by an increase in the covariance between firms' market share (or size) and their profitability (in the vein of Olley & Pakes 1996; Bartelsman *et al.* 2013). Firms' own reporting mandates, by contrast, tend to hurt firms with high market shares and/or profitability, as shown by negative (albeit not statistically significant) coefficients for the own reporting intensities.

In sum, the results in Table 4 are consistent with a redistribution of innovation gains from firms facing mandates, especially profitable ones, to other firms, especially larger ones. Thus, one potential economic consequence of mandatory financial reporting is a concentration of innovation activity among larger firms in industries that are relatively less affected by the reporting mandate.

6.3. Enforcement Reform in Germany

6.3.1. Main Effect of Regulation on Innovation

We also examine the impact of mandatory reporting in a single-country setting, exploiting the German enforcement reform. This setting, unlike the European one, does not allow us to accommodate broader country-wide, within-industry spillovers in the estimation. Here, we have to define markets more narrowly at the regional level, aggregating at the county and two-digit-industry level. It, however, provides a more powerful setting to investigate the direct impact of mandatory reporting on affected firms, because we can exploit finer local variation in the reporting mandate and observe more detailed outcomes (e.g., firms' returns to innovation). These features also allow us to

²⁹ We refer to revenue productivity as "profitability" because it essentially represents a ratio-based measure of profits (Foster *et al.* 2008). We tabulate the results for labor productivity, a simple measure which relates firms' sales to their amount of labor. The results are robust to using a measure of total factor productivity, which relates firms' sales to their labor and capital inputs. In the European setting, we rely on these admittedly coarse profitability measures, because many firms are exempt from reporting their profitability (limiting the availability of firms' profit information in the Amadeus data). In the following German setting, by contrast, we can use direct profitability measures specifically tied to firms' return to their innovation as reported in their survey responses.

shed more light on the channels through which reporting regulation affects corporate innovation in the aggregate.

Table 5 presents the estimates from county-industry-level regressions of innovation activities on the interaction of the share of limited firms and a post-enforcement indicator. This interaction essentially captures the increase in the effective strength of the reporting mandate at the local market level. That is, the enforcement reform had a larger effect in markets with a high share of limited firms, which after the reform face a much more stringent reporting mandate.³⁰

In column 1 of Panel A, we find that the increase in the strength of the mandate is associated with significantly lower innovation spending. Figure 1 plots the innovation spending effect over time. Consistent with the parallel trends assumption, we do not observe a differential trend between markets with higher vis-à-vis lower shares of limited firms in the pre-enforcement period. After the reform, innovation spending declines, at first gradually and then stabilizes at a significantly lower level.³¹ In addition to innovation spending, we find that the share of innovating firms (broadly defined) declines after the enforcement reform. Similar declines are also observed for the individual components of this measure: the share of firms with new-to-market innovations, product innovations, and process innovations. Panel B documents that these declines are also observed for total spending and the total number of firms with any of these types of innovation, which implies that the results are not only present for the average firm in an industry and county, but also come through in size-weighted, aggregate results.

Collectively, the results in Table 5 suggest more extensive mandatory reporting reduces

³⁰ 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.

³¹ 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 statements were publicly available. The following year, 1,079,235 financial statements were publicly available, covering nearly all limited liability firms in Germany (Bundesanzeiger 2019).

innovation activity in local markets. These results are consistent with and corroborate the earlier findings in the European setting. The negative impact of mandatory reporting is estimated with greater power at the local level than in the European setting, as evidenced by much higher significance levels. This increase in power is likely driven by two factors: (i) the larger number of observations and (ii) the local market design, which is less aggregated and hence accommodates fewer offsetting spillovers. As such, the local market results primarily capture the *direct* impact of the mandate on innovation, not the net impact including spillovers. This feature could for instance explain why we find a negative innovation spending effect in the German setting, whereas we fail to find one in the more aggregated design in the European setting. To explore this explanation, we next examine whether the local impact of mandatory reporting depends on the number of firms in the market, which can provide offsetting spillovers.

6.3.2. Heterogeneous Effects in Competitive vs. Monopolistic Markets

In this section, we estimate separate effects for the enforcement reform in local markets with many firms (more competitive) and few firms (more monopolistic). Table 6 provides estimates from county-industry-level regressions of innovation on the strength of the mandate, separately for local markets with an above median number of firms (“high”) and markets with a below median number of firms (“low”). We find that mandatory reporting is more negatively associated with innovation spending and innovating firms in markets with few firms, i.e., in regional oligopolies or monopolies. Notably, the decline in spending in markets with few firms appears to be driven by local monopolists stopping innovation activities altogether (column 4).³²

The results in Table 6 provide an explanation for why we observe negative spending effects

³² In supplemental tests, we document that the impact is concentrated along the extensive margin in the local market design (Table A1). In the firm-level design, the impact of the mandate occurs primarily at the intensive margin, as this design focuses on firms operating in the more crowded markets (due to the implicit requirement of the fixed effects, which require at least one control firm in the same county-year and industry-year).

in the local market design, yet do not observe a clear decline in the more aggregated European setting. When aggregating to the local market in the German setting, local markets with few firms tend to dominate or be overrepresented compared to a sample using firm-level observations. In these markets, local monopolists appear to stop innovating. At the economy-wide level (European setting), the spending declines of local monopolists are less relevant or offset by the shift in innovation activities to other larger firms in the economy, as suggested by our results in Table 2 and Table 4.

Collectively, the results in Table 6 suggest that mandatory reporting primarily discourages innovation activity of local monopolists. They make sense considering that local monopolists cannot benefit from offsetting information spillovers from other local firms' reporting, whereas firms in crowded markets at least benefit from other firms' reporting. The results in Table 6 are further consistent with the idea that, absent any reporting mandate, local monopolists can protect their rents from innovation via secrecy. Firms in more crowded markets, by contrast, are less likely to earn substantial rents to begin with and cannot easily hide their profits and rents given the proximity of their competitors, which facilitates the dissipation of proprietary information even absent reporting mandates (e.g., via employee poaching) (Li *et al.* 2017; Glaeser 2018). To shed light on the importance of proprietary costs from financial reporting for the negative innovation effect, we explicitly investigate the effects on profitability and economic gains from innovation in the next section.

6.4. Channels and Alternative Explanations

6.4.1. Proprietary Costs vs. Innovation Efficiency

Our results are consistent with reporting regulation discouraging corporate innovation, because it dissipates firms' gains from innovation. However, an alternative interpretation is that our findings reflect improved innovation efficiency. Information on other firms' innovative activities can, for example, help firms identify worthwhile activities and avoid duplicate efforts. To distinguish

between these potential explanations, we investigate several measures that reflect the economic returns to innovation. We expect to observe lower returns if mandatory reporting dissipates gains from innovation, whereas we expect to observe unchanged or even improved returns if a reporting mandate enhances innovation efficiency.

Table 7 presents the estimates from county-industry-level regressions of various returns to innovation measures on the effective strength of the German reporting mandate. We find that an increase in the strength of the mandate is negatively associated with firms' profit margins, sales from new-to-market innovations, the share of sales from new-to-market innovations among total sales, the share of sales increases from quality improvements, and cost reductions from process improvements (all at the county-industry level).³³ Thus, the returns to innovation decline across the board after the enforcement reform strengthened the reporting mandate in Germany.

In sum, the results in Table 7 support the interpretation that the channel for the effect of reporting mandates on innovation is the proprietary costs of reporting. They do not appear consistent with the alternative interpretation that reporting mandates enhance the efficiency of innovations. Further supporting this conclusion are the results of our earlier analyses showing declines not just in innovation inputs (e.g., spending), but especially in innovation outputs (e.g., product, process, or service innovations). Notably, we find that even new-to-the-market innovations decline, which is inconsistent with a mere reduction of duplicate efforts.

6.4.2. Financing Frictions

Another potential channel through which reporting regulation could affect innovation is

³³ 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.

through its impact on firms' ability to finance new investments (e.g., Brown *et al.* 2009; Kerr & Nanda 2015; Brown & Martinsson 2018; Park 2018). Our results are inconsistent with the notion that this channel is large enough to (over)compensate the decline in industry-wide due to proprietary costs. Arguably, this outcome is not particularly surprising in our setting. Capital-market benefits often motivate firms' voluntary reporting. That is, firms that, on net, 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, but avoids the leakage of proprietary information.

Although we expect the capital-market benefits from a mandate to be smaller for private firms, 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).³⁴ Consistent with this line of reasoning, Table 8 documents that firms report fewer external financing constraints as an impediment to innovation after the enforcement reform strengthened the reporting mandate in Germany. We also find some evidence suggesting fewer internal financing constraints. These results are consistent with a large literature in accounting (Leuz & Wysocki 2016) and suggest mandatory reporting comes with capital-market benefits, in our case at the market level. Still, these benefits are not large enough to produce a positive net effect with respect to market-wide innovation.

³⁴ See, for example, Garmaise and Natividad (2016) for information spillovers from transparent firms to others and improved access to credit. See (Zingales 2009) and Leuz (2010) for overviews on the benefits of mandatory reporting.

The documented reduction in financing constraints also allays concerns that the negative impact on innovation documented in the German setting is due to confounding influences from the financial crisis during our sample period. In particular, our evidence is inconsistent with the concern that the financial or ensuing economic crisis may have hit limited-liability firms harder than unlimited-liability firms (e.g., as a result of limited collateral), which in turn could spuriously result in a negative innovation effect.³⁵

6.5. Other Measures of Corporate Innovation

Our results are based on fairly broad, yet concrete innovation measures derived from firms' confidential responses to the Community Innovation Surveys. These survey-based measures are frequently used in innovation research and policy. In contrast, studies in accounting, finance, and economics tend to rely on patents and accounting information (R&D expenses) to measure corporate innovation activity. In this section, we investigate the impact of reporting regulation on these alternative measures of innovation to align our findings with the literature and also to validate the survey responses used to measure innovation.

6.5.1. Patents

Patents reflect innovation but they also represent one particular form with which firms protect rents from innovation. Moreover, patents grant formal legal protection only in exchange for mandated disclosure of patent information. These features have two important implications. First, patents capture only a subset of innovations. Supporting this claim, our descriptive evidence documents that

³⁵ In untabulated robustness tests, we find that our inferences remain unchanged when controlling for firms' local exposures 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 also contradict the influence of a temporary financial and economic crisis between 2007 and 2010. Moreover, it is worth noting that our results are consistent across the two settings. In the European setting, we do not exploit any regulatory reforms or changes that overlap with crises times but instead rely on a cross-sectional identification strategy. In sum, it is unlikely that financial or economic crises during our sample period confound our results.

only a small fraction of all innovation activity is patented (in line with, e.g., Arundel & Kabla 1998; Argente *et al.* 2020; Granja & Moreira 2020). Second, patents are a form of disclosure. As such, firms' patenting and reporting strategies are intertwined (e.g., Glaeser *et al.* 2019; Reeb & Zhao 2020).

These institutional features render the effect of mandatory reporting on corporate patenting ambiguous. On the one hand, a mandate could decrease patents through their negative impact on innovation activity. On the other hand, the increase in reporting due to the mandate makes it more important for firms to protect their innovations in some other way (as secrecy is less effective), which in turn could increase the use of patents. Thus, patents are arguably a problematic measure of innovative activity when studying the aggregate impact of reporting mandates.

Consistent with an ambiguous relationship, we find in Table 9 that reporting mandates are positively associated with patenting in the aggregate design of the European setting (Panel A), whereas they are negatively associated with patenting in the local market design of the German setting (Panel B). The positive association in the aggregate design likely reflects the increased use of patenting to protect firms' remaining innovations. In the local market design, however, the negative association reflects that local monopolists do not have (m)any remaining innovations to protect, as they often stop innovating altogether. In line with this interpretation, Panel C shows (using the firm-level design) that firms' survey responses indicate that secrecy has become less important after the reform effectively expanded the mandate. At the same time, the importance of patenting and actual patent applications increase after the reform (Panel C). Note that the firm-level analysis by construction is tilted towards more crowded markets (as it weighted by each firm-year). Firms in these markets reduce their innovation spending only along the intensive margin, but do not stop innovating altogether. Accordingly, these firms shift from secrecy toward patenting for their remaining innovations. Thus, our local-market and firm-level results are internally consistent.

Besides illustrating the ambiguous relation between mandatory reporting and patenting, the results in Table 9 document that firms' responses to the Community Innovation Survey align with their actual patenting behavior recorded in PATSTAT. In each of the panels of Table 9, the respective treatment variable is associated with firms' survey responses in the same direction as it is with firms' actual patenting behavior. This correspondence validates the survey-based innovation measures.

Lastly, the patenting results in Table 9 reinforce the proprietary costs explanation for the negative effect of reporting on corporate innovation. In column 3 of Panel A, we find that reporting mandates increase the share of patent citations *originating from competitors* in the same country-industry. This finding is consistent with the interpretation that reporting mandates increase within-industry competition by revealing the profitability of innovative firms to which innovative firms respond by increasing their patenting (which in turn competitors have to cite).

6.5.2. Accounting Information

Financial statements reflect firms' innovation activity in various, though imperfect ways. The balance sheet, for example, provides information on the investments in tangible and some intangible assets. Most intangible assets, however, do not make it onto the balance sheet (e.g., Lev 2001). In addition to the balance sheet, the income statement can, for example, provide an estimate of firms' R&D expenses. Often, however, these expenses are not broken out separately and buried in other expense line items (e.g., Koh & Reeb 2015). The absence of comprehensive and innovation-specific items hampers the usefulness of individual accounting line items for our purpose of assessing the aggregate impact of reporting mandates. This issue is compounded by the fact that reporting mandates mechanically affect the availability of accounting-based innovation measures through their impact on the availability of accounting information (e.g., for database providers). For example, aggregate R&D may appear to be increasing after a reporting mandate simply because it forces more firms to disclose

R&D expenses. With these caveats in mind, we examine the relation between mandatory reporting and accounting-based innovation measures, on one hand to check for consistency with our main results and on the other hand to make our results comparable to other studies in the literature.

Consistent with our earlier results, reporting mandates are negatively associated with measures of innovation derived from accounting numbers (Table 10). We find that reporting mandates are negatively associated with investments in tangible and, in particular, intangible assets. We further find some evidence that reporting mandates are negatively associated with firms' R&D intensity (defined as R&D expenses over sales), albeit insignificantly. The lack of significance is likely a consequence of power as the coefficient magnitudes are sizeable. The R&D intensity results are estimated based on a severely restricted subsample, as only few European companies provide as a separate R&D line item in the income statement and hence is often missing in the Amadeus database. Despite these limitations, the results for the accounting-based innovation measures support our conclusion that mandatory reporting reduces corporate innovation.

7. Discussion of the Results

Using multiple settings and detailed innovation input and output data, we consistently find that mandatory reporting reduces the prevalence of corporate innovation activities. This decline in the prevalence of innovation activity does not appear to reflect a reduction in wasteful duplication of innovation efforts and a corresponding increase in innovative efficiency. Instead, the results point to reduced incentives to innovate, even after accounting for positive spillovers within broad two-digit industries. The latter also provides a plausible explanation for why Breuer (2019) finds that reporting mandates spur competition, yet do not appear to have positive (or may even have negative) effects on industry-level productivity growth. We emphasize, however, that the question of whether the negative net impact of mandatory reporting on industry-level innovation generalizes to the economy-wide level

is unclear. Our country-industry analysis neglects potential cross-industry and cross-country spillovers in the aggregation. What appears clear though is that reporting mandates have important distributional consequences: some firms win, others lose. As we discuss here, this distributional impact can have important ramifications for market structure and innovation incentives at the economy level.

Our evidence is consistent with the notion that reporting regulation deters 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 negative effects on profit margins and positive effects from customer and supplier reporting, both of which are consistent with learning and increased bargaining power. Second, reporting mandates have been shown to shorten the duration of firms' contracting relationships (Dewatripont & Maskin 1995; Hombert & Matray 2016; 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; Saidi & Zaldokas 2019), reducing the efficacy of secrecy as a strategy to protect proprietary information and know-how about innovative products, services and processes. Broadly speaking, the three mechanisms are consistent with a shift away from relationships and the notion that disclosure regulation is integral to and furthers arms' length transactions (e.g., Leuz & Wüstemann 2004).

We find the strongest effects from mandatory reporting among smaller firms and in local markets with few existing competitors. This pattern suggests smaller, local monopolists in niche markets are particularly affected. Without a mandate, 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 much, 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 line of arguments, we find the strongest effects of reporting regulation along the extensive instead of the intensive margins of innovation spending, innovation outputs, and patenting. An interesting implication of these findings and patterns is that mandatory reporting appears to lead to a concentration of innovative activity at larger firms operating across several industries. Consistent with such a concentration, 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 as shown in Breuer (2019), but still 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 and broader trends in innovation activity (Rammer & Schubert 2018; EU 2019a). Similar to other information technologies (e.g., Begenau *et al.* 2018; Farboodi *et al.* 2019), reporting mandates appear to disproportionately benefit larger firms. It is plausible that the direct effect of a mandate 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.* 2020), can hide sensitive information through complexity (e.g., Bens *et al.* 2011), and face smaller, resource-constrained competitors. At the same time, the indirect (spillover) effect of a reporting mandate tends to benefit larger firms more than smaller firms. The former can exploit investment opportunities that are revealed by a competitor or contracting partner through the mandate more easily, given, among others, their financial resources, data-processing capabilities, and existing advertising channels.

8. Conclusion

In this study, we examine the effects of financial reporting regulation on market- and economy-wide innovation activity. We analyze two different settings: threshold-based reporting mandates in the EU and a major enforcement reform in Germany, both of which give rise to plausibly exogenous differences in the intensity with which European and German firms face reporting mandates. The two settings have different advantages and drawbacks, but provide remarkably findings and conclusions.

We find evidence that requiring firms to publicly disclose their financial reports reduces firms' innovation incentives. At the same, it increases firms' propensity to use patenting as a means to protect their innovations. Notably, these findings hold at the firm *and* at the market level. Our evidence is consistent with the notion that mandatory reporting deters firms' incentives to innovate and generate proprietary know-how because of concerns about the loss of proprietary information. Importantly, this result holds in the aggregate after accounting for potential within-industry spillovers. Our evidence indicates that reporting mandates redistribute existing rents from innovating firms to other firms (e.g., competitors, customers, or suppliers), typically larger ones. However, the positive spillovers are not large enough to fully offset the decline in the number of innovating firms at the industry level. In summary, our evidence suggests that proprietary costs and the ensuing reduction or, at least, concentration of corporate innovation are an important consideration for regulators and policy makers when setting reporting regulation.

In closing, we highlight the following caveats. While we are ultimately interested in whether innovation activity is lost to the economy due to reporting regulation, our ability to speak to this motivating question is constrained by two important limitations. First, our highest level of aggregation is at the country-industry level, not the economy level. We choose the country-industry level because

industry level variation enhances power (more observations) and affords identification with respect to reporting regulation, which is endogenous at the economy level. Compared to the commonly used firm-level analysis, this aggregation level makes an important step toward accommodating spillovers among related firms. However, it neglects potential spillovers across broad industries and country boundaries. Second, our survey-based innovation measures best capture the *prevalence* of innovation activity rather than its aggregate *value*. While our measures are more innovation-specific and comprehensive than most other measures (e.g., patents or accounting information), they do not perfectly capture the value-weighted aggregate of innovation activity, which would be the ideal measure necessary to conclusively answer our motivating question.

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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 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
Innovation Spending	Eurostat	Log 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) plus one
Innovating Firm	Eurostat	Indicator taking the value of one for firms that introduce new or significantly improved products, processes, or services
New-To-Market Innovation	Eurostat	New-to-the-market innovations (the enterprise was the first one to market these products/services)
Product Innovation	Eurostat	Indicator taking the value of one for firms that introduce new or significantly improved

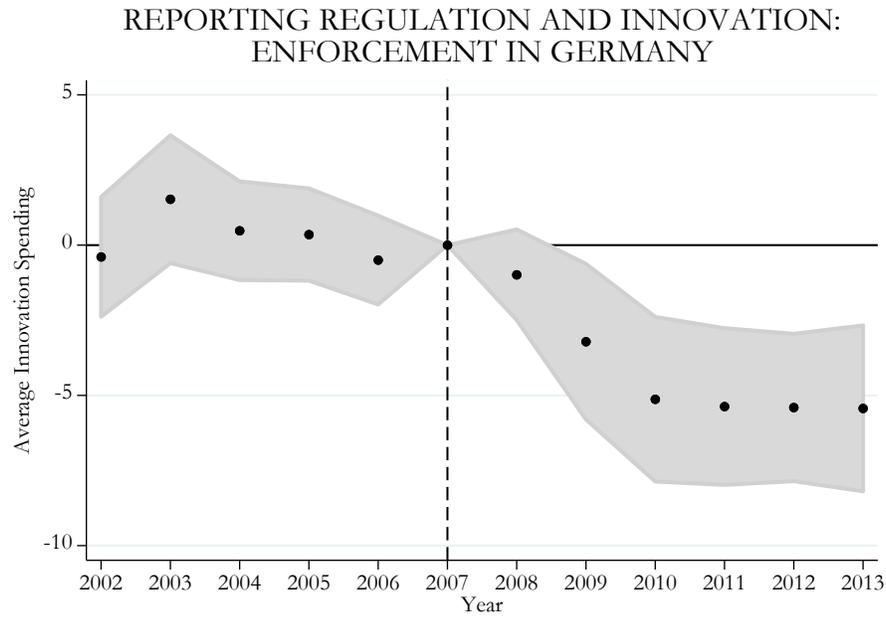
Process Innovation	Eurostat	products Indicator taking the value of one for firms that introduce new or significantly improved services
Sales per Employee	Amadeus	Log sales less log employees
Sales per Employee and Capital	Amadeus	Log sales less 0.3 times log tangible assets and 0.7 log employees
Market 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
Patenting Firm	Eurostat	Indicator taking the value of one for firms that apply for a patent
Patent Application Firm	PATSTAT	Indicator taking the value of one for firms that apply for a patent
Competitor-Forward Cites	PATSTAT	Share of forward patent cites from competitors in same country-industry
Change in Tangible Assets	Amadeus	Log difference in tangible assets over time
Change in Intangible Assets	Amadeus	Log difference in intangible assets over time
R&D Intensity	Amadeus	R&D expense scaled by sales

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									
Panel A: Exemptions in Europe (Country-Industry Level)									
Variable	Market Level	N	Mean	SD	p1	p25	p50	p75	p99
Reporting		31,953	0.220	0.271	0.001	0.054	0.123	0.252	1.000
Reporting and Auditing		31,953	0.159	0.176	0.001	0.050	0.111	0.209	1.000
Supplier Reporting		16,971	0.224	0.264	0.009	0.092	0.143	0.210	0.997
Customer Reporting		16,662	0.244	0.264	0.009	0.103	0.164	0.245	0.999
Supplier Reporting and Auditing		16,971	0.158	0.155	0.009	0.088	0.136	0.187	0.993
Customer Reporting and Auditing		16,662	0.178	0.158	0.009	0.098	0.156	0.220	0.997
Innovation Spending	Simple Average	6,316	11.206	2.949	0.000	10.147	11.543	12.828	16.725
Innovation Spending	Total	6,326	16.067	3.857	0.000	14.847	16.630	18.282	22.056
Innovating Firm	Simple Average	6,662	0.362	0.221	0.000	0.196	0.333	0.496	1.000
Innovating Firm	Total	6,672	218.280	598.071	0.000	11.398	43.480	153.798	2786.903
New-To-Market Innovations	Simple Average	6,694	0.161	0.167	0.000	0.041	0.113	0.232	0.911
New-To-Market Innovations	Total	6,704	83.566	250.299	0.000	3.180	15.077	56.750	1104.041
Product Innovation	Simple Average	6,703	0.258	0.207	0.000	0.101	0.215	0.370	1.000
Product Innovation	Total	6,713	146.072	422.455	0.000	7.000	28.590	101.414	1913.684
Process Innovation	Simple Average	6,631	0.273	0.188	0.000	0.142	0.246	0.362	1.000
Process Innovation	Total	6,641	161.052	432.180	0.000	8.083	32.270	115.614	2210.229
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
Patenting Firm	Simple Average	3,198	0.059	0.120	0.000	0.000	0.016	0.062	0.562
Patent Application Firm	Simple Average	31,936	0.008	0.025	0.000	0.000	0.000	0.004	0.114
Actual Reporting	Simple Average	31,953	0.194	0.270	0.000	0.022	0.074	0.231	1.000
Competitor-Forward Cites	Simple Average	11,773	0.022	0.072	0.000	0.000	0.000	0.012	0.307
Change in Tangible Assets	Simple Average	31,688	-0.028	0.499	-2.642	-0.056	-0.001	0.067	0.618
Change in Tangible Assets	Weighted Average	31,353	0.015	0.575	-2.669	-0.037	0.031	0.116	1.049
Change in Intangible Assets	Simple Average	30,865	-0.189	0.578	-2.898	-0.265	-0.150	-0.038	0.850
Change in Intangible Assets	Weighted Average	30,276	-0.062	0.776	-3.068	-0.223	-0.049	0.120	2.047
R&D Intensity	Simple Average	2,990	0.912	11.942	0.000	0.003	0.021	0.085	15.122
R&D Intensity	Weighted Average	2,990	0.107	1.771	0.000	0.002	0.014	0.049	1.012

Panel B: Enforcement Reform in Germany (County-Industry 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 Innovation	Simple Average	48,876	0.441	0.444	0.000	0.000	0.400	1.000	1.000	
Product Innovation	Total	48,876	0.877	1.619	0.000	0.000	1.000	1.000	6.000	
Process Innovation	Simple Average	48,800	0.367	0.426	0.000	0.000	0.000	1.000	1.000	
Process Innovation	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 Innovation	Simple Average	26,293	10.529	9.943	0.000	0.000	16.305	19.729	24.960	
Sales from New-to-Market Innovation	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 Innovation	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 Innovation	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	Simple Average	55,601	401.813	4,482.303	1.000	14.000	45.000	143.000	4,153.000
Employees	Total	55,601	868.681	8,925.645	1.000	17.000	69.000	261.000	10,808.000
Employees (Log)	Simple Average	55,601	3.950	1.606	0.693	2.708	3.829	4.970	8.332
Employees (Log)	Total	55,601	4.360	1.847	0.693	2.890	4.248	5.568	9.288

Panel C: Enforcement Reform in Germany (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	1.000	1.000
Private	123,692	0.991	0.093	1.000	1.000	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	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 Innovation	108,796	0.453	0.498	0.000	0.000	0.000	1.000	1.000		
Process Innovation	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	131,797	408.530	5,942.451	1.000	11.000	33.000	117.000	4,129.000		
Employees (Log)	131,797	3.748	1.640	0.693	2.485	3.526	4.771	8.326		

Notes: The table presents descriptive statistics for treatment and outcome variables. Corresponding variable definitions can be found in the “Variable Appendix” table. Panel A provides the statistics for the country-industry (two-digit NACE) analysis in the European setting. Panel B provides the statistics for the county-industry (two-digit NACE) analysis in the German setting. Panel C provides the statistics for the firm-level analysis in the German setting. 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 REGULATION AND INNOVATION: EXEMPTIONS IN EUROPE										
Panel A: Country-Industry Level (Average: 2-digit NACE)										
Outcome	Innovation Spending		Innovating Firm		New-To-Market Innovations		Product Innovation		Process Innovation	
Market Level	Simple Average		Simple Average		Simple Average		Simple Average		Simple Average	
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Reporting	0.613		-0.121**		-0.046		-0.098*		-0.100*	
	(0.90)		(-2.05)		(-1.11)		(-1.76)		(-1.73)	
Reporting and Auditing		0.059		-0.081		-0.082*		-0.152**		-0.024
		(0.07)		(-1.30)		(-1.68)		(-2.61)		(-0.43)
Country-Year FE	X	X	X	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X	X	X	X
Observations	6,129	6,129	6,473	6,473	6,503	6,503	6,514	6,514	6,444	6,444
Clusters (Country-Industry)	1,394	1,394	1,406	1,406	1,407	1,407	1,411	1,411	1,404	1,404
Clusters (Country-Year)	127	127	133	133	133	133	133	133	133	133
Adj. R ²	0.614	0.614	0.668	0.668	0.579	0.579	0.646	0.647	0.584	0.584

Panel B: Country-Industry Level (Aggregate 2-digit NACE)										
Outcome	Innovation Spending		Innovating Firm		New-To-Market Innovations		Product Innovation		Process Innovation	
Market Level	Total		Total		Total		Total		Total	
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Reporting	0.339		-286.206**		-37.106		-144.001*		-217.254**	
	(0.40)		(-2.29)		(-0.75)		(-1.77)		(-2.31)	
Reporting and Auditing		0.200		-301.651**		-45.600		-145.309*		-238.566***
		(0.21)		(-2.59)		(-0.99)		(-1.90)		(-2.67)
Country-Year FE	X	X	X	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X	X	X	X
Observations	6,135	6,135	6,489	6,489	6,519	6,519	6,529	6,529	6,460	6,460
Clusters (Country-Industry)	1,393	1,393	1,419	1,419	1,423	1,423	1,421	1,421	1,418	1,418
Clusters (Country-Year)	127	127	133	133	133	133	133	133	133	133
Adj. R ²	0.677	0.676	0.579	0.579	0.573	0.573	0.576	0.576	0.561	0.560

Notes: The table presents estimates from regressions of innovation measures on the share of firms subject to full reporting (and auditing) requirements in the European setting. In Panel A, the innovation measures are simple averages calculated for a given country, industry, and year. In Panel B, the innovation measures are totals 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. “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. The regressions include industry-year fixed effects 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 and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 3

REPORTING REGULATION AND INNOVATION: INNOVATION SPILLOVERS (EUROPE)					
Panel A: Reporting only					
Outcome	Innovation Spending	Innovating Firm	New-To-Market Innovations	Product Innovation	Process Innovation
Market Level Column	Simple Average (1)	Simple Average (2)	Simple Average (3)	Simple Average (4)	Simple Average (5)
Reporting	0.032 (0.03)	-0.221*** (-2.72)	-0.053 (-0.85)	-0.182** (-2.19)	-0.210*** (-2.65)
Supplier Reporting	-2.707 (-1.26)	0.394** (2.52)	0.177 (1.58)	0.390*** (2.80)	0.375** (2.53)
Customer Reporting	3.010** (2.51)	0.102 (1.06)	-0.006 (-0.08)	0.051 (0.55)	0.032 (0.38)
Country-Year FE	X	X	X	X	X
Industry-Year FE	X	X	X	X	X
Observations	3,502	3,667	3,672	3,682	3,649
Clusters (Country-Industry)	749	750	751	751	747
Clusters (Country-Year)	121	126	126	126	126
Adj. R ²	0.636	0.693	0.622	0.688	0.608

Panel B: Reporting and Auditing					
Outcome	Innovation Spending	Innovating Firm	New-To-Market Innovations	Product Innovation	Process Innovation
Market Level	Simple Average	Simple Average	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)	(4)	(5)
Reporting and Auditing	-1.529 (-1.26)	-0.129 (-1.48)	-0.100 (-1.42)	-0.217** (-2.45)	-0.151* (-1.80)
Supplier Reporting and Auditing	-2.101 (-0.94)	0.223 (1.34)	0.122 (1.03)	0.270* (1.80)	0.295* (1.89)
Customer Reporting and Auditing	2.004* (1.66)	0.028 (0.32)	-0.099 (-1.19)	-0.006 (-0.07)	-0.032 (-0.42)
Country-Year FE	X	X	X	X	X
Industry-Year FE	X	X	X	X	X
Observations	3,502	3,667	3,672	3,682	3,649
Clusters (Country-Industry)	749	750	751	751	747
Clusters (Country-Year)	121	126	126	126	126
Adj. R ²	0.636	0.691	0.623	0.687	0.607

Notes: The table presents estimates from regressions of innovation measures on the shares of firms, suppliers, and customers subject to full reporting (and auditing) requirements in the European setting. The innovation measures are simple averages calculated for a given country, industry, and year. In Panel A, “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. In Panel B, “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 and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively

Table 4

REPORTING REGULATION AND INNOVATION: PROFITABILITY SPILLOVERS (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 Column	Weighted Average (1)	Weighted Average (2)	Covariance (3)	Covariance (4)
Reporting	-0.170 (-0.45)	-0.194 (-0.64)	-0.390 (-1.21)	-0.348 (-1.38)
Supplier Reporting	1.339** (2.15)	1.391** (2.43)	1.094* (1.93)	1.139** (2.31)
Customer Reporting	0.677* (1.88)	0.459 (1.29)	0.691** (2.24)	0.560** (1.99)
Country-Year	X	X	X	X
Industry-Year	X	X	X	X
Observations	16,169	16,129	15,937	15,845
Clusters (Country-Year)	1,125	1,122	1,121	1,120
Clusters (Country-Industry)	372	372	368	369
Adj. R ²	0.792	0.743	0.490	0.491

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 (-0.40)	-0.001 (-0.00)	-0.465 (-1.26)	-0.298 (-1.00)
Supplier Reporting and Auditing	1.634*** (2.66)	1.484*** (2.70)	1.293** (2.31)	1.130** (2.33)
Customer Reporting and Auditing	0.787** (2.17)	0.544 (1.56)	0.713** (2.29)	0.624** (2.24)
Country-Year	X	X	X	X
Industry-Year	X	X	X	X
Observations	16,169	16,129	15,937	15,845
Clusters (Country-Year)	1,125	1,122	1,121	1,120
Clusters (Country-Industry)	372	372	368	369
Adj. R ²	0.792	0.744	0.491	0.492

Notes: The table presents estimates from regressions of profitability (or productivity) measures on the shares of firms, suppliers, and customers subject to full reporting (and auditing) requirements in the European setting. The profitability measures are sales-weighted averages or covariances (differences between sales-weighted and equally weighted measures) in a given country, industry, and year. In Panel A, “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. In Panel B, “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 and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Table 5

REPORTING REGULATION AND INNOVATION: ENFORCEMENT IN GERMANY					
Panel A: County-Industry Level (Average: 2-digit NACE)					
Outcome	Innovation Spending	Innovating Firm	New-To-Market Innovations	Product Innovation	Process Innovation
Market Level Column	Simple Average (1)	Simple Average (2)	Simple Average (3)	Simple Average (4)	Simple Average (5)
Limited Share×Post	-3.026*** (-4.06)	-0.132*** (-3.46)	-0.073 (-1.29)	-0.126*** (-3.30)	-0.086** (-2.32)
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	26,774	47,283	23,597	46,680	46,592
Clusters (County-Industry)	5,857	8,193	5,459	8,163	8,156
Adj. R ²	0.528	0.393	0.412	0.415	0.322

Panel B: County-Industry Level (Aggregate: 2-digit NACE)					
Outcome	Innovation Spending	Innovating Firm	New-To-Market Innovations	Product Innovation	Process Innovation
Market Level	Total	Total	Total	Total	Total
Column	(1)	(2)	(3)	(4)	(5)
Limited Share×Post	-3.050*** (-4.02)	-0.510*** (-6.09)	-0.213*** (-2.73)	-0.462*** (-5.89)	-0.340*** (-4.94)
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	26,778	47,279	23,597	46,672	46,589
Clusters (County-Industry)	5,861	8,178	5,460	8,150	8,148
Adj. R ²	0.528	0.561	0.377	0.550	0.440

Notes: The table presents estimates from regressions of innovation measures on the intensity of enforcement of reporting mandates in the German setting. In Panel A, the innovation measures are simple averages calculated for a given county, industry, and year. In Panel B, the innovation measures are totals calculated for a given 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. 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 REGULATION AND INNOVATION: NUMBER OF FIRMS (GERMANY)						
Outcome	Innovation Spending		Innovation Spending (Extensive)		Innovating Firm	
Market Level	Simple Average		Simple Average		Simple Average	
Number of Firms	High	Low	High	Low	High	Low
Column	(1)	(2)	(3)	(4)	(5)	(6)
Limited Share×Post	-2.554 (-1.51)	-4.373*** (-4.56)	-0.005 (-0.03)	-0.313*** (-4.52)	-0.100 (-1.09)	-0.132*** (-2.83)
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	12,273	12,673	12,307	12,642	22,825	23,234
Clusters (County-Industry)	2,466	3,110	2,474	3,108	3,640	4,446
Adj. R ²	0.500	0.538	0.449	0.508	0.363	0.403

Notes: The table presents estimates from regressions of innovation measures 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) in the German setting. The innovation measures are simple averages calculated for a given 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. 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 7

REPORTING REGULATION 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 Simple Average	Cost Reduction from Process Improvements Simple Average
Market Level Column	Simple Average (1)	Simple Average (2)	Simple Average (3)	Simple Average (4)	Simple Average (5)
Limited Share×Post	-0.356* (-1.69)	-3.798*** (-3.30)	-0.017* (-1.84)	-0.010* (-1.65)	-0.085 (-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

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 Column	Total (1)	Total (2)	Weighted Average (3)	Total (4)	Total (5)
Limited Share×Post	-1.112** (-2.40)	-3.911*** (-3.35)	-0.021** (-2.13)	-0.013 (-1.49)	-0.145* (-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: The table presents estimates from regressions of profitability measures on the intensity of enforcement of reporting mandates in the German setting. In Panel A, the innovation measures are simple averages calculated for a given county, industry, and year. In Panel B, the profitability measures are totals or sales-weighted averages calculated for a given 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. 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 REGULATION AND INNOVATION: FINANCING CHANNEL (GERMANY)				
Outcome Market Level Column	External Financing Constraint		Internal Financing Constraint	
	Simple Average (1)	Total (2)	Simple Average (3)	Total (4)
Limited Share×Post	-0.123* (-1.78)	-0.403*** (-3.68)	-0.033 (-0.48)	-0.393*** (-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 in the German setting. The financial constraints measures are simple averages or totals calculated 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. 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 9

REPORTING REGULATION AND PATENTS			
Panel A: Country-Industry Level in Europe (Average: 2-digit NACE)			
Source	CIS Survey	PATSTAT	PATSTAT
Outcome	Patenting	Patent Application	Competitor-Forward
	Firm	Firm	Cites
Market Level	Simple Average	Simple Average	Simple Average
Column	(1)	(2)	(3)
Reporting	0.041 (0.87)	0.015*** (2.88)	0.058*** (3.27)
Country-Year FE	X	X	X
Industry-Year FE	X	X	X
Observations	3,106	31,298	11,454
Clusters (Country-Industry)	1,292	2,188	1,407
Clusters (Country-Year)	66	387	378
Adj. R ²	0.542	0.645	0.206

Panel B: County-Industry Level in Germany (Average: 2-digit NACE)				
Source	CIS Survey		PATSTAT	
Outcome	Importance Patenting		Patent Applications	
Market Level	Simple Average	Total	Simple Average	Total
Column	(1)	(2)	(3)	(4)
Limited Share×Post	-0.375*** (-2.68)	-0.597*** (-2.68)	-0.032 (-1.59)	-0.076** (-2.48)
County-Industry FE	X	X	X	X
County-Year FE	X	X	X	X
Industry-Year FE	X	X	X	X
Observations	27,976	27,980	54,947	54,955
Clusters (County-Industry)	5,621	5,621	8,560	8,571
Adj. R ²	0.726	0.616	0.691	0.645

Panel C: Firm Level in Germany						
Source	CIS Survey		CIS Survey		PATSTAT	
Outcome	Importance Secrecy		Importance Patenting		Patent Applications	
Column	(1)	(2)	(3)	(4)	(5)	(6)
Limited×Post	-0.575*** (-3.59)		0.063 (0.74)		0.016** (2.00)	
Private×Post		-0.233 (-0.86)		0.150 (1.22)		0.086*** (3.03)
Controls	X	X	X	X	X	X
Firm FE	X	X	X	X	X	X
County-Year	X	X	X	X	X	X
Industry-Year FE (4-digit)	X	X	X	X	X	X
Observations	32,275	32,238	46,084	46,150	112,106	110,809
Clusters (Firm)	9,130	9,054	11,138	11,048	22,418	21,494
Adj. R ²	0.943	0.941	0.912	0.913	0.882	0.898

Notes: The table presents estimates from regressions of patenting measures on variation in reporting mandates. In Panel A, the patent measures are simple averages calculated for a given country, industry, and year in the European setting using Eurostat and PATSTAT data. The treatment variation, “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. The regressions include industry-year fixed effects and country-year fixed effects. *t*-statistics (in parentheses) are based on standard errors clustered at the country-industry level and the country-year level. In Panel B, the patent measures are simple averages and totals calculated for a given county, industry, and year in the German setting using the MIP and PATSTAT data. The treatment variation is 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. *t*-statistics (in parentheses) are based on standard errors clustered at the county-industry level. In Panel C, the patent measures are calculated at the firm-level in the German setting using the MIP and PATSTAT data. “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). In all panels, 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 10

REPORTING REGULATION AND ACCOUNTING INFORMATION												
Outcome Market Level Column	Change in Tangible Assets				Change in Intangible Assets				R&D Intensity			
	Simple Average		Weighted Average		Simple Average		Weighted Average		Simple Average		Weighted Average	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Reporting	-0.090*** (-2.92)		-0.019 (-0.43)		-0.116** (-2.50)		-0.168** (-2.17)		-1.528 (-1.45)		-0.133 (-0.84)	
Reporting and Auditing		-0.019 (-0.49)		0.074 (1.44)		-0.150** (-2.56)		-0.182** (-2.02)		-1.351 (-0.84)		-0.332 (-1.53)
Country-Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Industry-Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Observations	31,055	31,055	30,727	30,727	30,249	30,249	29,671	29,671	2,695	2,695	2,691	2,691
Clusters (Country-Industry)	2,177	2,177	2,168	2,168	2,153	2,153	2,143	2,143	310	310	311	311
Clusters (Country-Year)	387	387	387	387	387	387	387	387	90	90	89	89
Adj. R ²	0.950	0.950	0.886	0.886	0.856	0.856	0.604	0.604	0.417	0.416	0.258	0.259

Notes: The table presents estimates from regressions of financial-statement-based innovation measures on the share of firms subject to full reporting (and auditing) requirements in the European setting. The innovation measures are simple averages 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. “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. The regressions include industry-year fixed effects 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 and the country-year level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level (two-tailed), respectively.

Online Appendix

(for online publication only)

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- Reporting Examples: Exempted Reporting and Full Reporting
- Table A1: Reporting Regulation and Innovation – Innovation Spending Margins

Community Innovation Survey

Definition of Innovation

The following description is provided on the first page of the 2014 Community Innovation Survey questionnaire (Community Innovation Survey 2014a):

An **innovation** is the introduction of a new or significantly improved product, process, organisational method, or marketing method by your enterprise.

An innovation must have characteristics or intended uses that are new or which provide a significant improvement over what was previously used or sold by your enterprise. However, an innovation can fail or take time to prove itself.

An innovation need only be new or significantly improved for your enterprise. It could have been originally developed or used by other enterprises or organisations.

Innovation activities include the acquisition of machinery, equipment, buildings, software, and licenses; engineering and development work, feasibility studies, design, training, R&D and marketing when they are specifically undertaken to develop and/or implement a product or process innovation. This includes also all types of R&D consisting of research and development activities to create new knowledge or solve scientific or technical problems.

Examples

The following examples are provided in the official methodological notes accompanying the 2014 Community Innovation Survey questionnaire (Community Innovation Survey 2014b):

Enterprise managers are unlikely to have difficulty in recognizing major innovations such as the iPhone, ABS braking systems, new anti-cancer drugs, 'sharing economy' innovations such as Lyft, Uber and AirBandB, or financial derivatives. For this reason, the examples given below describe innovations that can be significant but might not be easy to recognize as an innovation. This should help the respondent to think of similar types of innovations in their own enterprise.

4.1 Product innovations

Product innovations cover goods and services with characteristics or intended uses that differ significantly from previous products produced by the enterprise. This includes new or significantly improved technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.

The product innovations can consist of goods or services that are entirely new to the firm or new to the firm's market, or goods or services that have been significantly improved.

Product innovations **exclude the following:**

- Minor changes or improvements.
- Routine upgrades.
- Seasonal changes (such as for clothing lines).
- Customisation for a single client that does not include significantly different attributes compared to products made for other clients.
- Design changes that do not alter the function or technical characteristics of a good or service.
- The simple resale of new goods and services purchased from other enterprises, but include goods and services developed and produced by foreign affiliates for your enterprise.

4.1.1 Examples of new or significantly improved goods

- Replacing existing materials with materials with improved characteristics (breathable textiles, light but strong composites, environmentally-friendly plastics, etc).
- Introducing new or improved components in existing product lines (cameras in mobile telephones, fastening

- systems in clothing, hybrid technologies in cars, etc).
- Equipment that incorporate software that improves user friendliness or convenience, such as toasters that automatically shut off when the bread is toasted or GPS systems that identify the location of specific types of shops or services.
- Adding new functions: bicycle lights that can be recharged through a USB port, rubbish bins that signal when they are full, products that can fold for easy storage, new smartphone apps, etc.
- Wearable technology, clothing and accessories incorporating computer and advanced electronic technologies

4.1.2 Examples of innovative services

- Improving customers' access, such as a home pick-up and drop-off service for rental cars, same-day delivery of online purchases, etc.
- 'Sharing economy' services such as Uber, Lyft, AirBandB, Listia (recycling and reusing goods), TaskRabbit, etc. First time introduction of internet services such as banking, bill-payment systems, electronic purchase and ticketing of travel and theatre tickets, social networking sites, online backup services, cloud-computing, on-demand internet streaming media etc.
- New forms of warranty, such as an extended warranty on new or used goods, or bundling warranties with other services, such as with credit cards, bank accounts, or customer loyalty cards.
- Installing gas heaters in outdoor restaurant and bar terraces or video on demand screens in the back of airline, bus or train seats.

4.1.3 Differentiating between goods and services

A respondent may not always be sure if their innovative product is a good or a service. The respondent's industrial classification is not always a reliable indicator, since firms that are assigned to the manufacturing sector can produce services and service sector firms can produce goods.

Goods are usually tangible, owned by the consumer, and can be used multiple times, for instance furniture, appliances, electronic equipment, packaged software, and clothing. There are exceptions, such as food purchased in a supermarket or diesel purchased from a refinery, which can only be used once, and downloaded movies and music, which are intangible.

Services are usually intangible, can only be used once and are not owned by the consumer. They include banking, retailing, hotel accommodation, insurance, educational courses, air travel, entertainment such as tours, theatres, and sporting events, repair and renovation work, consulting, cloud computing, streaming video and music (in contrast to downloadable video and music), etc.

Some aspects of utilities (gas, sewage, water, electricity, etc) and of construction can have characteristics of both a good and a service. Many utilities appear to provide a product (gas, water, etc) to domestic and commercial users, but they are intermediaries that often do not produce the product (gas or water), but only deliver it to their consumers. Electrical generators are also classified as a service, even when they both produce and deliver electricity. Construction enterprises that build houses or commercial buildings for clients act as a service, but a construction enterprise could also build housing to sell. In the latter case the respondent might see their enterprise as producing a product instead of a service.

In some cases, such as when construction firms build houses to sell, it may be best to leave it to the respondent to determine if they are providing a product or a service.

4.2 Process innovations

Process innovations occur in both service and manufacturing sectors and include new or improved production methods; logistics, delivery and distribution systems, and 'back office' activities, such as maintenance, purchasing, and accounting operations. They include significant changes in specific techniques, equipment and/or software, intended to improve the quality, efficiency or flexibility of a production or supply activity, or a reduction in environmental and safety hazards.

Some process innovations, particularly involving logistics or distribution, are closely linked to organisational innovations, such as for supply chain management. For these, it can be almost impossible to provide clear guidance on

the type of innovation. It is best left to the respondent to decide if the innovation is primarily a process innovation, organisational innovation, or even both.

Process innovations **exclude the following**:

- Minor changes or improvements.
- An increase in production or service capabilities through the addition of manufacturing or logistical systems that are very similar to those already in use.
- Innovations that have an important client interface, such as a pick-up or delivery service (these are product innovations).

4.2.1 Examples of innovative methods of producing goods or services

- Installation of new or improved manufacturing technology, such as automation equipment or real-time sensors that can adjust processes or 3D printing techniques.
- New equipment required for new or improved products.
- Computer-assisted product development or other technology to improve research capabilities, such as bio-imaging equipment. More efficient processing that reduces material or energy requirements per unit of output.
- More efficient processing that reduces material or energy requirements per unit of output.

4.2.2 Examples of innovative logistics, delivery or distribution methods

- Introduction of passive radio frequency identification (RFID) chips to track materials through the supply chain.
- GPS tracking systems for transport equipment.
- Automated feed-back to suppliers using electronic data exchange.
- Content delivery network, large distributed system of servers deployed in multiple data centers across the Internet to serve content to end-users.
- Using natural energy sources for logistics, for instance wind energy in maritime logistics, use of meteorological data and navigational algorithms to find and make use of optimum wind angles to reduce energy consumption of ships.

4.2.3 Examples of innovative supporting activities

- Introduction of software to identify optimal delivery routes.
- New or improved software or routines for purchasing, accounting or maintenance systems.

4.3 Organisational innovations

Organisational innovations involve the implementation of a significant change in business practices, the organisation of work responsibilities and decision-making, which includes training or education to increase skills and responsibilities; and the organisation of external relationships with other enterprises or public institutions. They are intended to improve the enterprise's innovative capacity or performance characteristics, such as the quality or efficiency of workflows or response time to opportunities and crises. Organisational innovations usually involve changes to more than one part of the enterprise's supply chain and are less technology dependent than process innovations.

Organisational innovations **exclude the following**:

- Changes in management strategy, unless accompanied by the introduction of significant organisational change.
- Introduction of new technology that is only used by one division of an enterprise (for example in production). These are usually process innovations.
- Simple extensions of organisational changes that have already been implemented in the past or in one part of the enterprise. For example, the reorganisation of work tasks in one establishment is not an organisational innovation if the same reorganisation was already implemented in a different establishment owned by the enterprise.
- Mergers or acquisitions.

4.3.1 Examples of business practice innovations

- Establishment of formal or informal work teams to improve the access and sharing of knowledge from different departments, such as marketing, research, production, etc.
- Introduction of quality control standards for suppliers and subcontractors.
- Supply management systems to optimize the allocation of resources from sourcing inputs to the final delivery of products.
- First introduction of group or individual performance incentives.
- First introduction of teleworking or a "paperless" office.

4.3.2 Examples of work organisation innovations

- Reduction or increase in the hierarchical structure for decision making.
- Change in responsibilities, such as giving substantially more control and responsibility over work processes to production, distribution or sales staff.
- Introduction of a High Performance Work System (HPWS) characterised by a holistic organisation featuring flat hierarchical structures, job rotation, self-responsible teams, multi-tasking, a greater involvement of lower-level employees in decision making and the replacement of vertical by horizontal communication channels.
- New training or education systems, such as regular videos on each employee's work station that describe ongoing challenges for the enterprise or provide skill upgrading, with the goal of improving the ability of employees to recognize problems and take responsibility.
- Creation of a new division, for example by splitting the management of marketing and production into two divisions, or alternatively a change to integrate divisions.

4.3.3 Examples of external relations innovations

- First use of outsourcing of research or production if it requires a change in how work flows are organised within the enterprise.
- First use of alliances that require staff to work closely with staff from another organisation, including temporary staff exchanges.

4.4 Marketing innovations

Marketing innovations cover significant changes in how an enterprise markets its goods and services, including changes to design and packaging. Many of them must be the first use by the enterprise. For example, the first use of product placement on the internet for one product line is an innovation, but the second use of internet product placement for a different product line or for a different geographical market is not an innovation.

Marketing innovations **exclude the following:**

- Routine or seasonal changes, such as clothing fashions.
- Advertising, unless based on the use of new media for the first time.
- Design or packaging changes that alter the functionality or user characteristics, these are product innovations.

4.4.1 Examples of design & packaging innovations

- Novel designs of existing products such as flash card memory sticks designed to be worn as jewelry.
- New designs for consumer products, such as appliances or kitchen units designed for very small apartments.
- Adapting packaging for specific markets (different covers and typeface for children and adult versions of the same book).

4.4.2 Examples of product promotion innovations

- First time use of a new advertising media. For instance the first time use of product promotion on television, radio, cinema, in books, films, internet, social media etc.
- First time use of product seeding through opinion leaders, celebrities, or particular groups that are fashion or product trend setters.
- First time use of a loyalty program. A loyalty card, rewards card, point card, advantage card or club card.
- Bundling existing goods or services in new ways to appeal to market segments.

- Developing trademarks for new product lines.
- Mobile marketing (applications). Providing customers with time and location sensitive, personalized information that promotes goods and services.

4.4.3 Examples of product placement innovations

- First use of in-store sales that are only accessible to holders of the store's credit card or reward card.
- First use of media programming for a specific institution, such as closed circuit television for hospitals, buses, or trains that contain programs to stimulate specific product sales.
- First use of direct marketing via email, telephone or mail using a customer database obtained through individuals that visit websites for information or join 'frequent user or buyer' reward plans.
- First use of exclusive retailing, such as only selling high-end products in special stores.
- First use of franchising or distribution licenses.
- First use of new concepts for product presentation.

4.4.4 Examples of pricing innovations

- First use of variable pricing, with the price varying by time of purchase, location of purchaser, etc.
- First use of penetration pricing or loss leaders to establish market share and brand recognition.
- First use of discount systems such as loyalty cards.

Methodology

The Community Innovation Survey is commissioned by the EU Commission and conducted by national research centers (e.g., the ZEW – Leibniz Centre for European Economic Research in Germany). The survey data is based on a harmonized questionnaire sent to a representative sample of firms. To ensure the quality and representativeness of the data, cognitive testing and non-response-bias corrections are applied by the respective research centers. The ZEW provides the following abstract description of its data collection and the resulting Mannheim Innovation Panel (ZEW 2019b):

Since 1993, the ZEW – Leibniz Centre for European Economic Research has been gathering data regarding the innovation behaviour of the German economy on an annual basis. The innovation survey covers firms from various industries including mining, manufacturing, energy- and water- supply, waste disposal, construction, business-related services and distributive services. The survey is representative for Germany and allows projections for the German firm population as well as for individual industries and size classes. The survey is conducted on behalf of BMBF (Federal Ministry of Education and Research) in cooperation with infas (Institute of Applied Social Science) and Fraunhofer ISI (Institute for Systems and Innovation Research). The MIP is the German contribution to the European Commission's Community Innovation Surveys (CIS).

The annual innovation survey is designed as a panel survey including the same firms every year. Sample size varies among the survey years. In 2010 e.g., more than 6000 firms answered the written questionnaire. Every two years the sample is refreshed by a random sample of newly founded firms in order to substitute firms that are closing or left the market through mergers. The MIP provides important information about the introduction of new products, services and processes, expenditures for innovations, ways to achieve economic success with new products, new services and improved processes. In addition, the MIP collects information on a number of competition-related issues which allows studying various topics in industrial economics.

For more information on the sampling and testing, see Rammer and Peters (2014).

Reporting Examples

Exempted Reporting

Name	Bereich	Information	V-Datum
Synergy Health Radeberg GmbH Radeberg	Rechnungslegung/ Finanzberichte	Jahresabschluss zum Geschäftsjahr vom 01.04.2011 bis zum 31.03.2012	16.04.2013
Synergy Health Radeberg GmbH			
Radeberg			
Jahresabschluss zum Geschäftsjahr vom 01.04.2011 bis zum 31.03.2012			
Bilanz			
Aktiva			
		31.3.2012	31.3.2011
		EUR	EUR
A. Anlagevermögen		9.873.592,26	9.741.587,57
I. Immaterielle Vermögensgegenstände		6.244,00	9.657,20
II. Sachanlagen		9.867.348,26	9.731.930,37
B. Umlaufvermögen		3.517.123,73	2.343.877,69
I. Vorräte		309.307,09	242.132,82
II. Forderungen und sonstige Vermögensgegenstände		1.217.023,58	994.772,58
III. Kassenbestand, Bundesbankguthaben, Guthaben bei Kreditinstituten und Schecks		1.990.793,06	1.105.972,29
C. Rechnungsabgrenzungsposten		106.681,17	101.336,69
D. Aktive latente Steuern		0,00	205.400,00
E. Aktiver Unterschiedsbetrag aus der Vermögensverrechnung		0,00	18.456,79
Bilanzsumme, Summe Aktiva		13.497.397,16	12.410.658,74
Passiva			
		31.3.2012	31.3.2011
		EUR	EUR
A. Eigenkapital		5.131.053,41	3.932.086,65
I. gezeichnetes Kapital		50.200,00	50.200,00
II. Kapitalrücklage		1.512.960,61	1.512.960,61
III. Gewinnvortrag		2.368.926,04	2.079.950,24
IV. Jahresüberschuss		1.198.966,76	288.975,80
B. Sonderposten für Zuschüsse und Zulagen		66.485,26	70.679,14
C. Rückstellungen		1.486.179,95	1.626.437,27
D. Verbindlichkeiten		6.808.378,54	6.781.455,68
E. Passive latente Steuern		5.300,00	0,00
Bilanzsumme, Summe Passiva		13.497.397,16	12.410.658,74
Anhang			
Synergy Health Radeberg GmbH, Radeberg			
I. Allgemeine Angaben			
Die Synergy Health Radeberg GmbH ist eine kleine Kapitalgesellschaft i. S. d. § 267 Abs. 1 HGB. Der Jahresabschluss wurde mindestens nach den Vorschriften des HGB für kleine Kapitalgesellschaften und den ergänzenden Vorschriften des GmbHG erstellt.			
Für die Bilanz bzw. die Gewinn- und Verlustrechnung werden die Gliederungsschemata der §§ 266 bzw. 275 Abs. 2 (Gesamtkostenverfahren) des HGB in der Fassung des Bilanzrechtsmodernisierungsgesetzes angewandt. Bei der Bewertung wurde von der Fortführung des Unternehmens ausgegangen.			
II. Bilanzierungs- und Bewertungsmethoden			
Der Jahresabschluss zum 31. März 2012 wurde nach den Vorschriften des HGB in der Fassung des Bilanzrechtsmodernisierungsgesetzes aufgestellt.			
In der Bilanz und der Gewinn- und Verlustrechnung sind jeweils die entsprechenden Vorjahresbeträge angegeben. Die Werte der verschiedenen Jahre umfassen aufgrund der Umstellung auf ein vom Kalenderjahr abweichendes Geschäftsjahr unterschiedliche Zeiträume.			
Wie in den Vorjahren erfolgte die Berechnung der Rückstellungen für Entlohnungen der Strahlentherapeuten auf Basis vorliegender Preislisten der Landesmittelstelle Sachsen für Konditionierung. Aufgrund der Erstellung eines neuen Entlohnungskonzeptes erfolgte eine Neuberechnung der Rückstellung entsprechend den voraussichtlichen Abgabepunkten sowie den Rücknahmekonditionen der verschiedenen Zulieferer. Zukünftige Preis- und Kostensteigerungen wurden mit einer Inflationsrate von 2,0 % berücksichtigt. Es erfolgte eine Abzinsung der Rückstellung gemäß § 253 Abs. 2 HGB mit dem der Restlaufzeit entsprechenden durchschnittlichen Marktzinssatz der letzten sieben Jahre.			
Hf wurde anhand der Erfahrungswerte der Vergangenheit für die zu entsorgenden Reststoffe gebildet.			
Die Rückstellung für die Abnahme der Reststoffe wurde anhand der Erfahrungswerte der Vergangenheit für die zu entsorgenden Reststoffe gebildet.			
Die unfertigen Erzeugnisse wurden auf Herstellungskostenbasis bewertet.			
Anlagevermögen			
Die immateriellen Vermögensgegenstände und die Vermögensgegenstände des Sachanlagevermögens werden zu Anschaffungs- oder Herstellungskosten abzüglich planmäßiger Abschreibungen bewertet. Die Herstellungskosten beinhalten die nach den handelsrechtlichen Vorschriften aktivierungspflichtigen Beträge.			
Bei der Bemessung der Nutzungsdauer stellen wir auf die betrieblichen Erfahrungen ab.			
Die Vermögensgegenstände des Anlagevermögens werden linear bzw. die Strahlentherapie leistungsbegrenzten abgeschrieben.			
Umlaufvermögen			
Die Vorräte an Roh-, Hilfs- und Betriebsstoffen wurden zu Einkaufspreisen angesetzt bzw. mit dem niedrigeren beizulegenden Wert bewertet.			
Die unfertigen Erzeugnisse wurden zu Herstellungskosten bewertet. In den Herstellungskosten sind die Materialeinzelkosten, die Materialgemeinkosten, die Fertigungseinzelkosten, die Fertigungsgemeinkosten sowie die Kosten der allgemeinen Verwaltung berücksichtigt worden. Zinsen für Fremdkapital wurden nicht angesetzt. Die Bewertung der unfertigen und fertigen Erzeugnisse erfolgte auf Basis der Herstellungskosten.			
Forderungen und sonstige Vermögensgegenstände werden mit dem Nennwert bzw. mit dem am Bilanzstichtag beizulegenden niedrigeren Wert angesetzt.			
Die Aktivwerte für eine Pensionszusage (TK 76) stellen Deckungsvermögen gemäß § 246 Abs. 2 HGB dar und wurden deshalb mit den entsprechenden Rückstellungen saldiert.			
Der Ansatz der flüssigen Mittel erfolgte zu Nennwerten. Die Umrechnung eines in US-Dollar geführten Bankkontos erfolgte mit dem Stichtagskurs zum 31. März 2012.			
Aktiver Rechnungsabgrenzungsposten			
In den aktiven Rechnungsabgrenzungsposten werden Aufwendungen für Folgejahre ausgewiesen.			
Abgrenzung latenter Steuern			
Die steuerlichen Verlustvorträge werden im Berichtsjahr vollständig verbraucht, sodass die aktiven latenten Steuern aufzulösen waren.			
Eigenkapital			
Das gezeichnete Kapital ist zum Nennwert bilanziert.			
Sonderposten			
Der Sonderposten für Investitionszuschüsse zum Anlagevermögen betrifft Investitionszuschüsse der im Anlagevermögen ausgewiesenen Strahlentherapie. Die Auflösung des Sonderpostens erfolgt entsprechend der Abschreibung der geförderten Vermögensgegenstände und ist unter den sonstigen betrieblichen Erträgen ausgewiesen.			
Rückstellungen			
Die Pensionsrückstellung ist nach versicherungsmathematischen Grundsätzen mit dem Anwartschaftsbarwertverfahren unter Berücksichtigung eines Zinssatzes von 4,76 % p.a. gemäß § 253 Abs. 2 HGB, einer erwarteten Gehalts- bzw. Rentensteigerung für Anwärter von 1,0 % p.a. und für Rentner von 1,5 % p.a. und den Richttafeln 2005 G von Prof. Dr. Klaus Heubeck angesetzt.			
Bei der Bewertung der Rückstellung für die Aufbewahrung von Geschäftsunterlagen wurde sich an der Verfügung S 2137 - 41 - St 211 der OFD Magdeburg vom 21. September 2006 orientiert, welche inhaltlich durch die OFD Chemnitz übernommen wurde.			
Die sonstigen Rückstellungen wurden unter Beachtung des § 253 Abs. 1 HGB in Höhe des nach vernünftiger kaufmännischer Beurteilung notwendigen Erfüllungsbetrags dotiert. Soweit die Rückstellungen eine Restlaufzeit von mehr als einem Jahr haben, erfolgte eine Abzinsung der Rückstellung gemäß § 253 Abs. 2 HGB mit dem der Restlaufzeit entsprechenden durchschnittlichen Marktzinssatz der letzten sieben Jahre. Zukünftige Preis- und Kostensteigerungen wurden mit einer Inflationsrate von 2,0 % berücksichtigt.			
Verbindlichkeiten			
Die Verbindlichkeiten sind gemäß § 253 Abs. 1 Satz 2 HGB mit dem Erfüllungsbetrag angesetzt.			
III. Erläuterung zur Bilanz			
Die Zusammensetzung und Entwicklung des Anlagevermögens gemäß § 268 Abs. 2 HGB sind im Anlagenpiegel (Anlage III, Seite 7) dargestellt.			
Die Vorräte beinhalten die Bestände an Roh-, Hilfs- und Betriebsstoffen sowie den Bestand an unfertigen und fertigen Erzeugnissen und Leistungen.			
Forderungen und sonstige Vermögensgegenstände mit einer Restlaufzeit von mehr als einem Jahr bestanden zum Bilanzstichtag nicht.			
In den aktiven Rechnungsabgrenzungsposten werden im Wesentlichen Versicherungsprämien, Kfz-Kosten und Gebühren für Folgejahre ausgewiesen.			
Die steuerlichen Verlustvorträge wurden im Berichtsjahr vollständig verbraucht, sodass die aktive latente Steuerabgrenzung aufzulösen war.			
Das gezeichnete Kapital entspricht der Handelsregisterertragsung. Das im Handelsregister eingetragene Stammkapital beträgt € 50.200.			
Der Sonderposten mit Rücklageanteil betrifft Investitionszuschüsse zum Anlagevermögen ausgewiesenen Strahlentherapie. Die Auflösung des Sonderpostens erfolgt korrespondierend zu den bilanziellen Abschreibungen der geförderten Vermögensgegenstände.			
Die Rückstellungen für Pensionen wurden auf Grundlage einer Pensionszusage an den Geschäftsführer sowie Pensionsverträgen mit den Gesellschaftern gebildet. Der in der Bilanz ausgewiesene Rückstellungsbetrag wurde aus dem versicherungsmathematischen Gutachten der PricewaterhouseCoopers Aktiengesellschaft entnommen.			
Die Sonstigen Rückstellungen betreffen hauptsächlich die Kosten für die Entsorgung von Strahlentherapie und Reststoffen (TK 213), für die Aufbewahrung von Geschäftsunterlagen (TK 45), ausstehende Rechnungen (TK 75), Verpflichtungen aus der Erstellung und Prüfung des Jahresabschlusses 2011/2012 (TK 50), Personalkosten inklusive Tartarsteine (TK 105) sowie Beiträge zur Berufsgenossenschaft (TK 11) und Provisionen (TK 14).			
Die Verbindlichkeiten sind wie folgt strukturiert:			
		Restlaufzeit	Gesamt
	bis zu 1 Jahr	1 bis 5 Jahre	über 5 Jahre
	Euro	Euro	Euro
Verbindlichkeiten gegenüber Kreditinstituten	79.235,63	50.500,00	0,00
Verbindlichkeiten aus Lieferungen und Leistungen	173.490,66	0,00	0,00
Sonstige Verbindlichkeiten	1.256.318,57	2.055.059,64	3.193.774,04
	1.509.044,86	2.105.559,64	3.193.774,04
			6.808.378,54
Von den Verbindlichkeiten sind TK 111 durch Raumsicherungsübereignung von Waren gesichert.			
Die Höhe der Verbindlichkeiten aus Lieferungen und Leistungen ergibt sich aus einer Offenen-Posten-Liste zum Bilanzstichtag, saldiertbestätigten, welche durch uns eingeholt wurden, führten zu keinen Abweichungen.			
Die passiven latenten Steuern wurden mit einem Steuersatz von 30 % auf temporäre Abweichungen zwischen Handels- und Steuerbilanz gebildet.			
IV. Sonstige Angaben			
Sonstige finanzielle Verpflichtungen gemäß § 285 Nr. 3 HGB bestehen zum Bilanzstichtag in Höhe von TK 233 aus Leasing-Verträgen. Während des Geschäftsjahres 2011/2012 waren durchschnittlich 56 Arbeitnehmer beschäftigt.			
Als alleinvertretungsberechtigter Geschäftsführer war im Geschäftsjahr 2011/2012 Herr Dipl.-Ing. Gerold Quilitz, Dresden, bestellt. Er ist befugt, die Gesellschaft bei der Vornahme von Rechtsgeschäften mit sich im eigenen Namen oder als Vertreter eines Dritten uneingeschränkt zu vertreten.			
Radeberg, den 30. April 2012			
Synergy Health Radeberg GmbH			
Gerold Quilitz			
sonstige Berichtsbestandteile			
Anhang zur Feststellung:			
Der Jahresabschluss wurde am 13.02.2013 festgestellt.			

Notes: The example reproduces the report published by Synergy Health Radeberg GmbH for fiscal year 2012 in the *Bundesanzeiger* (i.e., the German Federal Gazette). For the fiscal year 2012, the firm qualified for “small” firm reporting exemptions. The exempted reporting example features an abbreviated balance sheet (Bilanz) and brief notes (Anhang).

Full Reporting

Name	Bereich	Information	V.-Datum	31.3.2013	31.3.2012	Veränderung
Synergy Health Radeberg GmbH	Rechnungslegung/ Finanzberichte	Jahresabschluss zum Geschäftsjahr vom 01.04.2012 bis zum 31.03.2013	07.04.2014	EUR Mio	EUR Mio	%
Synergy Health Radeberg GmbH						
Radeberg						
Jahresabschluss zum Geschäftsjahr vom 01.04.2012 bis zum 31.03.2013						
Lagebericht						
1 Darstellung des Geschäftsverlaufs						
1.1 Entwicklung der Gesamtwirtschaft und der Branche						
Nachfolgend ein Zitat aus dem ifo Konjunkturtest Dienstleistungen Deutschland, Berichtsmonat: Dezember 2012:						
„Der ifo Geschäftsklimaindikator für die gewerbliche Wirtschaft (Verarbeitendes Gewerbe, Bauhauptgewerbe, Groß- und Einzelhandel) ist erneut gestiegen. Die Firmen bewerten ihre aktuelle Lage zwar etwas weniger günstig als im Vormonat, der Pessimismus bezüglich der weiteren Geschäftsentwicklung hat jedoch deutlich abgenommen. Im Verarbeitenden Gewerbe hat sich das Geschäftsklima weiter aufgehellt. Zwar schätzen die befragten Industriefirmen ihre Lage etwas ungünstiger ein als im Vormonat, doch blickten sie deutlich optimistischer auf die Entwicklung in den kommenden sechs Monaten. Die Geschäftserwartungen verzeichneten den stärksten Anstieg seit August 2009. Auch die Erwartungen an das Exportgeschäft sind erneut gestiegen. In den beiden Handelstufen hat sich der Geschäftsklimaindikator abgeschwächt.“						
Nachfolgend ein Zitat aus dem Commerzbank Branchen-Report Deutschland, Industriebranchen im Fokus, Group Industries Research / März 2013:						
„Commerzbank Research erwartet für das für das Wachstum der Weltwirtschaft 2013 eine etwas höhere Rate als im Vorjahr. Die Staatschuldenrisiko im Euroraum dürfte weiter abnehmen und die Unsicherheit sinken, die zuletzt die Investitionsbereitschaft begründete, so dass 2013 die Wirtschaft geringfügig wachsen sollte. In China deuten immer mehr Daten darauf hin, dass das Wirtschaftswachstum sich im Schlussquartal 2012 stabilisiert hat. Das Wachstum der US-Wirtschaft wird durch die Anfang dieses Jahres in Kraft getretenen Steuererhöhungen und das erneute Erreichen der staatlichen Schuldengrenze gedämpft und dürfte etwas niedriger als im Vorjahr ausfallen.“						
Nachfolgend ein Zitat aus dem ifo Konjunkturtest Dienstleistungen Deutschland, Berichtsmonat: März 2013:						
„Das ifo Geschäftsklima für die gewerbliche Wirtschaft (Verarbeitendes Gewerbe, Bauhauptgewerbe, Groß- und Einzelhandel) ist nach starkem Anstieg im Vormonat minimal gesunken. Die Geschäftserwartungen fielen im Vergleich zum Februar etwas weniger positiv aus. Die Unternehmen bewerten ihre momentane Geschäftslage jedoch fast noch genauso gut wie vorher. Im Verarbeitenden Gewerbe gab der Geschäftsklimaindikator nach. Die Industriefirmen bewerten sowohl ihre aktuelle Situation als auch den weiteren Geschäftsverlauf weniger optimistisch als im Vormonat. Die Exporterwartungen sanken merklich, sind aber weiter positiv ausgerichtet.“						
In der Sparte der Bestrahlungs-Dienstleister wird im abgelaufenen 1. Quartal des Jahres 2013 von Umsätzen und Erlösen auf dem Niveau des Vergleichs quartals des Vorjahres, aber auch für das gesamte Jahr 2012 auf dem Vorjahresniveau, gesprochen.						
1.2 Umsatz- und Auftragsentwicklung						
Neben den üblichen jahreszeitlich bedingten Nachfrageschwankungen hat sich der Eingang der Aufträge im Verlauf des 1. Quartals 2013 wieder erhöht. Im Monat März 2013 wurde der vorherige Bestwert des Vorjahres bei den Erlösen übertroffen.						
Im Geschäftsjahr 2012/2013 erzielt die Gesellschaft ein positives Ergebnis, welches einen erneuten Bestwert in der Firmengeschichte darstellt. Das Ergebnis ist maßgeblich durch die hohen Erlöse bei der Sterilisation und der Bestrahlung von Kundenprodukten im Rahmen von Lohnfertigung beeinflusst.						
Im Geschäftsjahr 2012/2013 konnten Umsatzerlöse von EUR 8,2 Mio (Vorjahr: EUR 7,1 Mio) erzielt werden. Der Rohertrag (Umsatzerlöse abzüglich Materialaufwand) lag bei EUR 7,5 Mio (Vorjahr: EUR 6,6 Mio). Dies entspricht einer Erhöhung gegenüber dem Vorjahr von 13,6 %.						
Die wesentlichen Sparten haben sich dabei wie folgt entwickelt:						
<ul style="list-style-type: none"> Erlöse Gamma-Bestrahlung + 15,5 % Erlöse Elektronen-Bestrahlung + 15,3 % Erlöse Verkauf Dosimeter / Dosimetrieservice + 0,6 % 						
Die erfreuliche Steigerung der Erlöse im Auslandsgeschäft, speziell in Polen und Dänemark, spiegeln die Marketing-Aktivitäten der letzten Jahre wider.						
<ul style="list-style-type: none"> Erlöse Gamma-Bestrahlung Ausland + 25,3 % Erlöse Elektronen-Bestrahlung Ausland + 8,9 % Erlöse Dosimeter / Dosimetrieservice Ausland + 22,8 % 						
Aber auch der Binnenumsatz ist 2012/2013 gegenüber dem Vorjahr um 12,9 % gestiegen.						
1.3 Investitionen						
Die Investitionen des Geschäftsjahres beliefen sich auf insgesamt EUR 0,6 Mio (Vorjahr EUR 1,1 Mio) für Kobalt 60-Strahlungsquellen, in Anlagenkomponenten als Ersatzinvestitionen sowie für verschiedene Modernisierungsmaßnahmen.						
Für das folgende Geschäftsjahr 2013/2014 sind neben Investitionen in Kobalt 60-Strahlungsquellen, Investitionen bzw. Ersatzinvestitionen im Bereich der Betriebsausstattungen geplant. Hier ist speziell die Erweiterung in Lagerflächen, die Erneuerung von Anlagenteilen der Gamma-Bestrahlungsanlage GS 300 und der Elektronenbestrahlungsanlage OSE 80 zu benennen.						
1.4 Finanzierungsmaßnahmen bzw. -vorhaben						
Die getätigten Investitionen konnten aus dem laufenden Cashflow finanziert werden und planmäßig wurden die üblichen Erneuerungen an den Anlagen vorgenommen.						
Wie in den Vorjahren wurden auch im Geschäftsjahr 2012/2013 aufgenommene Bankdarlehen und andere Verbindlichkeiten planmäßig zurückgeführt. Zum Geschäftsjahresende beliefen sich die Gesamtverbindlichkeiten auf EUR 5,3 Mio (Vorjahr: EUR 6,8 Mio).						
1.5 Personal- und Sozialbereich						
Im Durchschnitt gehörten 58 Mitarbeiter (Vorjahresdurchschnitt: 56) zur Belegschaft sowie ein Auszubildender und eine Studentin.						
Die Entlohnung ist prinzipiell einzelvertraglich geregelt.						
In den Bereichen Gesundheits- und Arbeitsschutz, z. B. Unfallschutz, Berufsunfälle haben sich im Geschäftsjahr 2012/2013 keine besonderen Vorkommnisse ergeben.						
Durch das im integrierten Management System (IMS) festgelegte Regelwerk wird sichergestellt, dass das Personal, welches die Produktqualität beeinflussende Tätigkeiten ausführt, auf Grund der angemessenen Ausbildung, Schulung, Fertigkeiten und Erfahrungen entsprechend befähigt ist.						
1.6 Umwelt- / Strahlenschutz						
Die Umwelteinwirkungen liegen in den projektierten und genehmigten Grenzen. Die Umwelteinwirkungen sind in der jährlichen Umweltklärung kommuniziert und stehen Interessierten zur Verfügung.						
Das Unternehmen verfügt über eine kunden- und umweltorientierte Transportorganisation. Der Begrenzung der Umwelteinwirkungen durch eigene Transportmittel messen wir große Bedeutung bei und haben LKW und PKW entsprechend technisch ausgerüstet.						
Beim Strahlenschutz zeigen die Kontaminationskontrollen und die Strahlenfeldmessungen, dass die Auslegung und Prozessführung in vollem Maß den sicherheitstechnischen Anforderungen in der Strahlenschutzverordnung entspricht. Die Information und die Kommunikation mit der zuständigen Behörde erfolgen planmäßig gegebenenfalls auch situativ.						
Gesetzliche Bestimmungen, insbesondere auf den Gebieten der Qualitätssicherung, des Umweltschutzes, der Sterilisation von Medizinprodukten, des Strahlenschutzes wurden eingehalten.						
Die Umwelt- und Qualitätsziele sowie die der technologischen Prozessführung wurden weitestgehend erreicht.						
1.7 Sonstige wichtige Vorgänge des Geschäftsjahrs						
Das Berichtswesen wurde weiter auf die Bedürfnisse der Synergy Health Gruppe angepasst, das Qualitätsmanagementsystem im Bereich des Geschäftsfelds "Applied Sterilisation Technologies" angepasst.						
Insgesamt ist es Synergy Health Radeberg GmbH gelungen, die definierten strategischen Unternehmens-Ziele weitgehend umzusetzen.						
2 Darstellung der wirtschaftlichen Lage						
2.1 Vermögenslage						
Die wesentlichen Vermögensgegenstände und Verbindlichkeiten stellen sich wie folgt dar:						
				31.3.2013	31.3.2012	
				EUR	EUR	
A. Anlagevermögen				9,5	9,9	-4,3
Umlaufvermögen				4,6	3,5	29,6
Rechnungsabgrenzungsposten				0,1	0,1	0
Eigenkapital				6,9	5,1	34,8
Rückstellungen				1,7	1,5	14,1
Verbindlichkeiten				5,5	6,8	-19,9
Die Bilanzsumme hat sich gegenüber dem Vorjahresstichtag von EUR 13,5 Mio auf EUR 14,1 Mio erhöht. Der Anteil des Anlagevermögens an der Bilanzsumme beträgt 66,9 % (Vorjahr 73,2 %).						
Die Veränderungen im Eigenkapital resultieren aus dem Jahresüberschuss des Geschäftsjahres 2012/2013 in Höhe von EUR 1,8 Mio.						
Das Fremdkapital (Rückstellungen plus Verbindlichkeiten) hat sich absolut auf EUR 7,2 Mio (Vorjahr: EUR 8,3 Mio), im Wesentlichen aus der planmäßigen Tilgung der Darlehensverbindlichkeiten, reduziert.						
2.2 Finanzlage						
Der Finanzmittelbestand zum 31. März 2013 betrug EUR 3,2 Mio und hat sich im Vergleich zum Bilanzstichtag 31. März 2012 um EUR 1,2 Mio erhöht. Ein Cashflow aus laufendem Geschäftsbetrieb wurde im abgelaufenen Geschäftsjahr in Höhe von EUR 3,0 Mio erwirtschaftet. Der Cashflow aus Finanzierung betrug EUR -1,2 Mio und der Cashflow aus Investition EUR 0,6 Mio.						
Infolge dieser Entwicklung konnte im Geschäftsjahr 2012/2013 ausnahmslos auf eine Inanspruchnahme der Kontokorrentlinien verzichtet werden.						
Die anfallenden finanziellen Verpflichtungen wurden stets – in der Regel unter Inanspruchnahme von Skonto – durch schnelle Zahlung erfüllt. Die Creditreform Wirtschaftsauskunft bescheinigte der Synergy Health Radeberg GmbH im März 2012 eine positive Geschäftsentwicklung und einen guten Geschäftsgang und bewertete die Bonität mit dem Index von 163 („sehr gute Bonität“).						
Die Zahlungsfähigkeit der Gesellschaft war im Geschäftsjahr jederzeit gesichert.						
2.3 Ertragslage						
Die Umsatzerlöse betragen im Geschäftsjahr 2012/2013 EUR 8,2 Mio (Vorjahr EUR 7,1 Mio). Dies ist im Wesentlichen aus der guten Auftragslage in den Teilbereichen, Medizinprodukte, im Pharmabereich, den kosmetischen- und anderen Rohstoffen sowie im Laborprodukte-Bereich zurückzuführen. Aber auch die Produkte aus technischen Anwendungen der Produktbestrahlung sind auf einem akzeptablen Niveau, da einige neue Kunden in diesem Bereich gewonnen wurden.						
Die sonstigen betrieblichen Erträge im Geschäftsjahr 2012/2013 beliefen sich auf EUR 0,3 Mio (Vorjahr EUR 0,3 Mio), der Materialaufwand lag bei einem Wert von EUR 0,6 Mio (Vorjahr EUR 0,5 Mio). Im Wesentlichen wirkten sich hier die Preissteigerung bei den Energieerstoffen beziehungsweise die weiter erhöhte EEG-Umlage sowie die Preisreduzierungen bei den Fremdspenditionen aus.						
Der Personalaufwand lag mit EUR 2,1 Mio nahezu auf dem Niveau des Vorjahres von EUR 2,0 Mio.						
Die planmäßigen Abschreibungen auf immaterielle Vermögensgegenstände des Anlagevermögens sowie Sachanlagen lagen wie im Vorjahr bei EUR 1,0 Mio. Die sonstigen betrieblichen Aufwendungen betragen EUR 2,2 Mio (Vorjahr EUR 2,0 Mio) und enthalten u. a. Veränderungen bei den Rückstellungen für die Entsorgung der Strahlungsquellen.						
Im Geschäftsjahr 2012/2013 wurde ein Jahresüberschuss in Höhe von EUR 1,8 Mio erwirtschaftet.						
3 Hinweise auf Risiken bei der künftigen Entwicklung						
Die Synergy Health Radeberg GmbH hat für das Erkennen wesentlicher Risiken ein umfassendes Kontrollmanagement als Bestandteil der Unternehmensplanung implementiert. Die eingesetzten Steuerungs- und Überwachungssysteme werden fortlaufend weiterentwickelt, um noch besser das Maß der Risiken bewerten und handhaben zu können.						
Chancen aber auch Risiken liegen weiterhin aus der Erweiterung des Osteuropäischen Markts ab. Das im Geschäftsjahr 2012/2013 abgewickelte Auslandsgeschäft entwickelte sich weiter positiv für die Synergy Health Radeberg GmbH, muss aber für das Geschäftsjahr 2013/2014 vor dem Hintergrund der sich teilweise im Vergleich zu Deutschland in Rezession befindlichen Auslandsmärkte zurückhaltender beurteilt werden. Es müssen auch die damit verbundenen latenten Verlustrisiken (Unterschlagungsrisiken, erhöhte Bonitätsrisiken, Insolvenzen der ausländischen Kunden u. a.) mitberücksichtigt werden; insoweit lassen sich zukünftige Belastungen nicht ausschließen. Positiv wirkt für Synergy Health Radeberg GmbH, neben der Einbindung in die Sales Organisation der Synergy Health Gruppe, insbesondere die Lage im Dreiländereck Deutschland, Polen, Tschechien sowie die Nähe zu Produzenten aus Ungarn, Slowenien und sogar Österreich, findet doch weithin der Transport der Produkte in unmittelbarer Nähe des Produzenten statt.						
Auch im nächsten Geschäftsjahr sehen wir weiterhin ein gutes Potenzial zum Ausbau des Medizinprodukte-Geschäfts. Hier speziell auch mit dem so genannten Global Playern des Marktes, die erst durch die Zugehörigkeit zur Synergy Health Gruppe stärkeres Interesse zeigen und auch ein erweitertes Leistungsspektrum angeboten bekommen können.						
Das vollzogene Wachstum der Gesellschaft bringt die bestehenden technischen Anlagen, aber auch die Lagerkapazitäten an ihre Grenzen. Es wird an Interimslösungen, wie ein externes Außenwarenlager, aber auch im Verbund mit der Synergy Health Gruppe an entsprechenden Ersatz- und Erweiterungsinvestitionen gearbeitet.						
Auf Grund unserer mittelfristigen Ergebnis- und Finanzplanung sehen wir derzeit kein großes Liquiditätsrisiko aus der Finanzierungstätigkeit.						
Durch die Zugehörigkeit zu der Synergy Health Gruppe werden sich im Bereich des Einkaufs der Energie Vorteile und verringerte Beschaffungsrisiken ergeben.						
Das gewährte Gesellschafterdarlehen der Synergy Health Holdings Limited kann erstmals mit einer 3-monatigen Kündigungsfrist zum 31. Dezember 2013 gekündigt werden. Dieses Risiko stufen wir jedoch als unzutreffend ein, entspreche doch die Vorgehensweise nicht der Wachstums-Politik des Konzerns; an entsprechenden Vertragsergänzungen wird zentral gearbeitet werden.						
Alle uns sonst bekannten Risiken wurde nach derzeitigem Erkenntnisstand ausreichend Rechnung getragen. Bestandsgefährdende Risiken lassen sich derzeit nicht erkennen.						
Sofern unser Lagebericht in die Zukunft gerichtete Annahmen und Einschätzungen enthält, besteht die grundsätzliche Unsicherheit von Prognosen in Bezug auf die tatsächlichen Ergebnisse.						
4 Sonstige Angaben, insbesondere über die voraussichtliche Entwicklung						
Der gute Geschäftsgang zum 31. März 2013 und die positiven Trends in den für uns relevanten Märkten weisen auf eine Umsatzsteigerung für die Synergy Health Radeberg GmbH für das Geschäftsjahr 2013/2014 hin.						
Vor diesem Hintergrund planen wir aus heutiger Kenntnis eine Gesamtleistung für das Geschäftsjahr 2013/2014 in Höhe von EUR 8,5 Mio und für das Geschäftsjahr 2014/2015 in der Höhe von EUR 9,1 Mio. Ergebnissteigerungen rechnen wir mit Ergebnissen auf dem Niveau des Geschäftsjahres 2012/2013.						
Ereignisse von besonderer Bedeutung nach dem Abschlussstichtag haben sich nicht ereignet.						
Radeberg, 30. Mai 2013						
Gerold Quilitz, Geschäftsführer						
Bilanz						
Aktiva				31.3.2013	31.3.2012	
				EUR	EUR	
A. Anlagevermögen				9.452.830,78	9.873.592,26	
I. Immaterielle Vermögensgegenstände				3.382,70	6.244,00	
1. sonstige immaterielle Vermögensgegenstände				3.382,70	6.244,00	
II. Sachanlagen				9.449.448,08	9.867.348,26	
1. Grundstücke, grundstücksgleiche Rechte und Bauten einschließlich der Bauten auf fremden Grundstücken				1.981.903,85	2.072.715,85	
2. technische Anlagen und Maschinen				7.230.615,44	7.471.582,22	
3. andere Anlagen, Betriebs- und Geschäftsausstattung				236.928,79	319.344,79	
4. geleaste Anzeihen und Anlagen im Bau				0,00	3.705,40	
B. Umlaufvermögen				4.559.509,71	3.517.123,73	
I. Vorräte				272.748,11	309.307,09	
II. Forderungen und sonstige Vermögensgegenstände				1.047.643,04	1.217.023,58	
1. sonstige Vermögensgegenstände				1.047.643,04	1.217.023,58	
davon mit einer Restlaufzeit von mehr als einem Jahr				823,00	37.890,83	
III. Kassenbestand, Bundesbankguthaben, Guthaben bei Kreditinstituten und Schecks				3.239.118,56	1.990.793,06	
C. Rechnungsabgrenzungsposten				104.443,09	106.681,17	
D. Aktive latente Steuern				10.385,00	0,00	
Bilanzsumme, Summe Aktiva				14.127.168,58	13.497.797,16	
Passiva						
				31.3.2013	31.3.2012	
				EUR	EUR	
A. Eigenkapital				6.916.511,83	5.131.053,41	
I. gezeichnetes Kapital				50.200,00	50.200,00	
II. Kapitalrücklage				1.512.960,61	1.512.960,61	
III. Gewinnvortrag				3.567.892,80	2.368.926,04	
IV. Jahresüberschuss				1.785.458,42	1.198.966,76	
B. Sonderposten für Zuschüsse und Zulagen				62.807,23	66.485,26	

	31.3.2013 EUR	31.3.2012 EUR
I. Immaterielle Vermögensgegenstände		
Entgeltlich erworbene Konzessionen, gewerbliche Schutzrechte und ähnliche Rechte und Werte sowie Lizenzen an solchen Rechten und Werten	3.382,70	6.244,00
II. Sachanlagen		
1. Grundstücke, grundstücksgleiche Rechte und Bauten einschließlich der Bauten auf fremden Grundstücken	1.981.903,85	2.072.715,85
2. Technische Anlagen, Maschinen und Strahlungsquellen	7.230.615,44	7.471.582,22
3. Andere Anlagen, Betriebs- und Geschäftsausstattung	236.928,79	319.344,79
4. Geleistete Anzahlungen und Anlagen im Bau	0,00	3.705,40
	9.449.448,08	9.867.348,26
	9.452.830,78	9.873.592,26
Angabe der Ausleihungen, Forderungen und Verbindlichkeiten gegenüber Gesellschaftern		
1.4.2012 - 31.3.2013		
Der Betrag der sonstigen Vermögensgegenstände gegenüber Gesellschaftern beträgt 0,00 EUR. Der Betrag der sonstigen Verbindlichkeiten gegenüber Gesellschaftern beträgt 5.062.961,49 EUR.		
1.4.2011 - 31.3.2012		
Der Betrag der sonstigen Vermögensgegenstände gegenüber Gesellschaftern beträgt 36.921,83 EUR. Der Betrag der sonstigen Verbindlichkeiten gegenüber Gesellschaftern beträgt 5.693.774,04 EUR.		
Angabe der Erträge aus der Auflösung des Sonderpostens mit Rücklageanteil innerhalb der "Sonstigen betrieblichen Erträge"		
1.4.2012 - 31.3.2013		
Die Erträge aus der Auflösung des Sonderpostens mit Rücklageanteil innerhalb des Postens "sonstige betriebliche Erträge" betragen 3.678,03 EUR.		
1.4.2011 - 31.3.2012		
Die Erträge aus der Auflösung des Sonderpostens mit Rücklageanteil innerhalb des Postens "sonstige betriebliche Erträge" betragen 4.193,88 EUR.		
sonstige Berichtsbestandteile		
Angaben zur Feststellung:		
Der Jahresabschluss wurde am 19.12.2013 festgestellt.		
Bestätigungsvermerk		
Wir haben den Jahresabschluss – bestehend aus Bilanz, Gewinn- und Verlustrechnung sowie Anhang – unter Einbeziehung der Buchführung und den Lagebericht der Synergy Health Radeberg GmbH, Radeberg, für das Geschäftsjahr vom 1. April 2012 bis 31. März 2013 geprüft. Die Buchführung und die Aufteilung von Jahresabschluss und Lagebericht nach den deutschen handelsrechtlichen Vorschriften liegen in der Verantwortung der Geschäftsführung der Gesellschaft. Unsere Aufgabe ist es, auf der Grundlage der von uns durchgeführten Prüfung eine Beurteilung über den Jahresabschluss unter Einbeziehung der Buchführung und über den Lagebericht abzugeben.		
Wir haben unsere Jahresabschlussprüfung nach § 317 HGB unter Beachtung der vom Institut der Wirtschaftsprüfer (IDW) festgestellten deutschen Grundsätze ordnungsmäßiger Abschlussprüfung vorgenommen. Danach ist die Prüfung so zu planen und durchzuführen, dass Unrichtigkeiten und Verstöße, die sich auf die Darstellung des durch den Jahresabschluss unter Beachtung der Grundsätze ordnungsmäßiger Buchführung und durch den Lagebericht vermittelten Bildes der Vermögens-, Finanz- und Ertragslage wesentlich auswirken, mit hinreichender Sicherheit erkannt werden. Bei der Festlegung der Prüfungshandlungen werden die Kenntnisse über die Geschäftstätigkeit und über das wirtschaftliche und rechtliche Umfeld der Gesellschaft sowie die Erwartungen über mögliche Fehler berücksichtigt. Im Rahmen der Prüfung werden die Wirksamkeit des rechnungslegungsbezogenen internen Kontrollsystems sowie Nachweise für die Angaben in Buchführung, Jahresabschluss und Lagebericht überwiegend auf der Basis von Stichproben beurteilt. Die Prüfung umfasst die Beurteilung der angewandten Bilanzierungsgrundsätze und der wesentlichen Einschätzungen der Geschäftsführung sowie die Würdigung der Gesamtdarstellung des Jahresabschlusses und des Lageberichts. Wir sind der Auffassung, dass unsere Prüfung eine hinreichend sichere Grundlage für unsere Beurteilung bildet.		
Unsere Prüfung hat zu keinen Einwendungen geführt.		

Nach unserer Beurteilung auf Grund der bei der Prüfung gewonnenen Erkenntnisse entspricht der Jahresabschluss den gesetzlichen Vorschriften und vermittelt unter Beachtung der Grundsätze ordnungsmäßiger Buchführung ein den tatsächlichen Verhältnissen entsprechendes Bild der Vermögens-, Finanz- und Ertragslage der Gesellschaft. Der Lagebericht steht in Einklang mit dem Jahresabschluss, vermittelt insgesamt ein zutreffendes Bild von der Lage der Gesellschaft und stellt die Chancen und Risiken der zukünftigen Entwicklung zutreffend dar.

Dresden, den 30. Mai 2013

KPMG AG
Wirtschaftsprüfungsgesellschaft
Möller, Wirtschaftsprüfer
Eichhorst, Wirtschaftsprüfer

Notes: The example reproduces the report published by Synergy Health Radeberg GmbH for fiscal year 2013 in the *Bundesanzeiger* (i.e., the German Federal Gazette). For the fiscal year 2013, the firm no longer qualified for the “small” firm reporting exemption and hence provides a full report. Full reporting features a management report (Lagebericht) discussing business developments (1), the economic position (2), business risks (3), and future developments (4). In the business developments section, the report reviews developments in the economy and industry (1.1), sales and profitability by segments (1.2), investment activities (1.3), financing activities (1.4), employment (1.5), environmental and radiation protection (1.6), and other changes during the fiscal year (1.7). With full reporting, the example company provides an extended balance sheet (Bilanz), income statement (Gewinn- und Verlustrechnung), detailed notes (Anhang) including additional information on balance sheet and income statement items (e.g., breaking out R&D related income) and a statement of changes in non-current assets (Anlagespiegel), and an audit opinion (Bestätigungsvermerk).

Table A1

REPORTING REGULATION AND INNOVATION: INNOVATION SPENDING MARGINS					
Panel A: Market Level					
Outcome Margin Market Level Column	Innovation Spending				
	Simple	Extensive Average	Total	Intensive Simple Average	Total
	(1)	(2)	(3)	(4)	
Limited Share×Post	-0.180*** (-3.18)	-0.347*** (-3.65)	-0.590 (-1.50)	-0.741* (-1.80)	
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	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 Margin Column	Innovation Spending				
	Simple	Extensive Average	Total	Intensive Simple Average	Total
	(1)	(2)	(3)	(4)	
Limited×Post	-0.060 (-1.62)		-0.029 (-0.13)		
Private×Post		-0.058 (-1.58)			-0.337** (-2.18)
Controls	X	X	X	X	X
Firm FE	X	X	X	X	X
County-Year	X	X	X	X	X
Industry-Year FE (4-digit)	X	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). *t*-statistics (in parentheses) are based on standard errors 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.