Uncovering the Hidden Effort Problem*

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Abstract

We analyze minute-to-minute Bloomberg login data to study how employment contracts and firm ownership affect the work habits and effort provision of CEO's and CFO's in public companies. While we expect executives to spend the majority of their time doing other activities than using Bloomberg, usage data allows us to detect how frequently they are in the office, estimate the length of their workdays, and create effort provision measures. We find that fixed wages are negatively correlated with these effort measures, whereas executives respond significantly to cash bonuses provided via accounting targets. Stock ownership via shares, option grants or bonuses appear to have little effect on executive effort. These results suggest that whereas money talks, ownership at current levels is an unreliable way to improve the agency conflict that arises with separation of ownership and control. We find supporting evidence that firm leverage (firm-specific risk) is positively (negatively) correlated with executive effort. Finally, we show that effort provision is predictive of positive unexpected earnings and positive cumulative abnormal returns, so that it is indeed beneficial to induce executive effort.

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1. Introduction

The moral hazard problem due to hidden effort provision is ubiquitous in economics and poses challenges anytime there are delegated decision rights, separation of ownership and control, or conflicts of interest. Fundamentally, a principal is tasked with solving an inference problem in which they only observe outcomes and update their beliefs about the hidden action taken by an agent. Taking this into account ex ante, principals design contracts or share ownership to hopefully ameliorate this agency conflict.

While this has been studied extensively from a theoretical perspective, the empirical relationship among compensation, effort, and outcomes remains elusive. If the principal in an organization (e.g., corporate shareholders) cannot observe the effort provision made by managers (e.g., CEO or CFO), how would it be possible for an economic empiricist to study this? Indeed, according to Yermack (2014), effort provision is difficult to analyze directly "as we cannot observe a [sic] CEO's hour-to-hour activities". [1] And while stock option grants and bonuses are universal in Corporate America, we have little evidence if and how much different types of extrinsic incentives affect effort provision in reality, and in turn how effort impacts firm performance. [2] As Murphy (1999) argues, we continue to know very little about how executive compensation affects firm value, largely because financial markets are efficient and executive effort is unobservable.

In this paper, we address these issues by directly observing the work habits of corporate executives at publicly-traded firms, many of which are in the Fortune 500. We hand-collect a time-series of usage microdata from Bloomberg accounts for CEO's, CFO's, and other top executives

[1] Yermack (2014) and Biggerstaff, Cicero, and Puckett (2017) find evidence consistent with an agency cost hypothesis by studying leisure activities. But, even in those activities (golf and travel to vacation homes), it is impossible to know to what extent business activities took place minute-by-minute during those times.

[2] Cowgill and Zitzewitz (2015) show that employees with more exposure to Google stock have better performance. Ostensibly, this is because of higher hidden effort provision, but only an outcome measure is observable and can be analyzed in this study.

from these firms. Since Bloomberg terminals are typically located at work (unless a mobile application is used), our dataset allows us to detect how often each executive is in the office and estimate the length of time they are there. Clearly, we expect executives to spend the majority of their time with other activities besides using Bloomberg. As such, we do not use the intensity or total time on the terminal in this study. Rather, we use their login patterns over time as a way to describe their typical workday length and how many days per week they work, and analyze their effort provision.[3]

Bloomberg's capabilities are work-related and offer little or no access to leisure activities. It is a well-known source of financial information and provides services for decision-makers in Corporate America such as tools for risk management, investor relations, communications with analysts, and competitive industry analysis.[4]

But, what is under-appreciated is that Bloomberg is a powerful social network that significantly pre-dates platforms like Facebook. The platform gives users access to each other via texting and encourages the exchange of information between traders and among corporate leaders. When individuals sign user agreements, they are given the opportunity to communicate with each other via messaging technology. As such, users are readily identified as "online" to others if they are logged into their personal account on their work terminal or on their mobile application.

We collect minute-by-minute user data that was publicly observable on Bloomberg terminals for the period from 2017-2019. Figure 1 provides an example of where we obtained user

[3] As we will describe, these variables are different from the total number of hours an executive spends on Bloomberg. Similarly, if we could identify when an executive uses his/her office phone, this would also provide us with measures of office work habits. Without arguing that phone usage is optimal or that particular conversations are valuable, such a measure would allow us to analyze each executive's presence in their office and their work effort.

[4] See https://www.bloomberg.com/professional/expertise/c-suite/

activity on Bloomberg.[5] However, it is important to note that we did not collect any private information about what the executives actually did on the terminal: we did not observe any information about messaging, news search, or trading-related activities. As we are only interested in the simple usage of the terminal as a proxy for work effort, we do not collect any sensitive information from corporate firms and keep all identities anonymous in our analysis.[6]

We first study patterns of usage intraday and during the week to provide evidence that Bloomberg usage captures work activity and effort. On a typical weekday, activity starts to rise at 8am, peaks at 11 am, dips during the lunch hour, rises again in the afternoon, and tails off by 6pm. During the week, Mondays and Tuesdays have the most activity, which declines over the rest of the week. There is a paucity of activity in the evening, early morning hours, on the weekend, and on holidays. These patterns suggest that Bloomberg usage correlates well with work activity. But, besides these natural patterns, we study how usage of the terminal evolves around corporate earnings announcements. For both CEO's and CFO's, activity rises and peaks up until their firm announces earnings, and then drops off right afterwards. This pattern is consistent with more attention during corporate events and also implies that our measure can be used for both CEO's and CFO's alike.

With this in mind, we create several measures of effort (length of workday and working days per week) and run regressions of ex ante incentive contract measures and stock ownership as

[5] According to Figure 1, Michael Bloomberg is actively using his terminal, as indicated by the green dot by his name. On Bloomberg, greater than 15 minutes of inactivity is designated by a yellow dot. A red dot indicates that a user is offline. Users have the option to remain anonymous, but most do not. The choice to remain private (opting out of social network functionality) is associated with a gray dot.

[6] We carefully reviewed the following contracts and disclosures with General Counsel at Rice University: Bloomberg's user agreement with Michigan State, Bloomberg's Terms of Service, and Bloomberg's Privacy Policy. See "Disclosure of Your Personal Information" in https://www.bloomberg.com/notices/privacy/ and https://www.bloomberg.com/notices/tos/. Further, once subjects were matched to compensation and firm information, their identities were anonymized and the investigators were made blind as to particular identities and results. Additionally, we do not disclose firm or subject identities in any of the results reported in this paper.

potential drivers of effort. We use data from Incentive Lab (ISS) that collects compensation contract information from firm proxy statements. The advantage of doing this is the contract measures are all forward-looking, that is they arise before we measure effort, so that we do not face an endogeneity or simultaneity problem. The Incentive Lab data also specifies the particular targets that executives are trying to meet/beat, the form of compensation (cash, stock, options), and whether the goals are of absolute magnitude or are relative to competing firms.

We find that cash bonuses provide the best incentives for effort. A counterfactual increase from zero percent of the contract including cash bonuses to 100% leads to roughly two hours more per day of work and an extra day per week of work. In contrast, the fixed wage paid to executives has a significant negative effect. The more income that an executive can rely on that is risk-free, the less they work.

We next analyze the effect of equity ownership. Jensen and Murphy (1990) argue that CEO equity ownership is too weak to provide economically significant incentives. We find evidence to support this conjecture. In our sample, the mean (median) stock ownership level is 0.55% (0.06%) of the firm. At this level, unconditional stock grants and equity incentives have little effect on CEO and CFO effort. In all of our specifications, stock and option grants that are issued due to performance-based measures or executive tenure do not positively affect effort provision. Also, both the dollar value of an executive's equity ownership or the fraction of the firm that an executive owns do not affect the length of the executive's day or the average hours per week as measure by our effort proxy. Admittedly, we do find that stock ownership does affect the number of days an executive works per week, but again not the total time. So, in contrast to the findings in Hall and Liebman (1998), we find evidence for Morck, Shleifer, and Vishny (1988) who argue that CEO ownership is not sufficient to solve agency problems in corporate America.

Our regressions control for the fraction of debt in each firm's capital structure. While leverage is commonly believed to be a discipline device for managers, there is little evidence that this is the case in practice, primarily because it is often challenging to measure hidden actions like effort provision or private benefits in empirical settings. We find that debt has a consistent positive economic effect on executive effort provision, but its statistical significance is equivocal and depends on which effort measure is studied.

We next explore how executives respond to idiosyncratic and systematic risk. Previously, Bertrand and Mullainathan (2001) used returns to oil prices as an instrument to conclude that executives are inefficiently compensated for systematic price movements that they have no control over (i.e., luck). Here, since we can directly observe the effort by executives, we analyze how they respond to different types of risk. We divide our sample of firms into those with higher and lower idiosyncratic and systematic risk, and show that executives respond to cash incentives when they face low levels of both types of risk. However, while bonus compensation leads to no discernible change in effort provision for firms with high idiosyncratic risk, it does improve effort in high systematic risk firms. This implies that CEO's and CFO's appear to disentangle different sources of risk when choosing effort and what has often been attributed to luck and outside an executive's locus of control, actually affects their actions within the firm.

Previously, academics have focused on how executive risk-taking changes in response to incentives, in particular to how risk affects their stock options (Hayes, Lemmon, and Qui, 2012; Gormley, Matsa, and Milborn, 2013). There is a difference of opinion on this: while Hayes, Lemmon, and Qui, (2012) find no discernible effect of decreasing option grants on managerial risk-taking, Gormley, Matsa, and Milborn, (2013) find the opposite. In our paper, while we do not measure risk-taking, but do find that option-grants when used as incentive compensation actually

lowers the tendency of executives to exert effort. As Hall and Murphy (2002) point out, many of these grants are non-tradable (due to retention reasons). As such, our findings suggest that executives do not view them as a reason to work harder.

Finally, we investigate the effect of effort on firm performance by analyzing earnings surprises and cumulative abnormal returns around corporate announcements. Using a measure of standardized unexpected earnings (Foster, Olsen, and Shevlin, 1984), we find that effort provision is associated with earnings surprises. However, when we analyze the surprise relative to consensus analyst forecasts, we do not find an effect. This implies that while effort likely adds to firm value, the market is indeed efficient and updates its beliefs quickly (Murphy, 1999). However, we show that effort provision has a robust association with cumulative abnormal returns. A one-hour increase in average workday length is associated with an abnormal return of 4-7 basis points and extra day per week on average yields an extra 8 basis points.

The remainder of the paper is organized as follows. In Section 2, we briefly describe the hypotheses we wish to test. In Section 3, we describe the data collection and provide sample statistics. There we construct our variables of interest and provide support for our measures of effort. In Section 4, we study the relationship between compensation, effort, and outcomes. Section 5 concludes.

2. Hypothesis Development

Holmstrom and Milgrom (1987) is a canonical model and principal-agent framework for analyzing optimal contracting, effort levels, and their determinants. We use the setup and notation in Edmans, Gabaix, and Jenter (2017) to develop the hypotheses that we will subsequently analyze

empirically. As such, our theoretical treatment here will be brief and we refer the reader to Edmans, Gabaix, and Jenter (2017) who provide a thorough review of the literature.

Under several assumptions (exponential utility, a pecuniary cost of effort, normally-distributed noise, and continuous time), Holmstrom and Milgrom (1987) show that the optimal contract offered by a principal should be linear: $c = \varphi + \theta V$, where c is the total compensation, φ is the fixed salary, and θV is the incentive compensation. The parameter V is the value of a firm, but can be interpreted as any outcome of interest to the principal. The parameter θ is the pay-for-performance sensitivity.

With such a contract, the agent chooses an optimal effort $a^* = \theta b/g$, where b measures how easy it is for the effort to impact performance and g measures the cost of effort. Taking this into account, a principal solves for an optimal pay-for-performance sensitivity $\theta^* = \frac{1}{\left[1+g\eta\left(\frac{\sigma}{b}\right)^2\right]}$, which is decreasing in the agent's risk aversion and firm risk, because they augment the risk-premium required to satisfy the agent. Plugging this into the agent's effort choice yields $a^* = \frac{b}{\left[1+g\eta\left(\frac{\sigma}{b}\right)^2\right]g}$.

Given this, we have two sets of hypotheses that we can test by observing executive effort and ex ante incentive contracts.

Set 1:

H1a: Executive effort is higher with larger cash bonus compensation.
H1b: Executive effort is lower with higher fixed wage compensation.
H1-0: Under the null hypothesis, neither the fixed wage or bonus compensation affect effort.

Set 2:

H2a: Executive effort is less responsive to incentives in firms with higher idiosyncratic risk.
H2b: Executive effort is less responsive to incentives in firms with higher systematic risk.
H2-0: Under the null hypothesis, the risk of the firm does not change how incentives impact effort.

Solving the problems that arise because of the separation of ownership and control (Berle and Means, 1932), has received longstanding attention from economists and practitioners. The primary mechanism that has been adopted to potentially solve this in Corporate America is to grant executives firm ownership in the form of stock and options. For example, during 2000-2005, 60% of compensation was comprised of equity (37% options and 23% equity) and 40% was comprised of salary and bonus (Edmans, Gabaix, and Jenter, 2017). Further, the proportion of compensation through ownership has been growing steadily since the 1930's (Frydman and Saks, 2010; Edmans, Gabaix, and Jenter, 2017). As mentioned above, previous studies debate whether these ownership grants have increased incentives for effort provision (Jensen and Murphy, 1990; Morck, Shleifer, and Vishny, 1988; Hall and Liebman, 1998). Further, because most stock option grants are non-tradable, they may not ameliorate agency problems (Hall and Murphy, 2002). This leads us to consider another set of hypotheses:

Set 3:

H3a: Executive effort is higher with greater equity ownership.
H3b: Executive effort is higher with incentive compensation with equity shares.
H3c: Executive effort is higher with incentive compensation with option grants.
H3-0: Under the null hypothesis, higher equity ownership and compensation do not increase effort.

Finally, based on Holmstrom and Milgrom (1987), higher executive effort should raise firm value. This, in fact, is by construction since the hidden action taken by the agent is usually assumed to be beneficial and raise firm value. Indeed, this economic force is present in principal's optimization problem as she trades off between higher productivity and compensating a risk-bearing agent with costly effort provision. This leads us to our final set of hypotheses:

Set 4:

H4: Firm value is higher with greater executive effort.
H4-0: Under the null hypothesis, executive effort does not impact firm value.

3. Data and Sample Statistics

3.1 Sample Construction and Summary Statistics

User Data: When Bloomberg users are assigned terminals, the company records their "status" by default.[7] Status is either designated as "online", "idle", "offline", or "mobile". When users first log on to the terminal, their status changes from offline to online, and it remains that way while they use the terminal. However, if they stop using the terminal for 15 minutes, the user's status automatically changes to "idle". Eventually, and depending on the users' settings, a user is logged off after a long period of inactivity. Also, when users are logged in via the "Bloomberg Anywhere" application on their mobile device, the status is listed as "mobile". While using the mobile app, access to the assigned desktop terminal is restricted, so there is no possibility of double-counting.

Other users of the terminal can detect the status of any other Bloomberg user by employing the "PEOP" function on the terminal, the "BIO" function, or by directly navigating to a user's profile. Figure 1 gives an example of a profile search for Michael Bloomberg. The green dot by Michael Bloomberg's name indicates that he is online. Other status indicators are as follows: a red dot means that a user is offline, a yellow dot means that a user is idle, and a gray dot indicates that a user has chosen to be private. If a user is online via the mobile app, a mobile phone icon appears. Note the full functionality of the software to contact people who use the terminal.

During 2017-2019, we use the profile search and follow 2,731 terminal users with executive in their title (e.g., "Chief Financial Officer", "Chief Accounting Officer", etc.). We record their name, title, location, firm name, and follow their user status continuously over the entire time series. At no time do we collect the content of their terminal use: we do not observe

[7] Users may set their profile status to "private", but only X? of Executives do so.

their text messaging, news search, or trading activity. The only data we collect is the time that each person actually uses the terminal.

Compensation Data: In the Definitive Proxy Statement (SEC form DEF 14A), public firms disclose their compensation contracts from the previous fiscal year for "named executives". Proxy statements are filed in advance of each firm's annual shareholder meeting, which typically are released during Q1. Item 402(a)(3) in SEC Regulation S-K defines the named executives as the CEO, the CFO, and at least three other executives with the highest compensation, and up to two former executives that served during the year and would have been in the previous category.

Proxy statements provide information on the type of compensation that each executive would receive – fixed wage, cash bonus, equity, option grant – as well as the target metric that would be used to compute end-of-year compensation (e.g., EBITDA, EPS, or Sales). While each proxy statement is backward looking, this allows us to study how ex ante contracting affects subsequent effort. For example, the 2019 proxy statement for a particular firm describes the compensation package and goals that its top executives received at the beginning of 2018. Given this, we can correlate the dimensions of each compensation contract with subsequent outcomes such as executive effort (to be describe below) and firm outcomes (e.g., earnings surprises and stock price abnormal returns).

The majority of the 2,731 executives in our user dataset work in private firms. Of that number, 387 are "named executives" at 308 unique public firms. Executives list their geographic location in their profile. While there are concentrations in the Northeast, Texas, Chicago, and California, there is a large geographic dispersion. Forty-three states plus the District of Columbia are represented. When we analyze the effect of effort on earnings surprises and abnormal returns,

we analyze 1319 executive-quarter observations. To study the effect of contracting on effort, we use the ISS Incentive Lab database, which collects compensation information from proxy statements and provides it in tabular format. After merging the set of named executives with the Incentive Lab database, we are left with 165 top executives from 124 publicly-traded companies, and 227 executive-year observations.

Table 1 provides summary statistics at the executive-fiscal year level for the executives in our sample. Panel 1.A presents statistics on firm characteristics. *Size* is the market capitalization (in millions of dollars) of the firm's stock (CRSP item *prc* times *shrout*) at the end of the previous fiscal year.; *Q* is Tobin's Q; *leverage* is long term debt (Compustat item *dltt*) plus debt in current liabilities (Compustat item *dlc*) all divided by total assets (Compustat item *at*); *productivity* is revenues (Compustat item sale) divided by total assets. The mean market capitalization for the executives' firms is $42 Billion, with a median of $12.9 Billion. We use the natural logarithm of size in our regressions (*ln_size)*. Tobin's Q is about 1.54, on average. The average ratios of debt to assets is 0.34, and average ratio of revenues to assets is 0.36.

Panel 1.B breaks executive-year observations into industries based on the 4-digit SIC code of their firms according to the Fama-French 12 industry classifications. The panel shows that roughly half of the observations are from executives at financial firms, which is not surprising given the nature of Bloomberg terminals. The next most common industry (15% of the observations) is "Other", which consists of firms in industries with fewer firms that do not fit into the remaining 11 industries. "Energy" is the third most common industry (11% of observations), followed by Telecommunications (6%), Utilities (6%), and Healthcare (5%). Business Equipment, Manufacturing, and Consumer NonDurables, collectively make up the remaining 6% of observations.

Panel 1.C provides statistics on executive's compensation contracts. We define the following variables: *value_stock_owned* as the dollar value of the executive's stockholdings in the firm measured using price at the beginning of the fiscal year; *salary* is the executives' fixed salary during the fiscal year; *cash_perf* is the target dollar amount of the cash-based performance incentive bonus from the executive's compensation contract for the fiscal year; *stock_perf* is the target dollar amount of the stock-based performance incentive bonus from the contract; *stock_time* and *option_time* are the values of the time-based stock and option grants, respectively, from the contract; Predicted compensation, *pred_comp*, is the sum of *salary*, *cash_perf*, *stock_perf*, *stock_time*, and *option_time*.

The top section of Panel C indicates that 27% of executive-year observations are for CEOs while 52% are for CFOs. The remainder are named executives with other roles. The middle section of the panel provides summary statistics on compensation contracts. The mean value of the firm's own stock held by the executive is about $43 Million, with a median of $8.9 Million. Executives in the sample own about 0.55% of the firm, on average, but this is highly skewed with a median of only 0.06%. The average annual predicted compensation is roughly $11.5 million, and is broken into incentive compensation of roughly $7.2 million that depends on attaining particular targets (*cash_perf* and *stock_perf*) and fixed compensation of roughly $4 million that is guaranteed while the executive is employed by the firm (*salary*, *stock_time*, and *option_time*).

The final section of Panel 1.C provides a breakdown of the average weights of the metric types that determine the performance-based cash bonuses. While Incentive Lab provides the many metrics (e.g., EBIT, customer satisfaction, etc.) as well as the metric types (e.g., Accounting), it does not provide the value-weight of each metric in the compensation formula. That is, for a particular executive, Incentive Lab determines the frequency with which a target or metric is used,

not the proportion of the bonus that is linked to that particular measure. Consequently, we gather this information manually from the proxy statements. We find that accounting metrics make up more than three-quarters of the metric types in the performance formulas in our sample. Metrics in the "Other" category make up about 17% of the formulas, on average. These are non-accounting based metrics that are typically industry- or firm-specific. Individual performance makes up about 6% of the weight, on average. Stock price performance almost never impacts cash based bonuses in our sample.

3.2 Effort Measures and Patterns in the Data

First, we examine patterns in the raw activity data and then provide evidence that the user data captures a plausible measure of effort provision. Table 2 provides some summary statistics of user activity. For the 575 executive-year periods that we collect, we have an average of 208 days of data per executive. On average, 150 of those are workdays, which we define as Monday through Friday. There is an average of 33 weeks per executive-year.

The "Bloomberg Usage" section of Table 2 provides statistics for active terminal and mobile usage for various timeframes. On average, executives in our sample are actively using the terminal for 8.3 hours per week and they spend much less time on the mobile app than on the terminal – less than 30 minutes per week, on average. They spend very little time on Bloomberg on the weekend or at night, which we define as 6pm on a given day to 3am the following morning.[8] Also, executives tend to spend little time on Bloomberg on holidays, about thirty minutes per day on average.

[8] These times are based on each executive's local time. We extend the nighttime window to include 3 am in case they work late and because activity on the terminal is at a daily minimum at 3am.

These patterns tend to suggest that Bloomberg use is a work activity, rather than one of leisure. To see this visually, Figure 2 presents the average percentage of executives that actively use the terminal during each minute of workdays. Active terminal use is very limited, on average, before about 7am, and after about 6pm. There is also a drop in activity during the lunch hour. Thus, the general activity level is concentrated during the traditional 9 to 5 workday.

In Figure 3, we examine average activity throughout the week. The top panel includes all days, regardless of whether the day is a federal holiday, while the bottom panel excludes federal holidays from the analysis. The plots show that effort is very low on weekends, generally highest at the beginning of the workweek, and declines throughout the week. Controlling for holidays (which often fall on Mondays), effort his highest on Mondays. During a typical workweek, effort is typically lowest on Friday.

To further explore the plausibility of Bloomberg usage as a proxy for time spent at work, we next examine whether activity is higher on days with important firm-level events. Figure 4 panel A shows the average number of active hours in event time for all executives, relative to their firm's quarterly earnings announcement. A trend line is fitted (using OLS) separately for the periods before and after the announcement date. The day with the highest amount of activity is the earnings announcement date. Following the announcement, activity drops and steadily increases until the next announcement. Panel B shows the same figure for the subset of Chief Financial Officers, where the pattern is more pronounced. Panel C presents the figure for the subset of CEOs. Again, activity is the highest on the announcement date, but is also high the following day.

Based on these observations, we create four proxies for effort provision. The first two measures are based on examining activity on individual days, while the last two are based on overall usage patterns across the fiscal year. First, because executives' roles involve more than

simply working on the terminal, we create the measure *workday length*, which is defined as the number of hours between the first time an executive logs onto the terminal and the last time they log off on a given day. Because executives must be at work to access the terminal, this is a lower bound on the length of time the executive is at work on a given day. Second, we create the measure *days_per_week* as the average number of days per week (including weekends) in which an executive logs onto the terminal at least once. Both *workday length* and *days per week* can be modified to account for activity that takes place on the mobile application.

Our first two measures of effort provision have different economic interpretations. The variable *workday length* directly measures the intensity of executive effort. Since it is measured as an average per day, it also captures an effort level on a weekly basis (simply by multiplying by five for most weeks). In contrast, *days_per_week* measures executive attention. Since it only requires one login, it captures the likelihood that an executive attends to their firm on a daily basis. As such, we view *workday length* as a superior measure of effort provision, but analyze both in what follows.

The final panel of Table 2 provides summary statistics for these effort first measures, with and without mobile usage. The mean and median of *workday length* during the sample are about 4 hours and the standard deviation is about 1 hour and 45 minutes. Accounting for mobile activity, the mean is closer to 4 hours and 20 minutes. The average number of days per week in which an executive logs onto the terminal or uses the mobile app is more than 2.5. The first two panels of Figure 5 provide histogram plots of the two effort measures that include mobile.

The second pair of effort measures are based on an examination of overall usage patterns across the entire year. This is motivated by the idea that while some executives spend much of their day logged onto the terminal, many may intermittently log on at different times each day.

Since an executive has to be at work to access the Bloomberg terminal, overall usage across the year will give a distribution of the hours in which an executive tends to be at the office. For each executive and year, we create such a distribution and examine how frequently executives are on the terminal each minute of the day (in the local time zone) for Monday through Friday.

To capture the typical length of the day from these plots, we use two techniques. Our first measure is called *length_mid_85* and is created by measuring the area under each executive's work curve. We identify the middle 85% and exclude the right and left tails (7.5% each).[9] The times corresponding to these tails delineate the beginning and end times for the bulk of the workday. As an example, Panel A of Figure 6 illustrates how this measure is created using the pattern of usage for a specific executive in our sample. The figure shows that 85% of the executive's workday tends to happen between 7:21am and 4:08pm. The effort measure is simply the number of hours between the left and right tail, in this specific case, 8 hours and 47 minutes. Panel C of Figure 5 shows a histogram of the number of hours between the tails for the executives and fiscal years in our sample. Finally, to account for vacation days, we reduce *length_mid_85* by the percentage of days in which the executive does not log onto the terminal (*length_mid_85_adjusted*).

The second measure is called *length_50_max* and is created in similar fashion, but requires two steps. First, we identify the maximum amount of activity in any minute during the day. Then, we divide that number by two and identify the first time the executive's average activity crosses that threshold from below and the last time the average activity crosses from above.[10] Panel B of Figure 6 illustrates these steps for the same executive as in the previous example. For this

[9] The choice of 85% to define the measure is based on the notion of including one standard deviation of time above and below a mean, but is somewhat arbitrary in this case since these parameters do not have the same interpretation as in statistical analyses. In the appendix, we also provide results for measures based on the middle 80% and 90% of the time distribution.

[10] A threshold of 50% is chosen arbitrarily. In the appendix, we also provide results for measures based on 40% and 60% levels.

executive, the maximum frequency of terminal activity in any given minute of the workday is 52% across the fiscal year. Using half of that value, 26%, as the threshold, we find that the executive's usage first crosses at 7:14am, and drops below for the final time at 4:18pm. The span of time between these two is 9 hours and 4 minutes. Panel D of Figure 5 shows a histogram of the number of hours for executives in the sample. As before, to account for vacation days, we reduce *length_50_max* by the percentage of weekdays during the sample that the executive does not log onto the terminal (*length_50_max_adjusted*).

The final panel of Table 2 provides summary statistics for *length_mid_85* and *length_50_max*. The average workday length as measured by *length_mid_85* is 9 hours, whereas it is 8 hours as measured by *length_50_max*. After adjusting for holidays, vacations, and other offline times, the measures are roughly 50% as large. For comparison purposes, Panel C of Figure 6 is an example for another executive, in which the two measures are computed and overlaid in the same graph. Panels D and E provide examples of the annual temporal patterns for two executives whose use of Bloomberg is less frequent and more sporadic.

4. Effort Provision, Incentives, and Outcomes

4.1 Incentive Contracts and Effort

Now we examine the relation between incentive contracts and effort provision. We perform regressions in which four dependent variables (w*orkday_length*, *days_per_week*, *length_mid_85_adjusted*, and *length_50_max_adjusted*) are regressed on target bonus amounts for each incentive type, firm characteristics, industry and year fixed effects, executive stock ownership (*log_stock_owned*.), and dummy variables that capture whether the executive is a CEO or a CFO. We study the effect of contractual terms on effort in both levels and in the proportion of

compensation that each makes up. The first two dependent variables include mobile application usage, and we cluster standard errors by executive in all regressions.

Panel A in Table 3 provides results using *workday length (including mobile).* In Specification (1), the negative and significant coefficient on *log_pred_comp* indicates that as total predicted compensation increases, effort tends to decrease. In specification (2), we examine the log dollar amounts of the individual components of predicted compensation and find that like total predicted compensation, fixed salary has a negative and significant coefficient. By contrast, higher target levels for cash bonuses lead to more effort.

In Specifications, (3) through (7), we examine how each individual component of predicted compensation – in percentage terms – is related to effort. Of the five components – *pct_salary, pct_cash_perf, pct_stock_perf, pct_stock_time,* and *pct_option_time*, only cash performance incentives have a positive, significant impact on effort. A counterfactual increase from zero percent of the contract including cash bonuses to 100% leads to roughly 1.75 hours more work per day.

According to Panel 3.A, stock ownership and stock incentives have little effect on executive effort. As discussed above, the average firm ownership by executives in our sample is 0.47% and the median is only 0.06%. Indeed, it may be that equity ownership might be too weak to provide economically significant incentives (Jensen and Murphy, 1990). In all of our specifications, stock and option grants that are issued due to performance-based measures or executive tenure do not positively affect effort provision. Also, both the dollar value of an executive's equity ownership or the fraction of the firm that an executive owns do not affect *workday length*. So, in contrast to the findings in Hall and Liebman (1998), we find support for Morck, Shleifer, and Vishny (1988) who argue that CEO ownership is not sufficient to solve agency problems in corporate America.

Panel 3.B uses *days per week (including mobile)* and finds similar patterns, except for the effect of stock ownership. Total predicted compensation and fixed wages are negatively related to effort, while the target level of cash based performance bonuses has a positive effect. According to specification (3), a counterfactual increase in the mix of compensation from zero cash-based performance incentives to 100% would predict roughly an extra day of attention per week (0.785). Stock or option-based grants, either due to performance or tenure, do not positively affect effort. Admittedly, we do find that the level of stock ownership in the firm does affect this attention measure. So, while our previous specification showed that work intensity is not higher with ownership, executives may be more attentive to the firm when they own more of it.

Panels 3.C and 3.D include our distributional measures and generally find similar patterns in the data. The coefficient on *pct_cash_perf* remains statistically significant and of similar positive magnitude. Likewise, there is no positive effect of firm ownership or equity incentives on effort in either regression. We provide additional results in the Appendix using other cutoffs (e.g., *length_mid_80* and *length_40_max*) and find that these results appear to be robust.

Finally, we extend all four of our specifications to consider whether past success in achieving a performance target affects an executive's subsequent effort. To measure this, we add a dummy variable, *lag_beat_target*, which is equal to 1 if the executive met or exceeded their cash-based compensation performance target during the previous fiscal year, and zero otherwise. Our first results are in panels A and B of Table 4. For virtually all versions using the four dependent variables, cash bonuses remain significantly positive, and stock ownership and equity grants do not lead to higher effort provision.

We explore this further and consider whether previous discretionary bonuses affect executive effort. There are two competing hypotheses. A positive correlation between effort and

discretionary bonuses might exist if these bonuses are used responsibly to reward an executive's commitment to their firm. In such case, an executive would have an incentive to work harder. Alternatively, a negative correlation might exist if a discretionary bonus is considered to be an additional fixed wage by executives, especially if they can be manipulated or the executive is entrenched. To test this, we add the log dollar amount of the discretionary cash bonus paid to the executive during the previous fiscal year (*lag_log_bonus*) as a dependent variable in Panels C and D. As the results in show, the relationships documented in Panels A and B are unaffected by past discretionary cash bonus payments.

Finally, we consider the prior earnings performance of the firm. We add a dummy variable called *pos_earn_surp*, which is equal to 1 if EPS during the previous fiscal year was higher than during the fiscal year two years prior. According to Panels E and F, past earnings performance does not affect current executive effort, and cash bonuses remain significantly positive, while stock ownership and equity grants do not lead to higher effort provision.

4.2 Effort and Risk

We next explore how executives respond to risk. As described above, executives may view their exposure to idiosyncratic and systematic risk differently. As Bertrand and Mullainathan (2001) argue, executives have more control over and impact on a firm's idiosyncratic performance, and less over systematic fluctuations in what they do. As such, we might expect them to exert more effort when exposed to idiosyncratic risk and not be affected by market risk. In contrast, executives might view their claims to their firms as option-like since they have limited liability. As such, we might expect that they assert themselves more when volatility is higher, including both idiosyncratic and systematic risk.

To examine this, we divide our sample of firms into those with higher and lower idiosyncratic and systematic risk. Idiosyncratic risk is defined as the root mean squared residual from regressions using the Fama French 4-Factor model (FF4) on daily stock returns during the previous fiscal year.[11] Systematic risk is defined using the CAPM beta from regressions on daily stock returns during the previous fiscal year. After estimating idiosyncratic and systematic risk, we divide the sample based on the median value of each.

Table 5 presents regressions using the same specifications from Table 3 for low and high risk firms. Panels 5.A through 5.D present results for splitting our sample based on idiosyncratic risk. Results in all four panels show that executives generally respond to cash incentives – both the level and the relative percentage – when they face low levels of idiosyncratic risk. This is typically absent in firms that face high idiosyncratic risk. In contrast, the negative influence of fixed wages tends to affect effort in high idiosyncratic firms only. Additionally, firm ownership generally has little effect on effort in either set of firms.

The patterns change somewhat when we consider systematic risk. According to Panels 5.E through 5.H, cash bonuses appear to increase effort in both high and low risk firms. While the degree of statistical significance varies across specifications, the coefficients are positive and economically meaningful. Another difference is that stock ownership typically affects effort, but this is mostly true for low systematic risk firms.

As such, our findings make two contributions to our understanding of executive compensation and risk. First, executives are affected by idiosyncratic risk in that they are less responsive to extrinsic motivation. This is likely due to risk aversion and a costly effort choice. Second, our results appear to qualify the analysis in Bertrand and Mullainathan (2001). In that

[11] Our results look similar when we use the CAPM to estimate idiosyncratic risk.

paper, the authors argue that exogenous sources of risk (like systematic risk) are out of a CEO's control, and therefore should not be compensated. Any positive innovation in firm value due to such factors is pure luck. Our analysis contrasts with that view because the presence of systematic risk appears to improve the ability of firms to increase effort provision through incentive contracting. Executives in our sample are responsive when systematic risk is high, but not when idiosyncratic risk is high.

4.3 Effort and Outcomes

Now, we address a long-standing question whether compensation can improve firm value. As discussed in Section 2, from a theoretical perspective, providing incentives should increase the probability of good outcomes. However, as Murphy (1999) points out, this is may be impossible to detect because equity markets are efficient. That is, as executives are granted particular ownership shares and are given incentives, markets quickly update their beliefs about firm value and equity prices adjust. As such, detecting an executive's contribution to firm value may remain elusive.

However, since we are able to measure executive effort and this is not observable to equity market participants, we now investigate whether uncovering this hidden action allows us to show that incentives do increase firm value. Indeed, previous studies may have been constrained because they had to connect compensation to firm value directly, without measuring the intermediate step of effort provision, and the studies had no better information than participants in equity markets.

In Table 6, we examine whether executives' effort provision during the fiscal quarter affects firm earnings surprises. We measure earnings surprises in two ways. First, we use Standardized Unexpected Earnings (SUE), which is defined as the difference in the current quarterly earnings per share and the earnings per share 4 quarters prior divided by the standard

deviation of these differences measured over the previous eight quarters (Foster, Olsen, and Shevlin, 1984).

The second measure is based on analyst earnings forecasts. For each executive and fiscal quarter during our sample period, we gather analyst earnings forecast data from the I/B/E/S dataset as well as actual earnings per share. We create a variable *earnings surprise (median)* by subtracting the median analyst forecast immediately prior to the earnings announcement from the actual quarterly earnings, and divide this difference by the stock price at the end of the fiscal quarter associated with the earnings. We also create a variable *earnings surprise (mean)* in a similar way. Because we can simply use executive effort in this exercise and do not need to match our data to Incentive Lab compensation data, we can expand our analysis to include the full set of 263 named executives at 209 publicly traded firms. As such, we study 1319 earnings announcements that fall in the sample period.

Panel A of Table 6 provides results of regressing SUE on the four effort measures, as well as 4-quarter-lagged effort measures. Ash shown in specifications (1), (5), (9), and (13), more effort is associated with larger unexpected earnings, using all four measures. Specifications (2), (6), (10), and (14) include quarter fixed effects. The significant results in all four columns indicate that this is not driven by general economic conditions. Because SUE is measured using innovations in earnings relative to earnings 4 quarters earlier, we control for effort during that previous period either directly (specifications (3), (7), (11), and (15)), or by subtracting that value from current effort (specifications (4), (8), (12), and (16)). Variables in the latter case include a suffix "d", which stands for "change". The table indicates that effort by executives during the current quarter is associated with higher unexpected earnings, even when controlling for a baseline level of effort.

In Panel 6.B, we regress mean or median earnings surprise on one of each of the four effort measures. For ease of disposition, all coefficients and standard errors have been multiplied by 1,000. In contrast to the case of Standardized Unexpected Earnings, we find no significant relation between effort and earnings surprises relative to analyst consensus forecasts. This discrepancy is likely due to the fact that analysts are rational Bayesians and they have opportunities to interact with top executives and update their beliefs about the hidden effort problem. For example, if effort is higher, then as a firm does well, analysts will internalize that in their expectations. Further, if they have the ability to listen to or speak with a top executive, that impression may be a signal of hidden effort. As such, analyst forecasts may reflect some information about effort and earnings surprises may not be present using this measure due to market efficiency.

Finally, to study the effect of effort provision on stock prices returns, we examine cumulative abnormal returns (CARs) around earnings announcements. To measure abnormal returns, we use the Fama French 3-Factor to estimate factor loadings using a year of past returns (after skipping the most recent week) and create daily alphas. Then, we regress cumulative abnormal returns on one of the four effort measures for 1 through 10 days starting with the trading day associated with the announcement. Table 7 provides the coefficients on the effort measure from each of these 40 individual regressions. Standard errors are clustered by executive.

The table indicates that there is a positive relation between quarterly effort and abnormal returns around the earnings announcement, starting with 2-day CARs. Results are consistent across all four effort measures. The coefficients indicate that an increase in the length of the executive's workday by an hour is associated with abnormal returns of 4 to 7 basis points, while an additional day per week is associated with about 8 basis points. Hence, effort provision has a robust association with cumulative abnormal returns.

5. Conclusion

While hidden action problems are ubiquitous in firms and markets, technology is making it easier to reassess how contracting may affect agent's actions. Indeed, the use of cookies and web traffic surveillance makes it easier to follow peoples' actions, even when they do not suspect it. We predict that such monitoring may eventually shed light on many unresolved issues in economics.

In this paper, we do not employ such tactics, but rely on a publicly-available measure to study how contracts affect executive effort and firm value. We find that while cash bonuses tend to increase effort provision, the level of stock ownership and promise of more equity grants do not. This latter finding probably results from the low level of firm ownership that executives receive (median of 0.06% of firm, mean of 0.4%). Normatively, this may imply that boards should provide more cash incentives and less stock, if they do not intend to give executives more ownership in the firm. Our findings are consistent with Jensen and Murphy (1990) and Morck, Shleifer, and Vishny (1988) that executives are paid like bureaucrats. Perhaps, paying more cash bonuses will make them more like the entrepreneurs we would like them to be.

Finally, effort appears to enhance firm-value. While we are careful not to collect information about the nature of how actually executives use Bloomberg (for privacy reasons), we are able to conclude that higher attention to their firm and higher work intensity appear to be associated with positive earnings surprises and abnormal stock returns. This was not obvious ex ante, since it could have been the case that effort was inefficient or possibly misguided. Happily, it does appear that compensation contracts can in fact increase firm value in Corporate America.

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Table 1. Summary Statistics

The table reports the summary statistics of firm characteristics (Panel A) of executives' firms, executives' industries (Panel B), and incentive contracts (Panel C). Our full sample includes data 575 executive-year observations for 263 named executives online on Bloomberg with accounting data on Compustat. *Size* is the market capitalization of the firm's stock (measured in thousands of dollars), *Q* is Tobin's Q, Leverage is long term debt (Compustat item *dltt*) plus debt in current liabilities (Compustat item *dlc*) all divided by total assets (Compustat item *at*). *productivity* is revenues (Compustat item *sale*) divided by total assets. The sample in panel C consists of the subsample of 124 executives with compensation data in ISS Incentive Lab. *value_stock_owned* is the dollar value of the executive's stockholdings in the firm. *salary* is the executives' fixed salary during the fiscal year. *cash_perf* is the target dollar amount of the cash-based performance incentive bonus from the executive's compensation contract for the fiscal year. *stock_perf* is the target dollar amount of the stock-based performance incentive bonus from the contract. *stock_time* and *option_time* are the values of the time-based stock and option grants, respectively, from the contract. Predicted compensation, *pred_comp*, is the sum of *salary*, *cash_perf*, *stock_perf*, *stock_time*, and *option_time*. The cash performance metric types *Accounting*, *Individual*, *Stock Price*, and *Other* are the weights of the categories for the metrics that determine the executive's cash based incentive program. Metrics are categorized by incentive lab and the weights of each metric are collected from the proxy statements. Industries are defined using the Fama French 12 industry definitions which are available on Kenneth French's website. Executive compensation and incentive contract data are from ISS Incentive Lab. Proxy statements are from the SEC EDGAR server. Summary statistics are based on executive-year observations.

Panel 1.A – Firm Characteristics

Variable	N	Mean	Std Dev	25th Pctl	Median	75th Pctl
size	227	42,178	67,113	4,781	12,894	48,752
Q	227	1.538	0.792	1.010	1.184	1.843
Leverage	227	0.339	0.249	0.150	0.272	0.475
productivity	227	0.360	0.420	0.053	0.236	0.543

Panel 1.B – Industries

Industry	Num	Pct of Sample
Finance	120	52%
Other	34	15%
Energy	26	11%
Telecommunications	13	6%
Utilities	13	6%
Healthcare	11	5%
Business Equipment	8	3%
Manufacturing	4	2%
Consumer NonDurables	2	1%

Panel 1.C – Ex-Ante Incentive Contracts

Variable	N	Mean	Std Dev	25th Pctl	Median	75th Pctl
Executive Role						
CEO	227	27%	-	-	-	-
CFO	227	52%	-	-	-	-
Compensation Contracts						
value_stock_owned	227	42,560	147,473	2,812	8,945	30,090
pct_firm_owned	227	0.55%	3.45%	0.02%	0.06%	0.19%
pred_comp	227	11,505	11,346	3,707	7,254	14,230
salary	227	827	532	500	704	1,000
cash_perf	227	2,802	4,646	684	1,265	3,000
stock_perf	227	4,383	5,338	830	2,734	5,775
stock_time	227	2,167	3,452	0	1,006	2,781
option_time	227	1,325	2,655	0	0	1,500
Cash Performance Metric Types						
Accounting	227	76.42%	-	-	-	-
Other	227	17.30%	-	-	-	-
Individual	227	5.93%	-	-	-	-
Stock Price	227	0.35%	-	-	-	-

Table 2. Effort Measures

The table reports the summary statistics of terminal usage by executives as well as the derived effort measures. Our sample includes data for 263 named executives that are online on Bloomberg during sample period at firms with data in the Compustat database. Summary statistics for Bloomberg usage are presented for both "Online" and "Mobile", where Online indicates that the executive is actively using the Bloomberg terminal and Mobile indicates that the executive is actively using the Bloomberg Professional mobile application. The effort measure *workday length* is defined as the average duration (in hours) between the first and last time an executive is online on the Bloomberg terminal in a given workday, where workdays include days Monday through Friday. The measure days per week is defined as the average number of days per week during which the executive is online on the terminal at least once. The measures *workday length (including mobile)* and *days per week (including mobile)* modify the two previously defined measures by allowing the activity to take place on either the terminal or the mobile application. Data used in the table cover the period from September 2017 to September 2019 and effort and usage variables are measured over the fiscal year of a given executive's firm.

Sample Coverage:						
named executives:	263					
executive-year obs:	575					
mean days:	208					
mean workdays (Mon-Fri):	150					
mean weeks:	33					
		Active			Mobile	
Bloomberg Usage:	Mean	Median	St Dev	Mean	Median	St Dev
weekly	8.32	6.98	7.65	0.43	0.13	0.66
evenings (Mon-Fri)	0.13	0.06	0.29	0.04	0.01	0.07
weekend (per day)	0.07	0.00	0.33	0.02	0.00	0.05
holidays	0.55	0.12	0.95	0.01	0.00	0.10

Effort Measures:	Mean	St Dev	25th pctl	Median	75th Pctl
workday length	4.15	1.69	2.76	4.05	5.43
workday length (including mobile)	4.42	1.72	3.10	4.35	5.64
days per week	2.61	0.82	2.06	2.50	3.20
days per week (including mobile)	2.62	0.83	2.06	2.52	3.22
length_50_max	7.97	2.60	7.42	8.47	9.40
length_50_max (ajusted)	4.07	1.82	2.97	4.15	5.17
length_mid_85	8.97	1.38	8.00	8.79	9.72
length_mid_85 (adjusted)	4.60	1.61	3.44	4.41	5.66

Table 3. Incentive Contracts and Effort – Regressions

The table provides results of regressions of measures of effort on target bonus amounts for various types of incentives and other control variables. The effort measures are average workday length (Panel A) – defined as the length of time (in hours) between the first activity on the terminal or mobile app and the last activity, average days at work per week (Panel B) – defined as the number of days in which the executive logs onto the terminal or mobile application at least once, length (50% of maximum) (Panel C) and length (middle 85%) (Panel D). The latter two measures are created using the distribution of activity by the executive across the fiscal year and are defined in Section 3. The prefixes *log* on the compensation variable indicates a natural logarithm of the variable while the prefix *pct* indicates that the variable has been scaled by predicted compensation, *pred_comp. CEO* and *CFO* are dummy variables indicating whether the executive's role is that of the Chief Executive Officer or Chief Financial Officer, respectively. Terminal activity data are from Bloomberg. Target bonus award amounts and other compensation data are from ISS Incentive Lab and variables are defined in Table 1. Twelve Fama French Industry Fixed Effects and Fiscal Year fixed effects are included. Data from 124 executives are included in the regressions. Standard errors are clustered by executive and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Panel 3.A – Effort: Workday Length

Variable	(1)	(2)	(3)	(3)	(4)	(5)	(6)
log_pred_comp	-0.137 (0.047) ***		-0.032 (0.237)	-0.194 (0.123)	-0.032 (0.128)	-0.130 (0.127)	-0.187 (0.123)
log_salary		-0.187 (0.078) **					
log_cash_perf		0.037 (0.021) *					
log_stock_perf		-0.042 (0.031)					
log_stock_time		0.009 (0.018)					
log_option_time		0.006 (0.019)					
pct_salary			0.796 (1.347)				
pct_cash_perf				1.753 (0.671) ***			
pct_stock_perf					-1.668 (0.541) ***		
pct_stock_time						-0.596 (0.663)	
pct_option_time							1.873 (1.230)
log_stock_owned	0.033 (0.027)	0.034 (0.027)	0.031 (0.027)	0.036 (0.026)	0.037 (0.028)	0.032 (0.026)	0.035 (0.027)
CEO	-0.606 (0.301) **	-0.541 (0.303) *	-0.641 (0.338) *	-0.499 (0.336)	-0.501 (0.333)	-0.634 (0.328) *	-0.604 (0.330) *
CFO	0.212 (0.279)	0.206 (0.292)	0.232 (0.279)	0.165 (0.278)	0.290 (0.287)	0.184 (0.275)	0.214 (0.279)
ln_size	0.085 (0.067)	0.115 (0.071)	0.071 (0.078)	0.156 (0.080) *	0.102 (0.069)	0.089 (0.074)	0.075 (0.073)
Leverage	0.960 (0.482) **	0.854 (0.479) *	0.936 (0.481) *	0.903 (0.465) *	0.762 (0.469)	1.016 (0.500) **	1.032 (0.491) **
Q	-0.128 (0.182)	-0.157 (0.188)	-0.113 (0.180)	-0.189 (0.192)	-0.129 (0.174)	-0.147 (0.182)	-0.158 (0.168)
productivity	0.707 (0.443)	0.632 (0.433)	0.679 (0.452)	0.859 (0.456) *	0.670 (0.413)	0.703 (0.439)	0.556 (0.360)
Industry FE?	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES
N OBS	227	227	227	227	227	227	227
R-Squared	0.150	0.177	0.141	0.165	0.172	0.143	0.155

Panel 3.B – Effort: Days Worked Per Week

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log_pred_comp	-0.077 (0.021) ***		-0.116 (0.103)	-0.163 (0.042) ***	-0.103 (0.043) **	-0.136 (0.046) ***	-0.151 (0.041) ***
log_salary		-0.096 (0.033) ***					
log_cash_perf		0.028 (0.009) ***					
log_stock_perf		-0.015 (0.012)					
log_stock_time		-0.001 (0.008)					
log_option_time		-0.006 (0.008)					
pct_salary			0.188 (0.582)				
pct_cash_perf				0.785 (0.289) ***			
pct_stock_perf					-0.575 (0.242) **		
pct_stock_time						-0.210 (0.328)	
pct_option_time							0.361 (0.462)
log_stock_owned	0.022 (0.010) **	0.020 (0.011) *	0.021 (0.010) **	0.022 (0.009) **	0.022 (0.010) **	0.021 (0.009) **	0.021 (0.010) **
CEO	-0.059 (0.143)	-0.041 (0.139)	-0.009 (0.150)	0.044 (0.145)	0.034 (0.144)	-0.012 (0.144)	0.001 (0.145)
CFO	0.086 (0.134)	0.042 (0.135)	0.093 (0.134)	0.066 (0.130)	0.115 (0.134)	0.078 (0.130)	0.089 (0.133)
ln_size	-0.018 (0.031)	0.009 (0.032)	-0.003 (0.034)	0.031 (0.035)	0.005 (0.031)	0.001 (0.032)	-0.001 (0.032)
Leverage	0.081 (0.210)	0.060 (0.211)	0.082 (0.208)	0.062 (0.203)	0.019 (0.207)	0.107 (0.218)	0.101 (0.211)
Q	-0.132 (0.076) *	-0.163 (0.080) **	-0.131 (0.075) *	-0.161 (0.080) **	-0.134 (0.074) *	-0.141 (0.077) *	-0.140 (0.074) *
productivity	0.410 (0.132) ***	0.407 (0.141) ***	0.394 (0.125) ***	0.469 (0.131) ***	0.388 (0.119) ***	0.399 (0.125) ***	0.371 (0.114) ***
Industry FE?	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES
N OBS	227	227	227	227	227	227	227
R-Squared	0.303	0.330	0.307	0.331	0.324	0.309	0.309

Panel 3.C – Effort: Length (50% of max)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log_pred_comp	-0.015		-0.008	0.065	0.185	0.135	0.111
	(0.062)		(0.255)	(0.128)	(0.139)	(0.133)	(0.129)
log_salary		-0.023					
		(0.083)					
log_cash_perf		0.038					
		(0.027)					
log_stock_perf		-0.036					
		(0.042)					
log_stock_time		0.018					
		(0.020)					
log_option_time		0.000					
		(0.025)					
pct_salary			-0.802				
			(1.394)				
pct_cash_perf				1.784			
				(0.857) **			
pct_stock_perf					-1.009		
					(0.693)		
pct_stock_time						-0.384	
						(0.766)	
pct_option_time							0.402
							(1.604)
log_shares_owned	-0.007	-0.004	-0.005	-0.004	-0.005	-0.007	-0.007
	(0.032)	(0.031)	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
CEO	-0.331	-0.254	-0.417	-0.371	-0.387	-0.486	-0.457
	(0.384)	(0.378)	(0.375)	(0.379)	(0.386)	(0.380)	(0.384)
CFO	0.572	0.524	0.544	0.513	0.612	0.544	0.563
	(0.344) *	(0.356)	(0.344)	(0.336)	(0.344) *	(0.341)	(0.341)
ln_size	-0.017	0.035	-0.034	0.024	-0.041	-0.056	-0.058
	(0.082)	(0.089)	(0.092)	(0.095)	(0.085)	(0.087)	(0.088)
Leverage	1.643	1.603	1.631	1.601	1.523	1.638	1.620
	(0.568) ***	(0.569) ***	(0.573) ***	(0.555) ***	(0.577) ***	(0.594) ***	(0.579) ***
Q	-0.154	-0.167	-0.166	-0.189	-0.151	-0.163	-0.162
	(0.208)	(0.209)	(0.206)	(0.200)	(0.212)	(0.208)	(0.207)
productivity	0.940	0.983	0.949	1.102	0.938	0.918	0.895
	(0.547) *	(0.573) *	(0.541) *	(0.570) *	(0.549) *	(0.542) *	(0.524) *
Industry FE?	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES
N OBS	229	229	227	227	227	227	227
R-Squared	0.254	0.271	0.257	0.276	0.264	0.257	0.257

Panel 3.D – Effort: Length (middle 85%)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log_pred_comp	-0.181		-0.634	-0.602	-0.431	-0.506	-0.543
	(0.118)		(0.279) **	(0.142) ***	(0.141) ***	(0.144) ***	(0.136) ***
log_salary		-0.084					
		(0.109)					
log_cash_perf		0.051					
		(0.029) *					
log_stock_perf		-0.085					
		(0.043) *					
log_stock_time		-0.009					
		(0.023)					
log_option_time		-0.016					
		(0.025)					
pct_salary			-0.652				
			(1.608)				
pct_cash_perf				2.409			
				(0.839) ***			
pct_stock_perf					-1.500		
					(0.679) **		
pct_stock_time						-0.563	
						(0.811)	
pct_option_time							0.704
							(1.437)
log_shares_owned	0.046	0.043	0.046	0.048	0.047	0.044	0.045
	(0.027) *	(0.027)	(0.026) *	(0.025) *	(0.026) *	(0.026) *	(0.026) *
CEO	0.091	0.230	0.465	0.550	0.538	0.392	0.435
	(0.399)	(0.382)	(0.411)	(0.395)	(0.402)	(0.397)	(0.404)
CFO	0.499	0.474	0.502	0.448	0.589	0.488	0.515
	(0.337)	(0.330)	(0.319)	(0.310)	(0.325) *	(0.311)	(0.321)
ln_size	0.090	0.165	0.208	0.298	0.213	0.189	0.186
	(0.085)	(0.084) *	(0.091) **	(0.092) ***	(0.080) ***	(0.084) **	(0.084) **
Leverage	0.791	0.855	0.909	0.881	0.765	0.935	0.913
	(0.577)	(0.534)	(0.557)	(0.526) *	(0.544)	(0.571)	(0.561)
Q	-0.279	-0.294	-0.294	-0.332	-0.281	-0.298	-0.299
	(0.166) *	(0.169) *	(0.149) *	(0.144) **	(0.154) *	(0.153) *	(0.154) *
productivity	0.875	0.878	0.936	1.156	0.937	0.907	0.866
	(0.487) *	(0.493) *	(0.422) **	(0.455) **	(0.418) **	(0.417) **	(0.382) **
Industry FE?	YES	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES	YES
N OBS	229	229	227	227	227	227	227
R-Squared	0.254	0.271	0.257	0.276	0.264	0.257	0.257

Table 4: Past Success and Effort

The table provides results of regressions of measures of effort on target bonus amounts for various types of incentives and other control variables as well as a variable indicating whether the executive achieved the target cash performance bonus the previous fiscal year. The effort measures are average workday length – defined as the length of time (in hours) between the first activity on the terminal or mobile app and the last activity, average days at work per week – defined as the number of days in which the executive logs onto the terminal or mobile application at least once, in Panel A and length (50% of maximum) and length (middle 85%) in Panel B. The latter two measures are created using the distribution of activity by the executive across the fiscal year and are defined in Section 3. The variable *lag_beat_target* is a dummy variable indicating whether the executive achieved at least the target bonus amount during the previous year for the cash performance incentive program. Panels C and D repeat the analysis with the addition of the log dollar amount of the discretionary cash bonus during the previous fiscal year – *lag_log_bonus*. Additionally, Panels E and F add the independent variable *pos_earn_surp*, which is equal to 1 of earnings pre share during the previous fiscal year were higher than the same figure from two years ago. The prefixes *log* on the compensation variable indicates a natural logarithm of the variable while the prefix *pct* indicates that the variable has been scaled by predicted compensation, *pred_comp*. *CEO* and *CFO* are dummy variables indicating whether the executive's role is that of the Chief Executive Officer or Chief Financial Officer, respectively. Terminal activity data are from Bloomberg. Target bonus award amounts and other compensation data are from ISS Incentive Lab and variables are defined in Table 1. Twelve Fama French Industry Fixed Effects, Fiscal Year fixed effects and firm characteristics are included as control variables where indicated. Standard errors are clustered by executive and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Panel 4.A

	dependent var: workday length			dependent var: days per week		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	1.942	1.832	1.545	0.066	0.640	0.555
	(0.750) **	(0.791) **	(0.736) **	(0.357) *	(0.379) *	(0.366)
log_salary	-0.047	0.083	-0.200	-0.064	0.016	-0.041
	(0.332)	(0.378)	(0.479)	(0.128)	(0.151)	(0.186)
log_cash_perf	0.142	0.127	0.123	0.074	0.070	0.070
	(0.052) ***	(0.057) **	(0.053) **	(0.024) ***	(0.026) ***	(0.030) ***
log_stock_perf	-0.063	-0.051	-0.066	-0.022	-0.016	-0.018
	(0.045)	(0.040)	(0.042)	(0.016)	(0.014)	(0.016)
log_stock_time	0.003	0.003	0.000	0.001	0.000	-0.001
	(0.024)	(0.025)	(0.025)	(0.010)	(0.010)	(0.010)
log_option_time	0.003	0.009	0.018	-0.008	-0.004	0.000
	(0.025)	(0.025)	(0.027)	(0.010)	(0.010)	(0.011)
log_shares_owned	0.007	0.036	0.080	0.010	0.026	0.040
	(0.045)	(0.044)	(0.051)	(0.024)	(0.024)	(0.023) *
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	223	223	223	223	223	223
R-Squared	0.101	0.143	0.191	0.230	0.280	0.310

Panel 4.B

	dependent var: length (50% of max)			dependent var: length (middle 85%		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	1.420 (0.720) **	1.320 (0.720) *	1.100 (0.580) *	1.410 (0.810) *	1.350 (0.780) *	0.920 (0.690)
log_salary	-0.080 (0.260)	-0.130 (0.290)	-0.170 (0.310)	0.100 (0.260)	-0.180 (0.260)	-0.630 (0.310) **
log_cash_perf	0.110 (0.050) **	0.100 (0.050) *	0.110 (0.040) **	0.130 (0.060) **	0.140 (0.060) **	0.130 (0.050) **
log_stock_perf	-0.060 (0.050)	-0.060 (0.050)	-0.060 (0.050)	-0.070 (0.040) *	-0.080 (0.040) **	-0.080 (0.040) **
log_stock_time	0.020 (0.020)	0.020 (0.020)	0.010 (0.020)	0.000 (0.020)	0.000 (0.020)	0.000 (0.020)
log_option_time	-0.010 (0.020)	-0.010 (0.020)	0.000 (0.030)	0.000 (0.020)	0.000 (0.020)	0.000 (0.020)
log_shares_owned	-0.040 (0.040)	-0.030 (0.040)	-0.050 (0.060)	0.010 (0.040)	0.000 (0.040)	0.070 (0.040) *
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	196	196	196	196	196	196
R-Squared	0.24	0.26	0.31	0.25	0.28	0.35

Panel 4.C

	dep. var: workday length			dep. var: days per week		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	2.360	2.311	2.040	0.765	0.807	0.652
	(0.756) ***	(0.814) ***	(0.793) **	(0.380) **	(0.405) **	(0.385) *
lag_log_bonus	0.005	0.004	0.018	0.002	0.004	0.011
	(0.028)	(0.028)	(0.029)	(0.014)	(0.014)	(0.014)
log_salary	0.048	0.187	0.017	-0.082	0.040	0.009
	(0.397)	(0.468)	(0.478)	(0.144)	(0.177)	(0.191)
log_cash_perf	0.177	0.165	0.165	0.082	0.082	0.080
	(0.052) ***	(0.057) ***	(0.058) ***	(0.025) ***	(0.028) ***	(0.027) ***
log_stock_perf	-0.058	-0.051	-0.063	-0.016	-0.012	-0.014
	(0.044)	(0.041)	(0.049)	(0.018)	(0.017)	(0.020)
log_stock_time	0.016	0.011	0.012	0.008	0.006	0.007
	(0.023)	(0.024)	(0.024)	(0.011)	(0.011)	(0.011)
log_option_time	-0.003	0.002	0.011	-0.004	0.001	0.005
	(0.026)	(0.026)	(0.027)	(0.012)	(0.012)	(0.012)
log_shares_owned	0.004	0.037	0.099	0.008	0.031	0.053
	(0.050)	(0.054)	(0.070)	(0.025)	(0.027)	(0.029) *
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	179	179	179	179	179	179
R-Squared	0.115	0.166	0.21	0.23	0.288	0.337

Panel 4.D

	dep. var: length (50% of max)			dep. var: length (middle 85%)		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	1.822	1.722	1.510	1.801	1.740	1.265
	(0.817) **	(0.864) **	(0.733) **	(0.829) **	(0.859) **	(0.808)
lag_log_bonus	0.000	-0.003	0.010	0.009	0.004	0.020
	(0.030)	(0.030)	(0.031)	(0.029)	(0.029)	(0.030)
log_salary	0.039	0.175	0.191	0.171	0.110	-0.303
	(0.292)	(0.339)	(0.369)	(0.358)	(0.410)	(0.356)
log_cash_perf	0.139	0.118	0.128	0.171	0.165	0.156
	(0.058) **	(0.064) *	(0.059) **	(0.057) ***	(0.062) ***	(0.060) **
log_stock_perf	-0.067	-0.055	-0.051	-0.081	-0.081	-0.085
	(0.065)	(0.062)	(0.063)	(0.048) *	(0.047) *	(0.056)
log_stock_time	0.022	0.018	0.015	0.007	0.002	0.006
	(0.023)	(0.023)	(0.025)	(0.023)	(0.024)	(0.024)
log_option_time	-0.025	-0.023	-0.017	-0.004	-0.009	-0.010
	(0.026)	(0.027)	(0.030)	(0.026)	(0.026)	(0.027)
log_shares_owned	-0.047	-0.024	-0.018	0.021	0.024	0.141
	(0.056)	(0.060)	(0.079)	(0.049)	(0.054)	(0.047) ***
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	171	171	171	171	171	171
R-Squared	0.204	0.243	0.288	0.237	0.263	0.346

Panel 4.E

	dep. var: workday length			dep. var: days per week		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	2.445	2.370	2.046	0.778	0.794	0.608
	(0.733) ***	(0.798) ***	(0.795) **	(0.384) **	(0.423) *	(0.398)
pos_earn_surp	-0.332	-0.147	0.034	0.012	0.115	0.151
	(0.335)	(0.336)	(0.367)	(0.156)	(0.156)	(0.169)
lag_log_bonus	0.011	0.007	0.016	0.000	0.000	0.007
	(0.030)	(0.029)	(0.030)	(0.014)	(0.014)	(0.015)
log_salary	0.092	0.220	0.030	-0.071	0.048	-0.001
	(0.412)	(0.480)	(0.479)	(0.150)	(0.178)	(0.188)
log_cash_perf	0.184	0.168	0.163	0.081	0.077	0.075
	(0.051) ***	(0.057) ***	(0.058) ***	(0.025) ***	(0.028) ***	(0.028) ***
log_stock_perf	-0.056	-0.050	-0.063	-0.017	-0.013	-0.014
	(0.044)	(0.040)	(0.049)	(0.019)	(0.018)	(0.021)
log_stock_time	0.023	0.015	0.011	0.009	0.005	0.005
	(0.025)	(0.026)	(0.027)	(0.012)	(0.012)	(0.012)
log_option_time	-0.002	0.003	0.011	-0.005	0.000	0.003
	(0.026)	(0.027)	(0.029)	(0.012)	(0.012)	(0.013)
log_shares_owned	0.013	0.042	0.100	0.005	0.027	0.050
	(0.054)	(0.056)	(0.071)	(0.027)	(0.028)	(0.029) *
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	176	176	176	176	176	176
R-Squared	0.124	0.172	0.212	0.234	0.295	0.341

Panel 4.F

	dep. var: length (50% of max)			dep. var: length (middle 85%)		
variable	(1)	(2)	(3)	(4)	(5)	(6)
lag_beat_target	1.846	1.729	1.493	1.860	1.780	1.301
	(0.796) **	(0.843) **	(0.755) *	(0.826) **	(0.873) **	(0.837)
pos_earn_surp	-0.370	-0.266	-0.080	-0.104	0.010	-0.042
	(0.330)	(0.324)	(0.351)	(0.293)	(0.298)	(0.324)
lag_log_bonus	0.014	0.008	0.022	0.008	0.002	0.017
	(0.031)	(0.031)	(0.032)	(0.029)	(0.029)	(0.032)
log_salary	0.041	0.155	0.177	0.216	0.150	-0.286
	(0.300)	(0.338)	(0.375)	(0.377)	(0.422)	(0.360)
log_cash_perf	0.150	0.127	0.132	0.171	0.163	0.156
	(0.058) **	(0.064) **	(0.060) **	(0.057) ***	(0.063) **	(0.063) **
log_stock_perf	-0.062	-0.052	-0.053	-0.081	-0.081	-0.083
	(0.064)	(0.061)	(0.062)	(0.048) *	(0.047) *	(0.056)
log_stock_time	0.027	0.022	0.014	0.012	0.004	0.008
	(0.026)	(0.026)	(0.028)	(0.024)	(0.025)	(0.026)
log_option_time	-0.018	-0.018	-0.007	-0.006	-0.010	-0.014
	(0.027)	(0.028)	(0.032)	(0.026)	(0.026)	(0.030)
log_shares_owned	-0.029	-0.012	-0.011	0.020	0.022	0.141
	(0.058)	(0.060)	(0.079)	(0.052)	(0.057)	(0.046) ***
Executive Role FE?	YES	YES	YES	YES	YES	YES
Year FE?	YES	YES	YES	YES	YES	YES
Firm Characteristics?	NO	YES	YES	NO	YES	YES
Industry FE?	NO	NO	YES	NO	NO	YES
N OBS	168	168	168	168	168	168
R-Sq	0.19	0.228	0.274	0.245	0.27	0.348

Table 5: Risk

The table provides results of regressions of measures of effort on target bonus amounts for various types of incentives and other control variables for subsample of high and low risk firms. The effort measures are average workday length (Panels A and E) – defined as the length of time (in hours) between the first activity on the terminal or mobile app and the last activity, and average days at work per week (Panels B and F) – defined as the number of days in which the executive logs onto the terminal or the mobile application, length (50% of maximum) (Panel C and G) and length (middle 85%) (Panels D and H). The latter two measures are created using the distribution of activity by the executive across the fiscal year and are defined in Section 3.s. Panels A and B include subsamples based on low (below median) and high (above median) idiosyncratic risk firms while Panels C and D include subsamples based on systematic risk. Idiosyncratic risk is defined as the root mean squared residual from regressions using the Fama French 4-Factor model (FF4) on daily stock returns during the previous fiscal year. Systematic risk is defined using the CAPM beta from regressions on daily stock returns during the previous fiscal year. The prefixes *log* on the compensation variable indicates a natural logarithm of the variable while the prefix *pct* indicates that the variable has been scaled by predicted compensation, *pred_comp.* Terminal activity data are from Bloomberg. Target bonus award amounts and other compensation data are from ISS Incentive Lab and variables are defined in Table 1. Executive role fixed effects, twelve Fama French industry fixed effects, fiscal year fixed effects, and firm characteristics are included as control variables. 12 executives are included in the regressions. Standard errors are clustered by executive and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Panel 5.A – Idiosyncratic Risk and Workday Length

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.171 (0.060) ***	-0.275 (0.162) *			-0.622 (0.368) *	-0.312 (0.168) *	-0.427 (0.361)	-0.190 (0.191)	-0.450 (0.373)	-0.233 (0.201)	-0.537 (0.357)	-0.313 (0.162) *
log_salary			-0.140 (0.093)	-0.992 (0.355) ***								
log_cash_perf			0.085 (0.033) **	0.006 (0.038)								
log_stock_perf			-0.044 (0.047)	-0.014 (0.066)								
log_stock_time			-0.014 (0.027)	0.034 (0.044)								
log_option_time			0.007 (0.032)	-0.004 (0.041)								
pct_cash_perf					2.888 (1.022) ***	1.501 (1.623)						
pct_stock_perf							-1.692 (0.816) **	-1.115 (1.542)				
pct_stock_time									-1.831 (1.034) *	-0.641 (1.424)		
pct_option_time											2.850 (1.648) *	2.836 (2.224)
log_shares_owned	0.068 (0.058)	0.021 (0.036)	0.059 (0.060)	0.032 (0.036)	0.039 (0.056)	0.031 (0.036)	0.062 (0.061)	0.025 (0.037)	0.055 (0.054)	0.021 (0.036)	0.072 (0.059)	0.025 (0.036)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	153	153	153	153	151	153	151	153	151	153	151	153
R-Squared	0.185	0.182	0.224	0.225	0.213	0.189	0.190	0.187	0.186	0.184	0.190	0.194

Panel 5.B – Idiosyncratic Risk and Days per Week

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.060 (0.030) **	-0.190 (0.072) ***			-0.354 (0.207) *	-0.205 (0.075) ***	-0.240 (0.202)	-0.140 (0.087)	-0.252 (0.211)	-0.166 (0.088) *	-0.294 (0.203)	-0.215 (0.070) ***
log_salary			-0.052 (0.044)	-0.498 (0.163) ***								
log_cash_perf			0.061 (0.017) ***	0.009 (0.018)								
log_stock_perf			-0.024 (0.026)	-0.005 (0.027)								
log_stock_time			-0.011 (0.014)	0.001 (0.018)								
log_option_time			0.001 (0.017)	0.004 (0.021)								
pct_cash_perf					1.678 (0.567) ***	0.577 (0.711)						
pct_stock_perf							-0.944 (0.469) **	-0.670 (0.742)				
pct_stock_time									-0.975 (0.567) *	-0.369 (0.608)		
pct_option_time											1.396 (0.763) *	1.873 (0.912) **
log_shares_owned	0.046 (0.026) *	0.011 (0.015)	0.039 (0.028)	0.016 (0.014)	0.029 (0.026)	0.015 (0.016)	0.043 (0.028)	0.013 (0.016)	0.039 (0.025)	0.010 (0.015)	0.048 (0.028) *	0.013 (0.015)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	153	153	153	153	151	153	151	153	151	153	151	153
R-Squared	0.203	0.244	0.280	0.271	0.251	0.248	0.223	0.250	0.217	0.246	0.217	0.264

Panel 5.C – Idiosyncratic Risk and Length (50% of max)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.054 (0.042)	0.071 (0.101)			-0.307 (0.314)	0.004 (0.110)	-0.062 (0.302)	0.195 (0.135)	-0.125 (0.306)	0.108 (0.138)	-0.148 (0.310)	0.073 (0.103)
log_salary			-0.031 (0.074)	0.104 (0.287)								
log_cash_perf			0.062 (0.028) **	0.018 (0.036)								
log_stock_perf			-0.055 (0.040)	-0.044 (0.066)								
log_stock_time			0.026 (0.025)	0.034 (0.039)								
log_option_time			0.034 (0.031)	-0.032 (0.044)								
pct_cash_perf					2.273 (0.917) **	2.434 (1.482)						
pct_stock_perf							-1.883 (0.780) **	-2.090 (1.478)				
pct_stock_time									-0.368 (1.050)	-0.512 (1.222)		
pct_option_time											1.446 (1.388)	-0.149 (2.808)
log_shares_owned	-0.004 (0.037)	-0.008 (0.033)	-0.003 (0.049)	-0.007 (0.033)	-0.022 (0.041)	0.009 (0.035)	-0.012 (0.040)	0.001 (0.033)	-0.006 (0.038)	-0.008 (0.033)	-0.002 (0.040)	-0.008 (0.033)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	109	120	109	120	107	120	107	120	107	120	107	120
R-Squared	0.252	0.392	0.314	0.407	0.280	0.417	0.278	0.406	0.247	0.393	0.253	0.392

Panel 5.D – Idiosyncratic Risk and Length (middle 85%)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Type:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.075 (0.045) *	-0.546 (0.138) ***			-0.830 (0.351) **	-0.623 (0.141) ***	-0.467 (0.337)	-0.456 (0.135) ***	-0.537 (0.335)	-0.442 (0.172) **	-0.524 (0.341)	-0.563 (0.136) ***
log_salary			-0.028 (0.075)	-0.857 (0.313) ***								
log_cash_perf			0.093 (0.031) ***	0.030 (0.033)								
log_stock_perf			-0.080 (0.042) *	-0.047 (0.063)								
log_stock_time			0.019 (0.027)	-0.047 (0.035)								
log_option_time			0.000 (0.033)	-0.016 (0.039)								
pct_cash_perf					3.560 (0.965) ***	2.826 (1.302) **						
pct_stock_perf							-2.115 (0.795) ***	-1.514 (1.413)				
pct_stock_time									-0.406 (1.165)	-1.411 (1.064)		
pct_option_time											0.153 (1.521)	1.246 (1.937)
log_shares_owned	-0.041 (0.050)	0.059 (0.026) **	-0.039 (0.069)	0.064 (0.025) **	-0.071 (0.050)	0.078 (0.026) ***	-0.051 (0.055)	0.065 (0.028) **	-0.044 (0.045)	0.059 (0.026) **	-0.043 (0.045)	0.061 (0.026) **
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	109	120	109	120	107	120	107	120	107	120	107	120
R-Squared	0.201	0.424	0.295	0.46	0.296	0.462	0.252	0.432	0.212	0.435	0.211	0.428

Panel 5.E – Systematic Risk and Workday Length

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.133 (0.064) **	-0.453 (0.167) ***			-0.099 (0.253)	-0.487 (0.163) ***	0.141 (0.258)	-0.380 (0.175) **	0.079 (0.235)	-0.472 (0.172) ***	-0.134 (0.224)	-0.416 (0.165) **
log_salary			-0.273 (0.096) ***	-0.238 (0.386)								
log_cash_perf			0.120 (0.048) **	0.056 (0.031) *								
log_stock_perf			-0.093 (0.044) **	-0.081 (0.067)								
log_stock_time			-0.016 (0.031)	0.004 (0.028)								
log_option_time			0.111 (0.036) ***	-0.085 (0.030) ***								
pct_cash_perf					2.020 (1.255)	1.890 (1.084) *						
pct_stock_perf							-1.924 (1.099) *	-1.033 (0.885)				
pct_stock_time									-2.544 (1.237) **	0.353 (0.938)		
pct_option_time											5.261 (1.608) ***	-5.607 (1.675) ***
log_shares_owned	0.080 (0.045) *	-0.002 (0.039)	0.104 (0.036) ***	0.005 (0.041)	0.079 (0.044) *	0.004 (0.039)	0.093 (0.044) **	0.001 (0.041)	0.073 (0.043) *	-0.002 (0.040)	0.094 (0.041) **	-0.014 (0.038)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	153	153	153	153	151	153	151	153	151	153	151	153
R-Squared	0.217	0.189	0.316	0.222	0.221	0.207	0.226	0.196	0.229	0.190	0.283	0.220

Panel 5.F – Systematic Risk and Days per Week

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.051 (0.029) *	-0.249 (0.065) ***			-0.135 (0.134)	-0.265 (0.064) ***	0.011 (0.135)	-0.204 (0.077) ***	-0.033 (0.128)	-0.263 (0.069) ***	-0.114 (0.127)	-0.240 (0.065) ***
log_salary			-0.086 (0.039) **	-0.268 (0.161) *								
log_cash_perf			0.063 (0.024) ***	0.043 (0.017) **								
log_stock_perf			-0.055 (0.020) ***	-0.017 (0.030)								
log_stock_time			-0.010 (0.015)	-0.004 (0.015)								
log_option_time			0.040 (0.017) **	-0.039 (0.017) **								
pct_cash_perf					1.467 (0.654) **	0.844 (0.524)						
pct_stock_perf							-1.036 (0.504) **	-0.641 (0.517)				
pct_stock_time									-1.084 (0.686)	0.259 (0.486)		
pct_option_time											1.810 (0.730) **	-1.431 (1.141)
log_shares_owned	0.044 (0.021) **	0.007 (0.017)	0.050 (0.018) ***	0.009 (0.020)	0.041 (0.020) **	0.009 (0.018)	0.049 (0.021) **	0.009 (0.018)	0.040 (0.021) *	0.006 (0.017)	0.047 (0.020) **	0.003 (0.017)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	153	153	153	153	151	153	151	153	151	153	151	153
R-Squared	0.262	0.191	0.335	0.219	0.288	0.204	0.277	0.200	0.271	0.192	0.289	0.198

Panel 5.G – Systematic Risk and Length (50% of max)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Level:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.018 (0.055)	-0.073 (0.131)			0.213 (0.205)	-0.104 (0.138)	0.524 (0.209) **	-0.057 (0.141)	0.303 (0.203)	-0.038 (0.131)	0.282 (0.208)	-0.036 (0.127)
log_salary			-0.105 (0.073)	0.449 (0.384)								
log_cash_perf			0.083 (0.045) *	0.011 (0.032)								
log_stock_perf			-0.056 (0.049)	-0.122 (0.079)								
log_stock_time			0.032 (0.032)	-0.006 (0.026)								
log_option_time			0.059 (0.042)	-0.027 (0.033)								
pct_cash_perf					1.961 (1.314)	1.645 (1.043)						
pct_stock_perf							-2.141 (1.031) **	-0.266 (0.886)				
pct_stock_time									0.417 (1.375)	-0.706 (0.836)		
pct_option_time											1.163 (1.717)	-3.943 (2.346) *
log_shares_owned	-0.057 (0.055)	0.024 (0.032)	-0.019 (0.059)	0.035 (0.032)	-0.050 (0.055)	0.030 (0.034)	-0.030 (0.056)	0.024 (0.033)	-0.039 (0.055)	0.024 (0.032)	-0.042 (0.059)	0.025 (0.032)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	114	115	114	115	112	115	112	115	112	115	112	115
R-Squared	0.282	0.303	0.340	0.346	0.312	0.322	0.322	0.304	0.297	0.308	0.302	0.318

Panel 5.H – Systematic Risk and Length (middle 85%)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk Type:	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
log_pred_comp	-0.071	-0.680 ***			-0.415	-0.722 ***	-0.038	-0.603 ***	-0.299	-0.655 ***	-0.330	-0.668 ***
	(0.051)	(0.111)			(0.253)	(0.113)	(0.256)	(0.116)	(0.243)	(0.116)	(0.244)	(0.109)
log_salary			-0.093	-0.404								
			(0.079)	(0.281)								
log_cash_perf			0.083 *	0.047								
			(0.047)	(0.031)								
log_stock_perf			-0.088 *	-0.170 **								
			(0.049)	(0.068)								
log_stock_time			0.019	-0.017								
			(0.030)	(0.025)								
log_option_time			0.031	-0.027								
			(0.046)	(0.031)								
pct_cash_perf					2.375 *	2.272 **						
					(1.301)	(0.962)						
pct_stock_perf							-2.601 ***	-1.236				
							(0.946)	(0.799)				
pct_stock_time									0.002	-0.486		
									(1.432)	(0.795)		
pct_option_time											1.312	-1.243
											(1.509)	(2.234)
log_shares_owned	0.122 ***	0.025	0.141 ***	0.033	0.103 ***	0.033	0.127 ***	0.025	0.112 ***	0.025	0.113 ***	0.026
	(0.035)	(0.031)	(0.036)	(0.037)	(0.035)	(0.034)	(0.037)	(0.033)	(0.034)	(0.031)	(0.034)	(0.031)
Executive Role FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm Chars	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N OBS	114	115	114	115	112	115	112	115	112	115	112	115
R-Squared	0.36	0.318	0.417	0.348	0.392	0.357	0.408	0.33	0.367	0.32	0.374	0.319

Table 6. Effort and Earnings Surprise

The table provides results of regressions of earnings surprises on various measures of effort. Two measures of earnings surprised are used in the regressions. Panel A presents results using Standardized Unexpected Earnings (SUE), which is defined as the difference in the current quarterly earnings per share and the earnings per share 4 quarters prior divided by the standard deviation of these differences measured over the previous eight quarters. Panel B presents results using analyst forecasts of earnings. The surprise is defined as actual earnings per share minus the mean or median (as indicated) analyst earnings forecast scaled by stock price at the end of the fiscal quarter associated with the earnings announcement. Effort measures are *workday length* – defined as the average length of time between the first activity on the terminal or the mobile application (where indicated) and the last activity – and *days per week* – defined as the average number of weekdays during which the executive logs onto the terminal or the mobile app (where indicated) at least once, *length_50*, and *length_tails_85*. The latter two measures are created using the distribution of activity by the executive across the fiscal year and are defined in Section 3. Terminal activity are from Bloomberg, analyst forecast and earnings per share data are from I/B/E/S, and stock price data are from CRSP. Standard errors are clustered by executive and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Panel 6.A – Standardized Unexpected Earnings

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
workday_length	0.170 (0.050) ***	0.120 (0.060) **	0.243 (0.073) ***													
workday_length_lagged			-0.212 (0.059) ***													
d_workday_length				0.224 (0.047) ***												
days_per_week					1.460 (0.390) ***	1.080 (0.480) **	2.384 (0.599) ***									
days_per_week_lagged							-2.283 (0.535) ***									
d_days_per_week								2.324 (0.405) ***								
length_50									0.070 (0.030) **	0.050 (0.030)	0.166 (0.047) ***					
length_50_lagged											-0.176 (0.036) ***					
d_length_50												0.172 (0.030) ***				
length_tails_85													0.110 (0.030) ***	0.080 (0.030) **	0.178 (0.048) ***	
length_tails_85_lagged															-0.164 (0.039) ***	
d_length_tails_85																3.562 (0.657) ***
Quarter FE?	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO
N OBS	1,319	1,319	500	500	1,319	1,319	500	500	1319	1319	1319	475	1,319	1,319	478	478
R-Squared	0.020	0.090	0.038	0.038	0.020	0.090	0.065	0.065	0.01	0.010	0.090	0.053	0.010	0.090	0.057	0.057

Panel 6.B – Surprise Relative to Consensus Analyst Forecast

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
consensus measure	mean	median	mean	median	mean	median	mean	median
workday_length	0.210	0.310						
	(0.490)	(0.500)						
days_per_week			3.980	5.110				
			(5.180)	(5.370)				
length_50					-0.120	-0.100		
					(0.340)	(0.340)		
length_tails_85							-0.180	-0.150
							(0.400)	(0.400)
N OBS	1,047	1,047	1,047	1,047	1,152	1,152	1,152	1,152
R-Squared	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7. Effort and Earnings Announcement Returns

The table provides results of regressions of cumulative abnormal stock returns (in basis points) around earnings announcements on executive effort measured during the fiscal quarter associated with the earnings. Each reported coefficient represents a single regression using one of four effort measures. The first two effort measures are *workday length* – defined as the average length of time between the first activity on the terminal or the mobile application (where indicated) and the last activity – and *days per week* – defined as the average number of weekdays during which the executive logs onto the terminal or the mobile app (where indicated) at least once, *length_50*, and *length_tails_85*. The latter two measures are created using the distribution of activity by the executive across the fiscal year and are defined in Section 3. Cumulative returns are measured using the Fama-French 3 Factor model where factor loadings are estimated using a year of past daily stock returns (skipping the most recent week). Cumulative abnormal returns are presented for ranges of 1 through 10 days where the first day is the trading day that includes the announcement. Terminal activity are from Bloomberg, analyst forecast and earnings per share data are from I/B/E/S, and stock price data are from CRSP. Fama French factor portfolios are from Ken French's website. Standard errors are clustered by executive and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

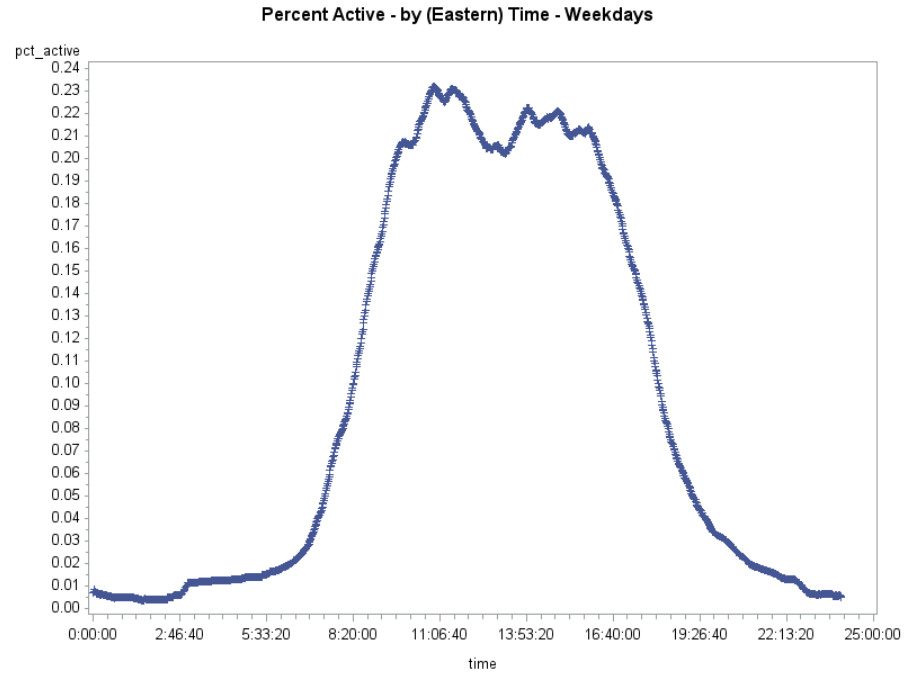
Effort measure	1-day	2-day	3-day	4-day	5-day	6-day	7-day	8-day	9-day	10-day
workday_length	1.09	7.33	6.85	6.69	7.60	9.36	6.87	5.51	2.87	5.83
	(1.77)	(3.02) **	(3.80) *	(4.66)	(5.38)	(5.43) *	(5.95)	(6.11)	(6.33)	(6.49)
days_per_week	1.12	8.14	10.88	10.34	12.23	14.92	12.22	9.27	3.93	10.14
	(2.24)	(3.89) **	(4.87) **	(5.95) *	(6.73) *	(6.69) **	(7.21) *	(7.39)	(7.51)	(7.70)
length_50	0.05	4.36	4.67	4.29	5.21	7.01	4.76	3.31	0.96	3.42
	(1.12)	(1.93) **	(2.43) *	(2.95)	(3.44)	(3.48) **	(3.81)	(3.85)	(4.01)	(4.19)
length_tails_85	1.23	4.93	5.76	6.05	7.08	8.46	7.32	6.16	3.86	6.84
	(1.17)	(2.05) **	(2.52) **	(3.08) **	(3.57) **	(3.60) **	(3.88) *	(3.95)	(4.12)	(4.22)

Figure 1. Bloomberg Screenshots

The figure provides a screenshot for Michael Bloomberg that was obtained using the profile search on the Bloomberg terminal. The green dot by Michael Bloomberg's name indicates that he is online. Other possible status indicators are a red dot (offline), a yellow dot (idle), a gray dot (private, opted out), and a mobile phone icon indicates (user is on the mobile Bloomberg app).

Figure 2. Executive Intraday Terminal Activity

The figure provides the average percentage of executives that are active on the Bloomberg terminal at a given time on weekdays (Monday through Friday) across the sample period. Panel A averages based on the Eastern time zone, while Panel B includes averages based on the local time zone of the Executive. Data are from Bloomberg.



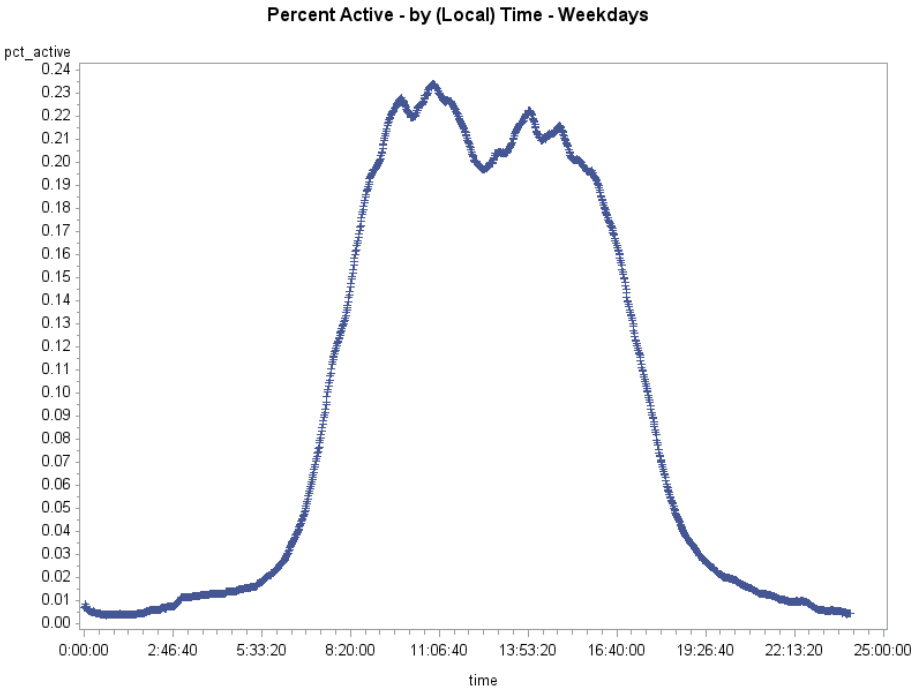
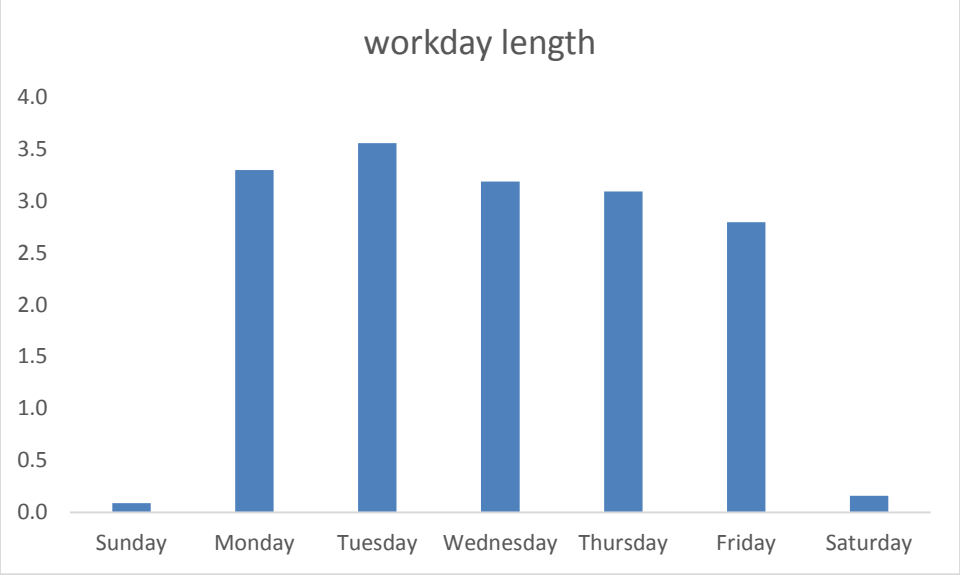


Figure 3. Effort by Day of the Week

The figure provides the average length of the workday for each day of the week for the full sample (Panel A), and after removing holidays (Panel B)

Panel 3A – All Days



Panel 3B – Excluding Holidays

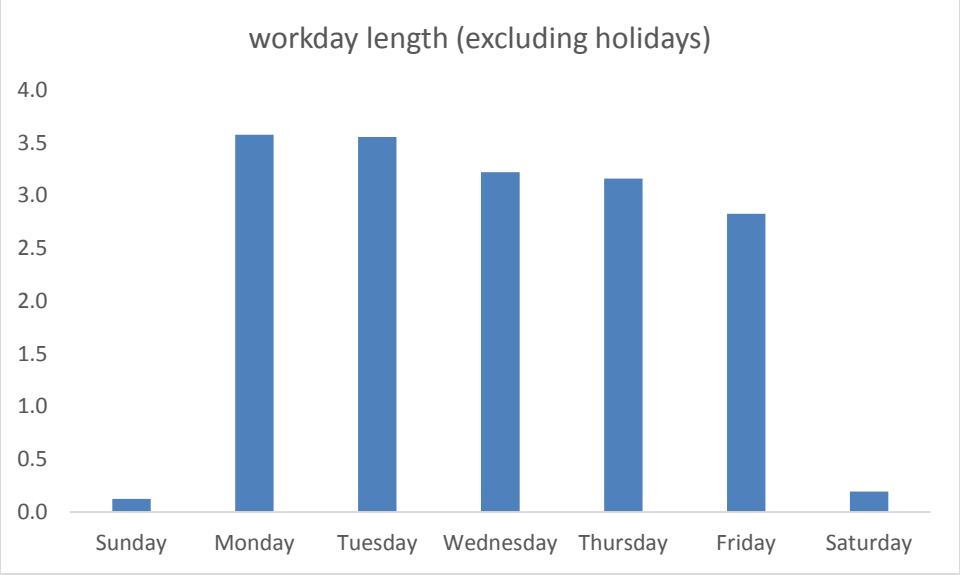
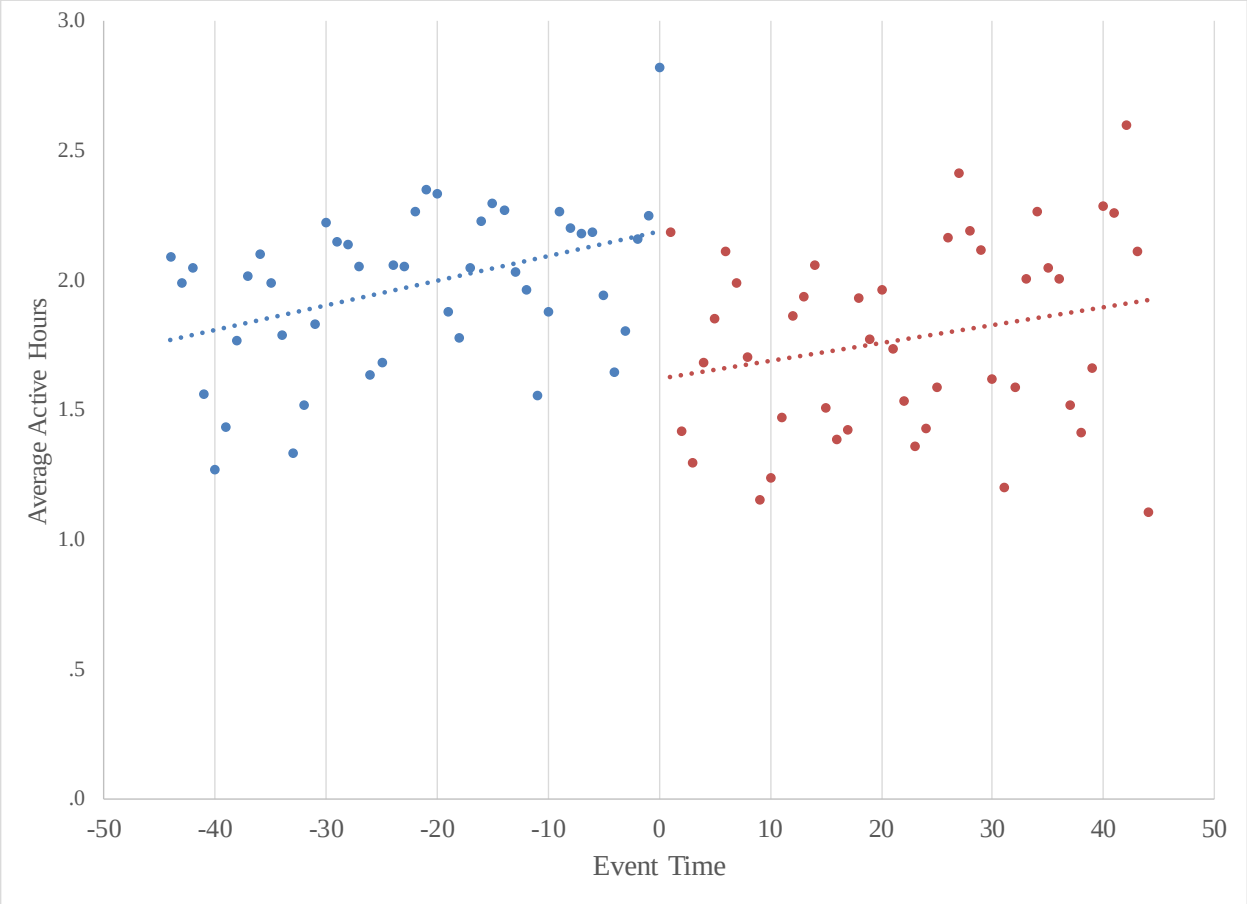


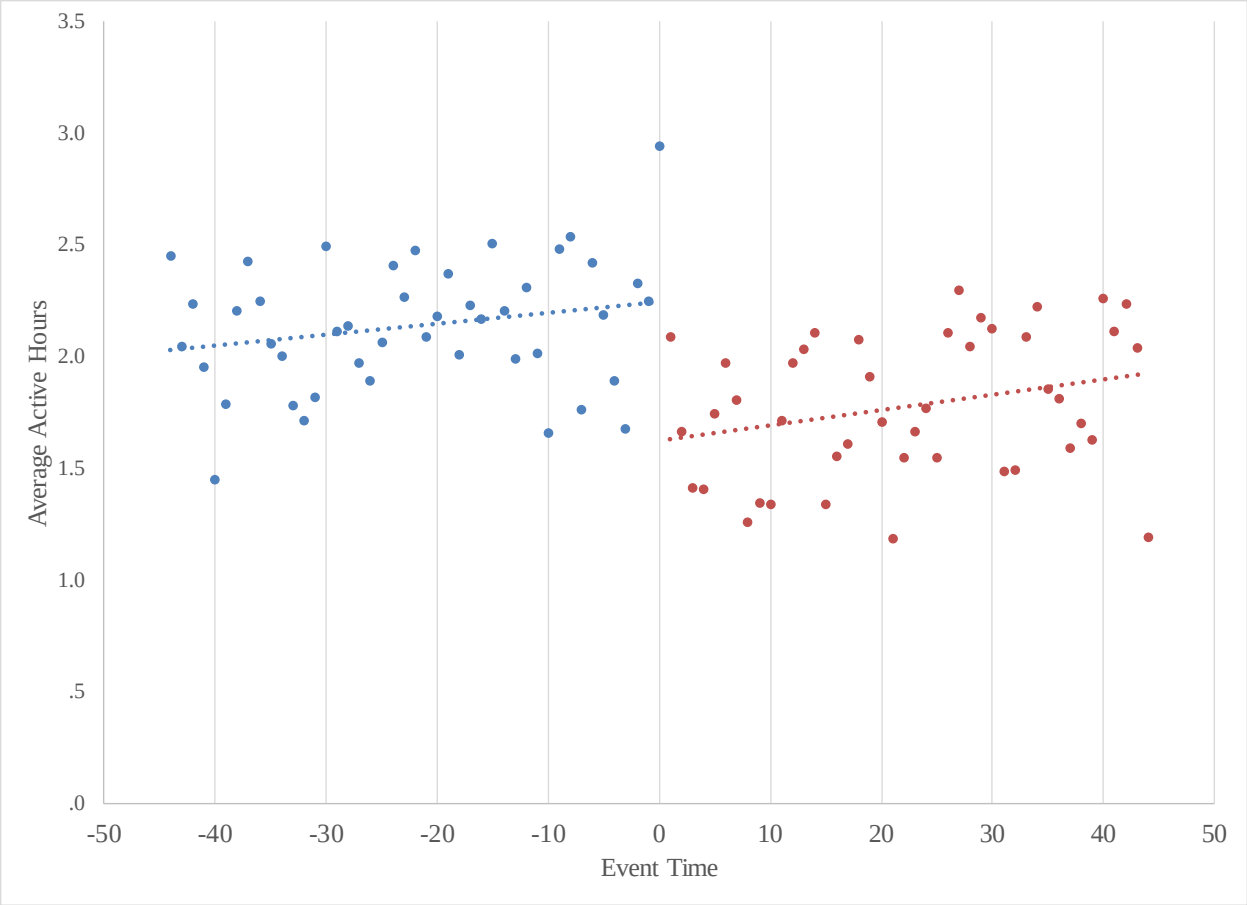
Figure 4. Executive Activity and the Earnings Announcement Cycle

The figure includes executive terminal activity through the quarter relative to the firm's earnings announcement. Effort is defined as hours online on the terminal. Panel A presents results for all executives in the sample while Panel B presents results for CFOs and Panel C presents results for CEOs.

Panel 4A: Executive Activity



Panel 4B: CFO Activity



Panel 4C: CEO Activity

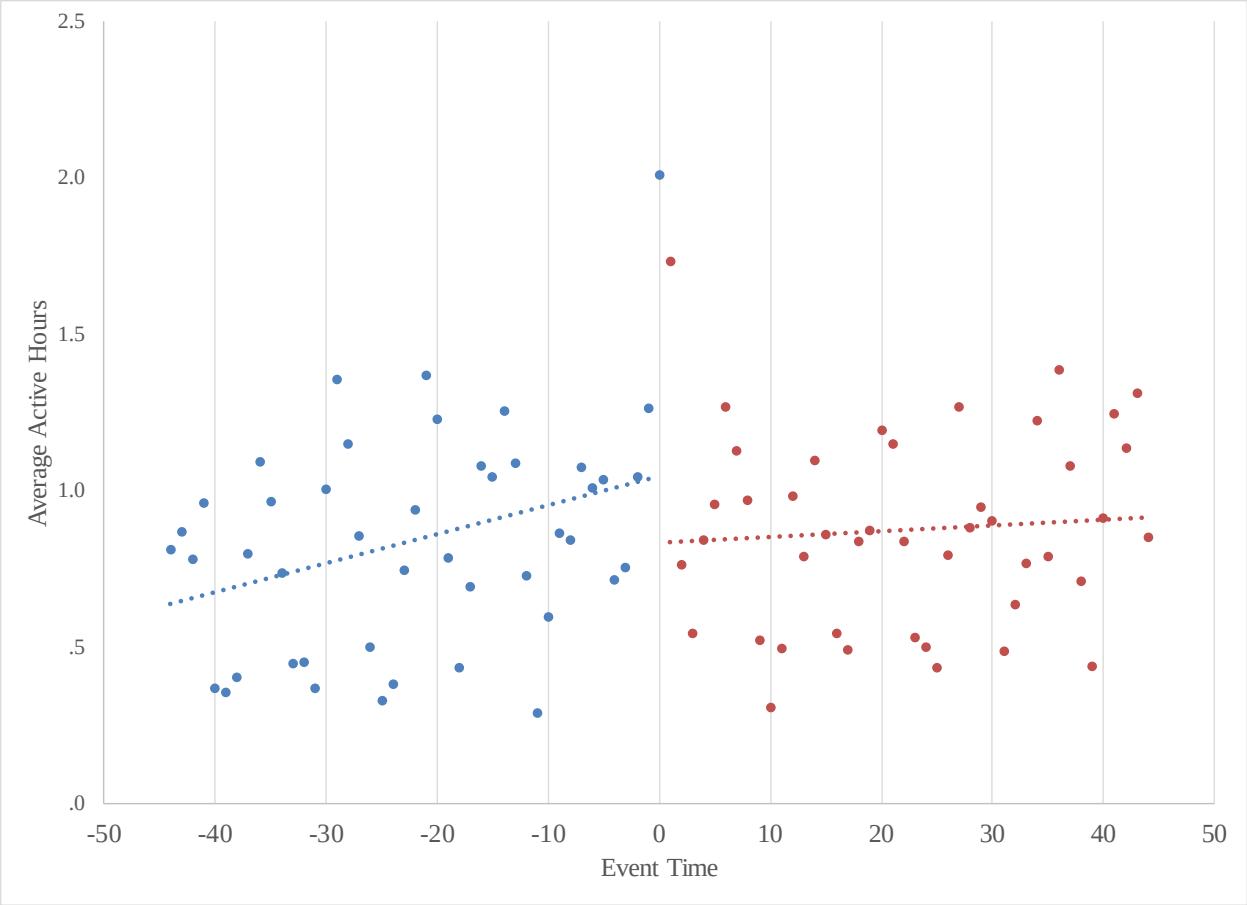
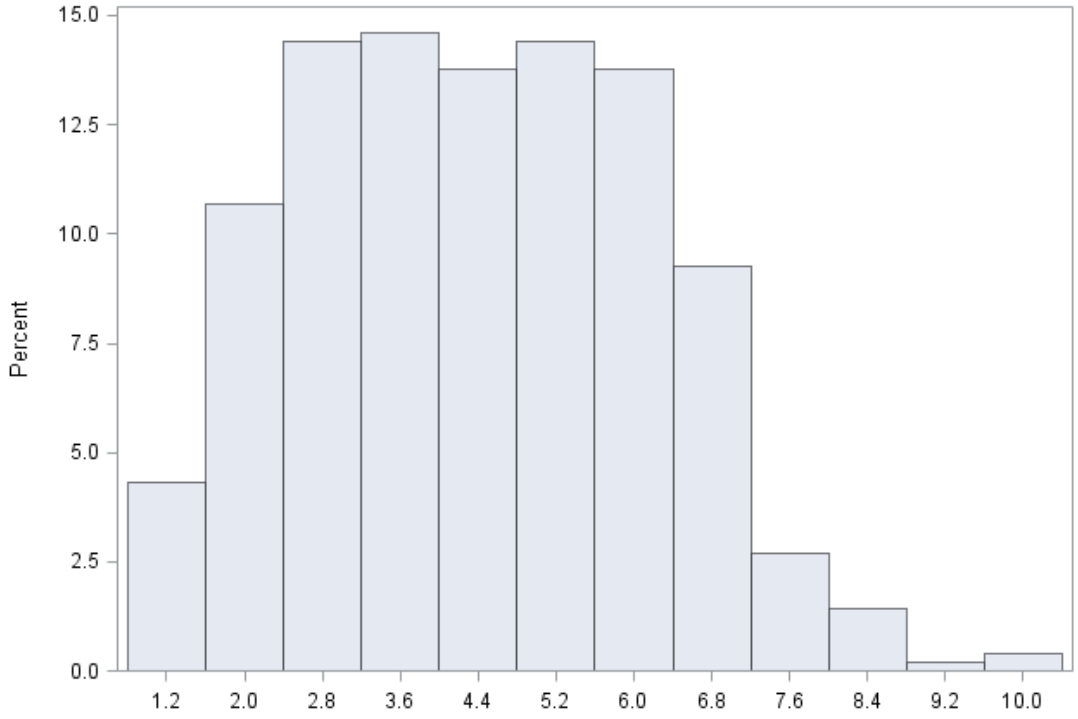


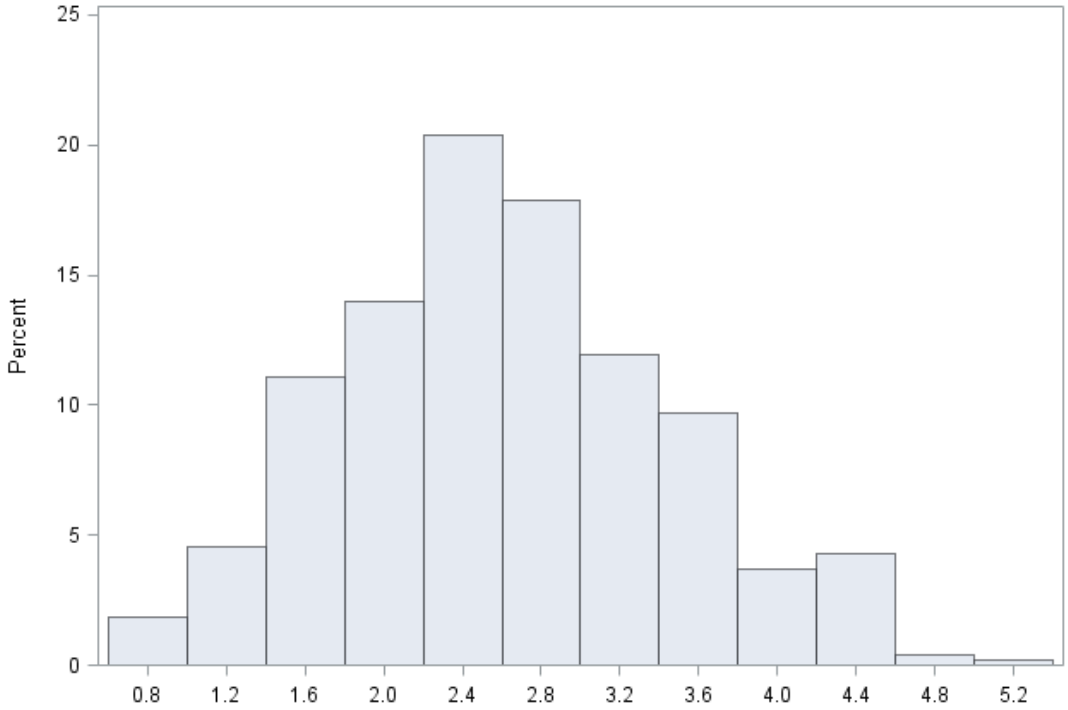
Figure 5. Effort Measure Histograms

The figure provides histograms of the effort measures *workday length (including mobile)* (Panel A), *days per week (including mobile)* (Panel B), and *length_tails_85* (Panel C), *length_50* (Panel D).

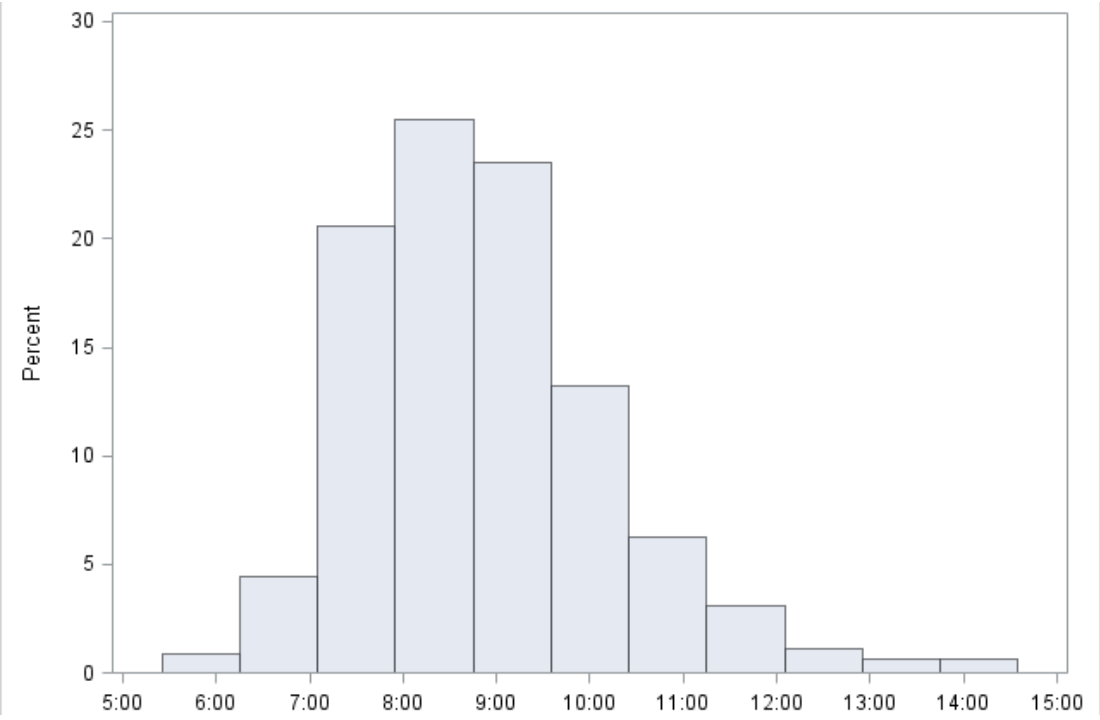
Panel 5A – Workday length (including mobile)



Panel 5B – Days Per Week (including mobile)



Panel 5C – Length (middle 85%)



Panel 5D – Length (using 50% of the maximum)

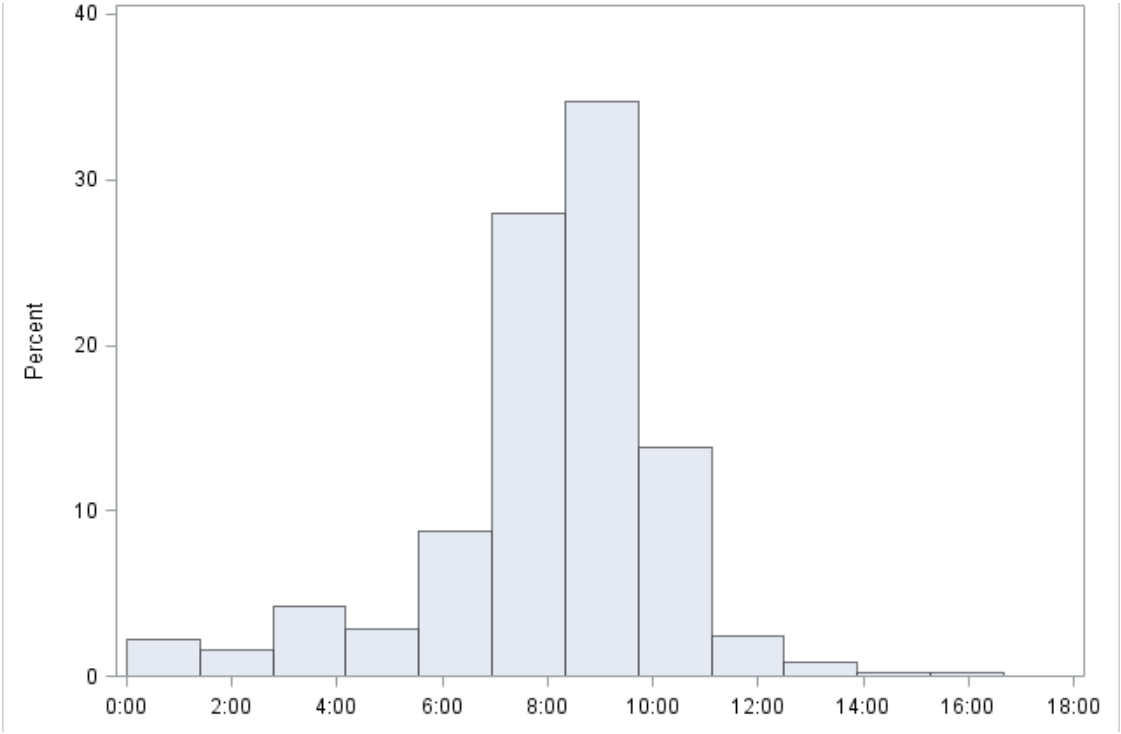
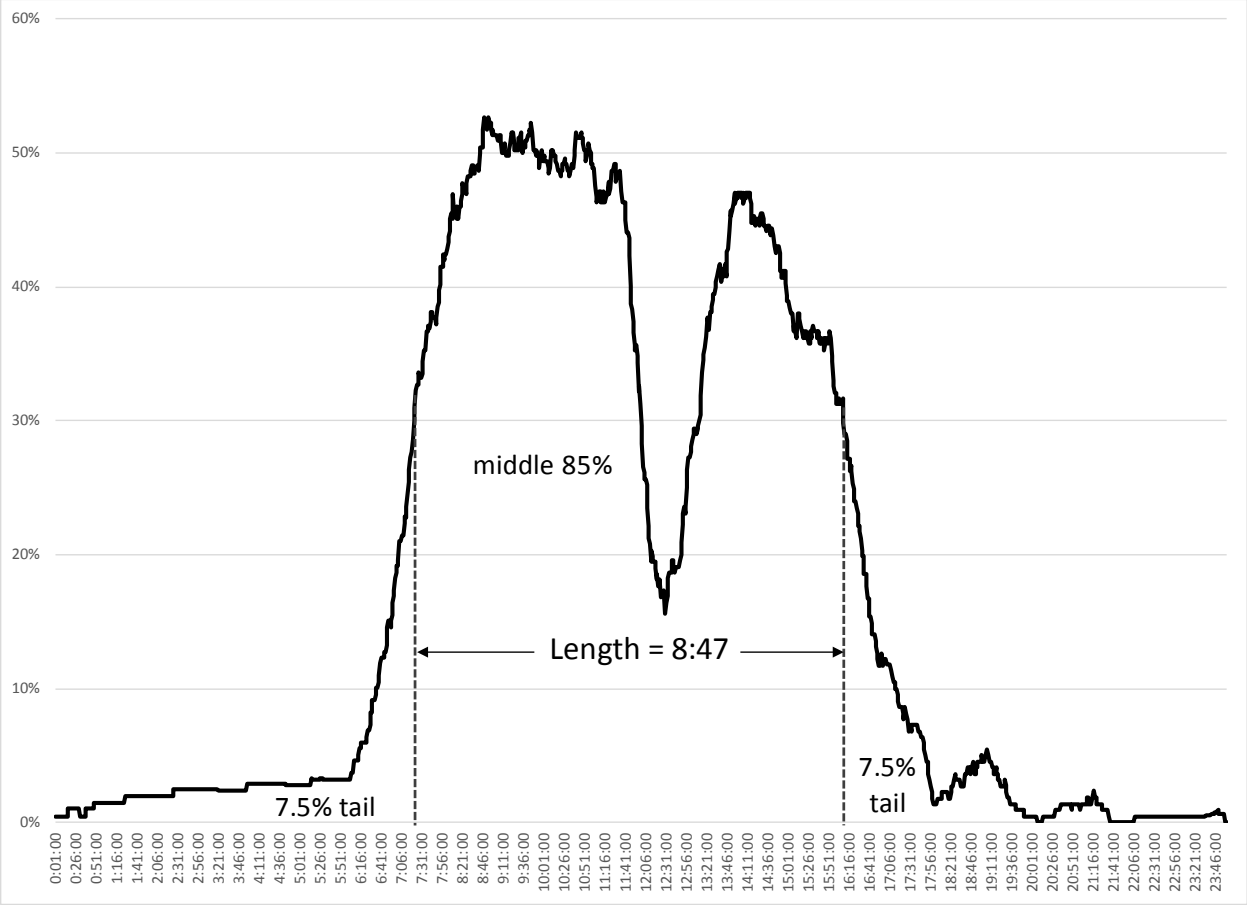


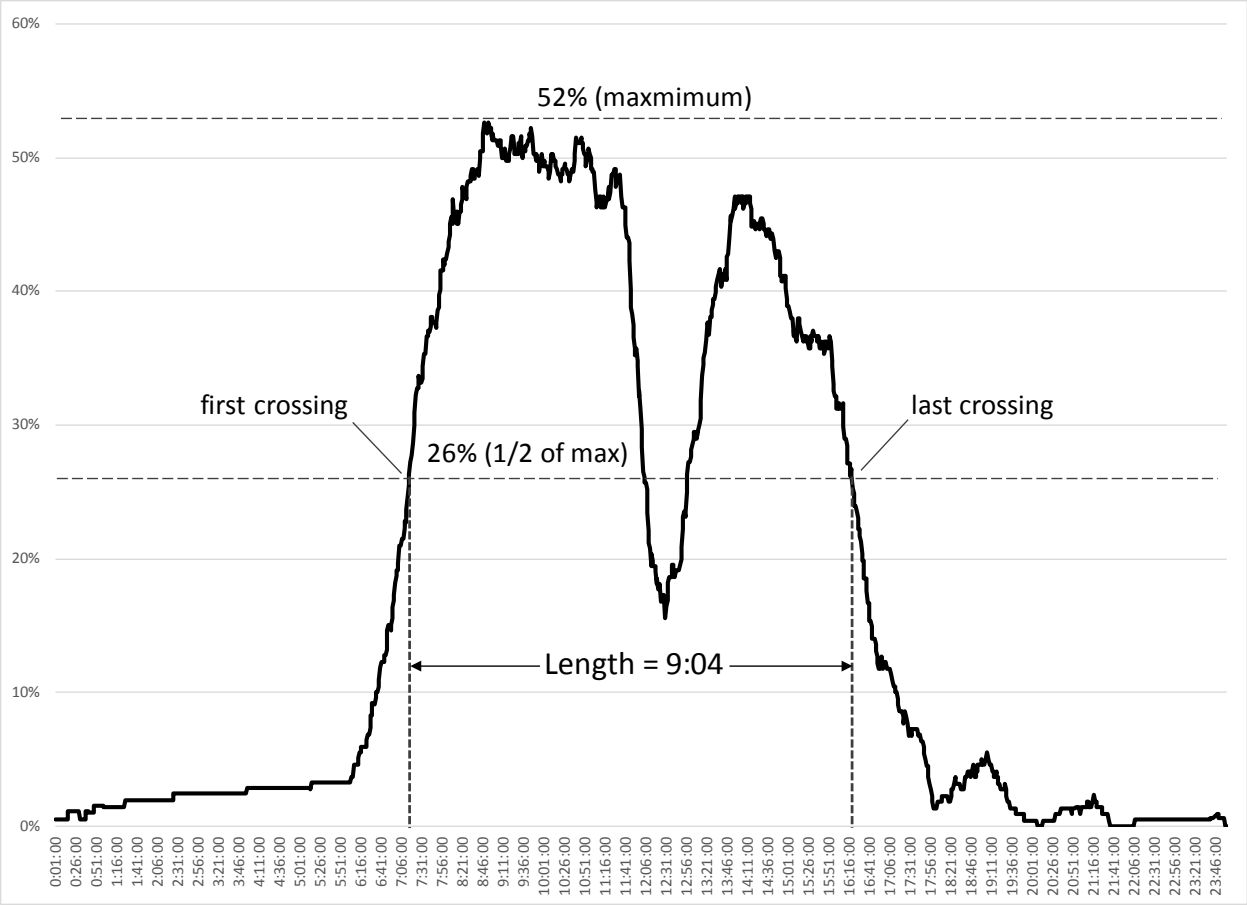
Figure 6. Activity Measures Example

The figure provides examples illustrating how the two measures are calculated for two executives in the sample. Panels A and B illustrate the measures based on the tails, and the maximum, respectively, for an executive. Panel C illustrates the two measures for a second executive. Panels D and E provide examples of annual patterns for two additional executives.

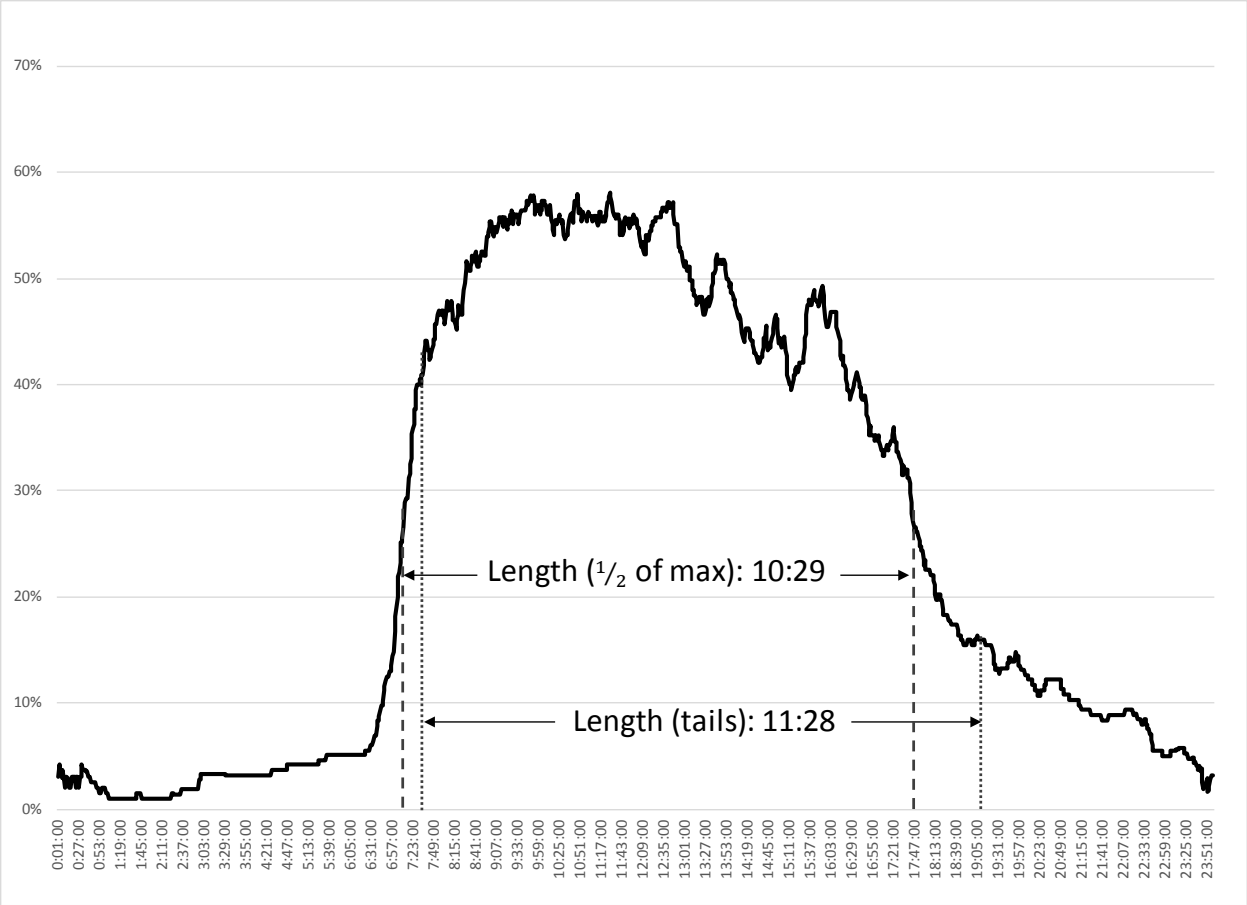
Panel 6A: Using the Tails – First Executive



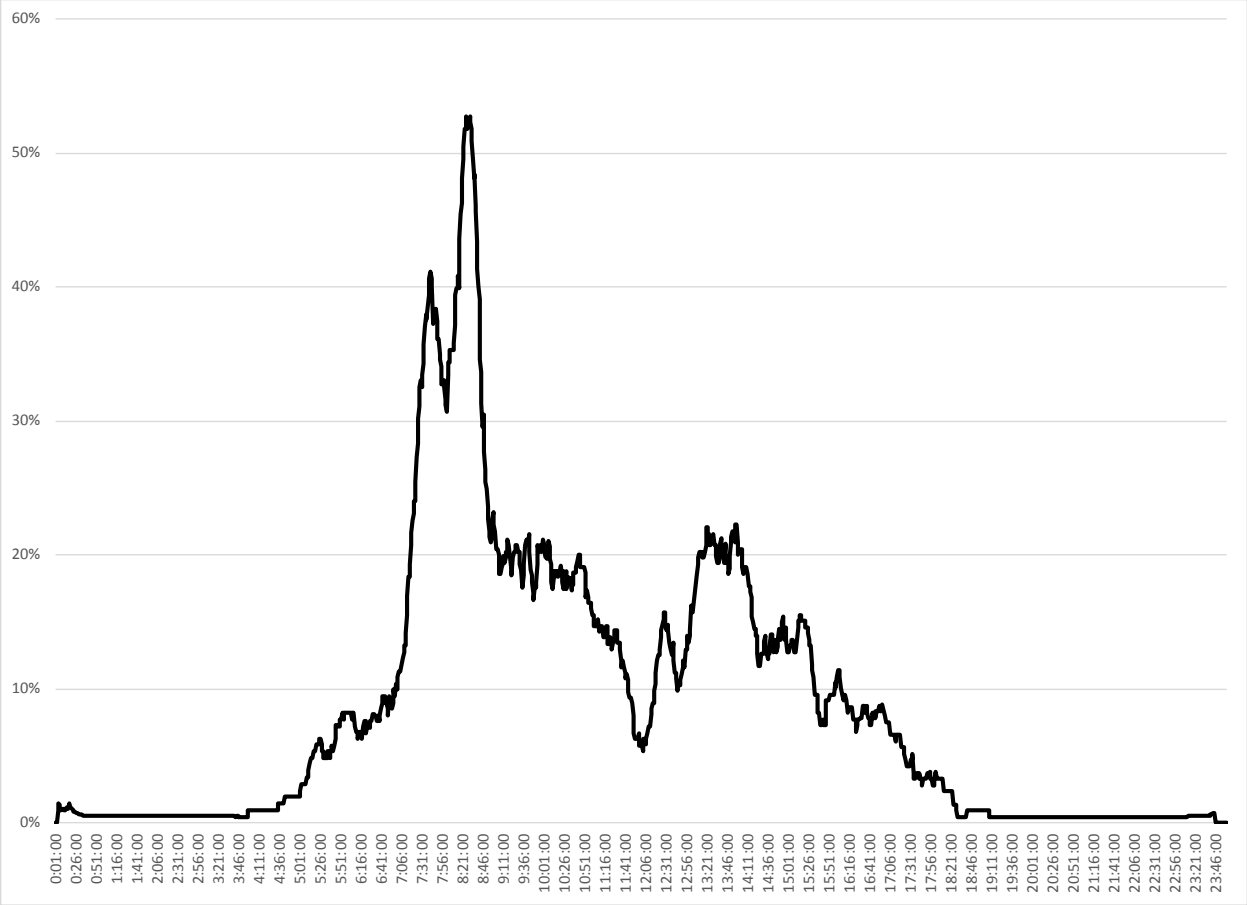
Panel 6B: Using the Maximum – First Executive



Panel 6C: Second Executive



Panel 6D: Other Executives



Panel 6E: Other Executives