PRIVATE FIRM DISCLOSURE AND PUBLIC FIRM PAY-FOR-PERFORMANCE SENSITIVITY: INTERNATIONAL EVIDENCE

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Private Firm Disclosure and Public Firm Pay-for-Performance Sensitivity: International Evidence

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CERTIFICATE OF ORIGINALITY

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Abstract

This paper examines whether and how private firm disclosure affects public firms' executive compensation contracting. Using data from 32 countries between 2000 and 2020, we find that disclosures by private peer firms significantly increase a public firm's pay-for-performance sensitivity, suggesting that the accounting earnings of public firms become more informative when private firms disclose more. To further establish causality, we use the staggered implementation of electronic business registers as a plausibly exogenous shock; thereafter, we continue to find a positive link between private firm disclosures and public firms' pay-for-performance sensitivity. We then conduct several cross-sectional analyses in support of the earnings informativeness view. We find that the impact of private firm disclosures is more pronounced for firms with higher information asymmetry, higher production uncertainty, and fewer alternative information sources. Overall, in documenting the externality of private firm disclosures on public firms' incentive intensity, we add new evidence on the benefits of private firm disclosures.

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1. Introduction

In this paper, we examine the effect of financial disclosure by private firms (henceforth private firm disclosures) on public firms' executive compensation contracting. In 2022, private firms comprise more than 98% of the 400 million firms that globally disclosed detailed financial statement information (Bureau van Dijk, 2022).[1] However, private firm disclosures around the world remain largely voluntary.[2] The debate about the regulation of private firm disclosures is growing, and the existing evidence is far from settled on the benefits (or costs) of financial reporting regulation (Minnis and Shroff, 2017; Lisowsky and Minnis, 2020). While some prior studies have discussed the impact of private firm disclosures, limited research explores the externality of private firm disclosures on public firms.[3] Thus, in this paper, we shed light on the externality by examining the interaction between private firm disclosures and public firms' compensation contracting. Specifically, we examine whether private firm disclosures affect public firms' pay-for-performance sensitivity.

Our paper focuses on pay-for-performance sensitivity because the compensation of chief executive officers (CEOs) has recently received growing public scrutiny, with most of the controversy surrounding the rising CEO compensation and the decreasing relation between executive pay and firm performance (Hubbard and Palia, 1995; Dutta, 2008; Correa and Lel, 2016; Carter et al., 2021).[4] For example, financially, Boeing had a historically bad 2020, and

[1] Private firms are economically important in the society. Privately-held firms represent over 99% of U.S. firms and generate over 50% of the private sector's GDP. The past twenty years have witnessed the rapid growth of private firms, with the number of private firms increasing by about 10% from 2000 to 2020, whereas the number of public firms decreased by around 40% over the same period (U.S. Census Bureau). Given such economic importance, the disclosures of private firms therefore are of great importance because they could be useful to a wide range of market participants. https://www.census.gov/data/tables/time-series/econ/bds/bds-tables.html

[2] In the United States and Canada, private firms are generally neither required to publicize their financial reports nor to audit their financial statements. In contrast, in Europe, private firms with assets of at least EUR 5 million and 50 employees are required to file at least some financial information publicly and are required to have their financial statements audited.

[3] However, externality is one of the keys to understanding the benefits (or costs) of regulating private firm disclosures (Leuz and Wysocki, 2016).

[4] In December 2006, the Securities and Exchange Commission (SEC) issued new disclosure requirements on CEO compensation, as a response to investor concerns that CEO compensation packages were not properly disclosed or well understood. According to these new requirements, firms need to disclose the types of performance

the company announced plans to lay off 30,000 workers and reported a $12 billion loss. Nonetheless, its chief executive, David Calhoun, was rewarded with $21.1 million in compensation.[5] Indeed, the low pay-for-performance sensitivity has been criticized for many years. See, for instance, ''*End the Madness of Excessive CEO Pay*'' (HuffPost, February 6, 2009);[6] "*CEO Pay and Performance Often Don't Match Up*" (WSJ, May 14, 2018);[7] "*Are C.E.O.s Paid Too Much?*" (NYT, May 11, 2021).[8]

To improve the accuracy of measuring CEO's efforts, firms try to use relative performance evaluation.[9] It is not surprising that public peer firms are used as benchmarks in compensation design.[10] However, what draws our attention is that private firms' financial data is also used as benchmarks by public peers. For example, *Resources Connection Inc.*, a global consulting company, indicated in its 2021 proxy statement that, in addition to the public peer firms' data, the company also valued the information from private firms in their compensation design. We can read: *"In addition to the peer group data, the Compensation Committee also reviews summary statistical information from survey data about general industry practices in private companies…"*[11]Meanwhile, *Robert Half International Inc*. highlighted the importance of privately-listed peer firms in its 2020 compensation philosophy. We can read: *"Committee is also mindful of the fact that the Company's industry is fractured with a myriad of private firms owned by entrepreneurial individuals or financed by private equity firms representing*

measures that determine CEO rewards, the performance targets, and the performance horizon. http://www.sec.gov/rules/final/2006/33-8732a.pdf

[5] https://www.nytimes.com/2021/04/24/business/ceos-pandemic-compensation.html

[6] https://www.huffpost.com/entry/end-the-madness-of-excess_b_164739

[7] https://www.wsj.com/articles/ceo-pay-and-performance-dont-match-up-1526299200

[8] https://www.nytimes.com/2021/05/11/learning/are-ceos-paid-too-much.html

[9] The usage of incentive plans based on relative performance in large U.S. firms has grown from 22% to 67% from 2006 to 2019. https://www.meridiancp.com/wp-content/uploads/Meridian-2019-Governance-and-Design-Survey.pdf

[10] The usage of relative performance evaluation in large U.S. firms has grown from 22% to 67% from 2006 to 2019. https://www.meridiancp.com/wp-content/uploads/Meridian-2019-Governance-and-Design-Survey.pdf For example, *Pacific Gas and Electric* (*PG&E*), an energy provider, determined its CEO's bonus in 2021 based on the firm's performance relative to that of preselected competitors like *Consolidated Edison* and *Xcel Energy*. https://www.sec.gov/Archives/edgar/data/1004980/000130817921000200/lpcg2021_def14a.htm

[11] https://sec.report/Document/0001140361-21-030722/

the Company's most effective competition in many markets…"[12] *FiscalNote* in its 2023 DEF14A report, indicates that it uses the Mercer's Comptryx Survey which includes public and private firms financial data to obtain a general understanding of the compensation structures maintained by similarly-situated companies.[13] Besides, even when the financial data of private firms is not publicly available, public firms emphasize the relevance of the private firms' peers in their compensation design. For instance, we can read from different sources: "*The firms that best fit our definition of a competitive peer are private firms for which financial results and compensation data are generally unavailable*" (MarketAxess Holdings Inc., 2014);[14] "*In addition to the peer group, we also take into account that Nasdaq faces competition for talent from private firms, such as high frequency and other small trading firms and private equity funds, for which public compensation data is not available*" (Nasdaq, Inc., 2016; 2019);[15] Overall, the above evidence suggests that private firm disclosures are considered by public firms in the context of compensation design.

Theoretically, the impact of private firm disclosures on public firms' pay-for-performance sensitivity is ambiguous. On the one hand, the *informativeness view* suggests a positive link between private firm disclosures and public firms' pay-for-performance sensitivity. Specifically, the information disclosed in financial reports of private firms would increase the informativeness of accounting earnings as a measure of CEO efforts and, accordingly, should be given a greater weight in an optimal incentive contract. Under the contracting theory, CEO compensation is usually viewed through the lens of an agency problem. In particular, executives are thought to be self-interested, and compensation plans are designed to align the interests of executives with those of shareholders. The "informativeness"

[12] https://www.sec.gov/Archives/edgar/data/315213/000119312520107862/d851427ddef14a.htm
[13] https://www.sec.gov/Archives/edgar/data/1823466/000119312523105713/d435759ddef14a.htm
[14] https://investor.marketaxess.com/node/19066/html
[15] https://ir.nasdaq.com/static-files/a0bfaf82-dbf4-4348-9835-74d7d3b8b1d1
http://ir.nasdaqomx.com/node/100251/html

principle of Holmstrom (1979) therefore suggests that any additional information about the agent's action, however imperfect, is useful to measure the agent's actions and efforts. Turning to our context, the aggregate disclosures of private firms could convey useful industry-wide information about earnings. Firms therefore can better insulate a CEO's efforts from common uncertainty, resulting in more efficient compensation contracts when using accounting earnings as a measure of CEO efforts. The argument of the informativeness view could also be supported by the literature of relative performance evaluation (Lazear and Rosen, 1981; Nalebuff and Stiglitz, 1983; Holmstrom and Milgrom, 1987). Holmstrom (1982) develops the economic theory of relative performance evaluation, arguing that it is optimal to use peer performance as an instrument to filter systematic risk from performance. This is because the additional information allows a more accurate judgment of the performance of the agent. In other words, the disclosures of private firms serve as benchmarks for public firms to distinguish between managers' contributions and the impact of exogenous shocks.

Alternatively, the *monitoring view* predicts a negative link between private firm disclosures and public firms' pay-for-performance sensitivity. The increased private firm disclosures would attract investors from public firms to private firms, leading to less monitoring from shareholders and subsequently lower pay-for-performance sensitivity. Specifically, when the disclosures of private firms are idiosyncratic, their disclosures would encourage investors to reallocate their capital away from public firms to more transparent private firms. Moreover, Kim and Olbert (2022) argued that such a fund reallocation assumption is more applicable to institutional investors, large corporate investors, and high net worth individuals. As large shareholders are effective monitors of corporate governance, we accordingly expect a decreased monitoring on CEO compensation. For example, prior studies find that higher institutional ownership is associated with greater pay-for-performance sensitivity (Hambrick and Finkelstein, 1995; Hartzell and Starks, 2003; Baghdadi et al., 2018).

Therefore, the increase in private firm disclosures could be negatively related with public firms' pay-for-performance sensitivity.

To measure private firm disclosures, we follow the methodology of Kim and Olbert (2022). Specifically, private firm disclosures are calculated at the country-industry-year level, defined as the natural logarithm of one plus the aggregate number of financial statement line items that private firms disclose. Kim and Olbert (2022) indicate that this measure considers both the extensive margin and the intensive margin of disclosures.[16] The necessary data for calculating private firm disclosures is obtained from Bureau van Dijk's (BvD) Orbis database. We find that private firm transparency significantly increases public firms' pay-for-performance sensitivity, which is consistent with our informativeness view. In terms of economic significance, CEO cash compensation increases by 35.32% for a 1% increase in accounting earnings, when private firm transparency changes from the 25th percentile to the 75th percentile.[17] In robustness checks, we show that our results continue to hold when we use alternative measures of firm performance or private firm transparency and when we use different samples. In addition, we show that our results are robust to alternative model specifications with different fixed effects and cluster levels.

To mitigate the concern of endogeneity, we rely on the difference-in-differences (DiD) analysis framework. Specifically, following Kim and Olbert (2022), we use the staggered implementation of electronic business registers across Europe as a plausibly exogenous shock to private firm transparency. Electronic business register implementation is similar to EDGAR adoption in the United States. It aims to facilitate the dissemination of firms' financial statements. It also harmonizes European countries' respective information environments. We

[16] Using Japan's manufacturing industry in 2018 as an example, the transparency variable can be decomposed in the following way: 14.13 = ln (1+90,712 *0.389*39), where 90,712 denotes the number of private firms in Japan that disclose at least one financial statement item (i.e., the "extensive margin" of private firm disclosures) and 0.389 denotes the ratio of disclosed financial statement items to the hypothetical full disclosure of 39 line items standardized by Orbis (i.e., the "intensive margin" of private firm disclosures).
[17] The detailed calculation of economic significance can be found in section 3.1.

find that the staggered implementation of electronic business registers significantly increases public firms' pay-for-performance sensitivity. To further support the validity of our DiD results, we test the parallel trend assumption and also apply the stacked DiD methodology. Meanwhile, we perform the randomization tests by randomly assigning shocks to countries, and we re-examine our results by using a matched sample.

Next, we conduct cross-sectional analysis to validate the aforementioned informativeness mechanism through which private firm disclosures affect public firms' pay-for-performance sensitivity. First, we expect a stronger impact of private firm disclosures for public firms with higher information asymmetry. If private firm disclosures do affect public firms' pay-for-performance sensitivity via the mechanism of increased earnings informativeness, the effect should be more pronounced for public firms with higher information asymmetry. We use firm size and bid-ask spread as proxies for information asymmetry (Lin et al., 2013; Holden and Jacobsen, 2014). Consistent with our expectation, we find that the effect of private firm disclosures is more pronounced for firms with smaller sizes and higher bid-ask spreads.

Second, we examine whether private firm disclosures play a larger role when firms have higher production function uncertainty. When faced with high production uncertainty, firms encounter challenges in utilizing accounting earnings as a metric for assessing the efforts of their CEOs. For example, Carter et al. (2021) argue that the costs of providing earnings-based incentives will be large for firms with high performance risk. If this is true, private firm disclosures would be more informative for firms with higher operation uncertainty and subsequently have larger impact on pay-for-performance sensitivity. To gauge production uncertainty, we rely on cash flow volatility and analyst forecast dispersion (Chen et al., 2021). The results are in line with our expectation that the role of private firm disclosures is larger for firms with higher cash flow volatility and for firms with greater analyst forecast dispersion.

Last, we expect that private firm disclosures' positive effect due to the increased informativeness on earnings will be stronger when public peers have fewer alternative information sources from which to learn. Specifically, public firms are more likely to depend on the information from private firm disclosures in compensation design when less information is available from other sources. We measure other sources of information in two ways: analyst coverage and industry concentration (Edmans et al., 2017). In particular, firms with few analyst followings are expected to receive less feedback from analysts, and firms in concentrated industries have difficulty learning from industrial peers. Consistent with our expectation, we find a larger impact of private firm disclosures on public firms with lower analyst coverage and for firms in concentrated industries. Collectively, the cross-sectional tests we describe above support our informativeness view; that is, private firm disclosures increase public firms' earnings informativeness, leading to a higher pay-for-performance sensitivity.

We perform a number of additional analyses. First, we examine if the effect of private firm disclosures still works when we use stock returns as a measure of firm performance. As the measure of private firm disclosures is calculated by using standardized accounting items, we expect that its impact would be more direct and clearer when we focus on accounting-based performance than price-based performance. Particularly, the effect of private firm disclosures on the informativeness of stock prices could be mixed. On the one hand, private firm disclosures could generate positive spillover effects by increasing the stock price informativeness; on the other hand, private firm disclosures could preempt informed traders' information advantage and discourage private information collection, leading to lower informativeness of stock prices. Consistent with our expectation, we find that private firm disclosures have no perceptible impact on public firms' pay-for-performance sensitivity when using stock returns as the performance measure. Second, we examine if private firm disclosures play a role when we focus on total compensation. In our main test, we focus on cash

compensation as prior studies suggest that accounting performance measures are mainly used to determine cash compensation (Bushman and Smith, 2001; Nam, 2020). Our results show that private firm disclosures also increase total compensation's sensitivity to accounting performance. Finally, we study the impact of different types of financial statements by splitting our private firm disclosures measure into three subcomponents – balance sheet items, income statement items, and footnote items. We find that private firm transparency calculated based on the three subcomponents is significantly and positively related with public firms' pay-for-performance sensitivity.

We contribute to a growing literature on private firm disclosures. Extant literature has documented the determinants and consequences for the disclosing firm. The determinant vector includes proprietary costs (Dedman and Lennox, 2009; Bernard et al., 2018), predation concern (Bernard, 2016), number of transaction stakeholders (Breuer et al., 2020), and agency problems (Lisowsky and Minnis, 2020); The consequence vector includes cost of debt (Minnis, 2011), cost of equity financing (Baik et al., 2023), resource allocation (Breuer, 2021), and innovation (Breuer et al., 2022). Few studies explore externality of private firm disclosures on public firms.[18] One exception is Kim and Olbert (2022), who examine the externality of private firm disclosures on public firms by focusing on equity demand. Kim and Olbert (2022) argue that firm-specific information is an important component in private firm disclosures.[19] Our paper therefore adds to this underexamined area by investigating whether private firm disclosures generate useful information for public peer firms, leading to higher pay-for-performance sensitivity. Indeed, Minnis and Shroff (2017) argue that the evidence about the optimal level

[18] Although Breuer (2021) and Breuer et al. (2022) analyse the externality of mandatory private firm disclosures, their focus is on industry-wide outcomes. Specifically, Breuer (2021) examines the impact of mandatory private firm disclosures on industry resource allocation and Breuer et al. (2022) do so for industrial innovation activity.

[19] Kim and Olbert (2022) find that private firm disclosures generate negative pecuniary externalities: global investors reallocate their capital away from public firms to more transparent private firms. We find a positive externality effect of private firm disclosures on public firms' PPS. Our paper differs from Kim and Olber (2022) as they focus on the role of accounting information in informing investors of firm value, while our paper studies the role of accounting information in improving the efficiency of compensation contracts.

of financial reporting regulation for private firms is far from clear and that more research into the issue is needed. From a policy-making perspective, our paper can provide useful insights into the regulation of private firm disclosures by highlighting some potentially unintended consequences of such disclosure in terms of its spillover onto public firms.

Second, our work is also closely related to the literature on pay-for-performance sensitivity. The extant literature has documented a variety of factors that determines the pay-for-performance sensitivity including market competition (Hubbard and Palia, 1995), managerial expertise (Murphy, 1986; Dutta, 2008), litigation risk (Dai et al., 2014), firm size and growth opportunity (Smith and Watts, 1992; Cichello, 2005; De Angelis and Grinstein, 2015), shareholder monitoring (Correa and Lel, 2016), political concern (Cao, 2019), financial report comparability (Albuquerque, 2009; Nam, 2020), and supplier competition (Carter et al., 2021). However, limited attention has been paid to the impact of private firm disclosures. Although some studies have examined the impact of relative performance on CEO compensation, most of them focus on the performance of public competitors (Albuquerque, 2009; Ozkan et al., 2012; Nam, 2020). For example, Ozkan et al. (2012) examine how the mandatory adoption of International Financial Reporting Standards (IFRS) in Europe affected the contractual usefulness of accounting information in executive compensation, as reflected in pay-for-performance sensitivity. Collectively, we still know little about the impact of privately listed peers' financial reports on public firms' compensation contracts. Our work adds evidence to the literature on compensation contracts.

2. Sample, variables, and model specification

2.1 Sample construction

We begin with the data on private firms' financial items from Bureau van Dijk's (BvD) Orbis database. The Orbis database provides financial information on close to 400 million companies from more than 200 countries and territories. Following Kim and Olbert (2022), we

construct the transparency measure at the country-industry-year level. We collect the data of global executive compensation from the S&P Capital IQ database. The Capital IQ database reports detailed information on compensation such as salary, bonus, and equity pay, as well as the data on firm governance and executive characteristics. We use the end-of-year exchange rates and gross domestic product (GDP) deflators from the World Bank to convert foreign compensation data into year-2000 U.S. dollars. When a firm has more than one CEO in a given year, we keep the one with the highest salary. International firm-level financial data is downloaded from Compustat North American and Compustat Global. We then construct our final sample by combining the firm-level financial and compensation data of public firms with the country-industry-year-level measure of private firm transparency. Following the standard practice of international studies, we exclude firms with total assets of less than $10 million and equity market value of less than $20 million (Foucault and Frésard, 2012; Correa and Lel, 2016).[20] In addition, we only keep firms with sales that are larger than zero, as well as those for which the necessary variables are not missing. Because the compensation data is more complete after 2000, we keep our sample period from 2000 to 2020. Ultimately, our sample comprises 49,332 firm-year observations for 9,676 unique firms that span 468 country-years and 22 industries based on the 2-digit NAICS classification.

We present the sample composition in Table 1. Panel A presents the sample composition by country/region. Our sample consists of 32 countries/regions, with the United States (10,638 firm-year observations), India (8,644 firm-year observations), and Hong Kong (5,450 firm-year observations) as the largest three regions in the sample. China has the highest private firm transparency, with a value of 14.674; and Spain, France, and Japan also have high transparency values, findings that are close to the summary statistics of Kim and Olbert (2022).

[20] Our results continue to hold if we exclude firms with total assets of less than $100 million. We report these results in robustness checks.

Panel B presents the sample composition by year. Both the sample size and private firm transparency steadily increase over the years. In Panel C, we report the sample distribution by industry.[21] We find that private firm transparency varies across industries with, as expected, the manufacturing sector having the highest transparency. Overall, these descriptive statistics are close to those reported by Kim and Olbert (2022).

2.2 Key independent variable: Private firm transparency

We measure private firm transparency following Kim and Olbert (2022). *Transp_Priv* is defined as the natural logarithm of one plus the aggregate number of non-missing financial statement line items that private firms disclose in a given country-industry-year, as follows:

$$Transp\_Priv_{j,m,t} = ln(1 + \sum_{k=1}^{N} Disclosed\ FS\ Items_{k,j,m,t})$$

$$= ln(1 + \sum_{k=1}^{N} \frac{Disclosed\ FS\ Items_{k,j,m,t}}{39N} * 39 * N).$$

Disclosed FS Items$_{k,j,m,t}$ is the number of non-missing financial items disclosed by firm *k* in industry *j*, country *m*, and year *t*. *N* denotes the total number of private firms with at least one financial statement item in a given country-industry-year and "39" represents the maximum number of line items a firm can disclose.[22] Kim and Olbert (2022) argue that this measure captures both the intensive and extensive margin effects of disclosure as $\sum_{k=1}^{N} \frac{Disclosed\ FS\ items_{k,j,m,t}}{39N}$ represents the "intensive margin" disclosure effect and *N* represents the "extensive margin" effect of disclosures (i.e., the number of disclosing private firms). The intensive margin gauges the quality of financial disclosures (by accessing granular line items) while the extensive margin gauges the breadth of the financial disclosures (by accessing more

[21] Following Kim and Olbert (2022), we classify industries into 10 unique NAICS sectors, and we remove the 'Other' sector after we impose different selection criteria.

[22] Kim and Olbert (2022) assume that each private firm can disclose up to 39 standardized financial statement items, as defined by BvD. That is, if there are 100 private firms in a given country-industry-year, the hypothetical full disclosure is 3,900. We detail the 39 standardized financial statement items in Appendix B.

private firms). Kim and Olbert (2022) conduct multiple tests to validate the measure's effectiveness, including a determinants test and the measure's response to regulatory shocks.[23]

2.3 Model specification

To investigate the effect of private firm transparency on public firms' pay-for-performance sensitivity, we perform the following regression:

$$Log\ (Cash\ Pay)_{i,t} = \beta_0 + \beta_1 Log(ROA)_{i,t-1} * Transp\_Priv_{j,m,t-2} + \beta_2 Log(ROA)_{i,t-1} + \beta_3 Transp\_Priv_{j,m,t-2} + \beta_4 Tranp\_publ_{j,m,t-2} + \beta_5 Prop\_priv_{j,m,t-2} + \beta_6 Size_{i,t-1} + \beta_7 Lev_{i,t-1} + \beta_8 BM_{i,t-1} + \beta_9 CEO\ age_{i,t-1} + \beta_{10} Dual_{i,t-1} + Firm\ F.E. + Country * Year\ F.E. + \varepsilon_{i,t} \quad (1)$$

Log (Cash pay) is the natural logarithm of one plus cash compensation which is the sum of salary plus bonus (Carter et al., 2021) of firm *i* in year *t*. We focus on cash compensation as prior studies suggest that cash compensation is mainly affected by accounting performance (Bushman and Smith, 2001). Firm performance is measured by *Log(ROA)*, defined as the natural logarithm of one plus earnings before interest and taxes divided by total assets at the beginning of the year (Albuquerque, 2014).[24] $Transp\_Priv_{j,m,t-2}$ is private firm transparency in industry *j* in country *m* during year *t-2*. The 2-year lagged transparency takes into account the typical 1-year lag between the fiscal year end and the date when private firms publicize their financial statements as well as additional time for the database vendor (e.g., BvD) to collect, standardize, and disseminate data (Moody's, 2021; Kim and Olbert, 2022). We add two more country-industry-year controls, including public firm transparency (*Transp_Publ*) and private firm proportion (*Prop_Priv*) to the regression, as these two factors could possibly correlate with private firm transparency and thus affect public firms' compensation contracts. Additionally, we control for a set of firm-level and CEO-level characteristics, including *Size*

[23] We also run the regression (at country-industry-year level) of firm performance on private firms' aggregate disclosure, finding no significant relation. This result rules out the possibility that firms with strong (or poor) financial performance are more likely to disclose.

[24] Our results hold if we don't use the logarithm transformation of ROA.

(the natural logarithm of total assets), *Lev* (total liabilities divided by total assets), *BM* (the book value of equity scaled by its market value), *CEO age* (the CEO's age in years), and *Dual* (a dummy variable equal to one if the CEO is also the chairman of the board of directors, zero otherwise). Finally, we include firm fixed effects and country-year fixed effects to capture the differences in compensation across firms and country-years.[25]

The coefficient of interest in equation (1) is β_1. If the informativeness view is supported, we predict a positive association between private firm transparency and public firms' pay-for-performance sensitivity. In other words, private firm disclosures increase the informativeness of public firms' accounting earnings, which should be given a greater weight in incentive contracts.

2.4 Descriptive statistics

Table 2 presents the summary statistics for CEO compensation and control variables used in our main model specification. To mitigate the impact of outliers, we winsorize all continuous variables at the 1st and 99th percentiles. On average, the CEOs in our sample received $488,000 in cash compensation. Meanwhile, the mean (median) of *Log(ROA)* is 0.046 (0.067) with a standard deviation of 0.182, which is similar to the value reported in recent compensation studies (e.g., Nam, 2020). In addition, private firm transparency (*Transp_Priv*) has an average (median) value of 11.311 (11.048), with standard deviation of 2.609, similar to what Kim and Olbert (2022) reported. Finally, public firm transparency (*Transp_Publ*) and private firm proportion (*Prop_Priv*) average 8.657 and 91.659, respectively, which are also consistent with Kim and Olbert (2022).

[25] The inclusion of country-year fixed effect mitigates the concern that our results are driven by country attributes.

3. Empirical results

3.1 Private firm disclosures and public firms' pay-for-performance sensitivity

Table 3 presents the results of estimating equation (1). Robust t-statistics are reported in parentheses and standard errors are clustered at the country-by-industry level. In column (1), we first report a positive and significant relation between accounting earnings and CEO cash compensation. In column (2), we examine the impact of private firm transparency on the link between firm performance and CEO cash compensation. Following Carter et al. (2021), to reduce multicollinearity arising from the introduction of interaction terms and to facilitate interpretation of coefficient estimates, we mean-center continuous variables that are interacted prior to computing the interaction (Aiken and West, 1991).[26] We find that the coefficients on the interaction term (*Log(ROA)*Transp_Priv*) are significantly positive at the 1% level. This result is suggestive of the informativeness view. More precisely, private firm disclosures increase the informativeness of public firms' earnings by helping public firms filter out common shocks from earnings, making it a better measure for CEO efforts. The results in column (2) suggest that for public firms with private firm transparency at the 25th percentile, a 1% increase in ROA is associated with approximately a 2.41% increase in compensation. For firms with private firm transparency at the 75th percentile, the same change in ROA is associated with approximately a 3.27% increase in compensation, which translates into a 35.32% increase in the incentive intensity.[27] This outcome is economically important and comparable to other studies on pay-for-performance sensitivity.[28] Additionally, the coefficients on control

[26] Our results hold without mean-centering. The mean-centering method is to deduct sample mean from the variable and it will not change the coefficient and significance of the interaction term (i.e., *Log(ROA)*Transp_Priv*). However, it will change the coefficients of *log(ROA)* and *Transp_Priv.*

[27] The coefficient of *Log(ROA)*Transp_Priv* is 0.2048 and the coefficient of *Log(ROA)* is 0.4648. At the 25th percentile, the *Transp_Priv* is 9.520 and 1% change in *ROA* is associated with 2.41% (=(0.2048*9.520+0.4648)/100) change in *Cash pay.* At the 75th percentile, the *Transp_Priv* is 13.684 and 1% change in *ROA* is associated with 3.27% (=(0.2048*13.684 +0.4648)/100) change in *Cash pay*. Finally, 3.27%/2.41%-1=35.32%.

[28] For example, Carter et al. (2021) report a 59% increase in pay-for-performance sensitivity because of supplier competition.

variables are consistent with prior literature. Specifically, firm size is positively related with CEO cash compensation while leverage is negatively related. Moreover, we show that CEO cash compensation decreases with age, indicating that younger CEOs are rewarded with higher pay.

3.2 Robustness checks

3.2.1 Alternative measures

We perform a series of robustness tests to validate our main test's findings. First, we examine whether our findings are robust to alternative measures of firm performance and private firm transparency. We present the results in Panel A of Table 4. First, we use the change of logarithm of cash compensation *(*$\Delta Cash\ pay$) and the change of ROA *(*ΔROA) to reexamine our results (Carter et al., 2021). In column (1), we continue to see a positive and significant impact of private firm transparency on public firms' pay-for-performance sensitivity. Next, in column (2), we use the industry-adjusted ROA (*Adj.ROA*) as the alternative measure of firm performance. *Adj.ROA* is calculated as a firm's *ROA* in excess of the median *ROA* of public peers in the same industry year. Column (2) shows that our results are robust to this industry-adjusted *ROA*. In other words, when we account for the impact from public peers, i.e., deducting industry median ROA, disclosures by private firm peers additionally play a role. Next, in column (3), we redefine firm performance as earnings before extraordinary items divided by total assets at the beginning of the year (Albuquerque, 2014; Nam, 2020). We find that our results are also robust to this alternative measure of firm performance. In column (4), following Kim and Olbert (2022), we disentangle the aggregate private firm transparency measure into "intensive" (*Transp_Priv%*) and "extensive" (*Number_Priv*) margin components (see Section 2.2). We find that both margins significantly increase public firms' pay-for-performance sensitivity, with the extensive margin having a somewhat stronger effect. Finally, in column (5), we add additional control variables into the regression. Previous literature finds

that CEO compensation could be affected by stock return performance, stock return volatility, CEO tenure, and CEO directorships (Correa and Lel, 2016; Nam, 2020; Carter et al., 2021). We find that our results continue to hold when controlling for these factors. Taken together, the results in Panel A of Table 4 show that our results are robust to alternative performance and transparency measures.

3.2.2 Alternative samples

In this section, we reexamine our results by using alternative samples. First of all, in column (1), we set stricter sample screening criteria by excluding firms with total assets of less than $100 million (Correa and Lel, 2016). This change shows that our results are robust to the exclusion of these firms. Next, in column (2), we restrict our sample period to 2005-2019. We start in 2005 as the data for private firm disclosures are more comprehensive after 2005, and we stop in 2019 to exclude the impact of COVID-19. We find that the coefficient on the variable of interest remains positive and significant for this alternative sample. In column (3), we follow Kim and Olbert (2022) by dropping from the sample the four countries (Australia, Israel, New Zealand, and the United States) that have the lowest likelihood of exogenous variation in private firm disclosures. As expected, we continue to find a positive impact of private firm transparency on public firms' pay-for-performance sensitivity. Column (4) excludes the three regions (the United States, Hong Kong, and India) from the sample to mitigate the concern that our results are driven by regions with the largest observations. Finally, in column (5), we delete firms in regulatory industries (SIC codes 4000-4999 and 6000-6999) as the incentive contracts of these firms may not be closely related with firm performance. In both columns (4) and (5), we observe a positive and significant coefficient on *Log(ROA)*Transp_Priv.*

3.2.3 Alternative model specifications

Last, we examine whether our results are sensitive to firm- or country-year heterogeneity. Specifically, we examine how the effect of private firm disclosures varies when imposing different (and more stringent) fixed effects or cluster levels from those used in our baseline specification. We report the results in Panel C of Table 4. Our first test imposes more stringent clustering in our model. Clustered standard errors allow the error terms to be correlated within but not across clusters. Accordingly, Abadie et al. (2017) argue that larger clusters have less bias, so bigger and more aggregated clusters are recommended. In column (1) of Panel C, we therefore use a bigger cluster, i.e., a cluster of country, industry, and year, as an alternative way of clustering standard errors.[29] More precisely, we assume that the error terms are correlated for firms within the same country, industry, and year. As our key independent variable, *Transp_Priv*, is measured at country-industry-year level, this clustering method well meets the correlation assumption. The results in column (1) show that the significance of the coefficient on *Q*Transp_Priv* decreases, although it still holds at the 5% level. Next, in column (2), we use a different cluster level (i.e., country-year cluster) from the country-industry cluster in our main regression. This change shows that our results still hold. In the succeeding columns, we use different fixed effects to further validate the robustness. In column (3), we replace country-year fixed effects with country-industry fixed effects and year fixed effects; we find that the coefficient on *Log(ROA)*Transp_Priv* remains positive and significant at the 1% level. In column (4), based on the change in column (3), we impose a greater cluster level (i.e., country cluster) in the regression, still finding a positive and significant coefficient on *Log(ROA)*Transp_Priv.* Finally, in column (5), we use the firm fixed effect and industry-year fixed effect, with country level cluster in the model. We find that our

[29] In our main regression, there are 491 country-industry clusters, whereas there are only 75 clusters in column (1) of Panel C in Table 4, which consists of 32 country-clusters, 22 industry (2-digit)- clusters, and 21 year-clusters.

earlier evidence is still robust at the 1% level. Collectively, the results in Table 4 increase our confidence in the robustness of our findings.

4. Endogeneity tests: Electronic business registers

One concern about our analysis is that private firm disclosures and public firms' pay-for-performance sensitivity could be endogenously determined. In this section, we therefore examine the causal relation between private firm disclosures and public firms' pay-for-performance sensitivity. Specifically, our empirical findings may suffer from endogeneity threats that stem from reverse causality or omitted variables. For reverse causality, private firms could increase their disclosures in anticipation of the worsening CEO performance valuation of public firms, thereby attracting capital from public firms. Although we lagged private firm disclosures by 2 years, we nevertheless exercise caution in interpreting the evidence because the 2-year lag is due to the typical reporting lag as well as a 1-year data collection lag. In other words, we cannot completely eliminate reverse causality concerns.

Endogeneity could also arise from omitted variables. If the omitted variables increase both private firm transparency and public firms' pay-for-performance sensitivity, then the link we observe could be spurious. For example, institutional and economic conditions could simultaneously affect private firm transparency and public firms' pay-for-performance sensitivity.[30] In addition, the adoption of the laws regarding CEO compensation could affect public firms' pay-for-performance sensitivity while also having externalities on private firm disclosures (Correa and Lel, 2016).[31]

We tackle the concern of reverse causality and omitted variables in a DiD framework. Specifically, following Kim and Olbert (2022), we use the staggered implementation of

[30] To some extent, our inclusion of country-year fixed effects mitigates the impact of a macro-environment change.
[31] For example, the say-on-pay (SoP) laws provide shareholders with the ability to vote on their firms' compensation policies on a periodic basis. SoP laws significantly increase a public firm's pay-for-performance sensitivity and could also affect a private firm's incentive to increase disclosure to avoid monitoring costs.

electronic business registers across Europe as a proxy for the change of private firm transparency. Breuer and Breuer (2022) argue that the staggered adoption of electronic business registers across European countries is exogenous, which supports the validity of identifying assumptions in a DiD design. The implementation of the business registers aims to harmonize the information environments across the European countries. More importantly, the electronic one-stop access facilitates the dissemination of private firms' financial statements and subsequently allows for substantial improvement in private firm transparency. In Germany, for example, limited-liability firms previously filed hard copies of their financial statements with local courts, and firms published them in physical newspapers, which limited the interested public's ease and speed of information access. Meanwhile, we want to emphasize that the electronic business registers would have a lower impact on public firms' transparency because they are required to publicize their financial statements prior to the adoption of business registers. We use the following model specifications for our DiD analysis:

$$Log\ (Cash\ pay)_{i,t} = \alpha_0 + \alpha_1 Log(ROA)_{i,t-1} * Post_{m,t} + \alpha_2 Log(ROA)_{i,t-1} + \alpha_3 Tranp\_Publ_{j,m,t-2} +$$
$$\alpha_4 Prop\_Priv_{j,m,t-2} + \alpha_5 Size_{i,t-1} + \alpha_6 Lev_{i,t-1} + \alpha_7 BM_{i,t-1} + \alpha_8 CEO\ age_{i,t-1} + \alpha_9 Dual_{i,t-1} +$$
$$Firm\ F.E. + Country * Year\ F.E. + \varepsilon_{i,t}. \quad (2)$$

$Post_{m,t}$ is an indicator variable equal to one for country m during or after the implementation, zero otherwise. The single term of *Post* is dropped in the model to avoid the multicollinearity with country-year fixed effects. The controls are the same as those we used in baseline regression. Our coefficient of interest is α_1, which compares the change in pay-for-performance sensitivity for the treated firms versus the control firms, as a result of the electronic business register implementation. Because the implementation of business registers increases private firm transparency, we expect α_1 to be positive. Table 5 reports the DiD results. We first show the basic results of the DiD model (Panel A) and then validate our DiD research design (Panel B). In addition, we use two different samples to examine our DiD results: the full list of countries (with all non-EU firms in the control group) and only European countries. In

the first two columns of Panel A, we see that the coefficients of the interaction term between *Post* and firm performance are positive and statistically significant, suggesting that private firm transparency significantly increases public firms' pay-for-performance sensitivity.

Column (3) tests the parallel assumption of our DiD design and investigates the dynamic effects of electronic business register adoption on pay-for-performance sensitivity. We first restrict the sample period for the treated firms to a [-7, +7] window. Next, we decompose *Post* into nine indicators, *Pre_4*, *Pre_3*, *Pre_2*, *Pre_1*, *Post_0*, *Post_1*, *Post_2*, *Post_3*, *Post_4+*, which successively indicate 4 years prior to the adoption year to 4 years after it. Year -1 (*Pre_1*) is set as the benchmark year and omitted from the analysis. We find that the coefficients on the interactions between the pre-year indicators and *Log(ROA)* are all insignificant, suggesting that there is no significant difference in pay-for-performance sensitivity between the treated and control firms before the shock; the parallel trends assumption therefore holds. In addition, the interaction coefficients become significant starting from year +1, a trend that persists throughout the post-period.

Figure 1 further illustrates the dynamic change. The figure plots the interaction coefficients between *Log(ROA)* and the relative time indicators in the window of [-7, +7]. Consistent with Table 5, we take year -1 as the benchmark year. The coefficients are estimated within 90% confidence intervals. Visually, there are no significant pre-trend differences in pay-for-performance sensitivity between the treated and control groups. The differences only become distinguishable from the implementation year. These results indicate that the parallel trend assumption holds in our DiD analysis.

In Panel B of Table 5, we conduct additional tests to validate our DiD results. First, we examine our DiD estimates using the stacked DiD design (Gormley and Matsa, 2011; Cengiz et al., 2019; Baker et al., 2022). Baker et al. (2022) indicate that the estimates of the staggered DiD could be biased when treatment effect heterogeneity exists either across groups or over

time because, in a staggered DiD, earlier-treated units act as controls for the later-treated units. The changes in the earlier-treated units' outcomes may reflect changes in the treatment effects over time, resulting in DiD estimates that reflect treatment effect heterogeneity between different treatment cohorts. To address this concern, we implement a stacked DiD analysis.[32] Specifically, we construct a "clean" cohort for each time-specific implementation. Each cohort is observed in a [-10, 10] window, 10 years before the adoption year to 10 years after it.[33] These cohorts are then stacked together, and the regression is estimated on the stacked dataset, with cohort-firm and cohort-time fixed effects. Standard errors are clustered at the country-cohort level. Column (1) reports the results of the stacked DiD. We find that the coefficients on *Post* Log(ROA)* remain positive and significant, both for the full and EU samples. Moreover, we find that the percentage of never-treated observations in the full sample is 78%.[34] This high percentage also mitigates the bias concern in our staggered DiD analysis because the larger the percentage of never-treated units, the less problematic are the associated biases (Baker et al., 2022).

We conduct randomization analysis in column (3). Specifically, we randomly assign adoption years to EU countries. *Post* is equal to one for firms in assigned treated countries after the assigned adoption years; it is equal to zero before the assigned adoption years or for firms in the assigned control countries. If the documented link between private firm transparency and pay-for-performance sensitivity is driven by omitted variables in the regression, we would also observe a statistically significant coefficient on *Post*Q*. However, the coefficient on *Post*Q* is not significant. Next, in column (5), we use a matching approach to eliminate the concern that the treatment and control groups are not fully comparable. Each treated firm is matched to a control firm in the same year and industry that has the closest firm size. For the treatment

[32] The idea behind a stacked DiD is to create event-specific datasets (or cohorts), which include only "clean" controls (e.g., never-treated units) within the treatment window.
[33] The results hold when we use shorter windows, including [-7, +7] and [-5, +5].
[34] In our full sample (with observations of 49,332), the number of never-treated observations is 38,466.

group, firm size is based on their mean in the 3 years prior to the reform year to hold the pre-adoption-period trend parallel. For the control group, as there are no clear reform years, we calculate their mean firm size for each year on a 3-year rolling basis. *Treat* is a dummy variable that is equal to one for countries that adopt electronic business registers, and zero otherwise. *Post_* is a dummy variable equal to one in the post-adoption period (for both the treated and control firms), zero otherwise. The positive coefficient on *Log(ROA)*Treat*Post_* suggests that relative to the matched control firms, the treated firms' pay-for-performance sensitivity significantly increases after the electronic business register implementation, a result that again supports our main findings.

5. Mechanism tests

In this section, we conduct three mechanism tests to corroborate the informativeness view. First of all, we expect the effect of private firm disclosures to be stronger when public firms have higher information asymmetry. Second, we expect the informativeness effect of private firm disclosures to be stronger when public firms show higher production function uncertainty. Last, private firm disclosures should be more informative when public firms have fewer alternative sources to evaluate CEOs' performance.

5.1 The role of information asymmetry

We expect the impact of private firm disclosures to be stronger when public firms have higher information asymmetry. When information asymmetry is high, it is difficult for shareholders to monitor and to evaluate managers' efforts. Then, the disclosures of private firms will be more useful to help shareholders and compensation committees to evaluate CEOs' performance. We use two measures to empirically assess the role of information asymmetry: firm size and bid-ask spread. According to previous literature, firms that are smaller in size and that have higher bid-ask spreads tend to be less transparent and have higher levels of

information asymmetry (Lin et al., 2013; Holden and Jacobsen, 2014).[35] We define firm size as the logarithm of sales and bid-ask spread as the difference between ask price and bid price, divided by the midpoint of bid and ask price. We then split our sample into two groups by comparing with country-year median. Specifically, a firm is classified as having high information asymmetry when its size (bid-ask spread) is lower (higher) than the country-year median.

Panel A of Table 6 reports the estimates for regressions by dividing our sample into two groups based on information asymmetry. Consistent with our expectation, the first two columns show that the coefficient of *Log(ROA)* Transp_Priv* is significant in the subgroup of firms with small size while no significant coefficient is observed in the subgroup of firms with large size. Subsequently, we test the coefficient difference of *Log(ROA)* Transp_Priv* between the two subgroups, finding that the difference is significant at the 1% level. Meanwhile, we find that the impact of private firm disclosure is only significant in the subgroup of firms with higher bid-ask spreads and the coefficient difference between the two subgroups is significant at the 10% level. In sum, Panel A of Table 7 shows that our main findings are stronger for firms with higher information asymmetry, supporting our argument that private firm disclosures increase the informativeness of earnings of public firms.

5.2 The role of production function uncertainty

Our second mechanism test discusses the variation in production uncertainty. We expect a larger effect of private firm disclosures when public firms have higher production function uncertainty. When production uncertainty is high, it is costly and difficult for these firms to use accounting earnings as a measure for CEOs' efforts. For example, Carter et al. (2021) argue that the costs of providing earnings-based incentives will be larger if firms have

[35] To calculate bid-ask spread, we download the daily stock data from CRSP (for the United States), from Compustat NA (for Canada), and from Compustat Global (for other countries).

high production risk. Therefore, the financial information disclosed by private firms would be more important and useful for these firms when designing compensation contracts. We use two measures as proxies for the uncertainty of production: cash flow volatility and analyst forecast dispersion (Chen et al., 2021). Cash flow volatility is calculated as the standard deviation of operating cash flow for the previous 3 years. Analyst forecast dispersion is calculated as the ratio of the standard deviation of analyst forecasts of earnings per share to the absolute value of the forecasts' consensus mean.[36] Next, we split our sample into two groups by comparing cash flow volatility (or analyst forecast dispersion) with country-year median. In particular, a firm is classified as having high production uncertainty when its cash flow volatility (forecast dispersion) is higher (higher) than the country-year median.

Panel B of Table 7 reports the results. The first two columns show that the coefficient of *Log(ROA)*Transp_Priv* is positive and significant only in the subgroup with high cash flow volatility. Moreover, the coefficient difference between the high volatility group and low volatility group is significant at the 1% level. This finding indicates that the informativeness role of private firm disclosures is more likely to happen when public firms have difficulty in using firm performance to measure CEOs' efforts. Again, consistent with our expectation, columns (3) and (4) show that the impact of private firm disclosures is only significant for firms with higher analyst forecast dispersion and the coefficients between the two groups are significantly different at the 10% level.

5.3 The role of learning sources

Finally, we assess how the alternative learning sources affect the link between private firm transparency and public firms' pay-for-performance sensitivity. Specifically, when firms have fewer alternative sources from which to learn, or we say, as benchmarks of CEOs'

[36] The data of analyst forecasts and analyst coverage are obtained from I/B/E/S.

performance, private firm disclosures would be more informative to these firms. In other words, these firms are more likely to depend on the information from private firm disclosures in compensation design because less useful information is available from other sources. We measure other sources of information using analyst coverage and industry concentration (Edmans et al., 2017). In particular, firms with lower analyst coverage are expected to receive less feedback from analysts, and firms in concentrated industries have difficulty learning from industrial peers. We define *analyst coverage* as the natural logarithm of one plus the number of analysts covering the firm in a fiscal year. *Industry concentration* is defined as the sales-based Herfindahl index (*HHI*) for each industry-country-year. Industry is classified by 2-digit NAICS code. A higher *HHI* indicates a higher industry concentration and fewer public industry peers. Similar to the previous section, we subsequently split our sample into two groups by comparing analyst coverage (or *HHI*) with its country-year median. In particular, a firm is classified as having fewer information sources when its analyst coverage (*HHI*) is lower (higher) than the country-year median.

We report our results in Panel C of Table 7. As expected, we find that the coefficient of *Log (ROA)* Transp_Priv* is positive and significant only for firms in concentrated industries and for firms with low analyst coverage. We test the difference in coefficients for firms with low analyst coverage versus those with high analyst coverage, finding that the difference is significant at the 1% level. Meanwhile, the coefficients of *Log (ROA)* Transp_Priv* are also significantly different at the 10% level when dividing the sample by using industry concentration. These results support our argument that private firm disclosures increase the earnings informativeness of public firms, especially when these firms have fewer alternative information sources as CEOs' performance benchmarks. Overall, these results support our hypothesis that private firm disclosures increase the earnings informativeness of public firms and subsequently pay-for-performance sensitivity.

6. Supplementary analyses

In this section, we implement three supplementary analyses. First, we examine whether private firm disclosure affect the pay-for-performance sensitivity when using stock return as firm performance. Second, we examine whether total CEO pay (rather than cash pay we measured in the main result) is affected by private firm transparency. Finally, we study the role of different types of financial statements by splitting our private firm disclosures measure into three subcomponents – balance sheet items, income statement items, and footnote items.

6.1 The impact on stock return informativeness

Having established private firm disclosures positively affecting accounting earnings informativeness as the channel through which private firm disclosures affect pay-for-performance sensitivity, our additional test examines whether private firm disclosures play a role in price-based earnings. In our paper, the transparency measure we calculated is based on a set of accounting items. We therefore expect that private firm transparency has a more direct effect on accounting earnings than on price-based earnings. Specifically, for stock returns, on the one hand, the aggregate disclosures of private firms could convey useful industry-wide information, which would then influence public firms' stock prices, making them a more informative measure for CEOs' performance. On the other hand, private firm disclosures could crowd out the acquisition of external information because the disclosures preempt informed traders' information advantage, making stock return a less informative measure for CEOs' performance (Jayaraman and Wu, 2019; Goldstein and Yang, 2019; Bird et al., 2021). Thus, these two effects may cancel each other out, resulting in no discernible impact from private firm transparency.

We present the results in Panel A of Table 7. As cash compensation is less related with price-based earnings, we use non-cash compensation to examine the link. Non-cash compensation includes restricted stock awards, stock grants, long-term incentive plans, option

awards, pension plans, and all other compensation (Correa and Lel, 2016; Chen et al., 2020). In the first column, we do observe a positive and significant association between stock returns and CEO non-cash compensation, a result that supports previous literature (Carter et al., 2007). We then connect private firm transparency with stock returns, failing to find that private firm transparency significantly affects the pay-for-performance sensitivity. This result further supports our argument that private firm transparency has a more direct and clearer impact on the informativeness of accounting-based earnings.

6.2 The impact on total compensation

We next evaluate whether private firm disclosures play a role for CEO total compensation, including salary, bonus, restricted stock awards, stock grants, long-term incentive plans, option awards, pension plans, and all other compensation. Column (1) shows that *Log (ROA)* has a positive and significant coefficient, suggesting that CEO total compensation is positively correlated with accounting-based earnings. Next, in column (2), we find that the coefficient on *Log (ROA)* Transp_Priv* is positive and significant at the 1% level, suggesting that private firm transparency significantly increases the pay-for-performance sensitivity when we focus on CEO total compensation. This finding is also consistent with prior literature (Correa and Lel, 2016).

6.3 The role of financial statement types

In this section, we examine whether the effect of private firm disclosure varies with different types of financial statements. We divide private firm disclosure measures into three subcomponents – balance sheet items, income statement items, and footnote items. We then calculate the transparency measure for the respective subcomponent. In Panel C of Table 7, we find that each of the subcomponents individually and positively affects public firms' pay-for-performance sensitivity. Specifically, we find that respective 10% increases in balance sheet items, income statement items, and footnote items are associated with a 1.994%, 1.868%, and

1.603% increase in pay-for-performance sensitivity. The statistically significant coefficients across all specifications suggest that different financial items make similar contributions to the earnings-informativeness effect. This finding also echoes Ferracuti and Stubben's (2019) call for more research to understand the role of specific financial statement items or disclosed items in a firm's decision making.

7. Conclusion

This paper examines whether private firm disclosures impose positive or negative externalities on public firms' executive compensation contracting. In theory, the increase in private firm disclosures could generate positive spillover effects onto the earnings informativeness of public firms, leading to higher pay-for-performance sensitivity. However, the increase in private firm disclosures could also attract investors (especially large shareholders) from public firms to private firms, leading to a reduced monitoring of public firms and subsequently lower pay-for-performance sensitivity. In this paper, we consider the tension in the relation between private firm disclosures and public firms' executive compensation contracts, as well as potential externalities of private firm disclosures. In doing so, our paper empirically studies the link between private firm disclosures and public firms' pay-for-performance sensitivity.

Using a sample of 32 countries from 2000 to 2020, we document a positive link between private firm transparency and public firms' pay-for-performance sensitivity. We infer from this finding that private firm disclosures generate a positive externality for public firms. That is, the information disclosed by private firms acts as a benchmark for public firms to evaluate their CEOs' performance. In other words, private firm disclosures increase the earnings informativeness of public firms. Our mechanism tests show that the positive association between private firm disclosures and pay-for-performance sensitivity is more pronounced

when public firms have higher information asymmetry, when firms have greater production uncertainty, and when firms have fewer alternative sources from which they can learn.

We note a few caveats to our research. First, we acknowledge the possibility of endogeneity in our baseline result, which shows a positive association between private firm disclosures and public firms' pay-for-performance sensitivity. We seek to mitigate this concern via additional tests that use the staggered implementation of electronic business registers as a plausibly exogenous shock. In these tests, we continue to find that private firm disclosures significantly increase public firms' pay-for-performance sensitivity. Second, while we find that such disclosures serve as a usable benchmark for public firms to evaluate their CEOs' performance, our findings cannot fully address the welfare implications of private firm disclosures because they do not consider the impact on other stakeholders. It would be interesting to examine the effect of private firm disclosures on other stakeholders, including debtholders, government, analysts, and auditors.

Our paper contributes to the literature on compensation contracts by studying whether and how private firm disclosures act as one method of relative performance evaluation for public firms to increase their assessment of CEOs. While evidence of relative performance evaluation is well established, evidence that relates to the impact of private firm disclosures is limited. Our paper also contributes to the literature on private firm disclosures by providing new evidence on externality. Overall, our paper adds to the private firm disclosure literature and helps researchers and regulators better understand the potential externalities of regulating private firms' financial reporting.

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Appendix

Appendix A. Variable Definitions

Variable	Definition
Log (Cash Pay)	CEO cash compensation, defined as the natural logarithm of one plus cash compensation. Cash compensation is the sum of salary plus bonus (Carter et al., 2021).
Log (ROA)	Firm performance, defined as the natural logarithm of 1 plus earnings before interest and taxes divided by total assets at the beginning of the year.
Transp_Priv	Private firm financial transparency, defined as the natural logarithm of one plus the number of non-missing financial statement line items disclosed by private firms in a given country-industry-year.
Transp_Publ	Public firm financial transparency, defined as the natural logarithm of one plus the number of non-missing financial statement line items disclosed by public firms in each country-industry-year.
Prop_Priv	The ratio of private firms with observable financial statements to all (public and private) firms with observable financial statements in Orbis, multiplied by 100.
Size	Firm size, defined as the natural logarithm of total assets.
Lev	Leverage, defined as total liabilities divided by total assets.
BM	Book to market ratio, defined as the book value of equity, divided by market value of equity.
CEO age	The CEO's age in years.
Dual	Equals one if the CEO is also the chairman of the board of directors, zero otherwise.
Δ*Cash pay*	Change in *Log (Cash Pay)* from year t to year t+1.
Δ*ROA*	Change in *ROA* from year t to year t+1.
Adj.ROA	The return on assets of the firm in excess of its corresponding industry median value in a given year at the level of two-digit industry code.
ROA2	Defined as the natural logarithm of 1 plus earnings before extraordinary items divided by total assets at the beginning of the year.
Transp_Priv%	Intensive margin of private firm financial transparency, defined as the number of non-missing financial statement line items disclosed by private firms in each investee-industry-year, divided by the total number of line items that these private firms can hypothetically disclose. The hypothetical full disclosure is based on 39 standardized financial statement items.
Number_Priv	Extensive margin of private firm transparency, defined as the natural logarithm of the total number of private firms with at least one financial statement item observable in a given investee-industry-year.
Return	Annual stock return, which is compounded by monthly stock return for the U.S. and Canada stocks while compounded by daily return for stocks in the rest of the world.
Return volatility	Annualized standard deviation of stock returns.
Tenure	The number of years the CEO has with the firm.
Directorships	The number of directorships of the CEO.
Analyst coverage	The natural logarithm of one plus the number of analysts covering the firm in a fiscal year.
Bid-ask spread	The difference between ask price and bid price, divided by the midpoint of bid and ask price.
Cash flow volatility	The standard deviation of operating cash flow for the previous three years.
Forecast dispersion	The ratio of the standard deviation of analyst forecasts of earnings per share to the absolute value of the forecasts' consensus mean.
Industry concentration	Industry concentration defined as the sales-based Herfindahl index (HHI) for each industry-country-year. Industry is classified by 2-digit NAICS code.
Log (Non-cash Pay)	CEO non-cash compensation, defined as the natural logarithm of one plus non-cash compensation. Non-cash compensation is the sum of restricted awards, stock grants, long-term incentive plans, option awards, pension plans, and all other compensation (Correa and Lel, 2016).
Log (Total Pay)	CEO total compensation, defined as the sum of cash and non-cash compensation.

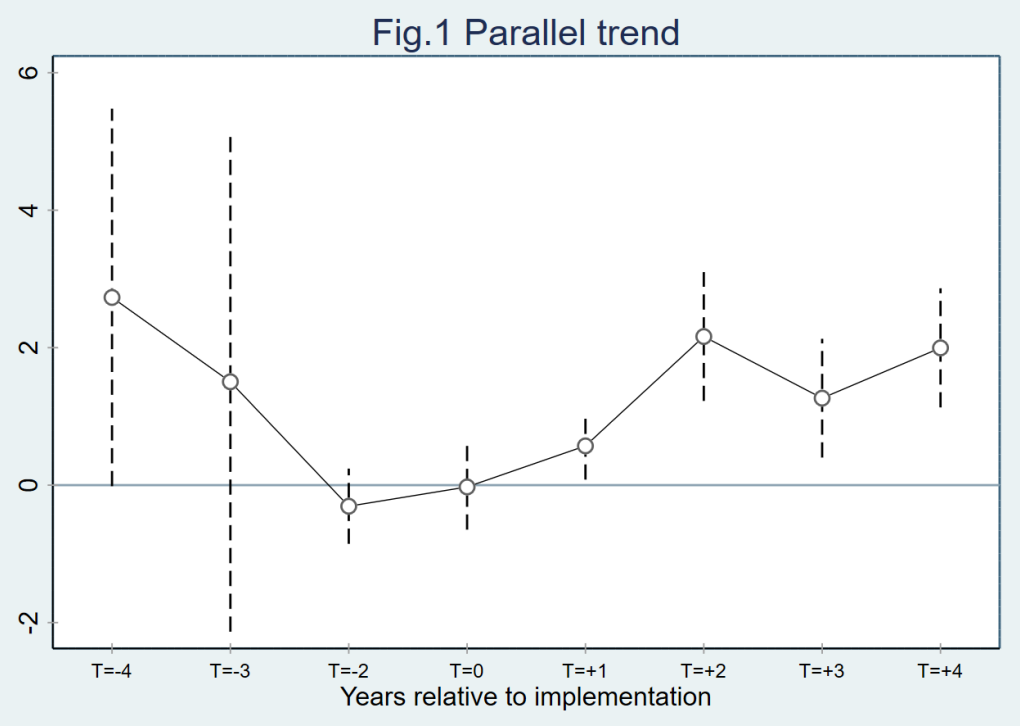
Post	An indicator variable equal to one for the treated countries after the adoption of an electronic business register, and zero otherwise.
*Post_*	An indicator variable equal to one for the treated and matched control firms after the adoption of an electronic business register, and zero otherwise.
Treat	An indicator variable equal to one for firms in countries that adopt electronic business registers, and zero otherwise.
Pre_4-	A dummy variable equal to one for four or more years before the implementation year, and zero otherwise.
Pre_3	A dummy variable equal to one for three years before the implementation year, and zero otherwise.
Pre_2	A dummy variable equal to one for two years before the implementation year, and zero otherwise.
Pre_1	A dummy variable equal to one for one year before the implementation year, and zero otherwise.
Post_0	A dummy variable equal to one for the implementation year, and zero otherwise.
Post_1	A dummy variable equal to one for one year after the implementation year, and zero otherwise.
Post_2	A dummy variable equal to one for two years after the implementation year, and zero otherwise.
Post_3	A dummy variable equal to one for three years after the implementation year, and zero otherwise.
Post_4+	A dummy variable equal to one for four or more years after the implementation year, and zero otherwise.

Appendix B. The 39 Standardized Financial Statement Items Observable in Orbis

Balance Sheet Items	
Fixed Assets	Equity Funds
Fixed Assets: Intangibles	Equity Capital
Fixed Assets: Tangibles	Equity Funds Other
Fixed Assets: Other	Noncurrent Liabilities
Current Assets	Noncurrent Liabilities: Long-term Debt
Current Assets: Stock	Noncurrent Liabilities: Other
Current Assets: Receivables	Current Liabilities
Current Assets: Other	Current Liabilities: Loans
Cash	Current Liabilities: Creditors
Total Assets	Current Liabilities: Other
	Provisions
	Total Equity and Liabilities
Income Statement (P&L) Items	***Footnote Disclosure Items***
Revenue	Number Employees
Costs of Goods Sold (COGS)	Export Revenue
Gross Profit	Labor Expenses
Operating Expenses	Material Expenses
Earnings Before Interest and Taxes (EBIT)	Depreciation & Amortization
Financial Revenue	Interest Expense
Financial Expenses	R&D Expense
Earnings Before Taxes (EBT)	
Tax Expense	
Net Income	

Figure

Figure 1. Electronic business registers and public firm pay-for performance sensitivity
Figure 1 presents the change of pay-for performance sensitivity around the adoption of electronic business registers. We restrict the window to [-7,+7] and we use T=-1 as the benchmark year. The coefficients are estimated at 90% confident intervals.



Tables

Table 1. Sample distribution
This table presents the distribution of our sample. Panel A presents the sample distribution and the average value of *Transp_Priv* by country/region. Panel B presents the sample distribution and the average value of *Transp_Priv* by year. Panel C presents the sample distribution and the average value of *Transp_Priv* by industry. Following Kim and Olbert (2022), the industry is classified into ten 10 NAICS sectors; the 'Other sector' is missing after imposing different selection criteria.

Panel A: Sample distribution by country/region

Country/region	*N*	*Transp_Priv*	Country	*N*	*Transp_Priv*
Australia	2,342	9.774	Italy	595	13.472
Austria	197	11.861	Japan	709	13.787
Bangladesh	38	5.036	Malaysia	625	12.508
Belgium	222	13.12	Netherlands	457	12.879
Bermuda	48	6.298	Norway	614	12.437
Canada	1,115	7.837	Philippines	51	10.305
Cayman Islands	52	7.737	Poland	144	13.108
China	3,246	14.674	Portugal	90	13.62
Denmark	173	10.773	Singapore	514	10.444
Finland	408	12.003	Spain	131	14.628
France	1,502	14.124	Sweden	1,483	12.707
Germany	1,494	13.521	Switzerland	855	9.942
Hong Kong	5,450	8.148	Thailand	1,362	13.212
India	8,644	11.96	United Kingdom	4,372	13.034
Ireland	233	12.125	United States	10,638	10.348
Israel	496	7.853	Zimbabwe	1,032	7.215
			Total	**49,332**	

Panel B: Sample distribution by year

Year	*N*	*Transp_Priv*	Year	*N*	*Transp_Priv*
2000	242	9.482	2011	2,086	10.809
2001	703	9.753	2012	2,213	11.306
2002	297	9.705	2013	2,360	11.643
2003	265	9.459	2014	2,569	12.021
2004	415	9.01	2015	2,866	12.221
2005	626	9.033	2016	3,441	12.364
2006	1,059	8.891	2017	5,535	12.097
2007	1,384	8.702	2018	6,400	11.992
2008	1,549	9.29	2019	6,469	11.823
2009	1,796	9.678	2020	5,013	11.382
2010	2,044	9.83	**Total**	**49,332**	

Panel C: Sample distribution by industry

Industry	*N*	*Transp_Priv*
Manufacturing	24,462	11.751
Finance, Insurance, and Real Estate	1,031	10.315
Arts, Entertainment, Hotels, and Dining	1,580	10.262
Information	4,946	9.978
Transportation and Warehousing	1,597	10.184
Business Services	4,061	12.038
Agriculture, Mining, Utilities, and Construction	6,535	10.993
Wholesale and Retail Trade	4,249	11.29

Education, Health, Public Administration, and Other Services	871	10.776

Table 2. Descriptive statistics (N = 49,332)
This table presents the summary statistics for the regression variables used in our main analysis. Our sample period extends from 2000 to 2020. Our final sample comprises 49,332 firm-year observations for 32 countries/regions. Appendix A summarizes all the variable definitions.

	Mean	S.D.	p25	Median	p75
Cash Pay (2000 USD dollars in $000)	488.934	604.217	79.324	299.865	644.256
Log (ROA)	0.046	0.182	0.021	0.067	0.118
Transp_Priv	11.311	2.609	9.520	11.048	13.684
Transp_Publ	8.657	1.983	7.312	8.901	10.151
Prop_Priv	91.659	17.224	94.044	98.319	99.650
Size	6.264	1.898	4.824	6.037	7.543
Lev	0.571	0.326	0.352	0.543	0.726
BM	0.784	0.890	0.288	0.547	0.990
CEO age	54.370	8.667	49	54	60
Dual	0.209	0.407	0	0	0

Table 3. Relation between private firm disclosures and public firms' pay-for-performance sensitivity
This table presents the results of the examination of the relation between private firm disclosures and public firms' pay-for-performance sensitivity. The dependent variable, *Log (Cash Pay)*, is defined as the natural logarithm of one plus CEO's cash compensation. *Log (ROA)* is the natural logarithm of 1 plus earnings before interest and taxes divided by total assets at the beginning of the year. *Transp_Priv* is private firm disclosure transparency, defined as the natural logarithm of one plus the number of non-missing financial statement line items disclosed by private firms in a given country-industry-year. *Transp_Publ* is public firm financial transparency and *Prop_Priv* is the proportion of private firms with observable financial statements. Appendix A summarizes the other variable definitions. Robust t-statistics are clustered at the country-by-industry level and reported in parentheses beneath each estimate. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

	(1) *Log (Cash Pay)*	(2) *Log (Cash Pay)*
Log (ROA)	0.3130**	0.4648***
	(2.07)	(2.81)
Log (ROA) Transp_Priv*		0.2048***
		(3.93)
Transp_Priv		-0.1021*
		(-1.67)
Transp_Publ	0.0552	0.1028
	(0.50)	(1.01)
Prop_Priv	-0.0004	0.0008
	(-0.07)	(0.17)
Size	0.1951***	0.1902***
	(3.49)	(3.44)
Lev	-0.1480**	-0.1534**
	(-2.23)	(-2.31)
BM	0.0236	0.0244
	(0.92)	(0.96)
CEO age	-0.0156***	-0.0158***
	(-3.66)	(-3.72)
Dual	-0.1216	-0.1175
	(-1.28)	(-1.24)
Constant	10.6269***	10.1600***
	(8.76)	(9.07)
Country-Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	49,332	49,332
Adj. R-squared	0.7017	0.7020

Table 4. Robustness checks

This table presents our robustness checks. In Panel A, we use alternative measures of firm performance and transparency. In Panel B, we present the results with alternative samples. In Panel C, we check whether our results are sensitive to alternative model specifications with different fixed effects and cluster levels. Appendix A summarizes all the variable definitions. Robust t-statistics are clustered at the country-by-industry level (for Panels A and B) and reported in parentheses beneath each estimate. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Alternative measures

Compensation Var. = *Performance Var. =* *Transparency Var. =*	*(1)* *ΔCash pay* *ΔROA* *Transp_Priv*	*(2)* *Log(Cash Pay)* *Adj. ROA* *Transp_Priv*	*(3)* *Log(Cash Pay)* *ROA2* *Transp_Priv*	*(4)* *Log(Cash Pay)* *Log (ROA)* *Transp_Priv%* *&Number_Priv*	*(5)* *Additional Controls*
*Performance*Transp_Priv*	0.0469**	0.2579***	0.1528***		0.1550***
	(2.25)	(3.97)	(3.41)		(2.75)
Performance	-0.0060	0.7430***	0.4727***	0.4664***	0.3766**
	(-0.08)	(3.40)	(3.61)	(2.75)	(2.22)
*Performance*Transp_Priv%*				0.1641*	
				(1.67)	
*Performance*Number_Priv*				0.2081***	
				(3.91)	
Transp_Priv%				0.0718	
				(0.37)	
Number_Priv				-0.0869	
				(-1.42)	
Transp_Priv	-0.0309***	-0.1005	-0.0992		-0.1037*
	(-3.60)	(-1.64)	(-1.61)		(-1.68)
Controls	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	49,332	49,332	49,332	49,332	4,4385
Adj. R-squared	-0.0932	0.7020	0.7021	0.7020	0.6942

Panel B: Alternative samples

Dep. Var.= *Log (Cash Pay)*	(1) Excluding firms with total assets of less than 100 million	(2) Keeping sample period for 2005-2019	(3) Excluding four countries (US, IL, AU, NZ)	(4) Excluding largest three regions (US, IN, HK)	(5) Excluding regulated industries
Log (ROA) Transp_Priv*	0.2219***	0.2209***	0.2344***	0.2597***	0.2178***
	(2.65)	(3.58)	(4.15)	(3.66)	(4.21)
Log (ROA)	0.6853**	0.5524**	0.7267***	0.5632**	0.4650***
	(2.56)	(2.49)	(3.22)	(2.40)	(2.77)
Transp_Priv	-0.0812	-0.1143	-0.1335	-0.1969**	-0.1005
	(-1.29)	(-1.56)	(-1.61)	(-2.59)	(-1.53)
Controls	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	39,238	41,635	35,856	24,600	47,325
Adj. R-squared	0.7013	0.7067	0.7305	0.7935	0.6974

Panel C: Alternative model specifications

	(1) *Log (Cash Pay)*	(2) *Log (Cash Pay)*	(3) *Log (Cash Pay)*	(4) *Log (Cash Pay)*	(5) *Log (Cash Pay)*
*Log (ROA)*Transp_Priv*	0.2048**	0.2048***	0.1794***	0.1794**	0.1966***
	(2.37)	(3.80)	(3.25)	(2.52)	(2.83)
Log (ROA)	0.4648***	0.4648***	0.4962***	0.4962**	0.4636**
	(2.88)	(3.07)	(2.89)	(2.35)	(2.08)
Transp_Priv	-0.1021	-0.1021**	-0.1087***	-0.1087**	-0.1243**
	(-1.41)	(-2.29)	(-3.12)	(-2.44)	(-2.44)
Controls	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	No
Country-Industry FE	No	No	Yes	Yes	No
Industry-Year FE	No	No	No	No	Yes
SE Cluster	Country, Industry, Year	Country-Year	Country-Industry	Country	Country
Observations	49,332	49,332	49,332	49,332	49,318
Adj. R-squared	0.7020	0.7020	0.6922	0.6922	0.6972

Table 5. Using a difference-in-differences design to study the relation between private firm disclosures and public firms' pay-for performance sensitivity

This table reports the results of using business register implementations across Europe as shocks to private firm disclosures. Panel A presents the basic results from the difference-in-difference research design. Column (1) uses the full list of countries with all non-EU firms in the control group and column (2) includes only European countries. In column (3), we present the results of parallel trend analysis. We use year-1 as the benchmark year. Panel B tests the validity of our staggered DiD research design. In columns (1) and (2), we conduct a stacked DiD analysis. In column (3), we assign countries' adoption year randomly. In column (4), we use a matching approach to eliminate the concern that the treatment and control groups are not comparable. Appendix A summarizes all the variable definitions. Robust t-statistics are clustered at the country-by-year level and reported in parentheses beneath each estimate. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Basic results from the difference-in-difference research design

	(1) Full sample	(2) EU sample	(3) Parallel trend analysis Window: [-7, +7]
*Post*Log (ROA)*	0.5283***	0.7600*	
	(2.87)	(1.86)	
*Log (ROA)*Pre_4-*			2.7310
			(1.72)
*Log (ROA)*Pre_3*			1.5040
			(0.71)
*Log (ROA)*Pre_2*			-0.3067
			(-0.97)
*Log (ROA)*Post_0*			-0.0263
			(-0.07)
*Log (ROA)*Post_1*			0.5712*
			(2.01)
*Log (ROA)*Post_2*			2.1621***
			(3.98)
*Log (ROA)*Post_3*			1.2653**
			(2.53)
*Log (ROA)*Post_4+*			1.9972***
			(3.97)
Log (ROA)	0.2090	-0.0265	0.1937
	(1.34)	(-0.11)	(1.16)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes
Observations	49,332	11,918	42,313
Adj. R-squared	0.7018	0.5253	0.7146

Panel B: Validity of the staggered DID

	Stacked DID Window: [-10, 10]		Randomization analysis	Matching
	(1)	(2)	(3)	(4)
	Full sample	EU sample	EU sample	Full sample
*Post*Log (ROA)*	1.2896***	1.8458***	-0.6076	
	(6.71)	(4.83)	(-1.24)	
Post	0.1761**	-0.4384		
	(2.20)	(-1.13)		
Log (ROA)	0.2705	-1.1554**	1.2456**	
	(1.36)	(-2.43)	(2.70)	
*Log (ROA)*Treat*Post_*				0.8141**
				(2.10)
*Log (ROA)*Treat*				-0.0197
				(-0.02)
*Log (ROA)*Post_*				-0.0773
				(-0.16)
Controls	Yes	Yes	Yes	Yes
Cohort-by-Firm FE	Yes	Yes	No	No
Cohort-by-Year FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Country-Year	No	No	Yes	Yes
Observations	129,657	9912	11,918	11,649
Adj. R-squared	0.7162	0.5190	0.5252	0.6724

Table 6. Cross-sectional tests

This table reports the cross-sectional tests. In panel A, we examine whether the impact of private firm disclosure is more pronounced for firms with higher information asymmetry. We use firm size and bid-ask spread to proxy for information asymmetry. In panel B, we examine whether the impact of private firm disclosure is more pronounced for firms with higher operation uncertainty. We measure operation uncertainty by using cash flow volatility and analyst forecast dispersion. In panel C, we examine whether the impact of private firm disclosures is stronger for firms with fewer alternative information sources to learn from. Alternative information sources are measured by using industry concentration and analyst coverage. Appendix A summarizes all the variable definitions. Robust t-statistics are clustered at the country-by-industry level and reported in parentheses beneath each estimate. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

Panel A: The impact of information asymmetry

	Firm size		*Bid-ask spread*	
	(1)	(2)	(3)	(4)
	Low	High	Low	High
Log (ROA) Transp_Priv*	0.1992***	0.0242	0.1406	0.1988***
	(3.10)	(0.16)	(0.91)	(3.04)
Log (ROA)	0.2945*	1.1126**	1.1180***	0.2606
	(1.73)	(2.43)	(3.04)	(1.39)
Transp_Priv	-0.1179	-0.0344	-0.0936	-0.0674
	(-1.42)	(-0.35)	(-0.93)	(-0.69)
Coef. difference	p-value:0.00		p-value:0.10	
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Observations	24,257	24,073	20,608	26,070
Adj. R-squared	0.6959	0.7157	0.7160	0.6999

Panel B: The impact of production uncertainty

	Cash flow volatility		*Forecast dispersion*	
	(1)	(2)	(3)	(4)
	High	Low	High	Low
Log (ROA) Transp_Priv*	0.1907***	-0.0279	0.1806***	0.2431
	(3.58)	(-0.13)	(3.25)	(1.45)
Log (ROA)	0.2539	1.9261***	0.3182*	0.3950
	(1.64)	(2.71)	(1.88)	(0.73)
Transp_Priv	-0.0894	-0.0565	-0.1335	0.0125
	(-0.93)	(-0.90)	(-1.53)	(0.17)
Coef. difference	p-value:0.00		p-value:0.10	
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Observations	23,307	22,853	34,984	12,059
Adj. R-squared	0.6777	0.7437	0.7009	0.6816

Panel C: The impact of alternative information sources

	Industry concentration		Analyst coverage	
	(1)	(2)	(3)	(4)
	High	Low	Low	High
Log (ROA) Transp_Priv*	0.1945***	0.1152	0.2799***	0.1660**
	(2.60)	(1.50)	(3.69)	(2.43)
Log (ROA)	0.4114*	0.4426	0.3336	0.5782***
	(1.75)	(1.64)	(1.59)	(2.75)
Transp_Priv	-0.1345	0.0149	-0.0426	-0.0675
	(-1.59)	(0.15)	(-0.33)	(-0.69)
Coef. difference	p-value:0.10		p-value:0.00	
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Observations	27,459	20,242	16,122	30,857
Adj. R-squared	0.7136	0.7050	0.7017	0.7113

Table 7. Supplementary analyses

This table reports the results of supplementary analyses. Panel A examines whether private firm transparency affects the pay-for-performance sensitivity when using stock return as firm performance. Panel B presents the result when using total pay as compensation measure. In Panel C, we divide our private firm disclosures measure into three subcomponents – balance sheet items, income statement items, and footnote items. Appendix A summarizes all the variable definitions. Robust t-statistics are clustered at the country-by-industry level and reported in parentheses beneath each estimate. *, **, and *** refer to significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Stock return as firm performance

	(1)	(2)
	Log (Non-cash Pay)	*Log (Non-cash Pay)*
Stock return	0.1748***	0.0644
	(5.76)	(0.53)
Stock return Transp_Priv*		0.0988
		(0.67)
Transp_Priv		0.0049
		(0.92)
Controls	Yes	Yes
Firm FE	Yes	Yes
Country-Year FE	Yes	Yes
Observations	44,399	44,399
Adj. R-squared	0.7062	0.7063

Panel B: Total compensation

	(1)	(2)
	Log (Total Pay)	*Log (Total Pay)*
Log (ROA)	0.2936*	0.4545**
	(1.67)	(2.45)
Log (ROA) Transp_Priv*		0.2201***
		(4.31)
Transp_Priv		-0.1440**
		(-2.50)
Controls	Yes	Yes
Country-Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	49,332	49,332
Adj. R-squared	0.7088	0.7091

Panel C: Financial statement types

	(1)	(2)	(3)
	Balance sheet	Profit & Loss	Footnote
Log (ROA) Transp_Priv*	0.1994***	0.1868***	0.1603***
	(3.96)	(3.16)	(3.23)
Log (ROA)	0.4704***	0.4552***	0.3942**
	(3.02)	(2.89)	(2.20)
Transp_Priv	-0.1659**	-0.1483**	-0.0720
	(-2.24)	(-2.05)	(-1.26)
Controls	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	49,313	49,269	49,322
Adj. R-squared	0.7021	0.7026	0.7021