NBER WORKING PAPER SERIES

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Working Paper 29042
http://www.nber.org/papers/w29042

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2021, Revised September 2022

We thank Iwan Barankay, Wouter Dessein, Robert Gibbons, Stephen Hansen, Mitch Hoffman, Adam Kleinbaum, Niko Matouschek, Meg Meyer, Antoinette Schoar, Toby Stuart, seminar participants at Columbia, and participants at the Spring 2021 NBER Organizational Economics, 2021 Strategy Science (HBS), 2021 Ghoshal (LBS), 2021 DRUID (CBS), and the 2020 People and Organizations (Wharton) Conferences for insightful feedback. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

At least one co-author has disclosed additional relationships of potential relevance for this research. Further information is available online at http://www.nber.org/papers/w29042.ack

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NBER Working Paper No. 29042
July 2021, Revised September 2022
JEL No. L2,M12

ABSTRACT

This paper uses novel, firm-level communication measures derived from communications metadata several months before and after a CEO transition for 102 firms to study whether and how this organizational event is reflected in employees' communication flows. We find that CEO turnover is associated with an initial decrease in intra-firm communication (-10% relative to the pre-CEO transition period), followed by a significant increase approximately five months after the CEO turnover (+33%). The increase in communications is driven primarily by inter-departmental (i.e. communication involving employees of different functional departments) and vertical (i.e. communication among managers and employees) communication flows. Firms where the medium-run increase in communication is higher experience greater increases in market returns and revenues in the year following the CEO transition.

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1. Introduction

CEO turnover is a significant organizational event that typically marks a discontinuous change in firms' strategies (Cannella et al., 2009; Friedman and Saul, 1991; Karaevli, 2007; Karaevli and Zajac, 2013; Tushman and Rosenkopf, 1996), creating uncertainty within the organization (Barrero et al., 2017; Srivastava, 2015). The increase in uncertainty is rooted in various factors. First, CEO turnover events are often an impetus for top management team (TMT) (Hambrick, 1995, 2007; Hambrick and Cannella, 2004; Keck and Tushman, 1993). Additionally, the first business decisions of newly appointed CEOs are often to divest from prior CEOs' strategies while working with their new leadership team to update the strategic vision for the firm (Coles et al., 2014; Pan et al., 2015). Exacerbating the uncertainty associated with these profound personnel and investment changes, new CEOs are unproven in their ability to perform their role (Dikolli et al., 2014) and typically cannot fully control entrenched managers (Denis et al., 2012; Finkelstein, 1992).[1]

In this paper, we explore whether and how CEO turnover events—and the increase in uncertainty associated with them—are reflected in the behavior of the organization itself and, more specifically, in how employees communicate and interact. Very little is known about this specific aspect of CEO turnover even though, as explored by extensive theoretical literature,[2] communication is considered essential to developing and executing firms' strategies, enabling firms to share knowledge, create organizational memory, and make decisions (Arrow, 1974; Simon, 1947) and is influenced by organizational changes and leadership choices (Kotter, 1995; Rotemberg and Saloner, 2000; Schein, 1994; Van den Steen, 2005).

[1] Recognizing the importance of new CEOs charting a novel course for their firms, a large body of prior research in management, economics, and accounting examines the impact of CEO turnover on measures of firm performance (Bandiera et al., 2020; Bertrand and Schoar, 2003; Denis and Denis, 1995; Fee et al., 2013; Murphy and Zimmerman, 1993; Pan et al., 2015; Shen and Cannella, 2002).

[2] Employees within the firm must communicate to coordinate their actions to land updated strategies. More efficient and effective communication can reduce transaction costs in decisions to internalize aspects of operations (Williamson, 1979), overcome the cognitive limitations of employees (Simon, 1947), increase the ability for firms to analyze and understand information (Arrow, 1974), make "sense" out of changes in firm strategy (Weick, 1995), and is one of the main reasons why firms form (Coase, 1937). In multi-divisional firms, employees communicate to coordinate decision-making across departments and align those decisions to local conditions to achieve the firm's goals (Alonso et al., 2008; Marshak and Radner, 1972).

From an empirical standpoint, the effect of CEO turnover on internal communication is a priori ambiguous. On the one hand, the arrival of a new CEO, and the corresponding changes in strategy, personnel and investments, may be matched by an *increase* in internal communication to establish new communication flows within organization (Ma and Seidl, 2018), resolve the uncertainty inherent with the new appointments, and equip every level of the organization with the information needed to act on the new direction set by the new CEO.[3] At the same time, however, the increased uncertainty surrounding CEO turnovers could *reduce* internal communication by creating ambiguity around employees' future roles, responsibilities and objectives (Srivastava, 2015), and potentially breeding misalignment and competition for resources among them. To the extent that employees communicate more when their interests are aligned (Alonso et al., 2008), a change in CEO may thus lead employees to become more protective of their turf and communicate less. In other words, communication flows may be inhibited by the fact that strategic communication behaviors sometimes prevail over the pragmatic needs of the firms.

To provide new evidence on this question, we use detailed email and meeting metadata to study how internal communication patterns respond to CEO turnover across a sample of 102 firms for which we could obtain comparable and longitudinal data on internal communication flows. We document the evolution of communication flows from six months before the transition to 12 months after a CEO transition to determine how increased uncertainty relates to changes in internal communication. We find that CEO turnover is associated with an initial *decrease* in intra-firm communication, followed by a significant *increase* approximately four months[4] after the transition. The magnitude of these swings is substantial—ranging between a 10% short-run decrease and 33% medium-run increase in emails and meetings relative to the pre-transition period. Additionally, these dynamics reflect primarily changes in the behavior of

[3] For example, DeFilippis et al. (2020) and Dye et al. (2014) show that communication increases after exogenous shocks for Covid-19 and hurricanes, respectively, due to the need for increased coordination.
[4] This period of time is consistent with the time period that Srivastava (2105) suggests uncertainty is greatest: the first 18 weeks after an organizational change.

employees that stay at the firm throughout the CEO transition, rather than compositional changes in the workforce.

Looking in more detail at the *types of interactions* most affected by the organizational event, we find that the medium run increase in meetings is heterogeneous across different types of interactions, namely we document a stronger increase in *inter-departmental* communication—meetings involving employees from more than a single functional department—relative to *intra-departmental* communication—involving only employees of the same department; and, similarly, in *vertical* communication—meetings involving both managers and individual contributors (IC)—relative to *horizontal* communication—meetings involving employees that are peers (i.e. managers-to-managers or ICs-to-ICs interactions). These patterns are consistent with the idea that the recovery in internal communications is primarily driven by centrally orchestrated communication flows (i.e. intra-departmental and vertical meetings) rather than local interactions.

Furthermore, we find evidence that communication evolves differently according to the *type of organizational transition* and, specifically, that firms with higher levels of board member and TMT turnover following a CEO change experience a slower recovery in meetings in the medium term. In contrast, the appointment of an internal CEO relates to a faster recovery in communication.

Lastly, though we cannot directly observe the CEO type and have limited performance data, we document a relationship between communication and post-turnover performance. Namely, firms with a greater increase in medium term communication have higher cumulative abnormal stock returns in the first year after the CEO change.

Lacking a reliable source of exogenous variation in CEO turnover within our sample (e.g. CEO sudden death or hospitalizations: Bennedsen et al., 2020; Johnson et al., 1985), we cannot precisely identify whether the associations we uncover are driven solely by CEO transitions or by other time-varying unobserved organizational events coinciding with the CEO's departure. With this caveat in mind, we show that the dynamic patterns observed in the data are consistent with the predictions of a simple intra-firm

communication model inspired by Marshak and Radner (1972) and Alonso et al. (2008). The model examines how sudden declines in organizational alignment—a situation that we believe, based on our reading of the prior literature, captures the effect of the uncertainty associated with CEO transitions—relate to internal communication flows over time. In line with what we observe in the data, the model shows that a decline in organizational alignment around the firm's strategy leads to an initial reduction in internal communication flows. However, as the new CEO onboards, sets expectations, redefines priorities, and shares this new strategy with the firm, the initial uncertainty is gradually resolved and alignment within the firm thus restored. CEOs who are better leaders can restore alignment---and, hence, internal communication flows—more quickly (Kotter, 1995; Schein, 1994) and experience greater performance effects, and internal communication dynamics provide investors an insight into usually unobservable CEO characteristics conducive to superior firm performance.

Our primary contribution is using novel metadata to examine internal communication flows across many firms before and after a common organizational event, a CEO transition. Prior studies (Kleinbaum, 2012, Kleinbaum et al., 2008, 2013; Kleinbaum and Stuart, 2014; Srivastava, 2015; Zhang et al., 2020) have pioneered the idea that email and meeting metadata contain valuable insight into within-firm information flows and that changes to information flows have important decision-making implications. Communications metadata for a single firm has been used in prior research to analyze employee coordination (Kleinbaum et al., 2008, 2013), the implementation of corporate strategies (Kleinbaum and Stuart, 2014), employee-level productivity (Aral et al., 2012), and organizational change (Srivastava, 2015). Other studies have used communications metadata at scale across many firms (Polzer et al., 2016; Polzer and DeFilippis, 2020; DeFilippis et al., 2020; Jacobs and Watts, 2021[5]). However, to our knowledge, this is the first study to use longitudinal firm-level communications metadata across many firms before and after

[5] Jacobs and Watts (2021) use data from 65 firms to analyze how communication networks correlate with firms' characteristics; however, our panel approach is different and complementary to their cross-sectional analysis because we look at longitudinal, within-firm variations in communication in relation to a firm-level event rather than cross-sectional correlations. See also (Impink, Prat and Sadun, 2020) for a discussion of the utility of email and meeting metadata for organizational research.

a common organizational event. This research design allows us to pin down the dynamics of intra-firm communication patterns to a specific organizational event and to examine communication dynamics in a homogenous fashion across a large sample of firms.

Second, we contribute to the literature dedicated to understanding the impact of CEO turnover on firms (Friedman and Saul, 1991; Ma and Seidl, 2018; Pan et al., 2016; Tushman and Rosenkopf, 1996), extending the analysis to internal communication flows, an example of intangible aspects of firms' behavior that are typically hard to observe yet associated with differences in firm performance (Bloom, Sadun, et al., 2012, 2016; Gibbons and Henderson, 2012; Syverson, 2011).

Third, this paper relates to a rich literature in organizational economics that focuses on the importance of intra-firm communication as a proxy for information flows and knowledge-sharing needed to support effective coordination (Alonso et al., 2008; Calvó-Armengol et al., 2015; Cremer et al., 2007; Dessein and Santos, 2006; Dessein et al., 2016; Hart and Holmstrom, 2002; Rantakari, 2008; Van den Steen, 2017). This literature has identified the existence of tradeoffs between the benefits of increased coordination and employees acting independently but has hardly been able to verify the adherence of these predictions in the real world. Our contribution is to leverage an established model of intra-firm communication and decision-making (Alonso et al., 2008; Rantakari, 2008) to interpret the empirical analysis of communication flows after a significant organizational event.

The paper proceeds as follows. Section 2 describes the communications metadata used in these analyses. Section 3 details the event study and performance research designs. Section 4 describes the main results and additional findings correlating communication changes with firm performance. Section 5 describes the stylized model we use to interpret the results. Section 6 concludes.

2. Data

We now describe the data used in the empirical analysis. First, we describe how we construct the sample of firms experiencing a CEO turnover event and summarize the types of CEO turnover, firm demographics, and other types of turnover coinciding with the CEO turnover (2.A.). Then we describe the communication variables proxying for internal communication flows and discuss some limitations of using communications metadata (2.B.). Lastly, we describe performance measures, including cumulative French-Fama stock returns and industry-adjusted revenue returns (2.C.).

2.A. CEO turnover events

We obtained metadata on meeting and communication flows through a partnership with a large email provider. The provider built firm-level aggregates based on meeting and email metadata following our specifications, under the condition that the firms used in the sample could not be identified (by other external researchers or us). To identify a suitable sample for the analysis, the provider gave us a sense of the time period and geographies for which email and meeting metadata had been captured and retained (approximately three years of data). We identified all firms experiencing a CEO transition within a three-month window during this time period using CEO names from Execucomp, Boardex, and Orbis. This initial sample consists of 338 firms, for which we collected additional firm-level data from multiple databases, including information on the number of employees, industry, CHQ location from Dun & Bradstreet, and revenue data from Orbis and CapIQ. From press releases, we manually coded why the CEO transition occurred (e.g., fired for performance issues, retirement, death, an internal transition to another role, merger, hired by another firm, or left to start an entrepreneurial venture). Once we completed the additional data collection, we sent this dataset to the email provider to anonymously match our dataset with firms in its

database. We describe additional details on the initial sample and matching process with our email provider in Appendix Note A.1.

This matching process led to a sample of 102 firms with communication data before and after a CEO turnover event.[6] The sample includes firms located in 21 high-income countries, and most firms have their headquarters in the United States (39%), Europe (25%), or the United Kingdom (16%). The CEOs left for various reasons, including being fired for performance reasons (20%), retirement (17%), and transfer to another firm (8%). Many CEOs (30%) remained at the firm in a different role, including board positions or honorary roles (e.g. technical advisor, consultant). The majority of the firms in the sample are classified as service[7] (29%), manufacturing (19%), or trade (9%) industries. The average firm has 6,545 (SD 4,217) users, defined as employees with an active email account connected to the firm's web domain, and the largest firm has almost 15,000 users. In total, our communications metadata contains approximately 500M emails and 80M meetings. We provide more details on the firms in our sample in Table 1.A., under the headings CEO Turnover Reasons, Country, and Industry.

2.B. Describing communication measures and their limitations

Once the usable sample was identified, we asked the email provider to build month-level, firm-specific aggregated communication measures using email and meeting metadata measured before and after the CEO transition. Our primary analysis is based on variables measuring meetings and email data at the firm-month level. Due to confidentiality and data privacy concerns, we could not obtain the text or subject lines of the emails included in the dataset. We also asked for more granular data (e.g. to map the internal graph of the firm), but it was not provided due to these concerns. We report summary statistics data in Table 1.B.

Meetings. We obtained data on the average number of meetings per employee, average duration of meetings, and the average number of attendees per meeting for 17 calendar months. Employees attended,

[6] All firms have balanced (i.e. for every month before and after the CEO transition) email data; however, only 55 firms have balanced meeting data, including the transition month.
[7] Includes financial and insurance services.

on average, 39 (Median 29, SD 32) internal meetings per month. These meetings lasted about 116 minutes (Median 79, SD 327) and included 42 attendees (Median 23, SD 62).[8] Employees were scheduled to attend around 80 hours of meetings in a typical month.

Email. We received the aggregated average number of internal emails, number of recipients, and the percent of emails that include only employees in the same department for 22 calendar months. We further broke down these aggregates into the average number of different department emails and the mix of different-same department emails within each firm. On average, employees sent around 247 (Median 223, SD 199) internal emails per month to 3 recipients per email (Median 3, SD 4). There are substantially fewer meetings per employee than emails per employee, consistent with the idea that meetings require higher effort to coordinate and are often limited by standard working hours. We report the distribution (kernel density) of email and meeting counts in Appendix Figure C.1.

Employee subsets. We were also able to obtain information on emails and meetings for employees by hierarchical level (e.g. senior managers, other managers, and individual contributors) based on each firm's organogram[9] and for employees who enter (Entrants) or exit (Exitors) after the turnover event or remain at the firm throughout (Stayers). These summary statistics are reported in Table 1.C.

Meetings vary along the hierarchy: senior managers, who manage other managers, attend more meetings per month (*sr. managers*: Median 52, SD 37) than both other managers (*managers*: Median 36, SD 28) and individual contributors (*ICs*: Median 16, SD 15). This is consistent with the notion that managerial roles are inherently more interactive than IC roles (Bandiera et al., 2020). Managers attend shorter meetings (*senior managers*: Median 77, SD 76; *managers*: Median 77, SD 145) than ICs (Median 85, SD 513). Variation by hierarchical level is similar for emails, too; senior managers send more emails

[8] To avoid the inclusion of all-hands meetings and training events, the data provider excluded meetings that lasted longer than eight hours, including all-day meetings and multi-day meetings. The data also excludes meetings that were declined by an employee in their calendar metadata. Meetings with no attendees other than the meeting scheduler (i.e., blocking off time on your calendar) is not included.

[9] Firms' organograms are derived from the firms' listing of formal reporting relationships, which are self-recorded by the firm when the email provider onboards a firm's employees to the platform. Through this pairing, we can distinguish between employees that are ICs, managers, and sr. managers. 88 firms record this information with the data provider.

per month (Median 310, SD 164) than other managers (Median 243, SD 130) and ICs (Median 132, SD 236).

We use t-tests to check whether the differences between the means across these subgroups differ from zero. For these groups, the only measure for which the means are not significantly different is the average number of attendees present in meetings: ICs attend meetings with 36 attendees/meeting (Median 23, SD 50), Managers attend meetings with 45 attendees/meeting (Median 24, SD 67), and Sr. Managers attend meetings with 46 attendees/meeting (Median 25, SD 68).

Meeting type subsets. Our email provider gave us data on *inter-department* communication intensity, meetings involving employees from across different functional departments within the firm (Median 25, SD 27), and *intra-department* communication intensity, meetings involving employees within the same functional division (Median 4, SD 8), for 89 firms with available data at the user aggregate level for 19 months. They provided an additional data set with hierarchical information capturing non-directional communication intensity across similar managerial hierarchy levels, which we define as *horizontal* communication (i.e. managers-managers or IC-IC), and across different hierarchy levels, which we define as *vertical* communication (i.e. managers-IC or IC-managers), for 88 firms with available data at the firm level for 14 calendar months. We provide additional information on these data aggregates and provide summary statistics in Appendix Note A.2.

Limitations. There are numerous limitations in the metadata aggregates described above. First, these measures do not capture all interactions, including communication through SMS or consumer-focused messaging services on mobile phones or web-based communication software platforms managed by firms other than our email provider. Our data only capture employee communication on our email provider's platform. Furthermore, employees that deal with highly sensitive information may opt for an ad hoc phone call or in-person meeting that is not recorded in their calendar to avoid sharing the information in a legally discoverable manner. To the extent that a CEO turnover affects these margins of adjustment in communication, we will be unable to capture them in our analysis.

Next, it is unclear if meetings represent what employees actually do or simply what they write in their digital calendars. For instance, employees could use their calendars inconsistently or may not attend meetings that they accept in their calendars. We do not know if employees attend the meeting; we only know they have not "declined" the meeting. Moreover, the opposite could be true, and employees could attend a meeting for which they declined or never received an invitation. The types of communication, both meetings and email, could vary drastically across people according to their responding habits. Similarly, for emails, we do not know if an individual exerted more or less effort writing an email or quickly sending a message. Our data are limited in that we do not have access to the content or subject lines of emails and meeting requests, which could provide us with more insight into the interaction and the exertion of effort. For example, a one-on-one meeting with your manager is different from a team-building event or monthly all-hands and, similarly, an email to update management monthly is quite different from an email to coordinate firm strategy.

Lastly, we do not have any proper network measures. Instead, we use firm-level aggregates with some network connotations (i.e. inter versus intra-departmental, horizontal versus vertical, etc.). Given that these data includes information on many firms, the network approach where every person is a "node" would not adequately anonymize individuals in our sample, and a panel containing every calendar entry or email, sent or received, for the 100K monthly user in our sample would have been difficult and exceedingly costly to store and analyze.[10]

2.C. Performance measures

We measure performance before and after the CEO transition using monthly stock market measures for the subset of 51 public firms included in our sample. Specifically, we build Cumulative Abnormal Returns (CAR) measures six months before and after the CEO turnover. The market-adjusted CAR is calculated through an OLS model that estimates the difference between each firm's risk-free return and the risk-free

[10] The information underlying the meeting and email variables contains about 15 petabytes of data, which due to our legal agreements with the email provider, was stored and analyzed within the bounds of their internal corporate domain.

market return. The cumulative Fama-French abnormal stock return is calculated using monthly French-Fama data from Ken French's website.[11] We build the pre-turnover CAR measure by summing abnormal returns (AR) every month before the CEO turnover. For example, the CAR for month -6 is the difference in AR between month -7 and -6; for month -5 it is the sum of the CAR measured at -6 and the AR between month -6 and -5; and so forth. The CAR for the post-CEO turnover period starts at month 1 (i.e. the month of the CEO turnover) and is the AR between months 0 and 1 after the CEO turnover; CAR for month 2 is calculated as the sum of AR between months 1 and 2 and the CAR measured at month 1; and so forth. We exclude the CAR at month 0 from our analysis since it reflects the effects of both prior and current CEO. We provide summary statistics of performance measures before and after CEO turnover in Table 1.D. and provide additional details on creating these performance measures in Appendix Note A.4.

3. Empirical Design

3.A. Communication

We exploit the CEO transition's timing by using an event study specification to analyze the change in email and meeting measures over different months before and after the CEO transition. All data are aggregated at the firm level and bi-monthly level.[12] The CEO transition occurs in month 0, and combined with the first month after the transition, is denoted "Period 0" in the tables and figures. The base period for these regressions is the bi-monthly period before the CEO transition (i.e. months -1 and -2, denoted as "Period 1" in the tables and figures). We include firm-level fixed effects in all specifications, such that the coefficients represent changes in communication patterns within the same firm over time.

$$ln\left(y_{i,t}\right) = \beta_0 + \sum_{t=-2}^{-3} \beta_t^{pre} D_t + \sum_{t=0}^{6} \beta_t^{post} D_t + \gamma_i + \varepsilon_{i,t} \quad (1)$$

[11] http://mba.tuck.dartmouth.edu /pages/faculty/ken.french/.

[12] We aggregate the communication data at the bi-monthly data to smooth out measurement error, but the results are qualitatively and quantitatively similar when we use monthly data. See Appendix Table B.1 (Monthly Data) for more details.

Where $y_{i,t}$ denotes the communication variable, such as the count of meetings or emails, for firm *i* in bi-month period *t*, and γ_i are firm-level fixed effects. We cluster standard errors at the firm level. In this specification, Periods 0 and 1 (i.e. months 0-3 after the CEO transition) map into the short-run transition period, Periods 2-3 (i.e. months 4-7 after the CEO transition) map into the medium run transition period, and Periods 4-6 (i.e. months 8-12 after the CEO transition) correspond to the new steady state.

This setup allows us to examine whether the changes in communication are accounted for by trends in the data pre-dating the CEO turnover. Furthermore, since we examine changes in communication flows within firms, we can also control for time-invariant differences across firms. However, since CEO turnovers are likely to be endogenous,[13] the estimated coefficients may clearly still reflect time-varying, unobserved factors that coincide with a CEO replacement (e.g. changes in organizational structure and strategy happening at the time of the CEO turnover).

3.B. Performance

To examine whether different communication patterns map into different performance outcomes, we estimate a difference in differences specification of the form:

$$CAR_{i,t} = \beta_0 + \left(\sum_{t=-1}^{-3} \beta_t^{pre} D_t + \sum_{t=-1}^{-3} \beta_t^{pre} D_t \hat{y}_i\right) + \left(\sum_{t=1}^{6} \beta_t^{post} D_t + \sum_{t=1}^{6} \beta_t^{post} D_t \hat{y}_i\right) + \hat{y}_i + \varepsilon_{i,t} \quad (2)$$

where $CAR_{i,t}$ denotes CAR for Periods -3 through -1 (calculated at the monthly level cumulating from 6 months before the transition until 1 month before the transition) and for Period 0 through 6 (calculated at the monthly level cumulaing from 1 month after the transition until 1 year after the transition). Note that in these regressions the base period is Period 0 (and not Period-1 as in previous regressions) due the specific way in which the CAR measure is constructed (i.e. cumulating from the first Period after the new CEO is in office).[14] The measure $\hat{y}_i$ is an indicator variable denoting if firms experienced an above-median increase

[13] In our sample only one CEO transition was driven by truly exogenous events, i.e. CEO illness or death.
[14] This is also the reason why Month 0, which corresponds to the month of the CEO change and is the first month of Period 0 is dropped.

in communication in the medium term after the initial CEO transition.[15] Standard errors are clustered at the firm level.

4. Results

4.A. Main results

We show the event study results in Table 2 and graph the bimonthly coefficients in Figure 1. Email and meeting measures do not display evidence of a pre-trend in months before the base period, Period -1, two months before the CEO transition month. Meeting and email counts experience a sharp drop (Table 2 column (1) *Meetings*: P0: -33% SD 0.11; column (4) *Emails*: P0: -16% SD 0.07) immediately after the CEO transition, occurring in Period 0 (i.e. months 0 and 1 after the transition), and recover slightly but remain depressed in Period 1 (i.e. months 2 and 3 after the transition). Meeting and email counts increase significantly from the base period, Period -1, through Period 2 (i.e. 4 and 5 months after the transition) and stabilize through Periods 3 to 5 (i.e. between 6 and 11 months after the transition). In the last period of our data, Period 6 (i.e. 12 and 13 months after the transition) counts for both email and meetings fall and are not significantly different from the base period. The duration of meetings and the number of attendees also increase in the medium run.

Two additional aspects of these results are worth noting. First, meetings appear to be more responsive after the CEO turnover event, declining twice as fast in the short run and recovering more quickly in the medium run than emails. Second, while the drop in communications is similar across firms, the increase in meetings and emails in the medium run is much more heterogeneous across firms. To illustrate this point, Figure 2 shows the kernel density of two firm-level variables: first, a measure of the

[15] In practice, we identify these high communication firms by calculating the difference in communication intensity between Period 1 (starting in month 2) and Period 3, the end of the medium run transition period (through month 6). We then generate an indicator variable taking the value 1 if the firm experienced an above-median change in communication within this time window and 0 otherwise. We also report results using continuous variable measuring changes in communication in the medium run rather than the dummy.

average monthly change in emails between months 0 and 2 after the CEO transition, and second, a measure of the average monthly change in emails between months 2 and 6 after the transition. The mass of the distribution of medium run changes shifts to the right relative to short-run changes depicting a higher medium run mean change on average, and the variance of the medium run changes is larger (two-sided F-test; reject the null that variances are equal, p=0.16). We will come back to a possible interpretation for both results in Section 5 through the lenses of our theoretical model.

4.B. Basic Robustness Checks

The results are not driven by the aggregation of months into bi-monthly periods: using monthly data delivers very similar, though slightly noisier (Appendix Table B.1.). The results are also not affected by the unbalanced nature of the sample. When we re-run the main event study for the balanced sample of firms with data before and after the transition, we obtain similar coefficients, though less precisely estimated due to the smaller sample. In Appendix Table B.2. columns (1) and (2) we repeat the main results from Table 2, columns (1) and (4), respectively, then we show results from balanced data in columns (3) and (4). Third, we investigate whether the results are driven by changes in the workforce composition before and after the CEO transition. For example, the short-term drop in communication could have been generated by the exit of managers or new workers in the months after the CEO turnover event rather than behavioral changes in incumbent employees. To do so, we examine the changes in meetings and emails differently for Stayers, whose corporate email accounts were active at the firm before and after the CEO turnover, Exitors, and Entrants (96 firms have available data). In Appendix Tables B.3., we show that results for Stayers are similar to the main results. We show results for Exitors in Table B.4. and Entrants in Table B.5. Exitors begin to communicate less before the CEO transition, and Entrants start from a low communication baseline and then communicate more similarly to Stayers as time progresses. Finally, we adapt the specification to include a CEO transition month fixed effect, as all of the CEO turnovers in our sample happen in a relatively short time span (around three months). These controls enable us to account for unobserved month-specific effects within this time period, and these results remain similar (Appendix Table B.6.).

4.C. Heterogeneity Across Types of Interactions and Across CEO Transitions

Central coordination vs. local interactions. The data allows us to study whether communication patterns vary by type of interactions. We study, in particular, differences between meetings that reflect coordination efforts emanating from the central organization versus local interactions. While we do not have explicit information on the specific purpose of the meetings, we exploit two different partitions of the data to provide a rough approximation of these different communication types. First, we examine differences between meetings involving participants belonging to different departments (*inter-departmental*, which we assume to be more likely to reflect central communication efforts) vs. those involving participants from the same department (*intra-departmental*, which we assume to reflect local activities). This information is available for 89 firms. Second, we explore the differences between *vertical* communication (meetings involving both managers and employees) versus *horizontal* communication (meetings involving only peers of the same management or IC hierarchical level). The assumption here is that Manager-IC interactions are more likely to reflect central coordination efforts relative to interactions among peers. We have these data for 88 firms.[16]

In both cases, we find that the medium-term recovery in communication is starker for meetings that reflect central coordination activities. We graph coefficients of inter-department meetings, intra-department meetings, and the ratio of inter- to intra-departmental meetings in Figure 3, and estimate both the levels and the ratio of inter-departmental meetings to intra-departmental meetings in Table 3. These results show that inter-departmental meetings increase more than intra-departmental ones in Period 2 (Table 3 column (4), *P2*: +14% SD 0.08, *P3*: +20% SD 0.08). Similarly, we find that vertical meetings increase with greater intensity relative to horizontal meetings, such that the ratio of vertical to horizontal meetings over time (i.e. vertical meeting count divided by horizontal meeting counts) significantly increases in the medium run

[16] This data is only available from six months before the CEO transition until eight months after, and was collected from the email provider after the first extraction of the primary data (see Appendix Note A.3) for our main analyses (i.e. without a distinction between horizontal and vertical communication). In the period of time between collecting the first and second data sets, they could no longer provide user-level email communications metadata due to updated legal guidance regarding their compliance with GDPR. We were instead provided firm-level aggregates. Email metadata was inaccessible for the bulk of firms in our sample, they provided meeting meta-data only. Empirically, we find the intensity of vertical meetings to be highly correlated with the intensity of inter-departmental meetings.

(Table 3 column (8), *P2*: +12% SD 0.02, *P3*: +18% SD 0.02). We graph the coefficients of vertical meetings, horizontal meetings, and the ratio (vertical/horizontal meetings) in Figure 4.

Types of CEO transitions. Second, we study whether the intensity of communication change varies according to the extent to which the CEO transition was accompanied by a more extensive C-suite overhaul, or by an internal CEO appointment. We use these partitions of the data to proxy for differences in the degree of uncertainty associated with the CEO transition. In particular, we argue that uncertainty is greater when the CEO transition reflects a broader organizational overhaul and lower when the firm appoints a prior internal manager as CEO. To study these aspects of the data, we calculated additional turnover measures from Boardex. In our sample, 67 firms reported top manager or board member turnover during the month of the CEO turnover or the three months afterward.[17] We find that firms with higher TMT turnover have a more sluggish recovery in meetings relative to firms with more stable TMTs (Appendix Figure C.3.) and boards (Appendix Figure C.4.).[18] Next, we investigate whether communication dynamics after the CEO transitions differ if the new CEO was already employed by the firm (internal transitions: 51%). We find that firms that replace their CEO with an internal employee experience a greater increase in meetings after the transition event (Appendix Figure C.5.) relative to external CEOs. In both cases, the data suggest that

[17] We calculate firm-level measures from the Boardex data for percentage of the TMT (Median 0.10, SD 0.56) and board members (Median 0.08, SD 0.46) exiting during this period. We summarize firm-level turnover in Table 1.A.

[18] We do not find any significant heterogeneity in communication due to the reason (e.g., fired, retirement, death, promotion to the board, etc.) for the CEO change. However, we note that the sample may be too small to capture these finer nuances of the CEO turnover event. We also investigated whether the changes in communication flows were driven by the timing of the actual CEO transition or by its mere announcement. We examine the reaction to the announcement of the CEO transition separately from that of the actual transition for 30 firms where the announcement occurred earlier than a month before the actual CEO transition. We find that the coefficients on the indicator variables denoting bi-monthly periods after the actual transition are negative and significant (Appendix Table B.2. columns (5) and (7)) even in this small subsample of firms. Point estimates on the indicator variables relative to the announcements — while negative — are not precisely estimated (columns (6) and (8)). Our communications data is at the calendar month level, so we are unable to adjust the model so that Period 0, which includes the transition month, starts on the actual transition day. In an unreported analysis, we examine the effects of the CEO transition if the CEO turnovers in the last 15 days of the transition month (55 firms) and find that the results of the event study are similar.

the type of transition does not affect the short-run drop in communication, but maps into different rates of recovery in communication in the medium run.[19]

4.D. Communication and performance

Finally, we investigate the relationship between communication and cumulative abnormal stock returns. We divide firms into two types, those that experienced an above median change in communication intensity in the medium term after the CEO transition—for brevity, we refer to these firms as high communication firms. We present the estimation of Equation 2 in Table 4. Column (1) shows that, on average, high communication firms have higher CARs immediately after the CEO turnover, and these differences persist for six months after the transition. We then repeat the same analysis using a different CAR measure built using French-Fama factors[20] in column (2), finding comparable results.[21] In columns (3) and (4) we repeat these regressions using a continuous measure of communication change rather than the dichotomous variable finding similar, though statistically weaker, results. We show these results visually in Figure 5.[22]

The performance results can be interpreted in three ways. First, differences in communication dynamics may directly affect firm performance. Second, differences in communication dynamics, especially the more intense recovery of communication flows after the immediate change in CEO, may proxy for latent differences in CEO types that become apparent to analysts and investors in the early months of a CEO's tenure, and are then factored in stock prices from the initial period. Finally, unobserved firm-specific shock, unrelated to the CEO type, affects CARs immediately after a CEO turnover and revenues

[19] In additional analysis (available upon request), we show that this effect is driven by Stayers (i.e. employees that were at the firm prior to the CEO change and stay after the change), who are precisely the employees who have a potential stronger knowledge of the CEO. In unreported analysis, we also analyzed the extent to which the results varied according to basic firm characteristics (country of headquarters, industry, and firm size) and did not find evidence for this.

[20] We include four factors in our French-Fama model: SMB, HML, Risk-free market returns and momentum. We share the histogram on these returns in Appendix Figure C.2.

[21] In unreported analyses, we also include a firm-fixed effect in each column of Table 4, which does not impact the first few periods after the transition, and minimally impacts later periods.

[22] We examine an alternate performance measure, industry-adjusted revenue returns, as a performance robustness check, using paired data from CapIQ's firm accounting data for a subset of 61 firms in our sample with publicly available data (Appendix Table B.7). Overall, these results suggest that higher communication firms start to diverge in terms of performance directly after the CEO transition and in the following six months.

with a delay. Furthermore, this unobserved shock, not the CEO type, induces a change in communication intensity after the CEO takes charge in the medium term. Unfortunately, our data do not allow us to distinguish between these alternative mechanisms.

5. Modeling CEO Turnover, Uncertainty, and Intra-firm Communication

The empirical analysis shows that CEO changes map into a distinct pattern of internal communication dynamics: namely, a sharp decline in communication in the short run up to 4 months after the transition, a gradual increase in the medium term 5 to 12 months after the transition, and stabilization around 1 year after the CEO is in charge. Additionally, the data show that these dynamics are relatively more heterogeneous across firms in the medium term relative to the short run. The intensity of the recovery in communication varies across different types of meetings both across firms and within a single firm. Namely, the medium run recovery in communication is starker in meetings more closely related to central versus local objectives (i.e. vertical and inter-departmental meetings) and in transitions that do not experience dramatic organizational overhauls alongside the CEO change (i.e. firms that do not change a large fraction of the TMT and firms that appoint an internal CEO).

In this section, we show that a highly stylized model of intra-firm communication based on Alonso et al. (2008), adapted to the context of a CEO turnover, can help us interpret all these results within a single conceptual framework. We choose Alonso et al. (2008) because it is a parsimonious framework that includes key insights about coordination in organizations that go back to corporate leaders like Sloan (1964) and scholars like Hayek (1949).

The starting point for the model is the idea that CEO transitions typically result in heightened organizational uncertainty: as discussed in the Introduction, CEO turnovers are related to many other firm-level changes, such as turnover of other top managers, changes to the board composition, divestment of

prior strategies, and changes to the network structure that increase uncertainty.[23] Furthermore, all this changes occur when new CEOs are unproven in their role and lack the benefit of the support structures they are in the process of developing.

In principle, uncertainty may lead to an *increase* in internal communication. For example, new CEOs may want to communicate new directions, or employees and managers may need to seek information to adapt their actions or provide feedback to the new leadership. Uncertainty, however, often breeds *misalignment* between individual and firm objectives, especially since crafting and communicating a new strategy takes time and may fundamentally change the allocation of resources within the firm. This is the channel through which internal communication may actually result in a *decrease* in internal communication because, as shown in Alonso et al. (2008), misalignment lowers agents' incentives to communicate with each other in equilibrium, especially when communication involves non-verifiable information (such as the one exchanged in meetings). The immediate decrease in meetings and email communication found in the data, as well as the steeper recovery of meetings, are thus consistent with the idea that, in the short run, strategic communication behavior more than offsets the pragmatic needs to communicate or learn about a new direction for the firm.

However, the model also recognizes that the new CEO is not a passive agent; over time, the new CEO will develop, pursue and communicate her new vision to the organization (Schein, 1994).[24] Therefore, as time progresses, we should expect an increase in internal communication such that, once the CEO establishes and communicates the new strategy, communication intensity returns to its pre-transition level. This framework explains not only the medium run recovery in meetings and email intensity, but also its

[23] Barrero et al. (2017) use implied volatility data from equity options to show that CEO turnover is one of the main firm-level risk factors in the short-term (30 days) and long-term (6 months), alongside oil price shocks.

[24] This involves both understanding the needs and constraints of the firm and communicating new objectives. For instance, CEOs may increase communications as a consequence of the fact that divisional managers have private information (i.e., asymmetric awareness) about local conditions and the fit of these more coordinated decisions with the external environment. Others highlight similar issues that arise with increased coordination, such as employees engaging in non-productive or "wasteful" activities to influence decision-making (Milgrom and Roberts, 1990; Milgrom, 1988; Powell, 2015) which could also determine more communication effort.

greater intensity in vertical and interdepartmental communication flows, which we assume to be more closely related to central coordination versus local activities. Moreover, it explains the faster recovery in communications in situations where the CEOs may presumably have an easier (i.e. promoting an internal manager to CEO) or more difficult (i.e., high levels of TMT turnover) time overcoming the uncertainty associated with the transition.

Finally, not all new CEOs are equal when it comes to (re)building alignment (Kotter, 1995). Some are better than others at establishing and communicating a compelling vision for the firm. That CEO type will generate higher alignment and increase communication faster and potentially a higher level. As a result, they may also ultimately experience better firm performance. And our evidence provides some reduced form for that effect too.

While we see value in providing a single unifying framework to make sense of the results, it goes without saying that we are unable to rule out more mechanical (but, in our view, less plausible) stories such as, for example, that the initial drop in internal communication flows and meetings are directly manipulated by CEOs (e.g. enforcing a no-communication rule in the first few months after taking charge), or even alternative interpretations.

We present the model in three parts. Subsection 5.A. reviews the firm intra-communication model of Alonso et al. (2008). Subsection 5.B. adapts the model to include the possibility of CEO transitions. Subsection 5.C. derives four predictions on communication dynamics around CEO transition by making three assumptions on the short-term and medium run effects of a change in leadership.

5.A. Simple model of intra-firm communication

Definitions. A highly stylized firm is modeled as a game with three players: the Center and two Agents. Each Agent i has a local payoff:

$$\pi_i = K_i - (d_i - \theta_i)^2 - \delta(d_i - d_{-i})^2$$

where K_i is a constant, d_i is Agent i's decision, and θ_i is the local state observed by i. The θ_i's are normally distributed with mean zero and variance one and are mutually independent. Besides the constant, the payoff depends on two components:

(1) Adaptation cost, $(d_i - \theta_i)^2$: how well the Agent's decision fits the local state of the world that she faces.

(2) Coordination cost, $(d_i - d_{-i})^2$: how well the Agent's decision fits with the decision taken by the other Agent.

The parameter δ measures the relative importance of coordination versus adaptation. It plays a central role in our analysis, and we refer to this variable as the *need for coordination*. If the need for coordination is high, the Agent's payoff depends more heavily on how her decision fits the other Agent's decisions. Each Agent cares both about her functional department's payoff and the other Agent's payoff. She maximizes:

$$\pi_i + \alpha\pi_{-i}$$

where α represents the *degree of alignment* of the Agent with the rest of the organization (e.g. those from other functional departments). When $\alpha = 0$, alignment is minimal, and the Agent only cares about her payoff. When $\alpha = 1$, alignment is maximal, and the Agent cares about the whole organization's payoff $\pi_i + \pi_{-i}$.

Communication modes. In Alonso et al. (2008), there are two possible modes of organization and communication. *Horizontal* communication occurs when the two Agents communicate with each other and then make decisions independently. Namely, first, each Agent observes the value of her local state. Second, Agent 1 sends a non-verifiable signal to Agent 2, and Agent 2 sends a non-verifiable signal to Agent 1. Third, each Agent makes a local decision. *Vertical* communication occurs when the two Agents communicate with the Center, who then makes decisions for both Agents (or tells them what decision to

take).[25] Namely, after each state observes her local states, she sends a non-verifiable signal to the Center, who then selects both d_1 and d_2.

In both communication modes, each Agent faces a tension between communicating the true value of her signal, who will help the other player—be it the Agent or the Center—make a correct decision, and exaggerating her own signal to induce the decision-maker to make a decision that is closer to the Agent's preference. For instance, if θ_i is positive, Agent i knows that her signal is likely to be higher than the other Agent's signal. If signals were taken at face value, Agent i would have an incentive to communicate a signal higher than θ_i to induce the other Agent or the Center to select a higher action. This effect is related to the one present in the celebrated cheap talk game studied by Crawford and Sobel (1982).

As in Crawford and Sobel (1982), in equilibrium Agents communicate a partitional signal. Although each Agent observes a continuous signal, she can only credibly communicate a coarser discrete signal with a finite number of realizations. Each realization informs the receiver that the true signal lies in a given interval. The residual variance after communication is a function of how coarse the partitional signal is. Therefore, in equilibrium, the partitional signal's fineness can be interpreted as a measure of the amount of information transmitted.[26]

While the incentive to exaggerate the Agent's own state is present both in horizontal and vertical communication, the two modes of communication differ in the relative importance decision-makers assign to local (i.e. functional) and global (i.e. firm-level) payoffs. As the Center always maximizes $\pi_1 + \pi_2$, we should expect her to assign more importance to achieving coordination gains.

Equilibrium. We next present two results borrowed from Alonso et al. (2008) that will form the basis of our predictions. The first links alignment and communication:

[25] There are also two hybrid configurations: (i) The Agents communicate horizontally, and the Center makes (uninformed) decisions; (ii) The Agents communicate with the Center and then make decisions themselves (without getting a signal from the other Agent). However, they are obviously suboptimal.
[26] A partitional equilibrium with n intervals would require transmitting approximately $log\ n$ bits of information.

Proposition 1*: For both modes of communication, an increase in the degree of alignment* α *increases the amount of information transmitted.*[27]

The intuition for this result is that more aligned Agents face a lower incentive to misrepresent their information because they internalize a higher share of the cost of misleading the other Agent or the Center. When the degree for alignment α is higher, the partitional message becomes finer and more information is transmitted. This proposition captures the basic idea that alignment breeds trust, and we communicate more and better when we trust each other. This proposition applies to both modes of communication. In the vertical mode, communication occurs between the Center and the Agents, and information transmission is higher if alignment is higher. In the horizontal model, communication is directly between Agents and, again, it depends on alignment.

The second result links the need for coordination with the relative value of the two communication modes:

Proposition 2*: Holding* α *constant, an increase in the need for coordination* δ *makes center-focused communication (weakly) more efficient than other communication.*[28]

This second result derives from a tradeoff identified by Hayek (1945) between centralized and decentralized decision-making. Centralization is more effective at solving coordination problems. Decentralization is better at using local knowledge and, thus, at solving adaptation problems. If a firm experiences an increase in the relative importance of coordination over adaptation, it should optimally respond by increasing the relative importance of central vs. local communication.

[27] Proof: See Proposition 3(iii) in ADM (noting that our α is related to their λ according to $\alpha=\lambda/(1-\lambda)$).
[28] Proof: See Proposition 5 of ADM as depicted in their Figure 6. For any given value of the alignment parameter (our α, their λ – see previous footnote), decentralization is always optimal for a low value of the need for coordination δ. As δ increases, two cases are possible. If λ is low, decentralization remains optimal (weak increase). If λ is high, centralization instead becomes strictly better with a high enough increase in the need for coordination.

5.B. CEO transition

Equipped with our intra-firm communication theory, we explore the effects of CEO transition on the intensity and mode (i.e. central versus local) of intra-firm communication. We distinguish between four stages of the transition: the steady-state (when the prior CEO still runs the firm), the short-run transition (the first weeks of the transition), the medium run transition (the first months of the transition), and the new steady-state.

We make three assumptions about the evolution of our two key parameters: α and δ. First, the initial weeks of the transition are characterized by a certain degree of confusion in the organization and a lack of clarity over the implicit and explicit incentive structure, as documented by Barrero et al. (2017). In the short term, alignment suffers, and each Agent becomes more protective of their turf. Following a large organizational change, increased ambiguity creates numerous, conflicting interpretations of the same situation (Weick, 1995; Weick et al., 2005). This misalignment persists until the new CEO effectively communicates a singular path forward, dispelling any possible misunderstandings regarding the firm's mission or strategy. Thus, we make the following assumption.

Assumption A*: In the short term, the degree of alignment falls from the pre-transition level* α_0 *to* α_{ST}*, where* $\alpha_{ST} < \alpha_0$.

In the medium run, the new CEO takes control of the firm, selects new leaders, and sets the firm's strategic vision. A new leader may change the firm's shared frame (Gibbons et al., 2021). Planned organizational changes require increased coordination, yet inertial pressures constrain the firm's ability to adapt (Gargiulo and Benassi, 2000; Maurer and Ebers, 2006). Prior structural rigidities (Leonard-Barton, 1992) are challenging to overcome, and the repositioning costs of changing firm strategy further reduce flexibility (Menon and Yao, 2017). The communication of the strategic vision ripples through the firm when information sharing is lower, helping employees adapt to the updated strategies. Subsets of the firm begin to coordinate their decisions based on the shared strategy, reducing uncertainty and increasing the need to coordinate. So, we assume:

Assumption B*: In the medium term, the need for coordination increases from the pre-transition level δ_0 to δ_{MT}, where $\delta_{MT} < \delta_0$.*

Finally, in the medium term, the CEO affects alignment. The CEO's unobservable type determines her ability to create the right organizational culture and implement effective incentive mechanisms. The CEO's type is $\theta \in \{bad, good\}$. The quality of management is important in multi-divisional, decentralized firms (Sah and Stiglitz, 1991), and aspects of CEO behavior and fit with the firm are related to increased firm performance (Bandiera et al., 2015, 2020). Good managers reduce employee turnover (Hoffman and Tadelis, 2021). Good managers can communicate their plans more effectively, reducing greater ambiguity (Kotter, 1995; Schein, 1994). This reduction in misalignment facilitates communication. We make one last assumption:

Assumption C*: In the medium term, a good CEO increases alignment relatively more than a bad CEO: $\alpha_{good} > \alpha_{bad}$.*

5.C. Predictions

These three assumptions lead to three predictions that are aligned with the results shown in Section 4.

Prediction 1*: In the short-term transition, the amount of information transmitted falls. This effect is stronger for communication formats that are more suitable for the transmission of unverifiable information, such as meetings as opposed to email.*

The first part of the prediction is an immediate consequence of Proposition 1 and Assumption A. The reduction in the degree of alignment leads to less intense equilibrium communication.[29] This is consistent with our findings in Table 2, i.e. the overall decline in communication and the greater decline in meetings relative to emails.

[29] One could expand our model by making communication costly. This would reinforce Prediction 1 as workers may exert less effort during the transition because they are subject to less monitoring.

The second part of the prediction relies on the distinction between verifiable information (for example, payments made or received) and unverifiable information (for example, a manager's subjective assessment of the likelihood that a certain R&D project will succeed). Alonso et al. (2008) applies to the communication of unverifiable information only. Instead, the successful transmission of verifiable information is less dependent on trust. We should expect the first part of Prediction 1 to affect more intensely communication channels—like in-person interaction—that are more suitable for transmitting unverifiable information.

We then have:

> ***Prediction 2****: In the medium-term transition, the ratio between the amount of central versus local communication increases.*

The second prediction derives from the assumption that the need for coordination increases after a CEO transition together with Proposition 2. The increased need for coordination makes centralized communication relatively more efficient. In other words, to develop a "new" organization, the CEO requires more centralization to acquire information from the functional divisions: we thus expect that there will be more communication reflecting central activities to coordinate decision-making around the new strategy (i.e. inter-departmental and vertical meetings) relative to local communication (intra-departmental and horizontal meeting). This is consistent with our findings in Table 3.

> ***Prediction 3****: A greater increase in communication in the medium term determines a higher steady-state performance.*

The third prediction is slightly more elaborate than the previous two, and focuses on the connection among CEO types, increased communication, and firm performance. By Assumption C combined with Proposition 1, a good CEO increases the degree of alignment and, hence, medium term communication more than a bad CEO. However, the increase in the degree of alignment also translates into a higher level of firm performance ($\pi_1 + \pi_2$ in the model). We do not know the CEO type, but we observe changes in

communication intensity and firm performance. The model predicts that the former will be correlated with the latter. This is consistent with our findings in Table 4.

6. Conclusion

We use email and meeting metadata on 102 firms to examine how CEO turnover impacts internal communication patterns. To our knowledge, this is the first time that longitudinal measures of intra-firm communication could be analyzed and linked to meaningful organizational events across multiple firms and longitudinally.

Using an event study research design centered on these CEO transitions, we find that CEO turnovers are associated with large communication changes within firms. During the first three months after the CEO transition, email and meeting intensity drops significantly. Around five months after the CEO transition, there is a large increase in email and meeting communication, compensating for the initial drop. The increase in communication is more pronounced in communication modes reflecting coordination activities from the center of the organization. We also find that firms that experienced a greater increase in communication in the medium term after the CEO turnover generate higher cumulative abnormal returns in their stocks immediately after the CEO transition and that these differences persist for six months after the event. We show that these results are consistent with a theoretical model of intra-firm strategic communication, in which a CEO change and the associated uncertainty and misalignment it creates directly affect intrafirm communication.

Overall, these results provide the first large-scale empirical evidence that internal communication flows are highly responsive to significant organizational events—such as CEO turnovers. The data also show that the response of internal communication flows to the same organizational event can vary considerably across firms and over time. These findings are relevant in light of the importance that hard-

to-measure intangible factors—including the strength of internal communication flows—play in the activities and performance of large and complex organizations.

We see this paper as a first step in studying the determinants of internal communication flows across large samples of firms. For instance, prior literature has established the connection between the structure of TMTs and the adoption of Information Technologies, which are often associated with meaningful changes in information flows and organizational structures within firms (Guadalupe et al., 2014). The ability to capture and analyze digital communications metadata opens the door to additional studies that directly measure information-processing activities and provide insight into how information flows through heterogeneous organizational structures. One possible use of the data considered in this paper is to study with greater precision the structure of internal communication networks in isolation and in conjunction with the adoption of new technologies or organizational structures. Furthermore, text from emails or messaging, though extraordinarily difficult to attain for many firms, could be analyzed to identify discussion topics and clean the data further to grasp not only the quantity of communication flows (as we do in this paper) but also the topics discussed and the sentiments expressed in these interactions.

Lastly, to future scholars interested in working with communication data, we stress the tradeoff between increased generalizability of studies using data from many firms versus the depth of information provided by studying a single firm. Access to uniform communication data for many firms is provided from an intermediary firm, such as our email provider, which collects this data through agreements with their customers, who have legal agreements dictating which aspects of their data can be used for research. On the other hand, collaborating with a single firm enables the ability to craft legal agreements that precisely fit the needs and research design of the study. Next, researchers must be aware of potential privacy concerns of working with such data. Source files where this data is stored at many large firms are deleted on a rolling basis, based on adherence to GDPR. As such, it is important to source all possible data needed at a single time, as future pulls from the source files may omit earlier months or certain firms. Our learnings from

anonymized metadata will hopefully serve as a rubric for research interested in building similar future collaborations.

In summary, we see promise in using email and meetings metadata—typically already passively collected by firms—to study unobserved aspects of the inner workings of organizations. We hope that our study can provide a possible blueprint to advance the exploration of these data, while at the same preserving the confidentiality of employees and firms.

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Tables and Figures

Table 1.A. – Firm Summary (102 Firms)

CEO Turnover Reasons	Firms	%
Within-firm Transfer	31	30%
Fired/Underperformed	20	20%
Other	21	21%
Retirement	17	17%
Poached/New Venture	8	8%
M&A	5	5%
Death	1	1%

Country	Firms	%
United States	40	39%
European Union	27	26%
United Kingdom	16	16%
Canada	7	7%
Rest of World	12	12%

CEO Turnover Characteristics	Firms	%
Internal Replacement	52	51%
Prior CEO Tenure (> 5 yrs.)	24	24%
New CEO Failure (<1 yr.)	9	9%

Industry	Firms	%
Services/Fin. (SIC 60-89)	30	29%
Manufacturing (SIC 20-39)	19	19%
Trade (SIC 50-59)	9	9%
Other Industry	44	43%

Firm Turnover Rates	Median	SD
Employee Turnover Rate	0.010	0.13
Manager Turnover Rate	0.012	0.13
TMT Turnover Rate	0.100	0.56
Board Turnover Rate	0.080	0.46

Executive Turnover	Firms	%
CFO	10	10%
COO	16	16%
Board Chairperson	9	9%

Notes: We collected reason, industry, and country from all firms in the broader sample from Execucomp, Boardex, and Orbis. Data on executive, TMT, and board turnover comes from Boardex. Employee and manager turnover rates are from our email provider, calculated based on the date the mailbox account created and deleted. Data we collected was sent to the email provider to be paired with their communications metadata. Internal replacement is an indicator variable for CEOs hired internally (already working at the firm). New CEO failure is an indicator variable if the CEO exits the new role within the first year. We use paired Boardex data to calculate board member or TMT turnover (67 firms) during the month of the CEO change and the three following months as a percentage of listed executives or board members. Lastly, we have an indicator variable for CFO, COO, or Board Chairperson turnover.

Table 1.B - Summary of Communications Data

	Total				
	Mean	Median.	SD	Min	Max
Meetings					
Count (avg/month)	39	29	32	1	377
Inter-department (Diff dept.)	*33*	*25*	*27*	*0*	*222*
Intra-department (Same dept.)	*6*	*4*	*8*	*0*	*194*
Duration (minutes/meeting)	116	79	327	5	24344
Attendees (avg invited/meeting)	42	23	62	2	1470
Emails					
Count (avg/month)	247	223	199	1	46927
Recipients (avg employees/email)	3	3	4	1	491

Notes: Means are user weighted by average monthly email and meeting users provided by the email provider at the firm-month level for the 102 firms in the main effect analysis. Meeting count, duration, and attendees are based on calendar invites that include at least one other individual.

Table 1.C. – Communication by Management Hierarchy Summary

	Individual Contributors			Other Managers			Senior Managers			T-Test (p-value)	
	Mean	Median.	SD	Mean	Median.	SD	Mean	Median.	SD	IC/ Ot. Man	Ot. Man/ Sr. Man
Meetings											
Count (avg/month)	20	16	15	42	36	28	59	52	37	0.00	0.00
Duration (minutes/meeting)	151	85	513	101	77	145	90	77	76	0.00	0.00
Attendees (avg invited/meeting)	36	23	50	45	24	67	46	25	68	0.06	0.96
Emails											
Count (avg/month)	163	132	236	266	243	130	333	310	164	0.00	0.00
Recipients (avg employees/email)	4	3	6	3	3	2	3	3	1	0.00	0.00

Notes: Management hierarchy is based on the firm's self-reported employee reporting structure: ICs have no direct reports, Other Managers only manage ICs, and Senior Managers manage at least one manager. Groups not included in the firm's formal reporting hierarchy, tagged as "no hierarchy" by the Email Provider, are dropped. The sample is the 102 firms of the main effect analysis. Two-sided t-test with equal variances: the null hypothesis is that the means are equal.

Table 1.D. – Summary of Performance Measures

	Cumulative Returns			
	Pre-transition		Post-transition	
	Mean	SD	Mean	SD
Return (Risk-free)	-0.11	0.25	-0.11	0.45
Market-Adjusted CAR	-0.10	0.26	-0.11	0.27
Market (OLS) CAR	-0.11	0.26	-0.11	0.27
French-Fama CAR	-0.09	0.25	-0.07	0.27
Industry-Adjusted Revenue	-0.22	1.80	-0.06	0.33

Notes: Stock market return data are sourced from CSRP for the 49 firms in our sample with available data. Information on the market, risk-free (10 yr. T-bill), HML, and SML rates are from Ken French's website at dartmouth.edu. All data is daily. Market-adjusted return is the stock return minus the market return. The Market OLS model used the predicted residuals of an OLS model, including the market rate, with no constant, to predict the abnormal returns. The French-Fama model used the predicted residuals of an OLS model, including the market rate, HML, and SML, with no constant, to predict the abnormal returns. Returns are calculated at the month level and summed pre (month -6 to month 0, the transition month) and post (month 1 to month 6). Industry-adjusted revenue returns are calculated by OLS regression based on all firms with publicly available accounting data in CapIQ, at the SIC 1 industry level (ten industries).

Table 2 – Firm-level Event Study Regressions of Meeting and Email Measures

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Period -3	0.049	0.220***	0.187*	0.034	-0.057**
	(0.071)	(0.077)	(0.099)	(0.033)	(0.026)
Period -2	-0.035	0.026	0.033	-0.108**	-0.047**
	(0.071)	(0.041)	(0.118)	(0.051)	(0.020)
Period -1 (Base)					
Period 0	-0.329***	0.128*	0.122	-0.164**	-0.017
	(0.105)	(0.068)	(0.085)	(0.070)	(0.031)
Period 1	-0.286***	0.117	0.057	-0.126**	-0.016
	(0.090)	(0.076)	(0.091)	(0.055)	(0.031)
Period 2	0.236***	0.051	0.307***	0.069	0.003
	(0.074)	(0.056)	(0.090)	(0.052)	(0.030)
Period 3	0.227***	0.175**	0.513***	0.111**	0.025
	(0.075)	(0.077)	(0.097)	(0.047)	(0.032)
Period 4	0.137*	0.289***	0.536***	0.095*	0.033
	(0.075)	(0.086)	(0.104)	(0.049)	(0.034)
Period 5	0.268***	0.269***	0.379***	0.108**	0.029
	(0.076)	(0.078)	(0.110)	(0.052)	(0.038)
Period 6	-0.088	0.137**	-0.081	0.014	0.035
	(0.091)	(0.067)	(0.121)	(0.083)	(0.041)
Observations	725	725	725	725	725
Firms	102	102	102	102	102

Notes: All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient. Firm-level fixed effects are included in all columns. The transition occurs during the first month of bi-monthly Period 0. Period -1, the bi-monthly period before the CEO transition, is the base period for the regressions.

Table 3 – Firm-level Event Study Regressions by Communication Modes (Meetings)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Inter- and Intra-department				**Horizontal and Vertical**			
	Meeting Counts (log)			Ratio	Meeting Counts (log)			Ratio
Dependent Variable is log of:	Total Inter & Intra	Inter-dept.	Intra-dept.	Inter/Intra-dept.	Total Hor. & Vert.	Vertical	Horizontal	Vertical/ Horizontal
Period -3	0.036	0.043	-0.020	0.038	-0.003	-0.052	0.027	-0.030*
	(0.074)	(0.074)	(0.066)	(0.065)	(0.145)	(0.192)	(0.135)	(0.015)
Period -2	-0.070	-0.086	-0.004	-0.083	-0.162	-0.236	-0.131	-0.031*
	(0.074)	(0.078)	(0.070)	(0.063)	(0.175)	(0.240)	(0.160)	(0.018)
Period -1 (Base)								
Period 0	-0.215**	-0.238**	-0.168*	-0.005	-0.184	-0.234	-0.168	-0.016
	(0.093)	(0.096)	(0.089)	(0.082)	(0.183)	(0.250)	(0.166)	(0.021)
Period 1	-0.159*	-0.164*	-0.091	-0.101	-0.056	-0.087	-0.051	-0.005
	(0.086)	(0.090)	(0.089)	(0.077)	(0.176)	(0.247)	(0.159)	(0.023)
Period 2	0.307***	0.345***	0.159*	0.141*	0.833***	1.192***	0.718***	0.115***
	(0.074)	(0.077)	(0.084)	(0.077)	(0.162)	(0.229)	(0.147)	(0.020)
Period 3	0.270***	0.320***	0.097	0.196**	1.173***	1.752***	0.993***	0.181***
	(0.079)	(0.081)	(0.089)	(0.080)	(0.179)	(0.258)	(0.160)	(0.023)
Period 4	0.058	0.088	-0.053	0.203**				
	(0.086)	(0.093)	(0.083)	(0.082)				
Period 5	-0.137	-0.104	-0.199*	0.396***				
	(0.119)	(0.122)	(0.105)	(0.130)				
Observations	469	469	469	469	352	352	352	352
Firms	89	89	89	89	88	88	88	88

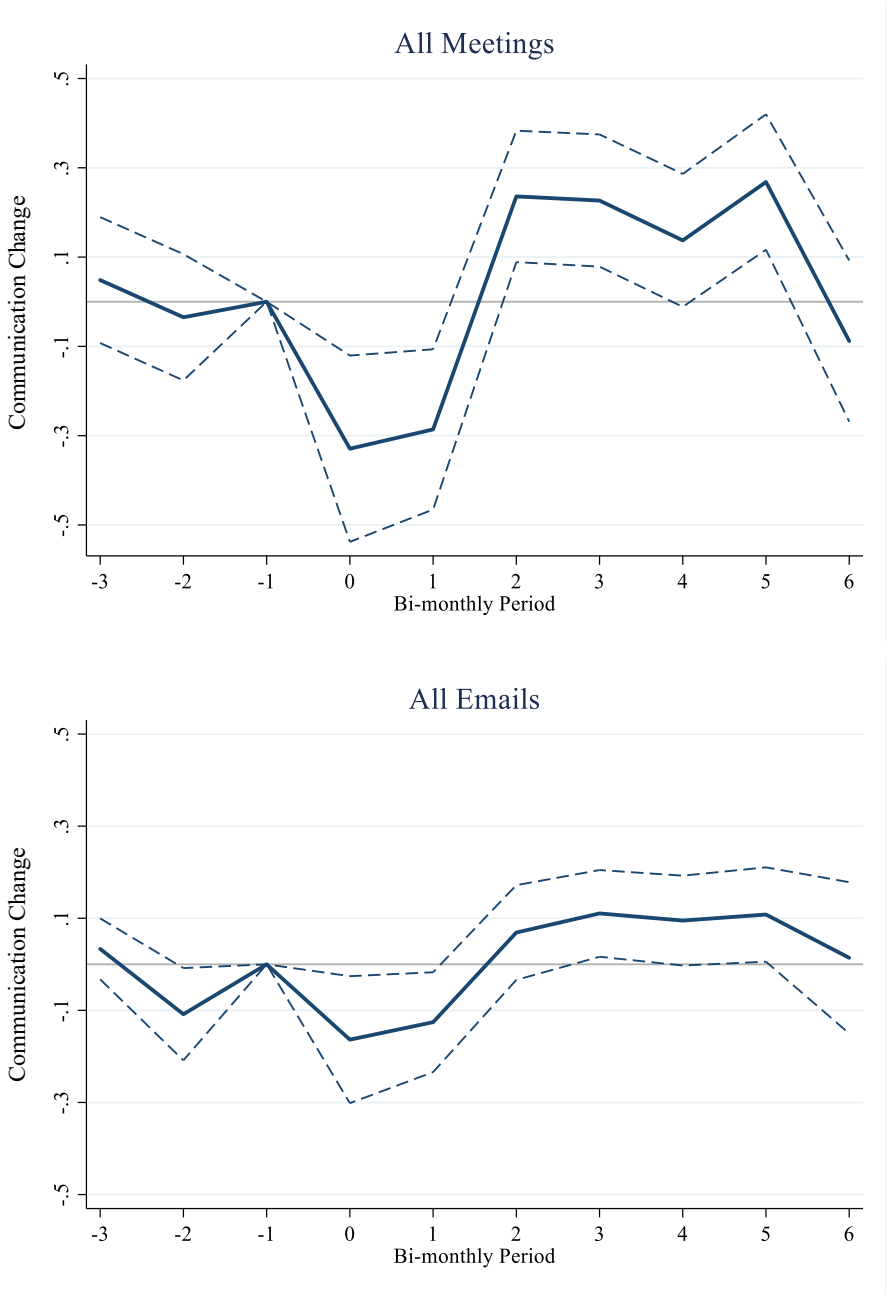
Notes: This analysis is the same as the main results; however, the specification is re-run with data at the department level. Column (1) reruns the main analysis on the subset of firms with department-level data. Column (2) uses inter-departmental communication (across different departments), and column (3) uses intra-departmental communication (within the same department) in each firm. Column (4) is the ratio of inter-departmental to intra-departmental communication. The data used in columns (5)-(8) were limited to seven periods (Period -3 to Period 3) based on data available at the time our email provider shared this additional data set. Column (5) uses the aggregate of only vertical and horizontal (352 firm-periods, 88 firms). Please see Appendix A.3. for a discussion of which types of interactions are and are not included and how the underlying sample differs. Vertical (column (6)) is the IC/Manager meeting interactions. Horizontal (column (7)) is the aggregate of IC/IC and Man/Man meeting interactions. The ratio of vertical to horizontal meeting interactions (column (8)) is vertical count divided by horizontal count at the firm-period level. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses, under the coefficient.

Table 4 - Cumulative Abnormal Ret in Higher vs. Lower Communication Firms

	(1)	(2)	(3)	(4)
Comm. Change:	+2 months to +6 months		Continuous	
Dependent Variable is log of:	**Mkt.-Adj. CAR**	**French-Fama CAR**	**Mkt.-Adj. CAR**	**French-Fama CAR**
Period -3	0.112**	0.079	0.082*	0.082*
	(0.051)	(0.051)	(0.041)	(0.041)
Period -2	0.018	0.003	-0.001	-0.001
	(0.054)	(0.054)	(0.045)	(0.045)
Period -1	-0.112	-0.106	-0.105*	-0.105*
	(0.082)	(0.081)	(0.062)	(0.062)
Period 0 (Base Period)				
Period 1	-0.116***	-0.094**	-0.068**	-0.068**
	(0.041)	(0.042)	(0.032)	(0.032)
Period 2	-0.239**	-0.184	-0.158*	-0.158*
	(0.111)	(0.111)	(0.082)	(0.082)
Period 3	-0.290*	-0.217	-0.194*	-0.194*
	(0.148)	(0.147)	(0.107)	(0.107)
Period 4	-0.310*	-0.226	-0.220	-0.217
	(0.181)	(0.181)	(0.132)	(0.132)
Period 5	-0.317*	-0.230	-0.252*	-0.244*
	(0.189)	(0.188)	(0.140)	(0.138)
Period 6	-0.317*	-0.223	-0.256*	-0.248*
	(0.187)	(0.187)	(0.139)	(0.137)
Change in Communication	0.057	0.042	0.050	0.027
	(0.064)	(0.063)	(0.109)	(0.107)
Period -3 x Change in Communication	-0.114*	-0.105	-0.144	-0.144
	(0.066)	(0.066)	(0.111)	(0.111)
Period -2 x Change in Communication	-0.069	-0.066	-0.079	-0.079
	(0.077)	(0.076)	(0.114)	(0.113)
Period -1 x Change in Communication	0.020	0.027	0.016	0.016
	(0.108)	(0.107)	(0.151)	(0.151)
Period 0 x Change in Communication (Base)				
Period 1 x Change in Communication	0.144***	0.144***	0.113*	0.113*
	(0.046)	(0.046)	(0.062)	(0.062)
Period 2 x Change in Communication	0.240**	0.244**	0.188	0.188
	(0.115)	(0.115)	(0.136)	(0.136)
Period 3 x Change in Communication	0.298*	0.307**	0.262	0.262
	(0.150)	(0.150)	(0.180)	(0.180)
Period 4 x Change in Communication	0.329*	0.337*	0.408*	0.376*
	(0.185)	(0.185)	(0.226)	(0.220)
Period 5 x Change in Communication	0.300	0.317	0.521*	0.462*
	(0.195)	(0.194)	(0.280)	(0.245)
Period 6 x Change in Communication	0.289	0.294	0.515*	0.456*
	(0.195)	(0.195)	(0.277)	(0.246)
Observations	924	924	924	924
Firms	49	49	49	49

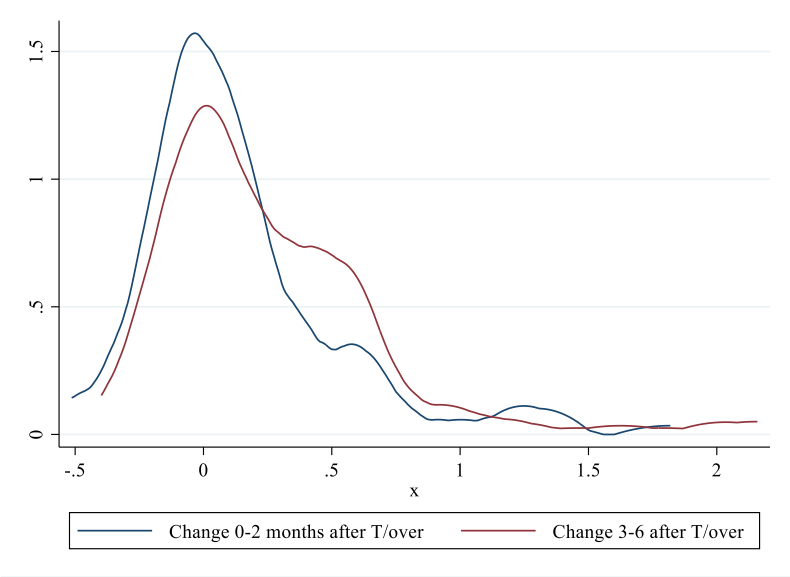
Notes: All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses, under the coefficient. Columns (1) and (2) use a dummy to denote firms with higher than median changes in communication in the medium-run after the CEO transition, whereas columns (4) and (5) use the continuous variable.

Figure 1 – Main Event Study Summary



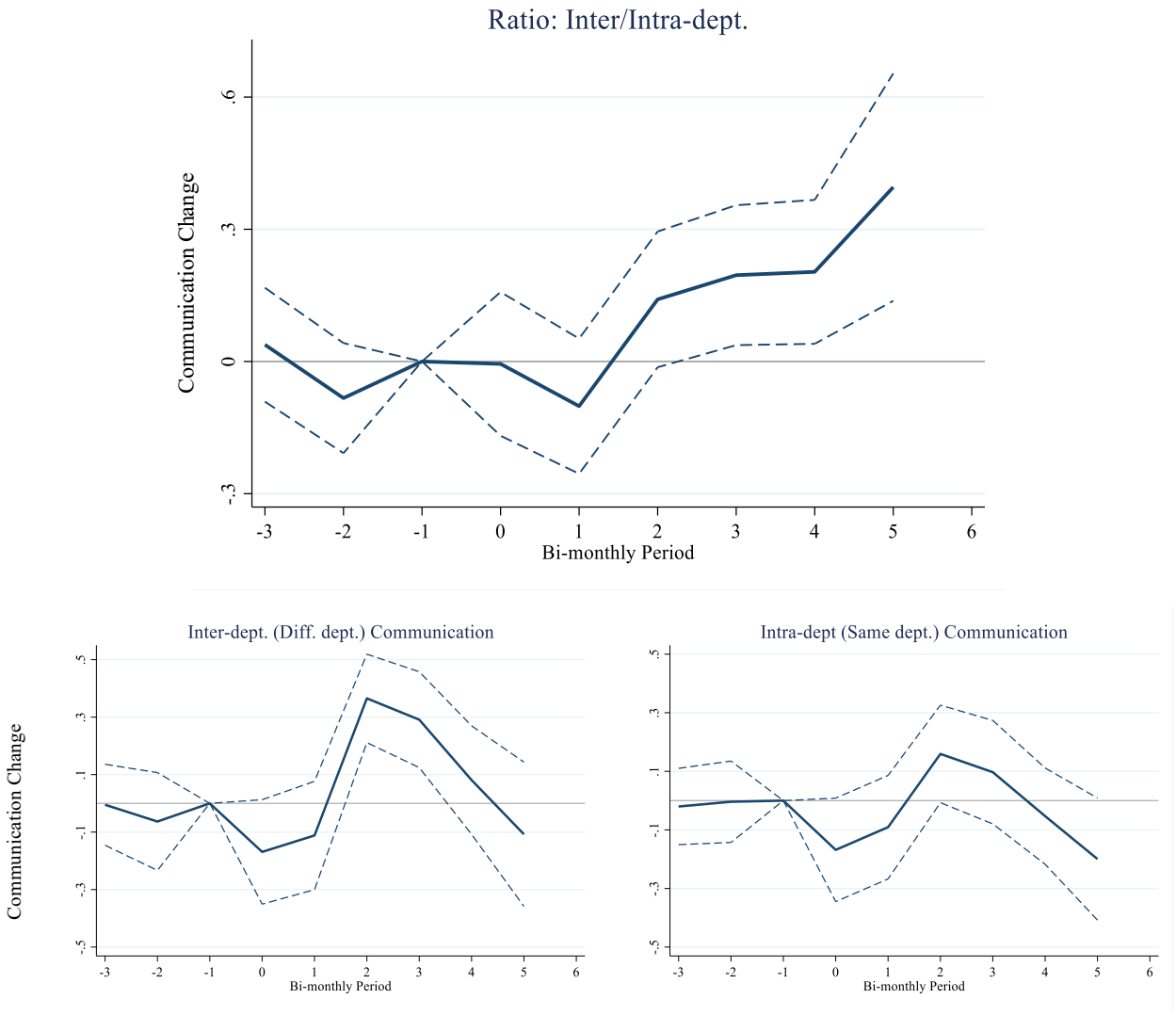
Notes: We plot the OLS regression coefficients from the main event regression specification on the top two graphs, reported in Table 2, across time for total meeting count (top) and email count (bottom) for the full sample of 102 firms.

Figure 2 –Kernel Density: Variation in Communication Changes by Short and Medium Terms



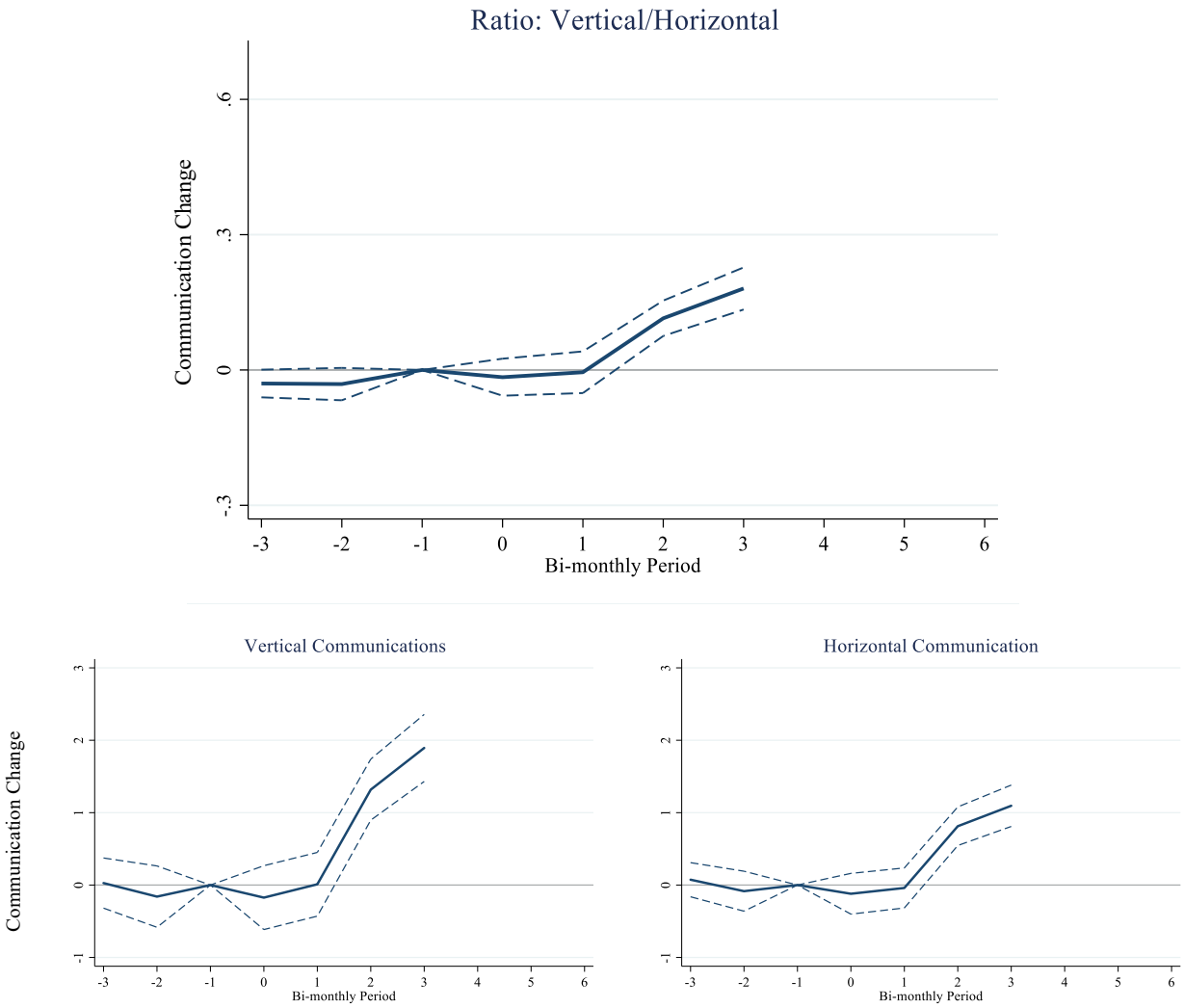
Notes: This figure shows the distribution of variables measuring changes in communication between months 0 and 2 (blue line), and months 2 and 6 (red line) after the CEO turnover. We perform a two-sided F-test on the equality of variances for these two variables; we reject the null that the ratio of variances is equal to 1 (Pr (F < f) = 0.16).

Figure 3 – Inter-department and Intra-department Communication



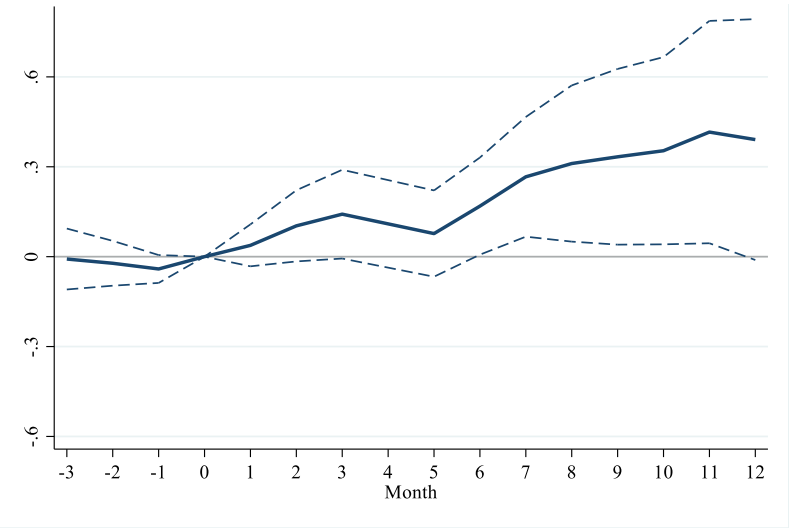
Note: We plot the OLS regression coefficients for the mix of inter-departmental to intra-departmental meetings (top). Below we plot the OLS regression coefficients for inter-departmental communication (bottom left) and intra-departmental communication (bottom right). These results are reported in Table 3 for 89 firms with available data. The CEO turnover occurs in Period 0. We use the period before the transition, Period -1, as the event study's base period. These results include firm-level fixed effects and standard errors clustered at the firm level.

Figure 4 – Hierarchy Event Study Summary (Firm-level Data)



Note: We plot the OLS regression coefficients the mix of vertical to horizontal meeting count (top). Below we plot the OLS regression coefficients for vertical communication (bottom left) and horizontal communication (bottom right). These results are reported in Table 3 for 88 firms with available data. The CEO turnover occurs in Period 0. We use the period before the transition, Period -1, as the event study's base period. These results include firm-level fixed effects and standard errors clustered at the firm level.

Figure 5 – Difference between CARs of Higher and Lower Communication Firms (+2 to +6 mos.)



Notes: Standard errors are clustered at the firm level. Firms (49) are divided into low and high communication groups, based on whether their communication changes between months +2 and +6 after the CEO turnover was above or below the sample median. This graph uses a monthly specification with a base of month=0, the transition month.

Appendices

Appendix A – Data & Summaries

Note A.1. – Sample Construction

The sample construction involved several steps. First, the email provider gave us a sense of the time window over which it had comprehensive email and meeting metadata. Due to regulation adherence and data collection system changes, the email provider had various gaps in its historical communications metadata records from deleting certain data in certain areas on a rolling basis. We then searched for all firms that experienced a CEO turnover during that period using Execucomp, BoardEx, and Orbis. This search led to a sample of 338 firms that experienced a CEO transition consisting of 155 publicly traded and 183 private firms. Third, we collected auxiliary data on all these firms using public information. These firms have, on average, 9,000 employees and are in 29 countries. Most of the firms, however, are located in the United States (130 firms, 38%), the United Kingdom (45 firms, 14%), and Canada (41 firms, 13%). We then provided this list of firms and associated firm-level data to the email provider to match our data with their communications metadata.

This matching process led to a final sample of 102 firms from the broader 338 firms with communication data around the time of the CEO turnover event. The sample includes firms located in 21 more economically developed countries, and most firms have their headquarters in the United States (39%), the United Kingdom (16%), and Canada (7%). The average firm has 6,545 (SD 4,217) users, defined as employees with an active email account connected to the firm web domain, and the largest firm has almost 15,000 users. We do not have the average number of employees as measures such as employee count and revenue levels were matched as employee count and revenue quintiles (1-5) to preserve the firm's anonymity.

We cannot compare these sample groups as we do not know which firms are included in the final data set and which are not. Also, we were not provided information on firms or subgroups within firms smaller than five individuals. No government entities are included in any data.

Note A.2. – Data Aggregation

The email provider sent us data at the following level of granularity across time:

- ID
- Management hierarchy (IC, M, M+)
- Tenure (Exitor, Stayer, Entrant)
- HQ (CHQ or sub)

We refer to the ID-Hierarchy-Tenure-HQ-Month as the cell level. There is a user count measure for both emails and meetings at the cell level. For the main analysis, we sum meeting and email users at the month-id-hierarchy level (the lowest level of granularity as we do not use Tenure or HQ data cuts. We then create a weighting variable for users and meetings: users at the cell level divided by users at the month-id-hierarchy level. We then collapse using the weighting variable.

Note A.3. – Meeting Interaction Data Availability

We also aggregated the meeting data along the firm hierarchy, across similar hierarchal levels (i.e., *horizontal* communication between employees or between managers) and across different hierarchical levels between ICs and managers (i.e., *vertical* communication between managers and workers) to proxy for the different communication modes discussed in the model. For vertical and horizontal communication flows, there are an average of 14,155 (SD 38,127) horizontal meetings and 8,722 (SD 29,357) vertical meetings per month at the firm level (88 firms). This roughly equates to 2 (Median 2 SD 2) vertical and 5 (Median 4 SD 4) horizontal meetings per user per firm per month.[30] We report these summary statistics in Table A.3.A below and summarize data availability in Figure A.3.B.

We use Appendix Table A.3 to reconcile the primary user-level meetings data for two sample composition issues. First, we only have hierarchy data for a subsample of firms (88) and for a shorter time window (only until Period 3). We find differences between the main analysis and the hierarchy data due to sample composition. In column (1) we report the main analysis using the primary user-level data set (matching the results in Table 2 column (1)). Next, we compare this model to column (2) where we run the analysis for the subsample and find that the communication declines are not as steep in P0 and P1. Also, the coefficient in P1 is not significantly different from zero.

[30] This measure does not map back to our other data set because these are distinct meetings. For example, if 100 employees attended an all-hands meeting, then it would count as 1/100 meetings. On the other hand, in the main data set, this would count as one meeting per user, regardless of how many employees attended, leading to higher per user estimates

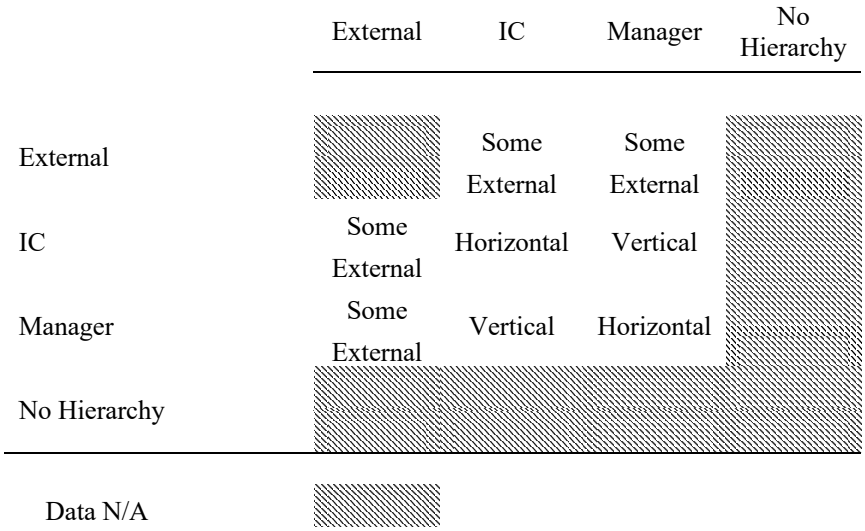
Second, any interaction that may include an "external" party, such as a vendor, temporary worker, summer intern, or any employee not included in the formal org chart, would not be included in the hierarchy data (from Table 3) but would be included in the primary user-level data (Table 2). The primary user-level meeting data capture any meetings from an internal sender that includes others inside the firm. Meetings sent from internal employees that only include external parties (different domain names) are excluded from all analyses. We receive data on **some** (but not all) of these interactions (i.e. IC-external, Manager-external, Vertical-external) for 73 firms. We still do not have information on employees with no listed hierarchy information but are not external. We re-run the model in column (4) to determine if these meetings with external parties, included in the primary user-level data and omitted from the firm-level *horizontal and vertical* communication measures, display different trends. Results help to reconcile differences in Period 1, but not in period 0. These differences support that sample selection is the main driver of the difference between these two data sets.

Table A.3.A - Summary of Meeting Interactions (Hierarchy, per-user)

	Total			Man-Man			IC-IC			**Horizontal**			**Vertical**		
	Mn.	Md.	SD	Mn.	Md.	SD	Mn.	Md.	SD	Mn.	Md.	SD	Mn.	Md.	SD
Meetings															
Count (avg/month)	9	7	6	2	2	2	3	3	3	5	4	4	2	2	2
Duration (avg. mins/meeting)				57	54	14	59	58	14				58	56	15

Notes: Meeting counts and duration provided at the firm level for 88 firms (353 observations) over seven bi-monthly periods (collapsed from 17 months of data). For these observations, we have matched firm-period observations in the main analysis. These are distinct meetings and do not include any information on the number of attendees. The means calculated above are based on the average number of meeting users per firm. Vertical meetings include an IC and a Manager (and no external or "no hierarchy" employees). Horizontal meetings are the sum of two groups: manager-only meetings and IC-only meetings. The Email Provider did not share separate details on manager type (i.e. other managers, senior managers) in this dataset; they are combined. Duration of meetings provided only for IC/Man, Man/Man, and IC/IC interactions.

Figure A.3.B – Depiction of Meeting Interaction Data Availability



Notes: Additional hierarchy data set summarized based on data shared by the email provider for 88 firms. We do not have information on the following types of employee interactions. We only requested proxies for horizontal and vertical intra-firm meeting interactions between employees with recorded hierarchy information. Email information was not provided.

Table A.3.C. –User Level (Main Analysis) and Firm Level (Hierarchy) Comparison

	(1)	(2)	(3)	(4)
	Meeting Counts (log)			
Dependent Variable is log of:	Total		Horizontal & Vertical	External (not included)
Data:	Primary User-level		Firm-level	
Period -3	0.049	0.062	-0.003	-0.108
	(0.071)	(0.079)	(0.145)	(0.165)
Period -2	-0.035	-0.056	-0.162	0.026
	(0.071)	(0.077)	(0.175)	(0.135)
Period -1 (Base)				
Period 0	-0.329***	-0.183*	-0.184	-0.055
	(0.105)	(0.094)	(0.183)	(0.140)
Period 1	-0.286***	-0.056	-0.056	-0.174
	(0.090)	(0.096)	(0.176)	(0.176)
Period 2	0.236***	0.418***	0.833***	0.803***
	(0.074)	(0.087)	(0.162)	(0.140)
Period 3	0.227***	0.576***	1.173***	1.208***
	(0.075)	(0.104)	(0.179)	(0.160)
Observations	725	352	352	289
Firms	102	88	88	73

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered at the firm level. Firm-level fixed effects are included in all Columns.

Note A.4. – Performance Measures

The cumulative Fama-French abnormal stock return is calculated using monthly French-Fama data downloaded from the following website: http://mba.tuck.dartmouth.edu /pages/faculty/ken.french/. For the Fama-French stock return measure, we use the four-factor model to estimate the residuals. These four factors are (1) High minus low, (2) Small minus big, (3) Risk-free market returns, and (4) Momentum. Since we run this model on a relatively small number of firms, we include 49 industries of firms in training the model (also from French's website) and then use the model to estimate abnormal returns for the public firms in our sample

Appendix B – Additional Results

Note B.1. – Monthly Data

Table B.1. shows the results of using a monthly instead of bi-monthly aggregation in the specification. Instead of the transition occurring in the bi-monthly Period 0 (in the main results), it occurs in month zero. The base period is the single month before the transition (Month -1) instead of the bi-monthly period, Period -1 (in the main results). The analysis supports that our results are not dependent on aspects of aggregation in our specification. Firm-level fixed effects are included in all columns.

Note B.2. – Combined Robustness Checks

Table B.2. we first re-run the main analysis (Table 2, columns (1) and (4)) in columns (1) and (2), respectively. We show results from balanced data for 55 firms in columns (3) and (4). We examine meetings and emails for the sample of firms with a CEO pre-announced (more than 1 month before the CEO transition) on the announcement and transition timeline. We find that the coefficients on the indicator variables denoting bi-monthly periods after the actual transition are negative and significant (columns (5) and (7)) even in this small subsample of firms. Point estimates on the indicator variables relative to the announcements — while negative — are not precisely estimated (columns (6) and (8)).

Notes B.3.-B.5. – Stayers, Exitors, and Entrants

To provide further support that our results were not driven by the entrance and exit of employees from the firms around the transition, we run the analysis for Stayer, defined as employees at the firm before and after the transition. The email provider based this category on the date when the user's mailbox was created. Table B.3. shows a similar specification to the main result replicated for the subset of Stayers in each firm. Additionally, we share results for Exitors (Table B.4.), who leave the firm after the transition, and Entrants (Table B.5.), who enter the firm after the transition. Analyses of these subgroups show that Exitors communicate far less, on average, in the post-period before they depart. On the other hand, Entrants on-ramp and begin to communicate at more similar levels to the Stayers. Firm-level fixed effects are included in all columns. The transition occurs during the first month of bi-monthly Period 0. Period -1, the bi-monthly period before the CEO transition, is the base period for the regressions

Note B.6. – Transition Month Fixed Effect

We repeat the main results with an added control for the calendar month to show that our findings are not impacted by the seasonality of the CEO transition date. CEO transitions occur during a roughly three-month period that overlaps four calendar months. These results, reported in Table B.6., remain similar. The transition occurs during the first month of bi-monthly Period 0. Period -1, the bi-monthly period before the CEO transition, is the base period for the regressions.

Notes B.7. – Performance

We find similar results to Table 4 in this performance-related robustness check. In Table B.7. we report results from analyzing an alternate variable, cumulative industry-adjusted revenue, on a quarterly timeline. We use paired data from CapIQ on 61 firms to create measures of quarterly revenue returns less average industry-level returns through a regression model. On this timeline, the CEO turnover event takes place in quarter 0. We calculate cumulative industry-adjusted revenue returns similarly to how we calculate CAR above. The only difference is that the pre-turnover measure starts from quarter -3 instead of month -6. These 61 firms are divided into high and low communication groups. The transition occurs during the first month of bi-monthly Period 0, which is used as the base period for these regressions

Table B.1. – Firm-level Event Study Regressions of Meeting and Email Measures (Monthly)

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Month -3	-0.080	0.009	-0.032	-0.093	-0.052*
	(0.100)	(0.059)	(0.162)	(0.065)	(0.028)
Month -2	0.020	-0.023	-0.191	-0.060	-0.021
	(0.094)	(0.052)	(0.121)	(0.051)	(0.028)
Month -1 (Base)					
Month 0	-0.221**	0.089	0.131	-0.163***	-0.034
	(0.107)	(0.073)	(0.094)	(0.062)	(0.029)
Month 1	-0.282**	0.089	-0.014	-0.202***	-0.031
	(0.114)	(0.074)	(0.107)	(0.077)	(0.030)
Month 2	-0.366***	0.016	-0.034	-0.254***	-0.022
	(0.105)	(0.067)	(0.101)	(0.057)	(0.031)
Month 3	-0.173*	0.128	-0.019	-0.124**	-0.020
	(0.099)	(0.089)	(0.106)	(0.054)	(0.032)
Month 4	0.173*	0.037	0.177	0.034	-0.009
	(0.088)	(0.064)	(0.110)	(0.046)	(0.031)
Month 5	0.288***	0.037	0.240**	0.094**	0.007
	(0.089)	(0.066)	(0.096)	(0.039)	(0.030)
Month 6	0.300***	0.056	0.444***	0.108***	0.017
	(0.086)	(0.066)	(0.103)	(0.038)	(0.032)
Month 7	0.145	0.194**	0.344***	0.107**	0.024
	(0.094)	(0.094)	(0.113)	(0.041)	(0.032)
Month 8	0.110	0.175**	0.410***	0.085*	0.032
	(0.089)	(0.088)	(0.126)	(0.043)	(0.033)
Month 9	0.148*	0.351***	0.384***	0.099**	0.025
	(0.086)	(0.093)	(0.112)	(0.041)	(0.035)
Month 10	0.083	0.208**	0.113	0.096**	0.026
	(0.109)	(0.080)	(0.145)	(0.044)	(0.036)
Month 11	0.308***	0.255***	0.196	0.110**	0.025
	(0.091)	(0.088)	(0.133)	(0.048)	(0.038)
Month 12	-0.032	0.143*	-0.340**	0.073	0.019
	(0.113)	(0.074)	(0.152)	(0.077)	(0.042)
Observations	1230	1230	1230	1230	1230
Firms	102	102	102	102	102

Notes: All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient.

Table B.2. – Robustness Tests: Firm-level Event Study Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	Total		Balanced Data		Pre-Announcement			
Dependent Variable is log of:	Meetings (count)	Emails (count)	Meetings (count)	Emails (count)	Meetings (count)		Emails (count)	
Timeline: Announcement = P0 or Transition = P0	Trans	Trans	Trans	Trans	Trans	Ann	Trans	Ann
Period -3	0.049	0.034	0.048	0.034	0.037		0.019	
	(0.071)	(0.033)	(0.072)	(0.034)	(0.094)		(0.051)	
Period -2	-0.035	-0.108**	-0.035	-0.109**	-0.015	0.090	0.010	0.028
	(0.071)	(0.051)	(0.072)	(0.051)	(0.044)	(0.127)	(0.054)	(0.052)
Period -1 (Base)								
Period 0	-0.329***	-0.164**	-0.324***	-0.161**	-0.372**	-0.216	-0.141***	-0.114
	(0.105)	(0.070)	(0.106)	(0.070)	(0.145)	(0.161)	(0.051)	(0.086)
Period 1	-0.286***	-0.126**	0.096	-0.077	-0.610***	-0.101	-0.245***	-0.246
	(0.090)	(0.055)	(0.072)	(0.059)	(0.133)	(0.100)	(0.079)	(0.163)
Period 2	0.236***	0.069	0.293***	0.080*	0.059	-0.284*	-0.038	-0.168
	(0.074)	(0.052)	(0.073)	(0.047)	(0.063)	(0.144)	(0.034)	(0.100)
Period 3	0.227***	0.111**	0.112	0.107**	0.087	0.061	0.001	-0.040
	(0.075)	(0.047)	(0.075)	(0.048)	(0.079)	(0.073)	(0.041)	(0.092)
Period 4	0.137*	0.095*	0.117	0.095*	0.047	0.132	0.017	-0.014
	(0.075)	(0.049)	(0.075)	(0.051)	(0.064)	(0.087)	(0.044)	(0.089)
Period 5	0.268***	0.108**	0.207**	0.144***	0.122	0.160**	0.024	-0.003
	(0.076)	(0.052)	(0.078)	(0.052)	(0.079)	(0.076)	(0.046)	(0.088)
Period 6	-0.088	0.014	-0.214**	-0.042	-0.107	0.259***	0.005	0.017
	(0.091)	(0.083)	(0.106)	(0.111)	(0.098)	(0.086)	(0.047)	(0.092)
Observations	725	725	463	463	213	173	213	173
Firms	102	102	55	55	30	30	30	30

Notes: * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered at the firm level. Firm-level fixed effects are included in all Columns. Columns (1) and (2) are the main effect, mapping to Table 2, columns (1) and (4), respectively. Columns (3) and (4) test the robustness of the main effect on the sample of 55 firms with balanced data before and after the CEO transition event. Columns (5) and (7) test the robustness of the main effect on the sample of 30 firms that announce the CEO turnover more than 1 month before the transition occurs, on the transition timeline (where the CEO transition event =Period 0 and the base = Period -1, one period before the CEO transition event), similar to the other regressions reported. Columns (6) and (8) use the announcement timeline for this same sample of 30 firms (where the announcement of the pending CEO turnover= Period 0 and the base = Period -1, one period before the announcement.)

Table B.3. – Firm-level Event Study Regressions (Stayers Only)

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Period -3	0.046	0.236***	0.203*	0.048	-0.041*
	(0.069)	(0.074)	(0.103)	(0.037)	(0.024)
Period -2	-0.073	0.039	0.038	-0.100*	-0.033*
	(0.075)	(0.040)	(0.118)	(0.052)	(0.017)
Period -1 (Base)					
Period 0	-0.296***	0.145**	0.132	-0.064	-0.002
	(0.106)	(0.062)	(0.087)	(0.057)	(0.026)
Period 1	-0.310***	0.119	0.054	-0.051	0.016
	(0.093)	(0.077)	(0.085)	(0.049)	(0.027)
Period 2	0.232***	0.030	0.342***	0.115**	0.021
	(0.073)	(0.049)	(0.088)	(0.049)	(0.028)
Period 3	0.208***	0.161**	0.510***	0.131***	0.040
	(0.072)	(0.073)	(0.096)	(0.049)	(0.030)
Period 4	0.137*	0.212***	0.539***	0.107**	0.050
	(0.069)	(0.069)	(0.104)	(0.051)	(0.033)
Period 5	0.243***	0.197***	0.385***	0.113**	0.049
	(0.071)	(0.057)	(0.108)	(0.052)	(0.037)
Period 6	-0.052	0.119**	-0.089	0.032	0.046
	(0.086)	(0.059)	(0.115)	(0.085)	(0.044)
Observations	696	696	696	696	696
Firms	96	96	96	96	96

Notes: * p<0.1, ** p<0.05, *** p<0.01. This analysis uses the same specification as the main results; however, the specification is re-run only on the subset of Stayers (at the firm before and after the transitions) in each firm. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient.

Table B.4. – Firm-level Event Study Regressions (Exitors Only)

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Period -3	0.072	0.040	0.158	-0.039	-0.149*
	(0.090)	(0.086)	(0.096)	(0.076)	(0.081)
Period -2	-0.024	-0.029	0.020	-0.168	-0.205**
	(0.097)	(0.063)	(0.124)	(0.152)	(0.079)
Period -1 (Base)					
Period 0	-0.216**	-0.027	0.141	-0.143	-0.097
	(0.096)	(0.073)	(0.095)	(0.105)	(0.090)
Period 1	-0.190*	0.019	0.113	-0.161	-0.123
	(0.098)	(0.101)	(0.104)	(0.111)	(0.095)
Period 2	0.211**	-0.007	0.453***	-0.107	-0.107
	(0.085)	(0.085)	(0.103)	(0.112)	(0.101)
Period 3	0.203**	0.104	0.607***	-0.273**	-0.061
	(0.087)	(0.116)	(0.111)	(0.113)	(0.103)
Period 4	-0.089	0.260*	0.663***	-0.684***	-0.041
	(0.093)	(0.133)	(0.119)	(0.142)	(0.107)
Period 5	-0.046	0.317**	0.688***	-1.383***	-0.083
	(0.096)	(0.123)	(0.124)	(0.171)	(0.118)
Period 6	-0.759***	-0.093	-0.440**	-1.577***	0.010
	(0.168)	(0.143)	(0.185)	(0.206)	(0.153)
Observations	547	547	547	547	547
Firms	89	89	89	89	89

Notes: * p<0.1, ** p<0.05, *** p<0.01. This analysis uses the same specification as the main results; however, the specification is re-run only on the subset of Exitors (at the firm before the transition; leave the company after the transition) in each firm. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient.

Table B.5. – Firm-level Event Study Regressions of Meeting and Email Measures (Entrants Only)

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Period -3					
Period -2					
Period -1 (Base)					
Period 0	-0.662***	0.047	-0.002	-1.168***	-0.128**
	(0.125)	(0.094)	(0.126)	(0.168)	(0.054)
Period 1	-0.520***	-0.101	-0.035	-0.527***	-0.039
	(0.101)	(0.068)	(0.105)	(0.085)	(0.040)
Period 2	-0.020	-0.057	0.287***	-0.171**	-0.029
	(0.063)	(0.047)	(0.084)	(0.068)	(0.033)
Period 3	0.023	0.039	0.488***	-0.072	-0.001
	(0.049)	(0.061)	(0.085)	(0.061)	(0.029)
Period 4	0.022	0.195***	0.582***	-0.014	-0.014
	(0.052)	(0.073)	(0.086)	(0.055)	(0.024)
Period 5	0.262***	0.240***	0.426***	0.073	0.001
	(0.040)	(0.069)	(0.077)	(0.050)	(0.016)
Period 6					
Observations	592	592	592	592	592
Firms	95	95	95	95	95

Notes: * p<0.1, ** p<0.05, *** p<0.01. This analysis uses the same specification as the main results; however, the specification is re-run only on the subset of Entrants (enter after the transition) in each firm. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient. Firm-level fixed effects are included in all columns.

Table B.6. – Firm-level Event Study Regressions, Firm and Month FEs

	(1)	(2)	(3)	(4)	(5)
	MEETINGS			**EMAILS**	
Dependent Variable is log of:	Meetings (count)	Avg. Duration (minutes)	Avg. Participants (people)	Emails (count)	Avg. Recipients (people)
Period -3	0.048	0.220***	0.188*	0.034	-0.058**
	(0.072)	(0.077)	(0.100)	(0.034)	(0.027)
Period -2	-0.035	0.025	0.034	-0.109**	-0.047**
	(0.072)	(0.041)	(0.118)	(0.051)	(0.020)
Period -1 (Base)					
Period 0	-0.327***	0.128*	0.126	-0.162**	-0.018
	(0.106)	(0.068)	(0.085)	(0.070)	(0.032)
Period 1	-0.278***	0.118	0.072	-0.125**	-0.016
	(0.090)	(0.077)	(0.090)	(0.055)	(0.032)
Period 2	0.244***	0.052	0.326***	0.070	0.002
	(0.075)	(0.057)	(0.089)	(0.052)	(0.031)
Period 3	0.235***	0.177**	0.532***	0.111**	0.025
	(0.076)	(0.078)	(0.097)	(0.048)	(0.033)
Period 4	0.148*	0.290***	0.556***	0.095*	0.033
	(0.075)	(0.087)	(0.104)	(0.049)	(0.035)
Period 5	0.279***	0.270***	0.400***	0.108**	0.029
	(0.077)	(0.078)	(0.109)	(0.052)	(0.039)
Period 6	-0.015	0.154**	-0.031	0.047	0.028
	(0.092)	(0.072)	(0.120)	(0.083)	(0.045)
Observations	725	725	725	725	725
Firms	102	102	102	102	102
Transition Cal. Month	4	4	4	4	4

Notes: * p<0.1, ** p<0.05, *** p<0.01. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient. Firm-level and calendar month fixed effects are included in all columns.

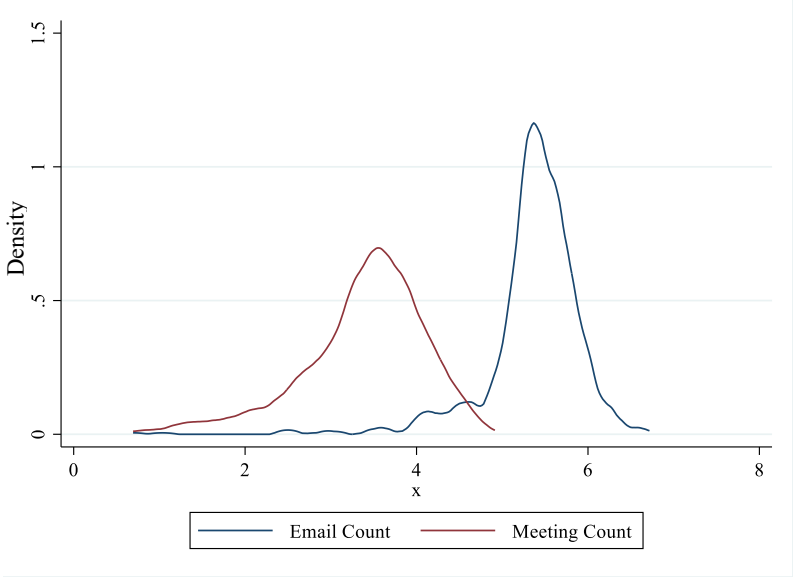
Table B.7 - Cumulative Revenue Change in Higher vs. Lower Communication Firms

Dependent Variable is log of:	(1) **Cumulative Total Revenue**
Communication Time Period:	**+2 to +6 Mos.**
Quarter -3	-0.155
	(0.362)
Quarter -2	-0.208
	(0.367)
Quarter -1	-0.093
	(0.362)
Quarter 0 (Base Quarter)	
Quarter 1	-0.083*
	(0.048)
Quarter 2	-0.097*
	(0.049)
Quarter 3	-0.106*
	(0.056)
Quarter 4	-0.114*
	(0.063)
Low/High Communication	
Quarter -3 x High Communication	-0.243
	(0.496)
Quarter -2 x High Communication	-0.163
	(0.497)
Quarter -1 x High Communication	-0.281
	(0.509)
Quarter 0 x High Communication (Base)	
Quarter 1 x High Communication	0.101*
	(0.056)
Quarter 2 x High Communication	0.106**
	(0.052)
Quarter 3 x High Communication	0.087
	(0.061)
Quarter 4 x High Communication	0.012
	(0.130)
Observations	488
Firms	61

Notes: * p<0.1, ** p<0.05, *** p<0.01. All columns are estimated by OLS. Standard errors are clustered at the firm level, in parentheses under the coefficient.

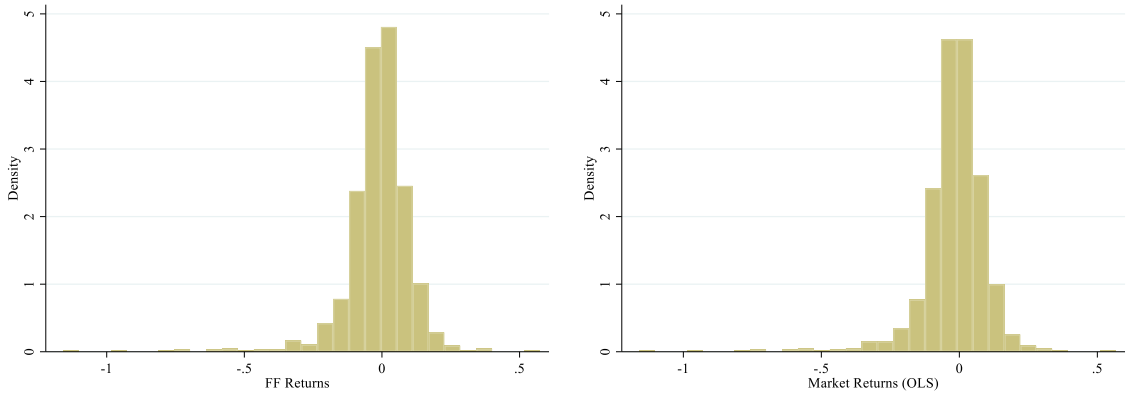
Appendix C – Figures

Figure C.1. – Kernel Density: Variation in Email and Meeting Count



Notes: This figure shows the variance of the changes in meeting and email communication for the entire sample of 102 firms from 6 months before the CEO change to 14 months afterward.

Figure C.2. – CAR Histograms

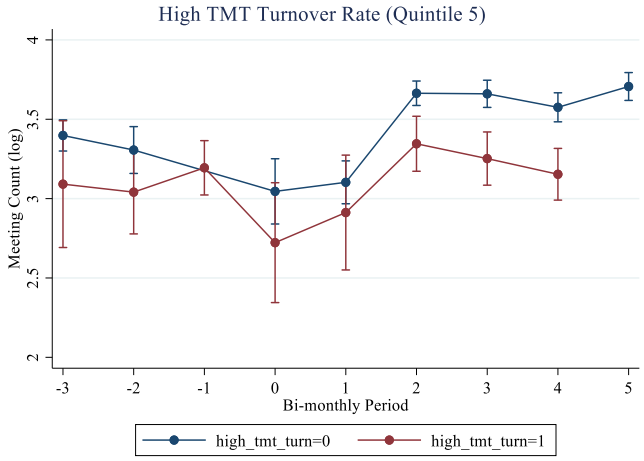


Notes: These are the histograms of the cumulative average French Fama 3F one-year returns (Market(rf), SML, HML) and the OLS Market one-year return (Market(rf) for the sample of firms included in the performance regressions.

Figure C.3. – Heterogeneous Effects of Top Management Turnover

(The blue line is lower turnover; the red line is higher turnover)

Meeting Count (log)

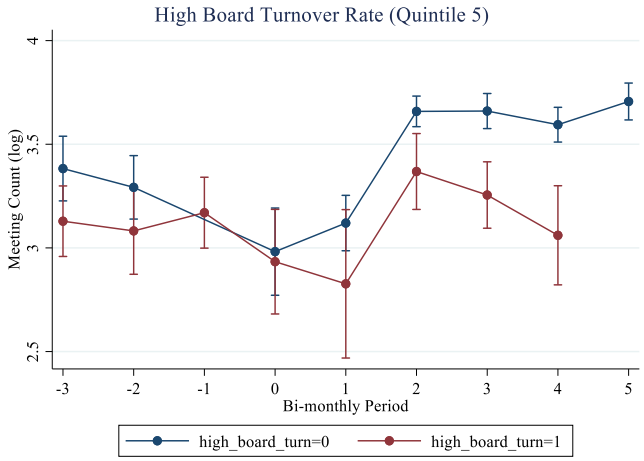


Notes: 67 firms experience corresponding TMT turnover during the period from the month of the CEO turnover until three months after the CEO turnover out of the total number of executives in the firm at that time (source: Boardex). For the top-left chart, we calculate higher turnover (red line) as the top quintile of TMT turnover rates; the blue line represents the remaining firms. Results are for meetings only.

Figure C.4. – Heterogeneous Effects of Board Turnover

(The blue line is lower turnover; the red line is higher turnover)

Meeting Count (log)

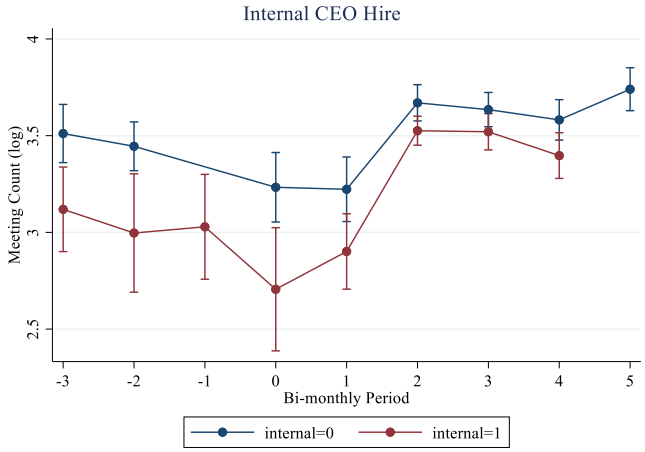


Notes: 54 firms experience corresponding board member turnover during the period from the month of the CEO turnover until three months after the CEO turnover out of the total number of board members in the firm at that time (source: Boardex). For the left chart, we calculate higher turnover (red line) as the top quintile of TMT turnover rates; the blue line represents the remaining firms. For the right chart, the red line represents all firms that experience board chairperson change (indicator variable). Results are for meetings only.

Figure C.5. – Heterogeneous Effects of Internal versus External CEO Replacement

(The blue line is external CEO replacement; the red line is internal CEO replacement)

Meeting Count (log)



Notes: 51 firms hire a CEO internally, meaning that the individual already worked at the firm becomes becoming CEO. The red line represents the firms that experienced an internal replacement, and the blue line represents external replacement. Results are for meetings only.